A GUIDE TO READINGS AND STUDIES IN THE BRITANNICA

1913

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Title: The reader's guide to the Encyclopaedia Britannica
A handbook containing sixty-six courses of systematic study or occasional reading

Creator: Inc. Encyclopaedia Britannica

Release date: July 14, 2024 [eBook #74039]

Language: English

Original publication: London: Encyclopaedia Britannica, 1913

Other information and formats: www.gutenberg.org/ebooks/74039

Credits: Richard Tonsing and the Online

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*** START OF THE PROJECT GUTENBERG EBOOK THE READER'S GUIDE TO THE ENCYCLOPAEDIA BRITANNICA ***

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THE READER'S GUIDE

TO THE

ENCYCLOPAEDIA

BRITANNICA

A HANDBOOK CONTAINING SIXTY-SIX COURSES
OF SYSTEMATIC STUDY OR OCCASIONAL READING

THE ENCYCLOPAEDIA BRITANNICA
COMPANY, Limited
London

THE ENCYCLOPAEDIA BRITANNICA
COMPANY
New York

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INTRODUCTION

In your ordinary use of the Encyclopaedia Britannica, you give your attention to the *one* article that will answer the *one* question you have in your mind. The aim of this Guide is to enable you to use the Britannica for an altogether different purpose, namely, for systematic study or occasional reading on any subject.

The volumes of the Encyclopaedia Britannica contain forty-four million words—as much matter as 440 books of the ordinary octavo size. And the subjects treated—in other words, the whole sum of human knowledge—may be divided into 289 separate classes, each one completely covering the field of some one art, science, industry or other department of knowledge. By the mere use of scissors and paste the alphabetical arrangement of the articles could be done away with, and the Britannica could be reshaped into 289 different books containing, on the average, about half as much again as an ordinary octavo volume. It would misrepresent the Britannica to say that you would then have 289 *text-books*, because there is an essential difference in tone and purpose. A text-book is really a book intended to be used under the direction and with the assistance of a teacher, who explains it and

comments upon it. The Britannica, on the other hand, owes the position it has enjoyed since the first edition appeared in 1768 to the fact that it has succeeded, as no other book has succeeded, in teaching without the interposition of a teacher.

It is not, of course, claimed that the idea of reading certain groups of Britannica articles in the order in which they will combine themselves into complete books is a novel invention. Thousands of men owe the greater part of their educational equipment to a previous edition of the Britannica. And not only did they lay out their own courses of reading without the aid of such a Guide as this, but the material at their disposal was by no means so complete as is the 11th Edition. Every edition of the Britannica before this one, and every other book of comparable size previously published, appeared volume by volume. In the case of the last complete edition before the present, no less than 14 years elapsed between the publication of the first volume and the last. It is obvious that when editors have to deal with one volume at a time, and are unable to deal with the work as a whole, there cannot be that exact fitting of the edges of one article to the edges of another which is so conspicuously a merit of the 11th Edition. All the articles in this edition were completed before a single volume was printed, and the work stood, at one stage of its preparation, in precisely the form which, as has already been said, might be given to it by merely rearranging the articles according to their subjects.

In this Guide, the principal articles dealing with the subject of each chapter are named in the order in which you may most profitably study them, and the summaries of the larger articles afford such a preliminary survey as may assist you in making your

choice among the courses. Besides, where it seems necessary, there is added to the chapter a fairly complete list of all articles in the Britannica on the subject, so that the reader may make his study exhaustive.

A brief review of the six parts into which the Guide is divided will show the general features of its plan, of which a more detailed analysis is given in the Table of Contents.

Part 1 contains 30 chapters, each designed for readers engaged in, or preparing for, some specific occupation. To the beginner, who still has everything to learn, the advantages derived from such a course of study may well be so great as to make the difference between success and failure in life, and to those who have already overcome the first difficulties, to whom the only question is how marked a success awaits them, the Britannica can render invaluable service of another kind. No amount of technical training and of actual experience will lead a man of sound judgment to believe that he alone knows everything that all his competitors put together know; or that his knowledge and theirs is all that ever will be known. The 1500 contributors in 21 different countries who wrote the articles in the Britannica include the men who have made the latest advances in every department of knowledge, and who can forecast most authoritatively the results to be expected from the new methods which are now being experimentally applied in every field of activity. The experienced merchant, manufacturer, or engineer, or the man who is already firmly established in any other profession or business, will naturally find in some of the articles facts and figures

which are not new to him, but he can profit by the opportunity to review, confirm, reconsider and "brush up" his previous knowledge.

Part 2 contains 30 chapters, each devoted to a course of systematic study designed to supplement, or to take the place of, some part of the usual school and college curriculum. The educational articles in the Britannica are the work of 704 professors in 146 universities and colleges in 21 different countries. No institution of learning in the world has a faculty so numerous, so authoritative, or so highly specialized. Nor has any system of home study ever been devised by which the student is brought into contact with teachers so trustworthy and so stimulating. The fascination of first-hand knowledge and the pleasure of studying pages intended not for reluctant drudges submitting themselves to a routine, but for students eager to make rapid progress, are factors in the educational value of the Britannica that cannot be overestimated, and the elasticity with which any selected course of study can be enlarged and varied is in full accordance with the modern theories of higher education.

Part 3 is devoted to the interests of children. The first of its chapters describes Britannica articles of the utmost practical value to parents, dealing with the care of children's health, with their mental and bodily training, and with the intelligent direction of their pastimes. The second chapter indicates varied readings in the Britannica for children themselves, showing how their work at school can be made more interesting and profitable to them by entertaining reading on subjects allied to those included in their studies. The third chapter in this Part gives a number of specific questions such as children are prone to ask, as well as questions which may be put to them

in order to guide their natural inquisitiveness to good purpose. The references to pages in the Britannica show where these questions are clearly and instructively answered.

Part 4 suggests readings on questions of the day which relate to American citizenship and to current politics. A study of the articles indicated in this section of the Guide will aid the reader not only to form sound opinions for himself, but also to exercise in private or public life the influence for good which arises from a clear view of the arguments on both sides of controverted questions. It is no exaggeration to say that the Britannica is the only existing work in which such subjects as tariffs, trusts, immigration, labour and the relation between legislative and judiciary powers are treated without partisan bias and with adequate fulness.

Part 5, especially for women, deals with their legal and political status in various parts of the world, their achievements in scholarship, art and science, as well as with home-making, domestic science and kindred subjects. The important part which women, both among the contributors and on the editorial staff of the Britannica, took in the preparation of the work sufficiently indicates that the editor-in-chief made ample provision for the subjects peculiarly within their sphere.

Part 6 is an analysis of the many departments of the Britannica which relate to recreation and vacations, travel at home and abroad, photography, motoring, out-door and indoor games and other forms of relaxation and of exercise. The extent to which the work can be used in planning motoring tours, and the superiority, in such a connection, of its articles to the scant information found in ordinary guide books, are shown in the extracts, included in

this Part 6, relating to a trip from New York through the Berkshire Hills to the White Mountains.

It will be seen from this brief survey of the field covered by the Guide that provision has been made for every purpose which can dictate the choice of a course of reading. But as you proceed to examine its contents for yourself, you should remember that the lists it gives name only a fraction of the articles in the Britannica, and that for a fuller summary of the work as a whole you should turn to the Table on pp. 881–947 of Vol. 29.

Finally, the form in which this Guide is printed may call for a word of justification. It is inevitable that chapters, of an analytical character, bespattered with references to the numbers of volumes and of pages, and terminating with lists of the titles of articles, should bear a certain air of formality. There is no danger that the possessor of the Britannica, familiar with the fascination of its pages and the beauty of the illustrations which enhance their charm would permit his impression of the work itself to be affected by the bleak appearance of the Guide. But he may feel that because a list has a forbidding aspect the pleasure he has derived from browsing at will in the Britannica would give place to a sense of constraint if he rigidly pursued a course of reading. It may easily be shown that such a fear would be groundless, for the Britannica articles are all the better reading when one carries forward the interest which one of them has excited to others of related attraction. But to anyone who is firmly determined that he shall not be persuaded to read systematically, the Guide will none the less be useful, for he may flit from one chapter to another, selecting here and there

an article merely because the account which is given of it pleases him. Or, better yet, he may find, in one portion only of a selected course, a series of only three or four articles which will, in combination, make the best of occasional reading.

THE EDITORS.

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Part I
Courses of Reading Especially Useful to Those Engaged In Certain Occupations or Preparing for Them

CHAPTER I
FOR FARMERS

SEE ALSO CHAPTER II, FOR STOCK-RAISERS, CHAPTER III, FOR DAIRY FARMERS

Every farmer in the United States knows that farming is to-day an industry which calls for study of the world's agricultural products, processes, and markets as well as for scientific knowledge of soils, crops, and animals. Fifty years ago the farmer sold for consumption in his immediate neighborhood the small surplus of his crops that was not needed for his own household and live stock. To-day he competes, in all the world's great markets, with all the world's farmers, and is the chief among American exporters. The Russian wheat fields and the Argentine cattle ranches are really nearer to him than a farm in the

next township was to his grandfather. He lives better, does more for his children and pays higher wages than do farmers in other parts of the world, and yet he can successfully compete with them, because, as the article on Agriculture in the Encyclopædia Britannica says, in speaking of the United States, "there is no other considerable country where as much mental activity and alertness has been applied to the cultivation of the soil as to trade and manufactures." American farmers "have been the same kind of men, out of precisely the same houses, generally with the same training, as those who filled the learned professions or who were engaged in manufacturing or commercial pursuits"; and their competitors abroad have been, for the most part, ignorant peasants. The course of reading indicated here is designed for wide-awake farmers who intend to be large farmers—by whom the latest information and the broadest outlook are recognized as essential to their calling. *If you think the articles named here cover a great deal of ground, remember that the Massachusetts Agricultural College provides no less than sixty-four distinct courses of instruction, and that the subjects included in all the sixty-four are treated in the Britannica.*

GETTING "GROUNDWORK" KNOWLEDGE

You may think, as you look at the titles of articles mentioned in these pages, that there are some which you need not read because you have already read bulletins of the United States Department of Agriculture or of your State Experiment Station. These official publications are most valuable, but naturally, they do not attempt to cover the whole

range of agricultural subjects as the Britannica does —they are not intended for that purpose. Their arrangement and the way in which they are issued shows that they are designed to meet only certain special needs, not to give a general view of all the branches of farming. One subject may for example be discussed in three different bulletins, published in three different years, and the first may be out of print before the third appears. In the Britannica you get information that forms the very foundation of a thorough knowledge of farming and that also extends over the widest field. Of course it would be absurd to say that merely reading these articles will make any man a successful farmer as to say that a medical student who works hard at his books will always develop the tact and the sound judgment that a doctor needs. But unless the medical student has studied those text books he will never make a successful doctor; and similarly the information in the Britannica will give the farmer new advantages, no matter how much practical experience and special training he has had.

Scope of the Articles

There are in the Encyclopædia Britannica 1,186 articles dealing with animal and vegetable life; and among the 11,341 geographical articles a great many give important information about the production, distribution and consumption of farm products. Those upon continents, countries, states and provinces describe the local crops and any local methods of farming that are of special interest. *There are some 600 articles on individual plants*, of which a list will be found on pp. 889 and 890 of Vol. 29 (the index volume). If any one of these thousands of

articles were not in the Britannica, it would not be quite so valuable as it is to you, for you may, any day, want to find out about any plant that grows, or about farming in any part of the world. A professor in an agricultural college would of course be glad to study the whole series. But in this Course of Reading only the articles which are of most immediate use to all practical farmers are mentioned, and the contents of each of these is described, so that you can omit any article that goes into details which you think you do not want. If you do skip any of them, it will, however, be a good plan to mark their titles in this list, for you may like to come back to them later when you realize how practical and understandable all the Britannica articles are—even those with dullsounding names.

Of course you will begin by reading the article AGRICULTURE (Vol. 1, p. 338), by Dr. Fream and Roland Truslove, which is the key to the whole subject. And remember that this chapter of the Readers' Guide *mentions only those subjects that are treated more fully in other parts of the Britannica than in that article*, so that the chapter does not attempt to tell the whole story.

Soil and Subsoil

The first thing a farmer has to deal with is the ground from which his crops are to come. The whole surface of the earth was originally hard rock. The article on PETROLOGY, the science of rocks (Vol. 21, p. 323), by J. S. Flett, and the second part (Vol. 11, p. 659) of the article GEOLOGY, by Sir Archibald Geikie, deal with the "weathering" of rock, which has in great part broken it down into the small particles of stone that, mixed with decayed roots and plants, form the soil or subsoil. It may seem that it is

going very far back into the origin of things for a farmer to read about the sources from which soil comes, but the nature of the mineral substances in it has a great deal to do with its power to nourish plants, and you cannot know too much about the material on which your principal work is done. The article which should next be read, SOIL (Vol. 25, p. 345), continues the story of these particles of rock and shows how sand and clay must be combined with decaying vegetable or animal matter in order to make the best soil. This mixture is in turn "weathered" by air, heat, frost, and moisture; and not only the size of the grains in which it lies, but also their shape—which makes them pack more or less tightly—affect the pores, or spaces between the grains, through which the roots of the plants must push their way, and through which air and water must reach these roots. The article EARTHWORM (Vol. 8, p. 825) describes the useful part that worms play in stirring the mixture, while the natural and artificial fertilizers, which supply whatever ingredients the soil lacks, are discussed in the article MANURES AND MANURING (Vol. 17, p. 610). An important part of this article deals with the best methods of keeping farm yard manure in such a way that it does not lose its value before it is spread over the fields, and with the use, in this connection, of the liquid-manure tank. The microbes in the soil render the farmer an enormous service by changing crude nitrogen, which plants cannot digest, into the forms in which it is indispensable to them, and this process is described in the article BACTERIOLOGY (Vol. 3, p. 164), by Professor Marshall Ward, Professor Blackman, and Professor Muir.

Sunlight and Shade, Heat and

Cold, Water Enough—and Not too Much

The action of light, the supply of which is just as necessary in causing growth as the warmth the sun gives, and the action of water and of heat and cold, are explained in the section “Physiology” (Vol. 21, p. 745) of the article on PLANTS. The proper method of working each farm, with a view to using these four in the right proportions, is influenced by the latitude in which it lies, its height above sea level, the protection that mountains give it, the slope at which the fields face the sun or turn away from it, the rainfall, the relative dampness or dryness of the air when it is not raining, and the moisture of the soil. Every one of these subjects is vital to the farmer, and the Britannica brings to its readers the latest information regarding them in articles written by the leaders of progress. You will find the latest scientific guidance, in the most practical shape, in the articles CLIMATE (Vol. 6, p. 509), by Professor R. de C. Ward, of Harvard, METEOROLOGY (Vol. 18, p. 264), by Professor Cleveland Abbe, of the United States Weather Bureau, and ACCLIMATIZATION (Vol. 1, p. 114). The distribution of heat in the soil is described in the article CONDUCTION OF HEAT (Vol. 6, p. 893), where the diagram showing variations of temperature at different depths in the soil should be carefully studied.

Drainage and Irrigation

The brackish water that troubles farmers near tidal creeks, the alkali water that often occurs West of the Mississippi, and the stagnant water that never does the farm any good, are all as bad in their way as the

river-floods or the merely sodden soil in which nothing will grow but coarse grass that is always unsafe pasturage. Drains and embankments need very careful planning, and sound information will be found in the articles DRAINAGE OF LAND (Vol. 8, p. 471), RECLAMATION OF LAND (Vol. 22, p. 954), and RIVER ENGINEERING (Vol. 23, p. 374), the latter by Professor L. F. Vernon H. Harcourt, the leading authority on such subjects the world over.

The saving of water and the method of bringing it to the farm and distributing it over the fields are authoritatively discussed in the articles IRRIGATION (Vol. 14, p. 841), WATER SUPPLY (Vol. 28, p. 387), by G. F. Deacon, WINDMILL (Vol. 28, p. 710), PUMP (Vol. 22, p. 645), and in the section headed "Utility of Forests" (Vol. 10, p. 646) of the article FORESTS AND FORESTRY, by Gifford Pinchot, formerly U. S. Chief Forester. The other parts of this article, dealing with the timber industry, are of course important to farmers whose land includes any lumber. WATER RIGHTS (Vol. 28, p. 385) explains the laws which regulate the taking of water from streams and lakes, and the article LAKE (Vol. 16, p. 86) is also of interest in connection with irrigation.

Farm Buildings and Fences

When the farmer, who has to be everything by turns, has been an engineer long enough to get the water off his farm or on his farm—and perhaps he has to do both in different parts of the same farm—he must next take on the builder's job. He will be reminded of a good many precautions and economies that are often overlooked, and may find, too, some hints that are quite new to him, in the excellent series of articles, all by experts in the building trade:

FARM BUILDINGS (Vol. 10, p. 180), BUILDING (Vol. 4, p. 762), FOUNDATIONS (Vol. 10, p. 738), BRICKWORK (Vol. 4, p. 521), STONE (Vol. 25, p. 958), MASONRY (Vol. 17, p. 841), TIMBER (Vol. 26, p. 978), CARPENTRY (Vol. 5, p. 386), and ROOFS (Vol. 23, p. 697). The use of concrete for buildings, tanks, irrigation works, etc., has proved so successful, and is so rapidly increasing, that you will be especially interested by the article CONCRETE (Vol. 6, p. 835). BARBED WIRE (Vol. 3, p. 384), in which the meshed field fencing, of late increasing in favor, is also dealt with, is another practical article.

Agricultural Machines

Advertisers no doubt supply you with more literature about farm machinery than you find time to read, but that makes it all the more essential to get sound information that has no trade bias. The Britannica goes into the principles of construction and helps you to see the good and bad points in the new models you are constantly offered. You can learn a great deal from the articles PLOUGH (Vol. 21, p. 850), HARROW (Vol. 13, p. 27), CULTIVATOR (Vol. 7, p. 618), HOE (Vol. 13, p. 559), and the sections on machines in the articles HAY (Vol. 13, p. 106), REAPING (Vol. 22, p. 944), SOWING (Vol. 25, p. 523) and THRASHING (Vol. 26, p. 887). OIL ENGINE (Vol. 20, p. 35), WATER MOTORS (Vol. 28, p. 382) and TRACTION (Vol. 27, p. 118) are also of importance.

Farm horses and the other live-stock required in general farming fall under Chapter II of this Guide.

Farm Finance

You cannot read the articles already mentioned, and consider all that has to be done in merely getting a farm ready to be worked, without realizing how

grossly unfair it is that the American farmer should be hampered, as he is, by the want of proper banking facilities when he is making a start. And after he has bought and prepared his land and equipped and stocked his farm he needs, each year, money to finance his crops. For any loan used in the purchase of land and in permanent improvements such as buildings, drainage, irrigation, a mortgage is the natural security; but the short-term farm mortgages —five years at most—customary in the United States, do not give the farmer as much time as he needs for repayment, no matter how successful he may be. The average farm offers quite as good a certainty of continued earning power as does the average railroad, and farm mortgages should be—in fairness —regarded not as opportunities for short loans, but as sound standing investments, just as suitable as railroad bonds for conservative investors. The farmer's position is even worse when he needs a short loan that he will be able to repay as soon as his crops have been sold, for he is then expected either to give a mortgage as security or to pay exorbitant interest.

Notwithstanding the prosperous conditions of farming in the United States, the country as a whole produces only half as much grain for every acre of farm land as is produced in Europe, and the only reason is that most of our farmers lack the capital needed in order to get the fullest yield from their land. In the chief European countries, the system of banking facilities for farmers, described in the article CO-OPERATION (Vol. 7, p. 86), by Aneurin Williams, shows what can be done, and sooner or later will be done, in the United States. This article fully describes the admirable Raiffeisen banks in Germany, which are based upon the idea that a society of farmers

(restricted to the neighborhood, so that each member's honesty and capability are known to the other members) make themselves jointly responsible for loans to the members. A promissory note is the only security required. The French, Italian, Austrian, and other systems are also discussed in the Britannica, but the German plan is that which offers the best example to America.

Plants and Crops

This course of reading has now covered the conditions and the material required for farming, and it is time to get down to something that *grows*. In the old books everything about the life of a plant was treated as a part of the science of botany, and if you remember the botany you were taught at school, you remember a string of long names and very little else. There is of course an article on botany in the Britannica, but it deals chiefly with the history of botanical science, and the life of the plant is treated under another heading, and in a novel, interesting, and practical way. The article PLANTS (Vol. 21, p. 728) is indeed one of the most important and unusual in the Encyclopædia, giving the results of recent investigation which you could not find in any other book. It is written by eight contributors, all men who have done a great deal of original work. The section on classes of plants is by Dr. Rendle, that on the anatomy of plants by A. G. Tansley, that on the healthy life of plants by Professor J. Reynolds Green, that on their diseases by Professor H. Marshall Ward, that on the relation between plants and their surroundings by Dr. C. E. Moss, that on plant cells by Harold Wager, that on the forms and organs of plants by Professor S. H. Vines, and that on the distribution of plants in various parts of the

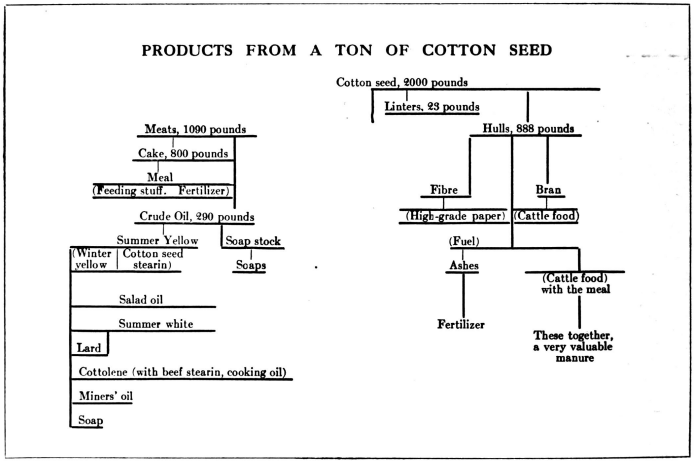
world by Sir. W. Thiselton-Dyer. Special accounts of the chief parts of the plant are given in the articles LEAF (Vol. 16, p. 322), STEM (Vol. 25, p. 875), and ROOT (Vol. 23, p. 712). The success of artificial fertilization or impregnation is explained (Vol. 13, p. 744) in the article HORTICULTURE.

Apart from the diseases described in the section, already mentioned, of the article PLANTS, the greatest danger to which crops are exposed is that of insect pests, and the special article ECONOMIC ENTOMOLOGY, dealing with them (Vol. 8, p. 896), gives a full account of each of the remedies that have proved useful. The cotton boll weevil is the subject of a most interesting section of the article COTTON (Vol. 7, p. 261). Separate articles are devoted to individual pests, such as LOCUST (Vol. 16, p. 857), and—turning to a larger enemy—RABBIT (Vol. 22, p. 767). There is no bird that troubles the farmer, or helps him by killing insects, upon which there is not an article, for more than 200 distinct bird articles are listed under the heading “Birds” on p. 891 of Vol. 29 (the index volume), in addition to the information in the article BIRD (Vol. 3, p. 959), and the article on families of birds (Vol. 20, p. 299).

The crops of all climates are treated in general in the article AGRICULTURE, and in particular under their individual names, all of which are so familiar, and indeed so fully listed on p. 889 of Vol. 29 (the index volume), that they need not be repeated here. Naturally you will include in this course of reading the crops with which you are personally concerned, and in any case you ought to read GRASS AND GRASSLAND (Vol. 12, p. 367), and GRASSES (Vol. 12, p. 369).

Wheat

The article WHEAT (Vol. 28, p. 576) deals with one of the chief products of "the greatest cereal producing region of the world." It begins the story of a wheat crop with the burning of the old straw of the previous year, then takes up ploughing, harrowing, seeding, thrashing, labor in connection with all these operations, and transportation and marketing. At this point, the article FLOUR AND FLOUR MANUFACTURE (Vol. 10, p. 548), by G. F. Zimmer, takes up the later history of wheat. It may surprise you to learn from the Britannica that wheat first found its way to America through a few grains being accidentally mixed with some rice. BARLEY (Vol. 3, p. 405) is an interesting article on the grain that is the oldest cereal food of the human race, and that is also remarkable for its power to grow over a greater range of latitude than any other grain. COTTON (Vol. 7, p. 256), by Professor Chapman, is an article of which the vast importance may be judged by the following table taken from page 261:



Every one of the other cereal and general crops produced in any part of the world is treated in the Britannica with the same fullness of information and with the same practical detail which characterizes these articles on wheat, barley and cotton.

Some of the principal articles on the routine of farming such as sowing, reaping, and the like, have already been mentioned in connection with agricultural machinery. The articles on individual countries contain sections on the crops of each of them, and you will find CANADA (Vol. 5, p. 152), and GERMANY (Vol. 11, p. 810), of special interest. The special features of tropical farming are described in the articles on tropical crops.

Fruit and Flower Growing

The article FRUIT AND FLOWER FARMING (Vol. 11, p. 260) covers fruit culture in general, and, in the section of it which deals with the United States (Vol. 11, p. 268), the American fruit crops. This section describes the wonderful development of the fruit industry since cold transportation and cold storage enabled consumers in every part of the country, and in Europe as well, to purchase fruit grown in whatever state most advantageously produces any one variety. You should select, from the twenty separate articles on individual fruits, not only those on the varieties which you are already growing, but those on any others that are possible in the part of the country where your land lies. The section on fruit in the article on HORTICULTURE (Vol. 13, p. 775) is devoted to growing on a smaller scale, in gardens. It contains (Vol. 13, p. 780) a practical calendar to show each month's work.

Flower culture is the subject of special sections in

both the articles above named and there is a descriptive list (Vol. 13, p. 766) of more than three hundred hardy annuals, biennials, and perennials, full of practical information. The calendar already mentioned indicates the dates for indoor and outdoor operations. From the many articles on individual flower plants listed at the end of Part 3 of this chapter you can make your own choice.

Poultry and Bees

Poultry and their rearing are dealt with in the articles POULTRY AND POULTRY FARMING (Vol. 22, p. 213), FOWL (Vol. 10, p. 760), TURKEY (Vol. 27, p. 467), GUINEA FOWL (Vol. 12, p. 697), DUCK (Vol. 8, p. 630), GOOSE (Vol. 12, p. 241), and INCUBATION and INCUBATORS (Vol. 14, p. 359). Bee-keeping and the honey industry are treated in the articles BEE (Vol. 3, p. 625) and HONEY (Vol. 13, p. 653). Truck farming is treated in the section dealing with vegetables (Vol. 13, p. 776), of the article HORTICULTURE. Apart from the law as to water rights already mentioned the legal doctrine most particularly affecting farmers is that of EMBLEMENTS (Vol. 9, p. 308). GRAIN TRADE (Vol. 12, p. 322), and GRANARIES (Vol. 12, p. 336), the latter describing the latest type of grain elevators, are articles of great interest to farmers who specialize in cereal crops.

The new system of purchase of grain by the government, which is working admirably in Western Canada, protects the farmer against the speculators who buy standing crops for less than a fair price, and it is to be hoped that some similar plan may be adopted in the United States.

ECONOMICS (Vol. 8, p. 899), by Professor Hewins, CO-OPERATION (Vol. 7, p. 82), and TARIFF (Vol. 26, p. 422), deal with topics related to the marketing of

all agricultural products. The articles on learned societies have an extensive section (Vol. 25, p. 317) on the agricultural societies of all countries.

The History of Farming

Agricultural history is, naturally, based upon the history of vegetable life, and the fossil plants described in the article PALÆOBOTANY (Vol. 20, p. 524), long as their appearance preceded that of man, greatly affected the nature of the earth's crust which he was to occupy.

The earliest of all known writings, the Code of Khammurabi, described in the article on Babylonian Law, shows (Vol. 3, p. 117) that agriculture was the subject of careful legislation under the oldest government of which a contemporary record has survived; and the provisions as to the working of land on the "metayer" system, under which the landowner received from the landholder a share of the crops, and as to irrigation, are most explicit and practical. Ancient Egyptian implements of agriculture are fully described (Vol. 9, p. 69) in the article EGYPT, and pictures of them appear on page 72 of the same volume. If the ancient history of farming interests you, it is only necessary for you to turn to the heading "Agriculture," in the Index (Vol. 29), where you will find references to a number of other articles on the early civilizations.

From these articles, as from the historical section of the guiding article AGRICULTURE, and the passages relating to agriculture in many of the 6,292 articles on the histories of races and countries, the reader may learn that agriculture has been the key to all history. The earliest migrations of the human race, as definitely as the comparatively recent

development of America, Australasia and the interior of Africa, were based upon an agricultural impetus. And his reading upon other subjects in the Encyclopædia Britannica will often remind him that the wool and cotton and linen and leather that we wear, the carpets and blankets and sheets in our houses, all originated in farming of one kind or another; while every food that nourishes us, save fish and game, is directly an agricultural product. All the bustle of the great cities, all the wheels that turn in the mills, all the intricate mechanism of industry and commerce, all the world's work and thought and happiness, depend upon the mysterious and inimitable processes by which the brown soil yields green growth. For all the progress science has made, we are no nearer to replacing these processes by any short cut of chemistry than were the first farmers whose husbandry is recorded in history. If all the little roots ceased for one year to do their work in the dark, the human race would hopelessly starve to death.

The alphabetical list of articles at the end of Chapter III of this Guide will make it easy for you to add to this course of reading, choosing for yourself the line that will be most attractive to you. In making your choice, do not forget that plant-life is a subject you cannot study too closely. No matter what crop you make your specialty, you have to *educate* the plants that produce it to do their work, just as carefully as a teacher trains children. Another fact to keep in mind is that just as a doctor is dealing with organs in the human body which he cannot see, so you are particularly concerned with the roots down in the soil, and the more you know about the way they eat and drink, the better for your farm.

The names of many of the writers of these articles

are given in the table of the 1,500 Contributors to the Britannica, beginning at page 949 of Vol. 29 (the index volume); a glance will show you what authoritative positions they occupy and how thoroughly they command your confidence.

[*See list of articles on subjects connected with farming, at the end of Chapter III of this Guide.*]

CHAPTER II
FOR STOCK-RAISERS

Stock-raising in the United States was, until quite recent years, under the evil influence of the careless methods which had been handed down from the old days of the range-cattle industry. Chicago men still tell the story of the Chicago banker, afterwards Secretary of the Treasury, who declared, in reply to a request for a loan on the security of range-cattle, that he "would as soon lend money on a shoal of mackerel in the Atlantic Ocean." The vague possession and the vague methods of breeding and marketing which suggested this comparison did not form the habits of close observation and incessant care which became necessary when land and food began to cost money. The lesson has been learned, and the present conditions of the industry are infinitely better for the country at large. It has been proved that fattening as well as breeding can be successfully undertaken in almost every part of the United States. Even in the North West, the tendency to-day is to turn from exclusive grain growing to a combination of cropping and feeding. Cattle, and

also work horses of the right type, for which the demand is always greater than the supply, are yielding fair profits on many of the New England farms which had been neglected for years.

Staying on the Land

One of the most encouraging features of the present situation is that the broader distribution of the live-stock industry encourages farm-bred boys to remain at home. It has long been a popular belief that the attraction of the cities lies largely in the facilities for amusement which they offer; but the best class of young men who have left the farms have done so because they did not believe that plowing and sowing and reaping gave enough scope for their intelligence and their initiative. When stock-raising is combined with tillage, there is not only a greater interest in farm life and a greater chance to make general knowledge effective, but there are also better opportunities for a young man to make a small venture of his own while he is still a farm hand. It is certainly true that stock-raising needs the young man who is determined to know something about everything and all there is to know about one thing. To him the articles in the Britannica which are indicated in this chapter should be of the greatest value, for they cover a broad range, and they are written by specialists of the highest authority. They do not profess to teach what can only be learnt in the course of practical experience, but they will make each day's work more interesting and more effective.

Cattle

You cannot do better than to begin your reading with the article (Vol. 4, p. 337) on the family of animals to which cattle belong, a family so varied

that it includes so small a creature as the hare, and so large a one as the rhinoceros. The article CATTLE (Vol. 5, p. 359), by Professor Wallace and Dr. Fream, begins by reminding you that the idea of cattle owning has always been so closely associated with the idea of wealth that the two words “capital” and “cattle” have the same root, and that our word “pecuniary” is taken from the Latin term for cattle. This article, illustrated with photographs of the best specimens of bulls and cows of different breeds, deals with Shorthorns, Herefords, Devons, Holsteins, Dutch Belteds, Sussexes, Longhorns, Aberdeen-Angus, Red Polleds, Galloways, Highlands, Kerry’s, Dexters, Jerseys and Guernseys, and has a section on the rearing of calves. OX (Vol. 20, p. 398) is chiefly about the origin of domestic cattle. AGRICULTURE (Vol. 1, p. 388) contains information of a more general kind as to practical stock-raising. The best methods of mating are described fully in BREEDS and BREEDING (Vol. 4, p. 487), VARIATION and SELECTION (Vol. 27, p. 906), and HEREDITY (Vol. 13, p. 350), by Dr. Chalmers Mitchell. MENDELISM (Vol. 18, p. 115) will tell you all about the theory which is nowadays the great subject of discussion among experts in breeding. EMBRYOLOGY (Vol. 9, p. 314), by Dr. Hans Driesch, and REPRODUCTION (Vol. 23, p. 116), by Professor Vines, contain the results of the latest investigations, and the article SEX (Vol. 24, p. 747) describes the recent experiments undertaken with the hope that breeders may at some future time be enabled to vary at will the proportion of males and females. TELEGONY (Vol. 26, p. 509) gives you the evidence for and against the belief that offspring are influenced by a previous mate of the dam. FOOD PRESERVATION (Vol. 10, p. 612) and REFRIGERATING (Vol. 23, p. 30) cover the cold shipping and cold

storage of beef. LEATHER (Vol. 16, p. 330), by Dr. J. G. Parker, one of the foremost technical experts on this subject, follows hides through the market to their final distribution and industrial uses.

Horses and Mules

Notwithstanding the harm that trolley cars and automobiles and mechanically propelled agricultural machines have done to important branches of the horse business, and notwithstanding the competition which American exporters find in Europe from the Argentine ranches, there is still an active market for farm horses and for stock suited to trucking and light delivery work in cities. You no doubt find, in whatever part of the United States your interests lie, that you need to watch the market very closely, and that you must always be ready to change your plans at short notice. But it is to the quick-witted man who is always prepared to vary his methods that the Britannica offers the greatest practical services. The article on the horse family in general (Vol. 9, p. 720) is very interesting, but you will give more time to the elaborate article HORSE (Vol. 13, p. 712), by Richard Lyddeker, E. D. Brickwood, Sir William Flower, and Professor Wallace. The illustrations are unusually valuable, for instead of following the usual custom of making all the photographs the same size, the Editors of the Britannica showed good sense and originality by making each one to scale. The breeds are separately described, and the sections on feeding and breaking are full of useful hints. The history of the thoroughbred strain is carefully traced, the pedigree of one famous type being shown in a table naming more than one hundred ancestors. The article HORSE-RACING (Vol. 13, p. 726), by Alfred Watson, shows how the sport has influenced breeding, and

the description of American trotting goes back to the day when “Boston Blue,” in 1818, trotted a mile in three minutes, “a feat deemed impossible” at that period! The English race meetings, in which American owners and jockeys now play so conspicuous a part, are described in special sections, as well as the training at Newmarket. RIDING (Vol. 23, p. 317), and DRIVING (Vol. 8, p. 585), are by practical experts, and TRACTION (Vol. 27, p. 118) contains an interesting table analyzing the draft power of the horse. The section on Arab horses in the article ARABIA (Vol. 2, p. 261) should be read, for it adds to the information, in the articles already named, on the breed that has influenced every variety of horse. MULE (Vol. 18, p. 959) will tell you about the varieties not only in the United States and Mexico, but also in France, Spain, Portugal, Italy, Asia Minor, Syria, Egypt, Algeria and North China. The section on Hybrids (Vol. 13, p. 713) of the article HORSE deals with all the attempts that have been made to get a perfect type of mule by introducing various strains of blood.

Sheep and the Wool Market

SHEEP (Vol. 24, p. 817) contains separate descriptions of the 28 best breeds, discussing their values both for wool and for the meat trade. Breeding, feeding, dipping and lambing are fully treated. Sheepdogs and other breeds useful to the stock-raiser fall under the article DOG (Vol. 8, p. 374). WOOL (Vol. 28, p. 805), by Professor Aldred Barker, is an article in which you will at once be impressed by the splendid thoroughness that is characteristic of the Britannica. It goes to the very foundation of the subject by giving you microscopic

photographs, on a scale of 320 to 1, of each of the six great varieties of wool, and explaining the structure of the fibres. The article FIBRES (Vol. 10, p. 309) will enable you to compare another microscopic photograph of wool fibre with similar pictures of silk, flax, cotton, jute, and other textile materials. The article wool deals next with wool-yolk and wool-fat, and then goes on to show why greasy wool is better than wool washed before shearing. Wool classing and sorting are next described, and then scouring. From this point the treatment of wool hardly comes within the jurisdiction of the sheep-man, although he cannot know too much about the qualities of the yarns obtained from different kinds of wool. It is interesting to note in this article that the first fulling mill in America was built at Rowley, Mass., in 1643, only thirty-four years after the first sheep was brought to America, and only twenty-three years after the Pilgrims landed on Plymouth Rock.

Pigs and Pork

The article SWINE (Vol. 26, p. 236) deals with the swine family in general, and the article PIG (Vol. 21, p. 594), containing a fine full-page plate, gives a detailed account of the breeds most profitable on the farm, including the Poland-China, the Berkshire, the Duroc, and the Chester White. Eleven breeds in all are particularized. The breeding and fattening of hogs, although it is now successfully followed as a distinct branch of the live-stock industry, must always remain in great part a mere branch of general farming; for the pig's power of thriving on many kinds of food, enables the farmer to utilize produce that cannot advantageously be shipped, and to keep his pigs following his cattle over the fields. Much

information will be found all through the article AGRICULTURE (Vol. 1, p. 388). TRICHINOSIS (Vol. 27, p. 266) deals with a disease that has sometimes seriously affected the pork market, and been made the excuse, too, for some very harsh restrictions on American exportation.

Diseases and Parasites of Live-stock

You will find in the Britannica (Vol. 28, p. 6) a very full and clear account of the diseases of all domestic animals, by Dr. Fleming and Professor McQueen, with special sections on the maladies of the horse, of cattle, of sheep, and of pigs, and on the parasites that infest them. TUBERCULOSIS (Vol. 27, p. 354) calls for special study, for it is a "disease of civilization" almost unknown among wild animals in their natural state and among the uncivilized races of mankind. The connection between the disease in cattle and its spread among human beings is fully explained in this article. PLEURO PNEUMONIA (Vol. 21, p. 838) deals with the lung disease from which cattle are the only sufferers, RINDERPEST (Vol. 23, p. 348), with the infectious fever which affects both cattle and sheep, and ANTHRAX (Vol. 2, p. 106), with the terribly infectious carbuncles communicated from cattle and sheep to man by the microbes carried in wool and hides. GLANDERS (Vol. 12, p. 76) describes the form in which this disease of horses and mules afflicts human beings, the symptoms and course of which, in the animals themselves, fall under the subject of horse diseases (Vol. 28, p. 8). The microbe by which this disease is carried is shown in the plate facing one of the pages (Vol. 20, p. 770) of the article PARASITIC DISEASES. FOOT AND

MOUTH DISEASE (Vol. 10, p. 617) afflicts cattle, sheep, and pigs, and occasionally human beings.

Among the articles on continents and countries which contain special information on stock-raising, you should not miss the interesting general review of the European live-stock industry in the article EUROPE (Vol. 9, p. 914), the section on live-stock in CANADA (Vol. 5, p. 153), that in ARGENTINA (Vol. 2, p. 465), in AUSTRALIA (Vol. 2, p. 950), and in NEW ZEALAND (Vol. 19, p. 627) The history of stock-raising is fully treated at the beginning of the article AGRICULTURE (Vol. 1, p. 388).

How to "Even Up"

When you have read the articles mentioned in the three parts of this chapter on Farming, do not turn away with the idea that you have got from the Britannica all that it can give you to help you in your business. Remember that you have to judge men, as well as live-stock, in order to succeed, and that general knowledge is of the greatest use in doing that. The one sure sign of the kind of man you cannot rely upon is that he talks confidently about subjects of which he really knows little, and the more you yourself know, the more readily you can detect the pretentious people who might make you think too well of them.

If you turn over the pages of this guide, and ask yourself, as you glance at the chapters, in what departments of general knowledge you are weakest, you will see what courses of reading will do most to make you an "evened up" man, without any weak threads in your intellectual texture. And, whatever you read, do not forget that the Britannica is a book of reference as well as for reading: that you are debasing your mind every time you leave

unanswered any question that comes up in the course of the day's work or talk, or while you are reading your newspaper. A vigorous mind wants an answer whenever it becomes conscious of a question or of a doubt, and if you fail to feed it with the information it asks for, it loses health. Now that you have the Britannica, the food is in the store-room, do not leave it there!

[*See list of articles on subjects connected with stock-raising and other branches of farming, at the end of Chapter III of this Guide.*]

CHAPTER III
FOR DAIRY FARMERS

SEE ALSO CHAPTER I, FOR FARMERS, AND CHAPTER II, FOR STOCK-RAISERS

The admirable set of rules for dairy farmers issued by the United States Department of Agriculture begins by telling you to "read current literature and keep posted on new ideas." And you can easily see that the information on dairy-farming and the many subjects connected with it, supplied by the Britannica, must cover a much broader field of new ideas than can be included in any periodical or dairying manual. The branches of science in which the greatest advance has been made since the beginning of the present century happen to be those that have most to do with dairying; and the industry itself has been completely revolutionized since the days when cities got their milk from ramshackle

cow-sheds in their suburbs, and when butter-making was regarded as one of the “chores” to be done at odd times.

The key article in the Britannica, DAIRY AND DAIRY FARMING (Vol. 7, p. 737), deals with the best milking breeds, the installation, equipment, and management of a dairy farm, the values of various kinds of pasturage and fodder; with the milk trade, with butter-making and cheese-making, with condensed milk, skim milk, and milk powder and with the organization and operation of creameries, cheeseries, and dairy factories in general. Such subjects as soil, grass, hay and other fodder crops fall under Part I of this chapter, and the articles dealing with the breeding and rearing of dairy cattle are mentioned in Part II, “For Stock-Raisers.”

Dairy-Herd Diseases

Cattle diseases in general are also covered by the course of reading suggested in Part II; but the dairy farmer has a special interest in contagious mammitis, milk fever, contagious abortion, and cowpox, all of which are described (Vol. 28, p. 10) in the article on VETERINARY SCIENCE. You cannot study too carefully the article on TUBERCULOSIS (Vol. 27, p. 354), for this terrible infection is not only a standing danger to your herd, but also affects the transportation and marketing of milk. Dr. Hennessy, who wrote the article, is an expert of the first rank and, like most other great authorities, is not inclined to encourage the popular exaggeration of the dangers for which newspaper “sensations” are responsible.

Milk and the Milk Market

You get to the very foundation of the supply of

milk in Professor Parson's and Dr. Edmund Owen's article MAMMARY GLAND (Vol. 17, p. 528), in which the comparative anatomy of the milk yielding organ is fully treated. The article MILK (Vol. 18, p. 451) discusses the chemistry of many kinds of milk and the diseases carried by milk, and deals with the gravest problems of the industry: the difficulty of sterilizing milk, so that tuberculosis and typhoid cannot be carried by it, and the difficulty of sterilizing cream, so that butter may be quite safe, without making the milk less nutritious and the butter less delicate in flavor. The article BACTERIOLOGY (Vol. 3, p. 156), by Professor H. Marshall Ward and Professor Blackman, goes to the root of this whole question of infection. Milk is, on the other hand, used to convey into the human system the "friendly microbes," and the use of soured milk and cheese for this purpose is explained in the articles THERAPEUTICS (Vol. 26, p. 800) and LONGEVITY (Vol. 16, p. 977), which deal with Metchnikoff's system of treatment. PEPSIN (Vol. 21, p. 130) describes the process by which milk is rendered more digestible, and INFANCY (Vol. 14, p. 513) deals with the preparation of milk to be sold for the use of young children. There is so general a demand for prepared milk which is from every point of view wholesome that you will find it worth while to read, in this connection, FOOD (Vol. 10, p. 611), NUTRITION (Vol. 19, p. 920) and DIETETICS (Vol. 8, p. 214).

Products and Marketing

BUTTER (Vol. 4, p. 889,) and CHEESE (Vol. 6, p. 22) are brief articles which you should not overlook, although they refer you to the key and article on

dairying for details; and OILS contains (Vol. 20, p. 47) an interesting analytical table in which butter is compared with other animal fats. FOOD PRESERVATION (Vol. 10, p. 612) deals with the cold storage of butter, cheese, condensed milk and milk powder; and REFRIGERATING (Vol. 23, p. 30) with the processes and machinery employed. KOUMISS (Vol. 15, p. 920) describes the milk-wine or milk-brandy prepared by fermenting mare's milk, and the similar product "kerif" made from cow's milk. Although the special developments of dairying in various parts of the world are discussed in the article DAIRY AND DAIRY-FARMING, the articles on individual countries also contain information of value. The section on dairying (Vol. 5, p. 154) in the article CANADA, and the account of co-operative dairying (Vol. 7, p. 87) in DENMARK should not be overlooked.

In reading these articles in Britannica, and thinking of the present conditions of this great business, you will be reminded that dairying is an industry of peculiar importance to the whole people of the United States, not only because of the money made out of it, and not only because it gives hundreds of thousands of men employment on the land instead of in crowded cities, but also because it promises to develop the co-operative action which harmonizes with the best ideals of democracy. The co-operative plants which are beginning to be established by dairy farmers are the only institutions our modern civilization has created in which you find the neighborly spirit that the first American settlers showed in the days when they joined to defend themselves against the Indians. At political meetings, in machine shops and cotton mills and shoe factories, you hear unhappy talk about the

relations of capital and labor, about strikes and trusts, about the man on top and the man underneath. But where the farmer's wagons clatter up to the separator platform, there is combination in the best sense of the word. The Britannica article on co-operation says that the word "in its widest usage, *means the creed that life may best be ordered not by the competition of individuals, where each seeks the interest of himself and his family, but by mutual help, by each individual consciously striving for the good of the social body of which he forms part, and the social body in return caring for each individual; 'each for all, and all for each' is its accepted motto. Thus it proposes to replace among rational and moral things the struggle for existence by voluntary combination for life.*"

ALPHABETICAL LIST OF ARTICLES IN THE BRITANNICA ON SUBJECTS CONNECTED WITH FARMING, STOCK-RAISING AND DAIRYING

(The more important articles have already been mentioned in the preceding pages, but the following list includes many others in which valuable information will be found.)

Aal

Aaron's Rod

Abaca

Abutilon

Acacia

Acanthus

Acaulescent

Acerose

Achimenes
Acinus
Acorn
Acorus Calamus
Acotyledones
Acrogenæ
Adonis
African Lily
Agave
Agrimony
Ailanthus
Alburnum
Alder
Aleurites
Alexanders
Algæ
Algum or Almug
Alismaceæa
Allamanda
Alliaria Officinalis
Allium
Almond
Aloe
Amadou
Amanita
Amaranth

Amaryllis
Amentiferæ
Ammoniacum
Ampelopsis
Anatto
Anemone
Angelica
Angiosperms
Angulate
Anime
Anise
Antirrhinum
Apiculture
Apple
Apricot
Araucaria
Arbor Day
Arbor Vitæ
Arboretum
Arboriculture
Archil
Aristolochia
Aroideæ
Arrowroot
Artichoke
Ascus

Ash
Asparagus
Aspen
Ashpodel
Aspidistra
Aster
Aubergine
Aucuba
Auricula
Autogamy
Auxanometer
Averruncator
Avocado Pear
Axile or Axial
Azalea
Bael Fruit
Balm
Bamboo
Banana
Baneberry
Banksia
Baobab
Barberry
Barley
Bdellium
Bean

Bee
Beech
Beet
Begonia
Benzoin
Betel-nut
Bilberry
Birch
Bird’s Eye
Blackberry
Bladder-wort
Boletus
Boll
Borage
Boraginaceæ
Botryis
Bottle-brush plants
Bouvardia
Boxwood
Bracket-fungi
Bramble
Bran
Brazil Nuts
Brazil Wood
Bread-fruit
Breed and Breeding

Bromeliaceæ
Brooklime
Broom
Broom-rape
Bryophyta
Buchu
Buck-bean
Buckthorn
Buckwheat
Bulrush
Bur, or Burr
Burnet
Buttercup
Butter-nut
Butterwort
Cabbage
Cactus
Caducous
Cæspitose
Calabash
Calabash Tree
Calceolaria
Calf
Camellia
Campanula
Candytuft

Cane
Cannon-ball Tree
Capers
Caprifoliaceæ
Capsule
Caraway
Cardamon
Cardoon
Carnation
Carrageen
Carrot
Caryophyllaceæ
Cashew Nut
Cassava
Cassia
Casuarina
Catalpa
Cataphyll
Catha
Cattle
Cayenne Pepper
Ceanothus
Cecropia
Cedar
Celandine
Celery

Centaurea
Centaury
Chantarelle
Chenopodium
Cherry
Chestnut
Chicory
Chive
Chlorosis
Chrysanthemum
Churn
Cicely
Cimicifuga
Cinchona
Cineraria
Cinnamon
Citron
Cleavers
Clematis
Climbing Fern
Cloudberry
Clover
Cloves
Cocoa, or Cuca
Cocculus Indicus
Cock’s-comb

Cocoa
Coco de Mer
Coco-nut Palm
Codiæum
Coffee
Colchicum
Coleus
Colleter
Colocynth
Colt's-foot
Columbine
Compass plant
Compositæ
Convolvulaceæ
Copaiba
Copal
Coppice
Coriander
Cork
Corn
Corn-salad or Lamb's Lettuce
Correa
Cotoneaster
Cotton
Cow-tree
Cranberry

Crassulaceæ
Crazy Weed
Cress
Crinum
Crocus
Crowberry
Cruciferæ
Cryptomeria
Cucumber
Cucurbitaceæ
Cumin or Cummin
Cupulliferæ
Cultivator
Currant
Custard Apple
Cyclamen
Cyperaceæ
Cypress
Cystolith
Daffodil
Dairy & Dairy Farming
Dahlia
Daisy
Dame’s Violet
Dammar
Dandelion

Daphne
Darlingtonia
Date Palm
Deciduous
Dewberry
Diatomaceæ
Dicotyledons
Dictyogens
Dividivi
Dock
Dodder
Dogwood
Dracæna
Dragons Blood
Drainage
Dropwort
Duck
Duckweed
Dulse
Duramen
Durian
Durra
Earth-nut
Earth-star
Ebony
Economic Entomology

Edelweiss
Eglantine
Elder
Elecampine
Elephant’s foot
Elm
Endive
Ensilage
Entada
Ericaceæ
Espalier
Esparto
Eucharis
Eunonymus
Euphorbia
Euphorbiaceæ
Evergreen
Everlasting
Fairy Ring
Fallow
Farm
Farm Buildings
Fennel
Fenugreek
Fern
Fig

Filmy Ferns
Finger-and-toe
Fir
Flail
Flax
Flower
Fool’s Parsley
Forage
Forests & Forestry
Forget-me-not
Fork
Foxglove
Freesia
Fritillary
Frog-bit
Fruit
Fruit & Flower Farming
Fuchsia
Fumitory
Fungi
Funkia
Furze
Fustic
Gale
Galls
Gardenia

Garlic
Genista
Gentian
Gentianaceæ
Geoponici
Geraniaceæ
Geranium
Geum
Gillyflower
Ginger
Gladiolus
Glasswort
Glaucous
Gloriosa
Gloxinia
Goat
Golden Rod
Goose
Gooseberry
Goose Grass
Gorse
Gourd
Graft
Grains of Paradise
Gram or Chick-pea
Granadilla

Grass and Grassland
Grass of Parnassus
Grasses
Greenheart
Ground Nut
Groundsel
Guano
Guava
Guelder Rose
Gulfweed
Gum
Gumbo
Gutta Percha
Gymnosperms
Hacienda
Hackberry
Harebell
Harrow
Hawthorn
Hay
Hazel
Heath
Hedges and Fences
Heifer
Heliotrope
Hellebore

Hemlock
Hemp
Hen
Henbane
Henna
Herb
Herbarium
Hickory
Hippeastrum
Hoe
Holly
Hollyhock
Honey
Honey Locust
Honeysuckle
Hop
Horehound
Hornbeam
Horse
Horseradish
Horsetail
Horticulture
Houseleek
Huckleberry
Humus
Huon Pine

Hyacinth
Hydrangea
Hydrocharideæ
Hyssop
Ice-plant
Iceland Moss
Idioblast
Immortelle
Impatiens
India Hemp
Indian Corn
Insectivorous Plants
Iridaceæ
Iris
Irish Moss
Iron-wood
Ivy
Jarrah Wood
Jasmine
Jew’s Ears
Job’s Tears
Judas Tree
Jujube
Juncaceæ
Juniper
Jute

Kaffir Bread
Kauri Pine
Kerguelen’s Land Cabbage
Kumquat
Labiatæ
Labrador Tea
Laburnum
Lac
Lace-bark Tree
Lancewood
Larch
Larkspur
Lattice Leaf Plant
Laurel
Laurustinue
Lavender
Leaf
Leek
Leguminosæ
Lemon
Lentil
Lettuce
Lichens
Lilac or Pipe Tree
Liliacæ
Lily

Lime or Linden
Liquidambar
Litchi
Lobelia
Loco-weeds
Locust
Loosestrife
Loquat
Lotus
Lucerne
Lupine
Lycopodium
Madder
Magnolia
Mahogany
Maidenhair
Maize
Mallow
Malvaceæ
Mammee Apple
Mandrake
Mangel-wurzel
Mango
Mangosteen
Mangrove
Manila Hemp

Manna
Manures
Maple
Marcescent
Mare’s-tail
Marguerite
Marigold
Marjoram
Mastic
Mate
Mattock
Medlar
Melon
Meristem
Mesquite
Merino
Mignonette
Mildew
Milkwort
Millet
Mimosa
Mimulus
Mint
Mistletoe
Moly
Momordica

Moonseed
Moonwort
Moraceæ
Moreton Bay Chestnut
Mucuna
Mulberry
Mushroom
Mustard
Myrobalans
Myrrh
Myrtle
Narcissus
Nard
Nasturtium
Nettle
Nettle Tree
New England Flax
Nightshade
Nut
Nutmeg
Oak
Oat
Okra
Oleander
Oleaster
Olive

Onagraceæ
Onion
Orach or Mountain Spinach
Orange
Orchard
Orchids
Orris-Root
Osier
Ox
Oxalis
Pæony
Palm
Palmetto
Pansy or Heartsease
Papyrus
Paraguay Tea
Parsley
Parsnip
Passionflower
Pea
Peach
Pear
Pellitory
Pennyroyal
Pentstemon
Pepper

Peppermint
Pepper Tree
Persimmon
Petunia
Phlox
Phormium
Pig
Pimento
Pine
Pine-apple
Pin-eyed
Pink
Pistachio Nut
Pistil
Pitcher Plants
Plane
Plantain
Plough and Ploughing
Plum
Poinsettia
Pokeberry
Pollination
Polyanthus
Polygonaceæ
Polypodium
Pomegranate

Pondweed
Poplar
Poppy
Potato
Potentilla
Poultry & Poultry Farming
Primrose
Primulaceæ
Privet
Pteridophyta
Puff-ball
Pumpkin
Purslane
Pyrethrum
Quince
Radish
Ram
Ramie
Ramsons
Ranch
Ranunculas
Ranunculaceæ
Rape
Raspberry
Reaping
Reed

Rhododendron
Rice
Richardia
Robinia
Rocambole
Roller
Root
Rosaceæ
Rose
Rosemary
Rosewood
Rosin or Colophony
Royal Fern
Rubraceæ
Rubber
Ruderal
Rue
Rush
Rye
Sabicu Wood
Safflower
Saffron
Sago
Sainfoin
St. John’s Wort
Salsafy or Salsify

Salvia
Sap
Sapan Wood
Sarcocarp
Sarmentose
Sarracenia
Satin Wood
Saxifrage
Saxifragaceæ
Scammony
Scion
Scorzonera
Screw-pine
Scrophulariaceæ
Scythe
Sea-kale
Seawrack
Sedum
Secund
Seed
Sequoia
Service Tree
Sesame
Shaddock
Shallot
Sheep

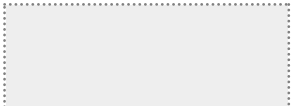
Sisal Hemp
Skirret
Snake-root
Snapdragon
Snowdrop
Soap-bark
Soil
Solanaceæ
Sorghum
Sorrel
Sowing
Spade
Spanish Broom
Spanish Grass
Spikenard
Spinach
Spruce
Stem
Stink-wood
Strawberry
Strophanthus
Sudd
Sumach
Sundew
Sunflower
Sunn

Sweet Gum
Sweet Potato
Sweet-sop
Swine
Switch-plants
Synanthry
Tallow Tree
Tamarind
Tamarisk
Tea
Teak
Teasel
Terebinth
Thistle
Thorn
Thrashing
Thrum-eyed
Thyme
Tiger-flower
Toadstool
Tobacco
Tomato
Tonqua Bean
Toothwart
Topiary
Traveller’s Tree

Tree
Tree-fern
Trowel
Truffle
Tuberose
Tulip
Tulip Tree
Tumble-weed
Turkey
Turmeric
Turnip
Turnsole
Umbelliferæ
Urticaceæ
Vanilla
Vegetable
Vegetable Marrow
Venus's Fly Trap
Venus's Looking Glass
Veratrum
Verbena
Vetch
Vine
Violet
Walnut
Water-lily

Water-thyme
Wax-tree
Wheat
Whin
Whortleberry
Willow
Willow-herb
Wintergreen
Winter’s-bark
Witch Brooms
Witch Hazel
Woad
Wormwood
Yam
Yew
Yucca
Zinnia

CHAPTER IV
FOR MERCHANTS AND MANUFACTURERS: GENERAL AND INTRODUCTORY



Technical Education for Manufacturer and Merchant

The article on TECHNICAL EDUCATION in the new (Eleventh) Edition of the Encyclopædia Britannica (Vol. 26, p. 487), written by Philip Magnus, one of the greatest educational authorities in the world, says that:

> "The widespread appreciation of the advantages of the higher education among all classes of the American people, and the general recognition among manufacturers, engineers and employers of labour, of the value to them in their own work, of the services of college-trained men, has largely helped to increase the number of students in attendance at the universities and technical institutions."

A still broader truth is that the men who have learned to think clearly, by whatever study or *reading* they may have developed that power, possess the greatest of all advantages. As the Britannica article on EDUCATION indicates, the true value of education (not simply school education, but all education) lies as much in the influence which intelligently directed study exerts upon the mind as in the immediate usefulness of the information acquired, and the articles in the Britannica not only supply the most recent and authoritative information, but are so logically arranged, one dove-tailing into another, that they give the reader precisely that *orderly* view of knowledge which is the foundation of all mental training.

Since all of the series of chapters which immediately follow and which are intended for merchants and manufacturers, deal with commerce and manufactures, it will be for the reader's

convenience to begin by dealing with those two subjects in general. But certain branches of industrial and manufacturing knowledge are dealt with in special chapters. The articles on banking and finance are described fully in this Guide in the chapter *For Bankers and Financiers*, those on insurance in the chapter *For Insurance Men*, and those on law in the chapter *For Lawyers*. Three of the legal articles should, however, be mentioned here, as they are on especially important subjects: SALE OF GOODS (Vol. 24, p. 63), COMPANY (Vol. 6, p. 795), which deals with the laws in various countries regulating corporations, and EMPLOYERS' LIABILITY (Vol. 9, p. 356), on this topic so important in modern industrial law and in the relations between capital and labour.

Practical Economics for Practical Men

The broad questions of commercial and industrial policy are discussed in ECONOMICS (Vol. 8, p. 899), by Prof. Hewins; COMMERCE (Vol. 6, p. 766); TRUSTS (Vol. 27, p. 334); MONOPOLY (Vol. 18, p. 733), and TRADE ORGANIZATION (Vol. 27, p. 335), which describes commercial associations in the United States, the work of the consular service, and the organizations in Germany, France, Great Britain and other countries. BOOK-KEEPING (Vol. 4, p. 225), with its up-to-date account of modern accounting methods, card ledgers and loose leaf systems; ADVERTISEMENT (Vol. 1, p. 235), and MERCANTILE AGENCIES (Vol. 18, p. 148) may be named as specimens of the many practical articles on business methods which need not all be enumerated here.

Imports and Exports

Much of what you read and hear about the tariff systems of the United States and various other countries and about their influence upon trade is so vague and confusing that you will be delighted with the group of clear, common-sense articles in the Britannica. TARIFF (Vol. 26, p. 422) is by one of the most famous American economists, Prof. Taussig of Harvard, and is a very full and fair discussion of the points in controversy. PROTECTION (Vol. 22, p. 464) is by Prof. James of the University of Illinois, and FREE TRADE (Vol. 11, p. 89) by William Cunningham. You should read with care CUSTOMS DUTIES (Vol. 7, p. 669); FREE PORTS (Vol. 11, p. 88), and BOUNTY (Vol. 4, p. 324). BALANCE OF TRADE (Vol. 3, p. 235) and TAXATION (Vol. 26, p. 458) are both by Sir Robert Giffen. EXCHANGE (Vol. 10, p. 50), by E. M. Harvey, a partner in one of the largest firms of bullion brokers in the world, deals with the movement of gold. COMMERCIAL TREATIES (Vol. 6, p. 771) is by Sir C. M. Kennedy. Freights are discussed in AFFREIGHTMENT (Vol. 1, p. 302) by Sir Joseph Walton. LIEN (Vol. 16, p. 594), with its section on "Stoppage in transitu," is by F. W. Raikes; SALVAGE (Vol. 24, p. 97), by T. G. Carver, and BLOCKADE (Vol. 4, p. 72), by Sir Thomas Barclay, the great international lawyer in Paris. Marine insurance, indemnity, Lloyds, and other insurance subjects fall under the chapter of this Guide *For Insurance Men* to which you should refer. Cargo-carrying and merchant shipping are further covered by SHIPPING (Vol. 24, p. 983). This article is by Douglas Owen, honorary secretary and treasurer of the Society of National Research, and author of *Ports and Docks*; it contains information about the great freight carrying lines of the world that can be found in no other book. Railroad freighting is covered by the article

RAILWAYS (Vol. 22, p. 819), in which there is a special section (p. 854b) on the new models of American freight cars.

Manufacturing and Consuming Nations

In the article UNITED STATES, which contains more matter than a whole book of ordinary size and more information than a dozen ordinary books, the sections (Vol. 27, p. 639) on manufactures and on foreign and domestic commerce, are by F. S. Philbrick, Ph.D. *The internal commerce of the United States, as this article states, is in itself greater than the total international commerce of the world*, and is so far from exhausting the country's power of production and consumption, that even when coastwise traffic is disregarded, New York is the most active port in the world. A section (Vol. 9, p. 916) of the article EUROPE deals with European commerce in general. The articles on the great manufacturing towns of Europe contain much information as to industries. Great Britain's industries are dealt with in the article UNITED KINGDOM (Vol. 27, p. 691). The industries of England alone are separately treated in a section (Vol. 9, p. 426) of the article ENGLAND. Germany's industries are the subject of sections (Vol. 11, p. 811) of the article GERMANY; and it is interesting to note that although Germany has outranked France in cotton manufactures since Mülhausen, Colmar and other important milling centres of Alsace became German, France has retorted by overtaking and passing Germany in the production of linen. The sections (Vol. 10, p. 785) on foreign commerce in the article FRANCE show her position as in the main a self-supporting country, though only a fourth of the

cargoes loaded and discharged in French ports are carried under the French flag. It would be a waste of space to enumerate here the articles on Belgium, Switzerland, Italy and other countries, which you will consult in relation to those of their exports in which you are especially interested; but you should not overlook the article on Japan. The Britannica has done commerce a great service in giving to the world at last a good account of this extraordinary country.

The body of the article JAPAN (Vol. 15, p. 156) is by Capt. Brinkley, long editor of the Japan *Mail*, whose opportunities of seeing Japanese life from the inside have been greater than those of any other foreign observer. Baron Dairoku Kikuchi, President of the Imperial University of Kyoto, a statesman of great experience and authority, contributes to the article a section (Vol. 15, p. 273) dealing with Japan's international position. His remarks upon the commercial morality of the Japanese are so ingenuous and so candid that an extract from them cannot be omitted:

> Now when foreign trade was first opened, it was naturally not firms with long-established credit and methods that first ventured upon the new field of business—some few that did failed owing to their want of experience—it was rather enterprising and adventurous spirits with little capital or credit who eagerly flocked to the newly opened ports to try their fortune. It was not to be expected that all or most of those should be very scrupulous in their dealings with the foreigners; the majority of those adventurers failed, while a few of the abler men, generally those who believed in and practised honesty as the best policy, succeeded and came to occupy an honourable position as business men.... Commerce and trade are now regarded as highly honourable professions, merchants and business men occupy the highest social positions, several of them having been lately raised to the peerage, and are as honourable a set of men as can be

met anywhere. It is, however, to be regretted that in introducing Western business methods, it has not been quite possible to exclude some of their evils, such as promotion of swindling companies, tampering with members of legislature, and so forth.

The account (Vol. 15, p. 201) by Capt. Brinkley of the curious system of creating branches of Japanese business houses is another part of this article which should not be overlooked.

Mill Labour

The proportion of labour cost to the total cost of production is in most industries so great that you cannot study too carefully every aspect of the labour question. The chief articles are LABOUR LEGISLATION (Vol. 16, p. 7), jointly written by the late Dr. Carroll D. Wright, the great American authority on the subject, and Miss A. M. Anderson, Principal Lady Inspector of Factories to the British government; TRADES UNION (Vol. 27, p. 140); STRIKES AND LOCKOUTS (Vol. 25, p. 1024); WAGES (Vol. 28, p. 229), by Prof. J. S. Nicholson; PROfiT SHARING (Vol. 22, p. 423), by Aneurin Williams and APPRENTICESHIP (Vol. 2, p. 228), by J. S. Ballin. The article EMPLOYERS' LIABILITY (Vol. 9, p. 356), has already been mentioned.

CHAPTER V
FOR MERCHANTS AND MANUFACTURERS OF TEXTILES

Practical Men Among the Contributors

The Course of Reading outlined in this chapter will help anyone who has to do with the making or with the buying and selling of textiles, in three ways, at least, each of the greatest importance to him—and possibly in many more. Taking up these three:—In the first place, it will teach him many facts about manufacturing and merchandizing in general, and about dry goods in particular, that he could learn nowhere else, because the scope of the Britannica is broader than that of any other book—or, for that matter, than the scope of any collegiate course can well be. In the second place, the number of distinguished men who have devoted their exclusive attention to the subjects upon which they write, and have given to the Britannica the results of their research and of their experience as practical experts —in many cases, indeed, as successful business men —is far greater than the number of men who form the faculty of any university in the world. The fifteen hundred contributors in fact include no less than 704 connected with the staffs of 151 different universities, technological and commercial institutes and colleges in twenty countries. The reader thus gets the benefit of contact with the thought of many, of varied, and always of authoritative, personalities. In the third place, the *textile trade is peculiarly an international trade*, the raw materials often traveling from one end of the world to the other before manufacture, and making as long a journey in the finished form, before they reach the consumer, and the international character of the Britannica gives equal weight to the articles which deal with the textiles and with the markets of all countries—a

statement which it would certainly not be safe to make about any other book.

Textile Fibres and their Treatment

The article FIBERS (Vol. 10, p. 309), by C. F. Cross, whose name has been much before the public in connection with the recent scientific investigation of the subject, compares the fibres yielded by all the vegetable and animal substances used in textiles. The 18 microscopic photographs on the full page plates (facing pp. 310 and 311) and the table of vegetable fibres (p. 311) should be carefully studied. CELLULOSE (Vol. 5, p. 606) deals with the "body" of cotton, flax, hemp and jute fibres. CARDING (Vol. 5, p. 324) deals with the brushing and combing of fibres. SPINNING (Vol. 25, p. 685) covers both cotton and linen, and it is curious to note from this article that in preparing yarns for the exquisite Dacca muslins one pound of cotton has been spun into a thread 252 miles long; while the article DACCA says that a piece 15 feet by 3 was once woven that weighed only 900 grains. YARN (Vol. 28, p. 906) deals with cotton, woollen and silk yarns. WEAVING (Vol. 28, p. 440), by Prof. T. W. Fox, author of *Mechanics of Weaving*, and Alan Cole, is the first article you should read in a group dealing with processes applied to more than one material. The first section is on the various combinations of warp and weft, and contains 23 illustrations showing the chief weaving "schemes." A section on weaving machinery follows, and then one on weaving as an art, illustrated with a number of reproductions of famous specimens of hand-loom work. The whole article is full of practical every-day information of the kind the merchant and manufacturer wants to

know. BLEACHING (Vol. 4, p. 49) describes the chemical processes which have expedited the bleaching of cotton, wool, linen and silk, which it used to take all summer to complete. DYEING (Vol. 8, p. 744), by Prof. Hummel, author of *The Dyeing of Textile Fabrics*, and Prof. Knecht, author of *A Manual of Dyeing*, is another of the thorough articles which entitle the Britannica to rank as a great original work on textiles. Every dye is separately treated, and the latest models of dyeing machinery are carefully described. FINISHING (Vol. 10, p. 378) deals with the processes used for cotton, woollens, worsteds, pile fabrics, silks and yarns. TEXTILE-PRINTING (Vol. 26, p. 694) is by Prof. Knecht and Alan Cole, author of *Ornament in European Silks*, and not only describes all the styles of printing, but gives sixty recipes for various shades of colour. The full page plates reproduce fine specimens of early printing. The art of textile-printing "is very ancient, probably originating in the East. It has been practised in China and India from time immemorial, and the Chinese, at least, are known to have made use of engraved wood-blocks many centuries before any kind of printing was known in Europe."

Cotton and Cotton Fabrics

The elaborate article COTTON (Vol. 7, p. 256) begins by discussing the peculiar twist of the hairs on the cotton seed which by facilitating spinning gives cotton its predominant position as a textile material. The section on cultivation, by W. G. Freeman, deals with the soils, bedding, planting, hoeing and picking, then with ginning and baling. A section on diseases and pests of the cotton plant follows, then a discussion of the improvement of yield by seed

selection. The section on marketing and supply is by Prof. Chapman, and his practical study of “futures,” “options,” and “straddles” shows how greatly the movement of prices is affected by speculation and often by artificial manipulation.

COTTON MANUFACTURING (Vol. 7, p. 281) describes the industry in England, that of the United States, with a special section on the recent developments in the two Carolinas, Georgia and Alabama, and also the mills in Germany, France, Russia, Switzerland, Italy and in other countries, including India, China and Japan. It is interesting to note (p. 293) that “Americans were making vast strides in industrial efficiency even before the period when American theories and American enterprise were monopolizing in a wonderful degree the attention of the business world” abroad. As far back as 1875 progress in the United States was so rapid that the production for each operative had increased during the ten years 1865–75, by 100% in Massachusetts as against only 23% in England. One explanation of American success is that the American employer “tries to save in labour but not in wages, if a generalization may be ventured. The good workman gets high pay, but he is kept at tasks requiring his powers and is not suffered to waste his time doing the work of unskilled or boy labour.”

COTTON SPINNING MACHINERY (Vol. 7, p. 301) describes all the machines in great detail and contains a number of full-page plates and other illustrations. MERCERIZING (Vol. 18, p. 150) is another important article.

Wool, Linen and Silk

WOOL, WORSTED AND WOOLLEN MANUFACTURES

(Vol. 28, p. 805) is by Prof. Aldred F. Barker. The development in wool production of various countries is first described and then the wool fibre is studied and microscopic photographs reproduced to show the structure of different varieties. A diagram of a fleece shows the qualities obtained from various parts of the animal, ranging from the shoulders, where the finest is found, to the hind quarters. Lamb, hogg and wether wools are compared and the article discusses shearing, classing, sorting, scouring, drying, teasing, burring, mule spinning, combing, drawing and spinning. The centres of the industry are then compared, with details as to the special products of each. The article contains illustrations of a number of machines. Articles dealing with certain sources of wool or of the wool-like hair used in textiles, and with the finished products, are: ALPACA (Vol. 1, p. 721), the history of its manufacture being "one of the romances of commerce;" MOHAIR (Vol. 18, p. 647), which deals with the hair of the Angora goat, familiar from discussions of the Underwood Tariff bill, and dealing with its weaving and the imitations of the cloth; LLAMA (Vol. 16, p. 827); and the articles GUANACO (Vol. 12, p. 649) and VICUGNA (Vol. 28, p. 47), on the two wild animals from whose hair high priced materials, extraordinarily warm and light, are woven.

FLAX (Vol. 10, p. 484) describes the cultivation of the crops which are harvested by being "pulled," roots and all, instead of being cut, the process of separating the capsules from the branches, and the subsequent stages of preparation. LINEN AND LINEN MANUFACTURES (Vol. 16, p. 724), by Thomas Woodhouse, takes up the story where the flax fibre is ready for market and carries it to the point where the yarn is delivered for weaving. The winding, warping,

dressing and beaming, and the looms employed, are virtually the same processes and machines that are used for cotton. The article states that the finest linen threads used for lace are produced by Belgian hand spinners who can only get the desired results by working in damp cellars, the spinner being guided by touch alone, as the filament is too fine for him to see. This thread is said to have been sold for as much as $72 an ounce.

JUTE (Vol. 15, p. 603) deals with the vegetable fibre which ranks, in its industrial importance, next after cotton and flax and with the processes employed in its manufacture.

SILK (Vol. 25, p. 96) contains illustrations of cocoons and worms, microscopic photographs of fibre, and pictures of the moths which produce wild silk. The section on the fibre and its production and preparation is by Frank Warner, president of the Silk Association of Great Britain and Ireland; and that on the silk trade by Arthur Mellor, a well known manufacturer of Macclesfield, the great British center. The degree of fineness to which silk thread can be spun is stated (Vol. 28, p. 906) to be such that 450,000 yards of thread have been produced from one pound of silk, and this is slightly in excess of the fineness of the Dacca cotton thread already mentioned as producing 252 miles for a pound. But at Cambrai the lace maker's linen thread already described has been made as fine as 272 miles to the pound, and the drawing of platinum wire to the fifty-thousandth part of an inch in thickness (Vol. 28, p. 738) seems hardly more wonderful than this. Spider silk is as valuable as the best qualities of the silkworm product, but spiders are such fierce cannibals that it is necessary to keep each one in a separate cage, and the cost of doing this has

prevented the fibre from being generally used (Vol. 25, p. 664). Artificial or "viscose" silk is described in the article CELLULOSE (Vol. 5, p. 609), and is a textile of which the importance is rapidly increasing.

Felting is an even older textile process than weaving, just as weaving, which no doubt originated in basket making (Vol. 3, p. 481) is older than spinning. The article FELT (Vol. 10, p. 245) deals with asphalted felts used for roofing as well as with the hat felts; and the article HAT (Vol. 13, p. 60) gives further details as to both woollen and fur felts and describes the machinery for hatmaking, which originated in the United States.

Save that gold, silver and other metals are occasionally used in cloth or gauze, ASBESTOS (Vol. 2, p. 714) is the only mineral employed in textiles, and its value for jacketing steam pipes and boilers and for insulating fabrics and fireproofing gives it great importance. RAMIE (Vol. 22, p. 875) is not so largely used in textiles, but experiments in the production of better fibre are being made.

SHODDY (Vol. 24, p. 992) is an article which shows how unfair it is to treat the re-manufacture of "devilled" fabric as an illegitimate if not absolutely fraudulent branch of the textile industry, for really serviceable cloths are woven from it, and masses of poor people who would otherwise be in rags are thus comfortably clad. "Mungo," another re-manufactured cloth, is described (Vol. 28, p. 906) in the article YARN. Pine-apple fibre is described (Vol. 10, p. 311) as of exceptional fineness and is used in yarn cloths of the best quality. The article PINE-APPLE (Vol. 21, p. 625) describes its culture. SISAL HEMP (Vol. 25, p. 158) is used in bagging as well as cordage, and the same is true of PHORMIUM (Vol. 21, p. 471), sometimes called New Zealand flax. Paper pulp

yields a yarn which is used in some cheap fabrics as described (Vol. 5, p. 609) in the article CELLULOSE already mentioned.

Textile Merchandise

The many varieties of woven cloths are described in the articles already mentioned in the manufacture of cotton, linen, wool, and silk, and in articles on special fabrics. HOSIERY (Vol. 13, p. 788) covers the textiles that are produced by knitting or looping, and gives an account, with illustrations, of the machinery employed. NET (Vol. 19, p. 412) covers the textiles of which the mesh is knotted.

LACE (Vol. 16, p. 37), by Alan Cole, contains some of the most beautiful full-page plates and other illustrations to be found in the Britannica, and is a very full treatise on the history and the present state of the lacemaking art.

FLANNEL (Vol. 10, p. 480) describes the true flannels made from wool, and FLANNELETTE (Vol. 10, p. 481) the cotton imitations and the new fire-resisting fabrics of this class. DRILL (Vol. 8, p. 580) covers both the cotton and linen tissues sold under this name. CREPE (Vol. 7, p. 379) mentions the curious fact that the Chinese and Japanese makers of soft crepe guard their secret processes, which are still unknown to western manufacturers, so carefully that the different stages of their production are carried on in towns far distant from one another.

CARPET (Vol. 5, p. 392) contains full-page plates of rare specimens and describes pile carpets, flat-surfaced carpets and the printed carpetings.

TAPESTRY (Vol. 26, p. 403) deals with another luxurious branch of the textile industry, and is illustrated with photographs of the finest specimens

and with pictures showing the methods of weaving. BROCADE (Vol. 4, p. 620) describes and illustrates this stately class of fabrics. EMBROIDERY (Vol. 9, p. 309) with six full-page plates and SHAWL (Vol. 24, p. 814) deal with other art textiles.

TARTAN (Vol. 26, p. 431) describes the colours and patterns of all Scottish clan tartans. DAMASK (Vol. 7, p. 785) discusses this fine class of fabrics, the weaving of which is the subject of a special section (Vol. 28, p. 454) of the article WEAVING. The enormous consumption of coarse bags for the packing of raw cotton and of sugar gives importance to the articles BAGGING (Vol. 3, p. 200) and SACKING AND SACK MANUFACTURE (Vol. 23, p. 975). CANVAS (Vol. 5, p. 223) discusses sail cloth and artists' canvas, and TARPAULIN (Vol. 26, p. 430) deals with waterproof covers.

The Seventy Articles on Special Fabrics

It is unnecessary to describe one by one the seventy articles on other fabrics and tissues, ranging through the alphabet from Alpaca to Velveteen; but they are all included in the list at the end of this chapter, and all are fully described in the Britannica. COSTUME (Vol. 7, p. 224) is a long and important article, with a full page plate and many other illustrations. The section on dress in general is by T. A. Joyce, of the British Museum staff, that on ancient costumes by H. S. Jones, director of the British School at Rome, and that on modern costume by Oswald Barron, editor of *The Ancestor*. The account of underclothing is of especial interest, as most books on costume altogether neglect this branch of the subject. Another section of this article is on national

and official costumes by W. Alison Phillips, principal assistant editor of the Britannica. The study of ceremonial robes is carried into further detail by the article ROBE (Vol. 23, p. 408), with its five richly colored plates, in one of which the judicial robes of the U. S. Supreme Court Justices are shown. Liturgical vestments are dealt with in VESTMENTS (Vol. 28, p. 27) and in a series of articles such as DALMATIC (Vol. 7, p. 776) and ALB (Vol. 1, p. 497).

Inventors of Textile Machinery and Great Textile Merchants

Among the biographies which are of interest in connection with textiles are those of ARKWRIGHT, RICHARD (Vol. 2, p. 556), the barber who invented the spinning frame; CARTWRIGHT, EDMUND, (Vol. 5, p. 425), inventor of the power loom; CROMPTON, SAMUEL (Vol. 7, p. 486), inventor of the spinning mule; SALT, TITUS (Vol. 23, p. 87), who created the alpaca industry; STRUTT, JEDEDIAH (Vol. 25, p. 1044), who did much to perfect the manufacture of cotton; and of WHITNEY, ELI (Vol. 28, p. 611), who went from Yale to Savannah to secure a position as school teacher and then, being disappointed, turned his attention to a device for separating the cotton fibre from the seeds and refuse, and invented the gin which has "profoundly influenced American industrial economic and social history." Another name of a great American inventor who individually rendered great services to the textile industry is that of HOWE, ELIAS (Vol. 13, p. 835), who invented the sewing machine. You will also be interested in the lives of successful merchants such as CANYNGES, WILLIAM (Vol. 5, p. 223), the great 15th Century

cloth manufacturer who became a clergyman after making a large fortune; MACKINTOSH, CHARLES (Vol. 17, p. 250), who introduced lightweight waterproof garments; WANAMAKER, JOHN (Vol. 28, p. 302), who began life as an errand boy in a book store; FIELD, MARSHALL (Vol. 10, p. 322), who when Chicago was a comparatively unimportant city founded there what has become the finest dry goods store in the world; STEWART, A. T. (Vol. 25, p. 912), who after studying for the ministry in Dublin, immigrated to New York and gradually built up the largest retail store in the city; PEASE, EDWARD (Vol. 21, p. 31), founder of a famous Quaker family of textile manufacturers in England; and CLAFLIN, H. B. (Vol. 6, p. 418), who came from Worcester, Mass., to New York where he for years controlled "the greatest mercantile business in the world." If you turn to the Article WORCESTER (Vol. 28, p. 823) you will note the associations of the locality with Elias Howe, Eli Whitney, Samuel Crompton, already mentioned, L. J. Knowles, another inventor who helped to perfect the power loom, and Erastus Bigelow, who invented the carpet-weaving machine (Vol. 6, p. 530) and was one of the incorporators of the Massachusetts Institute of Technology. Other lives of successful textile makers and dealers are those of RYLANDS, JOHN (Vol. 23, p. 950), founder of the largest cotton mills in Lancashire; DEXTER, TIMOTHY (Vol. 8, p. 141), the eccentric New England merchant of the 18th Century who beat his wife for not weeping heartily enough at the rehearsal of his funeral; HORROCKS, JOHN (Vol. 13, p. 712), the great English cotton manufacturer who was far ahead of his time and died of brain fever produced by overwork in 1804; WORTH, C. F. (Vol. 28, p. 834), the famous Paris dressmaker who began life as a London draper's apprentice; WHITELY,

WILLIAM (Vol. 28, p. 605), "the Universal Provider," of London; and TATA, J. N. (Vol. 26, p. 448), the great Parsee textile manufacturer.

A LIST OF THE PRINCIPAL ARTICLES IN THE BRITANNICA OF SPECIAL INTEREST TO MERCHANTS AND MANUFACTURERS OF TEXTILE GOODS

Alb

Alpaca

Apprenticeship

Arkwright, Richard

Artel

Asbestos

Bagging

Baize

Bleaching

Bombazine or Bombasine

Book-keeping

Bounty

Brocade

Buckram

Bunting

Calender

Calico

Cambric

Camel

Canvas
Canynges, William
Carding
Carpet
Cartwright, Edmund
Cellulose
Chasuble
Cheese Cloth
Chenille
Chintz
Claflin, H. B.
Cloth
Clouting
Codilla
Coir
Commerce
Corduroy
Costume
Cotton
Cotton Manufacture
Cotton Spinning Machinery
Crash
Cravat
Crepe
Cretonne
Crompton, Samuel

Dalmatic
Damask
Denim
Dexter, Timothy
Demurrage
Diaper
Die
Dimity
Dowlas
Drill
Duck
Dyeing
Embroidery
Felt
Fibres
Field, Marshall
Finishing
Flannel
Flannelette
Flax
Flock
Floorcloth
Frock
Fustian
Gante
Gauze

Gimp
Gingham
Girdle
Glass Cloth
Guanaco
Gunny
Haberdasher
Hat
Hessian
Holland
Honeycomb
Horrocks, John
Hosiery
Hose-pipe
Howe, Elias,
Huckaback
Jute
Knitting
Lace
Lawn
Linen
Llama
Longcloth
Manila Hemp
Macintosh, Charles
Maniple

Mantle
Matting
Mercantile System
Mercerizing
Merchant
Mohair
Moleskin
Mull
Muslin
Nankeen
Net
Osnaburg
Padding
Pease, Edward
Petticoat
Phormium
Pine-apple
Plaid
Plush
Poplin or Tabinet
Print
Protection
Ramie
Rep
Ribbons
Ring

Robes
Rylands, John
Sacking
Salt, Titus
Salvage
Scarf
Scrim
Shawl
Sheet
Shoddy
Silk
Sisal Hemp
Sleeve
Spinning
Stewart, A. T.
Stocking
Stole
Strutt, Jedediah
Tare and Tret
Tariff
Tarpaulin
Tartan
Tata, J. N.
Tapestry
Technical Education
Textile-printing

Ticking

Tow

Towel

Trousers

Tulle

Twill

Veil

Velvet

Velveteen

Vestments

Vicugna

Wanamaker, John

Weaving

Whiteley, William

Whitney, Eli

Wool, Worsted and Woollen Manufactures

Worth, C. F.

Yarn

CHAPTER VI
FOR MERCHANTS AND MANUFACTURERS OF MACHINERY



A Change in Public Opinion

An appreciation of the science of mechanical engineering is so indispensable to the manufacture and sale of machinery that the reader of this Guide might simply have been referred to the chapter *For Engineers* as covering the industry, if it were not that the Britannica contains (as the list at the end of this chapter shows) a great number of articles dealing with individual machines. The amount of space which the new Britannica devotes to mechanical subjects, and the great number of expert contributors whose collaboration was enlisted in this connection, are significant from more than one point of view. All other general encyclopaedias, including earlier editions of the Britannica itself, seem to have been influenced by the old-fashioned fetish of "pure" scholarship and "pure" science, treating theory as a subject of study much more dignified than the application of knowledge to the practical affairs of life. Until recent days the great universities of such important manufacturing countries as England, Germany and France were almost exclusively devoted to the teaching of philosophy, history, Greek and Latin, mathematics and pure or natural science. The older universities of the United States, too, were for a long time reluctant to recognize the growing importance of technical education, and the necessity, apart from technical education, of giving the general student some knowledge of mechanics. And it is a significant fact that the Britannica, the first encyclopaedia that has ever been published by a university, should be, although it comes from one of the oldest of all universities, the first to give full recognition to the importance of this department of knowledge.

Men in the machinery trade will welcome this change of attitude in the Britannica, not because they crave a public acknowledgment of the great share of the world's work that they are doing, but because public ignorance of mechanical subjects results in the abuse of machines and in unreasonable complaints against manufacturers when improperly used machinery fails to do its work. A curious illustration of the general disregard of the subject is supplied by the fact—as true of the United States as of England, Germany or France—that representative government is, in practice, chiefly government by lawyers, and that in this age of machinery it is the exception to find in the cabinet which directs the affairs of any country, a single member who has any knowledge of mechanics. The same ignorance is conspicuous in newspaper offices. Even the most dignified dailies seem unable to deal with any news that has to do with machinery without making ridiculous blunders.

Influence of Automobiles

Fortunately, the automobile is beginning to stimulate interest in practical mechanics, for no one can attempt to drive his own car, or even to obtain proper service from his chauffeur and from garage workmen, without realizing that he failed, at school, to learn some of the most useful of lessons. Before long the authorities responsible for our public schools may realize that it is absolute barbarism to neglect mechanical teaching as they do; and the new Britannica is already doing good service in stimulating public interest in the subject.

An examination of the articles mentioned in detail in the following summary, and a glance at the long list of articles at the end of the chapter, will show the

comprehensiveness with which the Britannica treats all types of machinery. The materials employed are, logically, the first subjects upon which information will be desired.

IRON AND STEEL (Vol. 14, p. 801), by Professor H. M. Howe of Columbia University, is a mine of information about the properties and uses of the different varieties of the indispensable metal of which 50,000,000 tons per annum are employed. In the manufacture of electrical apparatus COPPER (Vol. 7, p. 102) is largely employed, and for this reason alone the article has great value for the manufacturer. Almost as important is ALLOYS (Vol. 1, p. 704). Its chief author, Sir William Chandler Roberts-Austen, is the greatest living authority on alloys, and it is full of interesting facts about new admixtures.

The processes of ANNEALING, HARDENING AND TEMPERING are described in J. G. Horner's article under that title (Vol. 2, p. 70). This authority explains clearly the difference between hardening and tempering and gives valuable advice as to the most efficient methods of hardening. FOUNDING (Vol. 10, p. 743), also by J. G. Horner, is fully illustrated, and the question of the highest economies of machine moulding are among the practical matters considered. FORGING (Vol. 10, p. 663), with 19 illustrations, discusses fullering, swaging, upsetting, bending, welding, pinching, cutting-off, and die-forging. There is also a separate article, WELDING (Vol. 28), in which the section on *Electric Welding* is written by Elihu Thomson, who invented the process. A table of energy used in electric welding is added. See also BRAZING AND SOLDERING (Vol. 4, p. 463).



Manufacturing Methods

The designer of machinery will find much practical information in DRAWING, *Drawing Office Work* (Vol. 8, p. 556), and SUN-COPYING (Vol. 26, p. 93). It is a remarkable fact that prints identical in scale with the originals are now made up to a length of 22 feet.

BEARINGS (Vol. 3, p. 578), illustrated, is written by Professor Dalby of the South Kensington Central Technical College. The article TOOL (Vol. 27, p. 14), by J. G. Horner, is 33 pages in length and has 79 illustrations. The whole subject is completely covered. In the section on *Machine Tools* are discussed turning lathes, reciprocating machines, machines with drill and bore holes, milling machines, machines for cutting the teeth of gear wheels, grinding machinery, sawing machines, shearing and punching machines, hammers and presses, portable tools, appliances, wood-working machines, and measurement. In regard to the last subject great advances have lately been made. A thousandth of an inch is now considered a coarse dimension in the machine shop, where gauges within one five-thousandth of an inch are often used. This article is an invaluable manual for the machine-shop, and supplies many hints which should be given to workmen, for, to use the author's words, "a clumsy workman is as much out of place in a modern machine-shop as he would be in a watch-factory." Another article useful to the mechanic is SCREW (Vol. 24, p. 477), with 10 illustrations, by J. G. Horner, with a section on the *Errors of Screws*, by the late Henry A. Rowland, the American physicist, whose skill, shown in the construction of dividing engines of extraordinary precision and delicacy, made him famous the world over. See also

GRADUATION (Vol. 12, p. 312).

Engines and Motors

The articles on the prime-movers are an important and noteworthy part of the new Britannica. Professor Ewing, of Cambridge University, contributes AIR ENGINE (Vol. 1, p. 443) and STEAM ENGINE (Vol. 25, p. 818), both fully illustrated. The latter has a most interesting preliminary historical account of engines from the aeolipile of Hero of Alexandria (about 130 B.C.) to the steam-turbine, the most modern type of all. The newest forms of internal combustion motors, OIL ENGINE (Vol. 20, p. 35) and GAS ENGINE (Vol. 11, p. 495), are described by Dugald Clerk, inventor of the Clerk cycle gas engine, and the articles are fully illustrated. Under HYDRAULICS (Vol. 14, p. 91) will be found complete information as to the construction of water-pressure engines, water-wheels, turbines, and also pumps. The article is written by Professor W. C. Unwin, and has been universally declared to be the best treatise on the subject that has yet appeared. There is a separate illustrated article WATER-MOTORS (Vol. 28, p. 382), by Professor Beare of Edinburgh University. See also WINDMILL (Vol. 28, p. 710).

Designers and constructors of electrical machinery will be greatly interested in C. C. Hawkins' illustrated article DYNAMO (Vol. 8, p. 764), which explains fully how the dynamo is constructed and gives its history from Faraday's discovery of the principle in 1831. Dr. Louis Bell, of the General Electric Co., writes on MOTORS, ELECTRIC (Vol. 18, p. 910).

Machinery for Special Purposes

In hundreds of articles on manufacturing and manufactured products there are excellent descriptions of the machinery employed. COTTON-SPINNING MACHINERY (Vol. 7, p. 301), by Professor Fox, of Manchester University, gives details, with illustrations, of the modern systems of spinning, all founded on the inventions of Paul, Arkwright, Hargreaves and Crompton, while an historical account of primitive machines as well as much practical information, will be found under SPINNING (Vol. 25, p. 685). WEAVING has a section *Weaving Machinery* (Vol. 28, p. 443). An account of the special machinery and appliances used in the manufacture of woollens is included in Professor Barker's illustrated article WOOL, WORSTED AND WOOLLEN MANUFACTURES (Vol. 28, p. 805). In HOSIERY (Vol. 13, p. 788) we learn about framework knitting and warp-knitting machines. It is recorded that up to the middle of the 19th century only a flat web could be knitted, and that a circular knitting machine of American origin is the type of machine on which is produced the seamless hosiery of to-day. This was introduced by J. W. Lamb in 1863. ROPE AND ROPE MAKING (Vol. 23, p. 713), by Thomas Woodhouse, of the Dundee Technical College, is richly illustrated with pictures of the most modern type of machinery for the manufacture of fibre and wire ropes. The various machines and apparatus for sugar making are carefully described in SUGAR, *Sugar Manufacture* (Vol. 26, p. 35). For milling machinery see FLOUR AND FLOUR MANUFACTURE (Vol. 10, p. 548), by George F. Zimmer, author of *Mechanical Handling of Material*. The latest designs in agricultural machines, with illustrations, as well as a history of their development, will be found under PLOUGH AND PLOUGHING (Vol. 21, p. 850), SOWING

(Vol. 25, p. 523), HARROW (Vol. 13, p. 27), REAPING (Vol. 22, p. 944), THRASHING (Vol. 26, p. 887), etc. It is a matter of interest that the first successful reaping-machine was invented by a Scotch clergyman in 1826. For machinery used in the modern dairy see DAIRY AND DAIRY PRODUCTS (Vol. 7, p. 750). The germ of the sewing machine dates back to 1755, and the whole story of its development is told in SEWING MACHINES (Vol. 24, p. 744). **A Vast Encyclopaedia of Machinery** The descriptions of machinery of various kinds are continued under such headings as BREWING, *Brewing Operations* (Vol. 4, p. 506), illustrated; BELLOWS AND BLOWING MACHINES (Vol. 3, p. 705), illustrated; PIN (Vol. 21, p. 615); NEEDLE (Vol. 19, p. 338); TYPOGRAPHY, *Modern Practical Typography* (Vol. 27, p. 542), illustrated; PRINTING (Vol. 22, p. 350), illustrated; BOOKBINDING, *Modern Methods* (Vol. 4, p. 218), illustrated; TEXTILE PRINTING (Vol. 26, p. 694); ALKALI MANUFACTURE (Vol. 1, p. 674), illustrated; REFRIGERATING AND ICE MAKING (Vol. 23, p. 30); SILK, *Silk Manufacture* (Vol. 25, p. 102); LACE, *Machine-made Lace* (Vol. 16, p. 44), illustrated; CARPET, *Modern Machinery* (Vol. 5, p. 396); LEATHER (Vol. 16, p. 330), illustrated; BICYCLE (Vol. 3, p. 913), illustrated; TYPEWRITER (Vol. 27, p. 501), illustrated; DREDGE AND DREDGING (Vol. 8, p. 562), illustrated; and PAPER, *Paper Manufacture* (Vol. 20, p. 727), illustrated.

Biographies of many inventors, designers and builders of machines are included in the list of articles at the end of the chapter *For Engineers* in this Guide, and are therefore omitted in the following alphabetical summary.

ALPHABETICAL LIST OF THE PRINCIPAL MACHINES AND APPLIANCES DESCRIBED IN THE BRITANNICA AND GENERAL SUBJECTS AND ARTICLES ON MACHINERY

Accumulator

Acetylene Generator

Aerating Apparatus

Aeroplane

Air Brake

Alternators

Alloys

Ammunition Hoist

Anemometer

Annealing, Hardening and Tempering

Archimedes, Screw of Babbitt's Metal

Back-starching Mangle

Bale-breakers

Band-knife Cutting Machine

Barbed Wire Machinery

Barker's Mill

Barrel Organ

Bearings

Beating Machine

Beetling Machine

Bellows and Blowing Machines

Bessemer Convertor

Bevel
Bicycle
Black-ash Revolving Furnace
Blast Furnace
Blocking Machine
Boiler
Bolt-screwing Machines
Book-sewing Machine
Boring Tools
Brake, Hydraulic
Brass
Brazing and Soldering
Breaker Card
Brewing Machinery
Bronze
Bundling Press
Burner
Butter Worker
Butyrometer
Calculating Machines
Calender Machine
Calipers
Calorimeter
Carburetter
Carding Engine
Carpet-making Machinery

Case-making Machine
Casing-in Machine
Centrifugal Machines
Chisel
Chronograph
Chucks
Churn, Mechanical
Clepsydra, or Waterclock
Clock
Coal-cutting Machines
Coal-wedging Machines
Coal-weighing Machine
Coining Press
Comber
Compressed-air Machines
Continuous Press
Conveyors
Copper
Copying Machines
Core-making
Cotton-gin
Cotton-spinning Machinery
Cranes
Crushing Machine
Cultivator
Current Meter

Curvometer
Cutting Machines
Cutting Tools
Damping Machines
Dash Wheel
Depth Recorder
Die
Differential Machines
Dividing Engines
Diving Bell
Doublers
Dough Kneaders
Dough Dividers and Moulders
Dough Mixers
Drawing-box
Drawing-frame
Drawing-office
Dredgers
Dressing Machine
Drill
Drop Hammer
Drying Machine, Horizontal
Dye-jigger
Dynamo
Dynamometer
Eccentric

Elevators, Lifts and Hoists
Error of Screws
Fans, Rotary
Fire-engines
Flour-sifters
Flying Machines
Fly-shuttle
Forging
Forging Press, Hydraulic
Founding
Friction
Furnace
Gas Engine
Gas Plants
Gas Producers
Gill Frame
Glass-blowing Machine
Glass Press
Graduation
Gravity Stamp
Grinding Machinery
Gyroscope and Gyrostat
Hackling and Spreading Machine
Half-stuff Machine
Hammer
Hand Drill, Electric Harrow

Hat-making Machines
Hay Elevator
Hide Mill, or Double-Acting Stock
Hoe, Horse
Holden Burner
Hydraulic Machines
Hydraulics
Hydro-extractors
Ice-making Machines
Indicator
Injector
Integrators
Iron and Steel
Ironing Machines
Jigger, Hydraulic
Jigs
Jute-Crusher
Jute-Opener
Jute-softening Machine
Kier
Knitting Machines
Labour Legislation
Lace Machines
Lappet Looms
Lathe, Automatic
Laundry Machines

Lever
Lifts, Hydraulic
Linotype Machine
Liquid-air Machine
Lithographing Machines
Loaders
Lock
Locomotives
Loom
Lubricants
Luggage-weighing machine, Automatic
Machine
Machine Gun
Machine Moulding
Mandrel Lathe
Mangling Machines
Manometer
Measuring Machine
Mercerizing Machines
Metal-turning Tools
Meter, Electric
Micrometer
Microtome
Milling Cutters
Milling Machines
Milling Stock

Monotype Machine
Mortising Machine
Motors, Electric
Motor Vehicles
Mowers
Mule, Crompton’s
Nail Machines
Needle Machines
Netting Machine
Oil Engine
Oil Muffle Furnace
Opening Machine
Ore-Breaker
Pantograph
Paper-making Machines
Patent logs
Patents
Perpetual Motion
Phonograph
Phosphor Bronze
Pin Machine
Pig-casting Machine
Planimeters
Planing Tools
Plug and Ring Gauge
Pneumatic Hammer

Potter’s Wheel
Power-looms
Power Transmission
Price-computing Weighing Machine
Printing Presses
Pulley
Pumps
Purifiers
Rag Boiler, Revolving
Rag-breaking Engine
Rake, Horse
Reaping Machines
Reciprocating Machines
Rectifiers
Reel Paper-Cutter
Reels
Refrigerating Machines
Remontoire
Reverbatory Furnace
Rifling Machine
Ring-frame
Rock Drill
Rod Gauge
Roller Milling Machine
Roller Washing Machine
Rolling, Mill

Rope-making Machines
Rotary Washing Machines
Rounding and Backing Machines
Rusden and Eeles Burner
Salt-cake Furnace, Mechanical
Sawing Machines
Scalpers
Screw cutting
Screw-Gill Drawing Frames
Screw-thread gauge
Screw
Screwing Machine
Scutcher
Separators
Sewing Machines
Shaping Machines
Shearing and Punching Machines
Shuttles
Signal Lever
Silk-reeling Machine
Slide-rule
Slime-tables
Slotter Tools
Sowing Machines
Spinning-jinny
Splitting Machine

Steam Engine
Steam Hammers
Steam Plough
Steam Turbines
Stentering Frame
Still
Stocking Frame
Strength of Materials
Sugar-making Machinery
Sugar Weighing Machine, Automatic
Sulphuric-Acid Plant
Sun Copying
Swathe Turners
Sweep Rake
Table, Mathematical
Tea-weighing Machine
Teasel
Technical Education
Testing Machines
Thermodynamics
Thrashing Machines
Throstle
Tool
Tractors, Steam and Oil
Trepans
Turbine

Turning Lathes
Turret Lathe
Type-setting Machines
Typewriter
Units, Physical
Vacuum brake
Valve
Vanners
Vernier
Voting Machines
Vulcanizer
Washing Machines
Wash Mill
Watch
Water Motors
Water-pressure Engines
Water Wheels
Weaving Machinery
Weighing Machines
Welder, Automatic
Welding
Welding, Electric
Winding Machines
Windmill
Wire-winding Machine
Wiring Machine

Wood-working Machines

Woolen Mule

CHAPTER VII
FOR MERCHANTS AND MANUFACTURERS OF METALS, HARDWARE, GLASS AND CHINA

Elisée Reclus, the great French student of the origins of civilization, says, in the Britannica article FIRE (Vol. 10, p. 399), that "human culture may be said to have begun with fire, of which the uses increased in the same ratio as culture itself." The industries grouped in the present chapter all depend upon the curiously diverse effects of heat; the softening and tempering of metals, the hardening of clay and the changes by which sand becomes glass. It is for the reader himself to decide whether he wishes to begin his course of reading by a study of the article HEAT (Vol. 13, p. 135), and the allied articles to which it refers, and thus to understand how temperature plays its dominant part in the most useful of manufacturing processes.

Knowledge in "Layers"

It is, indeed, one of the most attractive features of the Britannica that it presents knowledge in *layers*. In text-books, the theoretical and practical aspects of an industry are so interwoven that you cannot separate them. But in the Britannica, if you desire only to examine the finished products of any branch of industry, as you might see them and hear them

described at an exhibition or in a manufacturer's sample room, you can turn to articles and sections of articles in which critical comment and elaborate illustrations put clearly before you the varieties of, for example, plated ware, china or glass. Proceeding to the next "layer," you find technical information about the manufacture of these and all other goods; you have been permitted to pass from the sample room into the factory, which is not usually so easy of access. And in the scientific articles you arrive at the very substratum and foundation of knowledge; you have what the experts in the factory could not give you if they would: the clear teaching that only the great masters of science can supply.

The manufacturer, of course, absolutely *needs* to know all that can be learned about the origin of his materials and the principles upon which his processes are based. But the dealer, in his turn, will be a shrewder buyer, a more convincing salesman and a better manager of the salesmen under him, if he knows the whole history of his wares, of the ingredients that enter into their composition and of their manufacture. Factory experience is hardly more universal among wholesale men, most of whom begin as clerks, than among retailers, and it is impossible for a business man who has got his foot fairly on the ladder to drop his work and go through an apprenticeship or take a thorough course at a technical college. If, however, he will for a few months devote his spare time to the studies he can pursue, unaided, in the Britannica, the insight he obtains will give a new value to all the knowledge he picks up in the course of his business.

Physics and Chemistry

Some of the Authorities

The departments of physics and physical chemistry are of course those in which the Britannica's scientific contents especially interest those to whom this chapter is addressed, and the authority of the Britannica in those departments of knowledge is shown by a very striking fact. You may remember that Alfred Nobel, the great Swedish chemist, who made a fortune by the invention and manufacture of dynamite, devoted $9,000,000 to the establishment of the annual Nobel prizes, to be awarded, irrespective of nationality, for eminence in scientific research and in the cause of peace. In physics and chemistry, *Britannica contributors have won, in eleven years, seven of these prizes*, these winners being: in 1901, Prof. J. H. van't Hoff, of the University of Berlin; in 1902, Prof. Lorentz, of the University of Leiden; in 1904, Lord Rayleigh, Chancellor of the University of Cambridge; in 1906, Sir J. J. Thomson, of the University of Cambridge; in 1909, Prof. Ostwald, of the University of Leipzig; in 1911, Prof. Van der Waals, of the University of Amsterdam. In other words, you find that the scientific committee who award the Nobel prizes select for these unique distinctions the same men whom the editor of the Britannica selected as contributors. Now apply another test, in connection with the subject matter of this chapter. What is, by general consent, the most exquisitely finished product of any of the industries under discussion in the present section? To this question there can be but one answer: Optical glass. Where is the best glass made? At the Zeiss Works in Jena, Germany. Very well, Dr. Otto Henker and Dr. Eppenstein, both of the scientific staff of the Zeiss Works, wrote the optical articles in the Britannica

which deal with the lens and with aberration in lenses. You should therefore remember, in reading the Britannica, that whether you are only going as far as the uppermost layer of knowledge, or reaching down to the very foundations of science, the men whose articles you are reading command the respect that you can pay to them by giving your very closest attention. Do not imagine that because the book contains forty-four million words, it is made to be skimmed; every article in it is condensed; and you cannot derive the fullest benefit from your reading unless you feel, as you would feel if you were fortunate enough to be brought into personal contact with any of these great men, that you have a privilege of which you must make the most.

Metals

Other chapters of this Guide also deal in detail with the scientific side of the industries mentioned here; and in examining the groups of industrial articles, those dealing with metals claim first consideration. The article METAL (Vol. 18, p. 198) is devoted to classification only, and would not occupy more than ten pages of this Guide. It contains information as to the physical properties of the metals, including a table in which the specific gravity of each of 42 metals is stated, a table of comparative ductility under the hammer, for rolling and for wire drawing, a table of elasticities, and other tables showing the ratio of expansion under heat, the melting and boiling points, and the relative thermic and electric conductivity. A section is devoted to the action of chemical agents upon the simple metals.

METALLURGY (Vol. 18, p. 203), and ELECTROMETALLURGY (Vol. 9, p. 232), by W. G. McMillan, lecturer on metallurgy at Mason College,

Birmingham, deal with all the methods of smelting ores. Your next reading should be the great article IRON AND STEEL (Vol. 14, p. 801), by Prof. H. M. Howe, of Columbia University, containing as much matter as would fill 110 pages of this Guide. At the beginning of this article Prof. Howe disposes of the much discussed question as to the true distinction between iron and steel, as to which there has been great confusion. Before 1860, the word "steel" was never applied to a metal that could not be hardened by tempering. But when the invention of the Bessemer and open-hearth processes introduced a new class of iron, "which lacked the essential property of steel, the hardening power, yet differed from the existing forms of wrought iron in freedom from slag," the men interested in the new product did not like to call it "wrought iron," which is what it really is, because that name would confuse it with a lower-priced grade of metal. They ought to have coined a new word for it, but they appropriated the name of steel—so that to-day "steel" means either true steel or the low-carbon, slagless variety of malleable iron. The article is divided into 133 sections, so that to analyze its contents would swamp this chapter of the Guide, but the reader will find in it the clearest and most authoritative account of the industry which has yet been published.

Among articles on the commercial metals are COPPER (Vol. 7, p. 102), LEAD (Vol. 16, p. 314), TIN (Vol. 26, p. 995), ZINC (Vol. 28, p. 981), ALUMINIUM (Vol. 1, p. 767), NICKEL (Vol. 19, p. 658), ANTIMONY (Vol. 2, p. 127), and, on the precious metals, GOLD (Vol. 12, p. 192), SILVER (Vol. 25, p. 112), and PLATINUM (Vol. 21, p. 805).

The article ALLOYS, of which Sir W. C. Roberts-Austen, long chemist of the London Mint, is the chief

contributor, with its photomicrographic illustrations, contains not only an account of the alloys already generally used in the metal industries, but also practical information as to the experiments which have been made recently with some of the newly discovered rare earths. In the article METALLOGRAPHY (Vol. 18, p. 202), by the same specialist, the microscopic examination and photography of metals and alloys is described.

Among articles on the metallic compounds are BRASS (Vol. 4, p. 433), in which "Dutch metal," "Mannheim gold," "similor" and "pinchbeck" are described; BRONZE (Vol. 4, p. 639), which deals with steel bronze, phosphor bronze, and other combinations; FUSIBLE METAL (Vol. 11, p. 369) is an important compound. PEWTER (Vol. 21, p. 338), by Malcolm Bell, author of *Pewter Plate*, etc., is of historical interest, and of value to the dealer or collector, while he who wishes to distinguish between the older and the more modern electroplated ware is referred to the article SHEFFIELD PLATE (Vol. 24, p. 824), also by Malcolm Bell. ELECTROPLATING (Vol. 9, p. 237) describes the art that put an end to the Sheffield plate industry. Other methods of coating metals are given under GALVANIZED IRON (Vol. 11, p. 428), TIN PLATE AND TERNE PLATE (Vol. 26, p. 1000), and GILDING (Vol. 12, p. 13). The art of making gold-leaf is described in GOLDBEATING (Vol. 12, p. 202).

In regard to manufacturing processes there are the separate articles: FORGING (Vol. 10, p. 663), with 19 illustrations; FOUNDING (Vol. 10, p. 743), with 11 illustrations; ANNEALING, HARDENING AND TEMPERING (Vol. 2, p. 70), and BRAZING AND SOLDERING (Vol. 4, p. 463). These four articles are by J. G. Horner. And see WELDING (Vol. 28, p. 500),

also by Mr. Horner, with a section on *Electro-Welding*, by Elihu Thomson, inventor of the process of electric welding and expert for the General Electric Co. The article TOOL (Vol. 27, p. 14), another of Mr. Horner's valuable contributions, has 79 illustrations and possesses special interest for the manufacturer of metal-ware as well as the dealer in hardware.

Metal-Ware

Coming now to the production of metal wares, the article METAL-WORK (Vol. 18, p. 205), beautifully illustrated, is the work of three noted experts. The late J. H. Middleton, Slade Professor of Fine Art, Cambridge University, writes on *Methods of Manipulation in Metal Work* and tells of the metal work of Greece, Italy, Spain, Germany, France, England, Persia and Damascus. J. S. Gardner, an expert metal worker, deals with *Modern Art Metal Work*, and J. G. Horner contributes the section on *Industrial Metal Working*, in which he deals with *Plater's Work*, *Coppersmith's Work*, *Raised Work*, *Cast Work*, *Methods of Union and Protection of Surfaces*. In connection with the last mentioned subject, see also JAPANNING (Vol. 15, p. 275), LACQUER (Vol. 16, p. 53), and PAINTER-WORK (Vol. 20, p. 457). Further information about lacquering, with valuable formulas, will be found in the article JAPAN (Vol. 15, p. 188). Some of the ornamental forms of metal work are described in REPOUSSÉ (Vol. 23, p. 108), by M. H. Spielmann, formerly editor of *The Magazine of Art*; INLAYING (Vol. 14, p. 574), and DAMASCENING (Vol. 7, p. 783). See also GRILLE (Vol. 12, p. 596).

PLATE (Vol. 21, p. 789), an article by H. R. Hall, of the British Museum, H. Stuart Jones, director of the British School at Rome, and E. A. Jones, author of *Old English Gold Plate*, etc., is a concise, complete

hand-book on work in silver and gold of any class other than those of personal ornaments and coins. It is profusely illustrated with plates and text-cuts, showing many exquisite models; and the reader can master the details of style in different periods and countries. The subjects of the assay of gold and silver plate and hall-marks are discussed, the former being treated more fully in ASSAYING (Vol. 2, p. 776), by A. A. Blair, chief chemist of the U. S. Geological Survey. The article ROMAN ART, by H. Stuart Jones, has a section devoted to *Work in Precious Metals* (Vol. 23, p. 483).

CUTLERY (Vol. 7, p. 671) is one of the articles pertaining specifically to hardware manufacture and trade, in which general processes of manufacture are described; and of allied interest are KNIFE (Vol. 15, p. 850), FORK (Vol. 10, p. 666), SPOON (Vol. 25, p. 733), SCISSORS (Vol. 24, p. 407), SHEARS (Vol. 24, p. 815), RAZOR (Vol. 22, p. 937), CHAfiNG-DISH (Vol. 5, p. 800), NAIL (Vol. 19, p. 153), AXE (Vol. 3, p. 67), HAMMER (Vol. 12, p. 897), CHISEL (Vol. 6, p. 247), WIRE (Vol. 28, p. 738), and BARBED WIRE (Vol. 3, p. 384). Articles describing all forms of agricultural implements will be found under their respective headings.

Glassware

GLASS (Vol. 12, p. 86) is most complete in its consideration of the entire subject. The introductory section by H. J. Powell, of the Whitefriars Glass Works, London, author of *Glass Making*, and W. Rosenhain, of the National Physical Laboratory, London, deals with the manufacture of optical glass, blown glass and mechanically-pressed glass. The necessary qualities of each kind are stated and the newest processes of manufacture described, with full

information about materials. The second part of the article is devoted to the *History of Glass Manufacture*, by Mr. Powell and Alexander Nesbitt, who wrote the well-known *Introduction* to the South Kensington Museum Catalogue of Glass Vessels. Egyptian, Assyrian, Roman, Venetian, Bohemian and Oriental glass, as well as the modern types, are exhaustively described. The article is splendidly illustrated. DRINKING VESSELS (Vol. 8, p. 580), by Dr. Charles H. Read, of the British Museum, describes old forms of glass cups and goblets. It is most valuable for its information in regard to styles of different countries and periods, and the illustrations show many types.

Stained glass is the subject of the separate article GLASS, STAINED (Vol. 12, p. 105), illustrated, by the late Lewis F. Day, author of *Windows, a Book about Stained Glass*. It is both historical and descriptive in its nature, deals with painted and stained glass, contains a table of examples of important historical stained glass, and treats of the latest progress in the art, including the productions of La Farge and L. C. Tiffany in this country. The art of fitting and setting of glass is described in GLAZING (Vol. 12, p. 116), illustrated, by James Bartlett. Here we learn about the setting of window glass, the use of glass in decoration, systems of roof glazing and the use of wire glass.

Full information about glass for optical purposes will be found under LENS (Vol. 16, p. 421), illustrated, by Dr. Otto Henker, of the Carl Zeiss Factory, Jena, Germany; LIGHTHOUSE, *Optical Apparatus* (Vol. 16, p. 633), illustrated, by W. T. Douglass, who erected the Eddystone and Bishop Rock lighthouses, and Nicholas G. Gedye, chief engineer to the Tyne Improvement Commission; TELESCOPE, *Instruments* (Vol. 26, p. 561), illustrated,

by H. Dennis Taylor and Sir David Gill; PHOTOGRAPHY, *Photographic Objectives or Lenses* (Vol. 21, p. 507), illustrated, by James Waterhouse; SPECTACLES (Vol. 25, p. 617).

Chinaware, Pottery and Porcelain

To those engaged in the china ware, pottery or porcelain manufacture and trade, the great article CERAMICS (Vol. 5, p. 703) will prove a revelation. It is the joint product of a number of experts, both practical and artistic, including William Burton, chairman, Joint Committee of Pottery Manufacturers of Great Britain, Henry R. H. Hall and Robert Lockhart Hobson, both of the British Museum, and A. Van de Put and Bernard Rackham, both of the Victoria and Albert Museum. It is 85,000 words in length and contains over a hundred beautiful illustrations, including six plates in colour. It deals fully with the artistic and economic phases of the subject, the methods of manufacture, the different varieties of ceramics, their history, decoration, etc. Japanese ceramics are treated separately in JAPAN, *Ceramics* (Vol. 15, p. 183), illustrated, by the late Capt. Frank Brinkley.

CLAY (Vol. 6, p. 472), by Dr. J. S. Flett, describes the occurrence, composition and properties of the various clays used in ceramics.

TERRACOTTA (Vol. 26, p. 653), illustrated, by William Burton and H. B. Walters, of the British Museum, deals with the artistic use to which baked clay is put, while TILE (Vol. 26, p. 971), illustrated, also by William Burton, has great practical value for the present-day manufacturer.

KAOLIN (Vol. 15, p. 672), by F. W. Rudler, of the

Museum of Practical Geology, London, deals specifically with china clay and its preparation for the market. GILDING (Vol. 12, p. 13) contains material on the subject of the gilding of pottery and porcelain, and PAINTING has a section *Painting with Coloured Vitreous Pastes* (Vol. 20, p. 484), by Prof. G. B. Brown, of Edinburgh University, which describes the use of these pastes in ceramics. ENAMEL (Vol. 9, p. 362), illustrated, by Alexander Fisher, yields equally valuable information for those concerned with the decoration of china.

In MURAL DECORATION, by Walter Crane and William Morris, there is a section devoted to *Wall-Linings of Glazed Brick or Tiles* (Vol. 19, p. 17). Material of great archaeological interest relating to earthenware, etc., will be found in such articles as AEGEAN CIVILIZATION (Vol. 1, p. 245), illustrated, by D. G. Hogarth, of the Ashmolean Museum, Oxford; CRETE, *Archaeology* (Vol. 7, p. 421), illustrated, by Arthur J. Evans, the famous Cretan explorer, and GREEK ART (Vol. 12, p. 470), illustrated, by Percy Gardner, the classical archaeologist.

The following is a partial list in alphabetical order of articles and subjects in this field treated in the Britannica.

ALPHABETICAL LIST OF ARTICLES AND SUBJECTS IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO THOSE IN METAL, HARDWARE, GLASS AND CHINA MANUFACTURE AND TRADE

Adze

Aegean Civilization

Ainmuller, M. E.
Alloy Steels
Alloys
Aluminium
Amphora
Andiron
Annealing, Hardening and Tempering
Antimony
Anvil
Armour Plate
Arms and Armour
Arretine Ware
Assaying
Auger
Awl
Axe
Barbed Wire
Banko Ware
Basin
Beaker
Belleeck Ware
Bidri Work
Binocular Instrument
Biscuit
Bismuth
Bizen Ware

Bohemian Glass
Bottle
Bow Ware
Bradawl
Brass
Brasses, Monumental
Brazier
Brazing and Soldering
Bronze
Byzantine Glass
Caffieri, Jacques
Candlestick
Capo di Monte Ware
Capronnier, J. B.
Cast Work
Cellini, Benvenuto
Ceramics
Chafing Dish
Chalice
Chelsea Ware
China
China, *Art*
Chinese Porcelain
Chisel
Churn
Clay

Cookworthy, William
Coperta
Copper
Coppersmith’s Work
Crete
Crown Glass
Cup
Cutlery
Cultivator
Damascening
Damask Steel, or Damascus Steel
Damascus Ware
Delft Ware
Della Robbia
Derby Ware
Doulton, Sir Henry
Dresden, or Meissen, Ware
Drinking Vessels
Dwight, John
Electrolier
Electroplating
Electrum
Enamel Painting
Etruscan Ware
Faience
Fender

File
Finiguerra, Maso
Fireback
Firing
Fire-irons
Flint Glass
Fork
Forging
Founding
Fusible Metal
Galvanized Iron
German (or Nickel) Silver
Gilding
Gimlet
Girandole
Glass
Glass, Ancient
Glass-blowing Machine
Glass Cutting and Engraving
Glass, Painted
Glass-press
Glass, Stained
Glazes
Glazing
Goblet
Gold

Gold and Silver Thread
Goldbeating
Gouge
Gombroon Ware
Gouthière, Pierre
Graffito Ware
Grate
Greek Art
Grille
Hall-marks
Hammer
Harrow
Hatchet
Henri-Deux, Oiron, or St. Porchaire Ware
Hispano-Moresque Ware
Hizen Ware
Hoe
Horseshoes
Ingot
Inlaying
Invar
Iron and Steel
Iron Work
Izumo Ware
Japan, *Ceramics*
Japanning

Jug
Kaolin
Kashi
Kiln
Kioto Ware
Knife
Kuang-Yao
Kuft Work
Kutani Ware
Lacquer
La Farge, John
Lang-Yao
Latten
Lead
Lens
Lighthouse Apparatus, Optical
Lock
Lubricants
Lustred Ware
Majolica
Meissonier, J. A.
Medal
Metal
Metallography
Metallurgy
Metal Work

Mezza Majolica
Minoan, or Kamares, Ware
Mirror
Monstrance
Morel-Ladeuil, L.
Mural Decoration
Nail
Needle
Nickel
Niello
Ormolu
Owari Ware
Painter-work
Palissy, Bernard
Palissy Ware
Painting
Pen
Persian Pottery
Pewter
Photographic Objectives or Lenses
Pin
Pitcher
Plaque
Plate
Plated Ware
Plate-glass

Plater’s Work
Platinum
Plough
Porcelain
Pot-hook
Potteries, The
Potter’s Marks
Potter’s Wheel
Pottery
Protection of Surfaces
Raised Work
Rake
Razor
Reaper
Repoussé
Roman Art
Rookwood Ware
Royal Copenhagen Ware
Royal Worcester Ware
Salt Glaze
Salver
Samovar
Saracenic Glass
Satsuma Ware
Saw
Scissors

Sconce
Screen
Screw
Scythe
Sèvres Porcelain
Shears
Sheet Glass
Sheffield Plate
Shovel
Shuttle
Sieve
Silver
Smith
Solder
Spade
Spectacles
Spit
Spoon
Spade
Stone Ware
Table-ware
Takatori Ware
Tanagra Figures
Tankard
Tazza
Telescopic Instruments

Terracotta
Thrasher
Tiffany, C. L.
Tiffany Glass
Tiles
Tin
Tinker
Tin and Terne Plate
Tongs
Tool
Torchère
Tray
Tripod
Trivet
Tube-making, Glass
Turkish Pottery
Tweezers
Trowel
Vacuum Cleaner
Vase
Venetian Glass
Wedgewood, Josiah
Wedgewood Ware
Whitefriars Glass
Wire
Wired Glass

Yatsushiro Ware

Yi-Hsing-Yao

Zinc

CHAPTER VIII
FOR MERCHANTS AND MANUFACTURERS OF FURNITURE

Art and Industry

When you think of your home, making a picture in your mind of the familiar surroundings associated in your memory with your greatest pleasures, you are really thinking of furniture. Tradition makes the dwelling itself the tangible symbol of home, because when a primitive tribe ceased to be wanderers, the walls that excluded wild beasts and inclement weather and gave privacy were conspicuous evidences of a change for the better. But in our higher civilization our way of thinking has changed. Nothing seems to us more desolate than the bleak surfaces and harsh angles of an unfurnished house. Colour and softness and the curved lines which we instinctively love because they suggest softness come into the dwelling with furniture, and culture has progressed so far that the chair or bed must be a delight to the eye as well as to the weary limbs, that the dinner table and the bookcase must be so designed as to enhance the satisfaction we find in refreshing body and mind. You would not get so

much pleasure as you do from your Encyclopaedia Britannica if its paper and print and pictures and the colour and texture of the bindings did not make it one of the chief adornments of your home; the volumes might be just as useful in a less pleasing guise, but you would not feel the same affection for the book.

Form and Embellishment

To satisfy the spirit of home-love and house-pride in the making of furniture is an art, and the idea that furniture can only be artistic when it is made by hand, from a design that is to be used but once, is as nonsensical as it would be to say that a beautiful etching is not true art because a press produces it and others like it. “Fine art is everything which man does or makes *in one way rather than another* ... in order to express and arouse emotion ... with results independent of direct utility.” These words from Sir Sidney Colvin’s delightful Britannica article FINE ARTS (Vol. 10, p. 361), and another passage (p. 370), in which he speaks of “the artificers who produce wares primarily for use, in a form, or with embellishments, that have the *secondary virtue of giving pleasure*,” might well be quoted to the supercilious and superficial critic who condemns every product which machinery has brought within the reach of the less fortunately situated. Furniture, made in one form rather than another, because that one form gives greater pleasure, is artistic furniture whether it is made of machined pine chemically stained or of handworked and hand-polished rosewood. The manufacturer and dealer who ingeniously minimize the cost of production and distribution are benefiting the public just as truly as

did Thomas Chippendale, “at once an artist and a prosperous man of business,” or Thomas Sheraton, “the great artistic genius who lived in chronic poverty.” The adaptation and variation of their ideas, under modern conditions of manufacture, have given pleasure to tens of thousands for every one whose home was enriched by the original products.

Related Subjects

We have, then, in the furniture business, the combination of an art with an industry of the most practical and useful kind, and this art is one which does more than any other to “express and arouse” the home-cherishing emotions which solidify family life. The principles which underlie architecture, sculpture, painting, metal work, embroidery and the weaving of patterns all affect the design of furniture, since its contours and surfaces are obtained by the application of the structural and decorative laws of all of them, and it might therefore be said that the only course of reading in the Britannica which could fully justify the title of this chapter would be one which covered all these diverse fields. The reader can, however, with the assistance of other chapters of this Guide, easily find his way to the Britannica’s articles on each of these allied subjects, and an indication of the articles dealing specifically with furniture will at any rate serve his primary purpose.

“Art Nouveau” School

The keystone article FURNITURE (Vol. 11, p. 363) is by James Penderel-Brodhurst, one of the greatest of living authorities, to whom many of the subsidiary articles are also due. The 37 illustrations on plate paper include two large views of the most famous and resplendent piece of furniture ever constructed,

the cylinder desk, now in the Louvre Museum in Paris, made for Louis XV by a number of "artist-artificers," the chief among them Oeben and Riesener, with bronze mounts by Duplessis, Winant and Hervieux. The article explains the scanty attention paid to furniture in ancient Egypt, Rome and Greece, and throughout the Middle Ages in Western Europe, as due to the routine of life in centuries during which people spent their days in the open air, and went to bed as soon as it was dark, therefore needing but few household appliances. The Renaissance was the first era of sumptuous and elaborately varied furniture; and it was not until the 18th century that the art of the cabinet-maker was fully developed. The English periods of Queen Anne and early Georgian craftsmanship and the reigns of Louis XV and Louis XVI brought the development to its high-water-mark. Since then, there has been no really new departure except the "art nouveau" school, which professed to be free from all traditions and to seek inspiration from nature alone. The revolution which was thus attempted was not successful, and the permanent influence of the movement will, in all probability, be less notable for its effect upon style than for the very great service it rendered in reviving the use of oak. Lightly polished, fumed or waxed, this wood, which was so long neglected, is the most effective that can be employed at moderate cost.

Beds

The oldest and most indispensable of all furnishings is treated in the article BED (Vol. 3, p. 612). The Egyptians had high bedsteads to which they ascended by steps, and the Assyrians, Medes and Persians followed the same custom. The Greek

bed had a wooden frame, with a board at the head, and bands of hide laced across, upon which skins were laid. At a later period, as vase-paintings show, the Greeks used folding beds. Another ancient application of an idea commonly supposed to be of modern origin is found in the Roman use of bronze beds, and metal is so much more sanitary than wood for this purpose that it seems strange it was afterwards discarded for many centuries. The bed of the Emperor Eliogabalus was of solid silver, with counterpane and hangings of purple embroidered in gold. In Pompeii wall-niches for beds, like those still used in Holland, are found, and were apparently closed by sliding partitions as well as by curtains. To our modern ideas, this arrangement seems to have been disgustingly devoid of ventilation, but the four-poster, with its “tester” roof and its curtains, which was widely used until the middle of the 19th century, was not much better. Mattresses developed very slowly, for in the 18th century pea-shucks and straw were the stuffing materials employed in houses of prosperous people, and hair had not come into use. The article gives a full and interesting account of the quaint custom, instituted by Louis XI of France, and followed by many of his royal successors, of a sovereign remaining in bed while he received the visits of his ministers and courtiers.

Chests and Chairs

The chair, to us the commonest of objects, did not come into general use until, as the articles BENCH (Vol. 3, p. 715) and STOOL (Vol. 25, p. 967) indicate, these two had long been the usual seats. The CHEST (Vol. 6, p. 106) was also used as a seat, and was the original form of wardrobe before hanging space and drawers were provided. The ecclesiastical chests, of

great length in order that they might contain, without folding, church vestments stiff with embroidery, are the most ornate of all the models of furniture which have been preserved from the 13th and 14th centuries. The article CHAIR (Vol. 5, p. 801) shows that chairs were everywhere uncommon until the middle of the 16th century; and it was not until the 17th was well advanced that upholstery began to be employed for them. The typical Louis XVI chair, with its oval back and ample seat, descending arms, round-reeded legs and gay tapestry was the most beautiful and elaborate model that has ever been devised. But it was the original Chippendale design and the still lighter patterns of Hepplewhite, Sheraton and Adam that gave us the slender, compact and easily moved chairs which will always be the more numerous. It is interesting to observe that the revolving chair, commonly regarded as an office convenience of modern origin, has a pedigree of no less than four centuries.

Bookcases and Desks

It would seem that the old English makers of furniture went somewhat astray when they gave themselves the general designation, still surviving, of "cabinet-makers"; for we learn from the article CABINET (Vol. 4, p. 918) that the elaborate cabinets which have come down to us from the 16th, 17th and 18th centuries are almost invariably of Italian, Dutch and French origin, and it was in other branches of work that the English were most successful. THE CUPBOARD (Vol. 7, p. 634) was used to contain books long before the BOOKCASE (Vol. 4, p. 221) had assumed a distinct form, and in the earlier bookcases the volumes were either placed on

their sides, or, if upright, were ranged with their backs to the wall and their edges outwards. Until printing had cheapened books, it was not the custom to mark the title on the back, and the band of leather which closed the volume, like the strap on an old-fashioned wallet, bore the inscription. Sheraton's satinwood bookcases were among the most elegant of all his pieces. The DESK (Vol. 8, p. 95) about the year 1750 had assumed the form which is now described as a library table—a flat top with a set of drawers on each side of the writer's knees, when its vogue was interrupted by the invention of the cylinder-top desk. At first the cover was a solid piece of curved wood, but the "tambour," or series of slats mounted on canvas proved more serviceable; and the American roll-top desk is now exported to all parts of the world. Other articles dealing with individual pieces of furniture are WARDROBE (Vol. 28, p. 323), SIDEBOARD (Vol. 25, p. 38), DRESSER (Vol. 8, p. 577), CHEFFONIER (Vol. 6, p. 22), CRADLE (Vol. 7, p. 360), BUFFET (Vol. 4, p. 757), and MIRROR (Vol. 18, p. 575).

Technical Articles

Of the more technical articles TIMBER (Vol. 26, p. 978) shows the comparative advantages of all the varieties of wood used for furniture; and, as the list at the end of this chapter shows, there is a separate article on each kind. TOOL (Vol. 27, p. 14), by J. G. Horner, is of great importance. It would fill 75 pages of this Guide, and contains 79 illustrations. The furniture maker will find in it complete information about all the hand tools and machine tools used in the industry. JOINERY (Vol. 15, p. 476), by James Bartlett, describes, with practical diagrams, every variety of joint and dovetail. Sound guidance for the

workshop will be found in GLUE (Vol. 12, p. 143), PAINTER-WORK (Vol. 20, p. 457), LAC (Vol. 16, p. 35), LACQUER (Vol. 16, p. 53), in regard to which there is also information in the article JAPAN (Vol. 15, p. 188), FRENCH POLISH (Vol. 11, p. 154), WEAVING, *Industrial Technology* (Vol. 28, p. 440), DYEING (Vol. 8, p. 744), by Profs. J. J. Hummel and Edmund Knecht; REP (Vol. 23, p. 105), TAPESTRY (Vol. 26, p. 403), with numerous illustrations, by A. S. Cole; SILK, *Manufacture* (Vol. 25, p. 102); PLUSH (Vol. 21, p. 857), VELVET (Vol. 27, p. 979), MARBLE (Vol. 17, p. 676), by J. S. Flett; ONYX (Vol. 20, p. 118); and ALABASTER (Vol. 1, p. 466).

Decoration and Ornament

Biographical Articles

Although wood, ivory, precious stones, bronze, silver and gold have been used from antiquity for the decorations of furniture, the modern maker will be more concerned with WOOD-CARVING (Vol. 28, p. 791), illustrated, by F. A. Crallan, author of *Gothic Wood-carving*. In this article materials and methods are described, and there is much information as to the domestic use of wood-carving. The article will be most valuable to manufacturers and dealers who have to do with church fittings. GILDING (Vol. 12, p. 13) and CARVING AND GILDING (Vol. 5, p. 438) impart knowledge of a practical nature as to these processes. The art of inlaying is described in MARQUETRY (Vol. 17, p. 751) and BOMBAY FURNITURE (Vol. 4, p. 185); see also VENEER (Vol. 27, p. 982). Materials other than wood used for inlaying are described, as, for example, PEARL (Vol. 21, p. 25) for pearl and mother of pearl; IVORY (Vol.

15, p. 92), LAPIS LAZULI (Vol. 16, p. 199), TORTOISESHELL (Vol. 27, p. 71), BRASS (Vol. 4, p. 433), etc. The mention of the last two materials naturally suggests the name of BOULLE and the Britannica's biography of that artist. Such biographies, as anyone interested in the subject knows, are most difficult to find, and they are included in much detail in the new Britannica. BOULLE (Vol. 4, p. 321) was the most distinguished of modern cabinet-makers before the middle of the 18th century; and, beginning with that date, both France and England produced a number of men whose renown is scarcely less than that of the great painters, sculptors, architects or musicians of the period. The Britannica's accounts of their lives, ideas and work will be of much value and interest to those who make or deal in furniture. For the French schools we get the essential facts about, for example, OEBEN (Vol. 20, p. 11), to whom Louis XV's famous desk owes its general plan; RIESENER (Vol. 23, p. 324), his more celebrated pupil, who completed the desk; RÖNTGEN, DAVID (Vol. 23, p. 693), the maker of "harlequin furniture," several of whose ingenious mechanical devices are described; and GOUTHIÈRE (Vol. 12, p. 291), the metal-worker whose furniture mounts are among the most noted art products of the Louis XV and XVI periods. CHIPPENDALE (Vol. 6, p. 237), with whom arose the marvellously brilliant school of English cabinet-makers, is the subject of a biography describing fully the characteristics of his designs; and the history of this school is continued under such headings as HEPPLEWHITE (Vol. 13, p. 305), whose taste at its best "was so fine and so full of distinction, so simple, modest and sufficient that it amounted to genius"; ADAM, ROBERT (Vol. 1, p. 172), who left so deep and enduring a mark upon

English furniture, and SHERATON (Vol. 24, p. 841), "the most remarkable man in the history of English furniture," whose extravagant creations marked the end of the great school. Many other biographies are included in the list appended.

ALPHABETICAL LIST OF ARTICLES, INCLUDING BIOGRAPHIES, IN THE ENCYCLOPAEDIA BRITANNICA WHICH ARE OF SPECIAL INTEREST TO FURNITURE MANUFACTURERS AND DEALERS

Acacia

Adam, Robert

Agate

Ailanthus

Alabaster

Alder

Algum

Arabesque

Arbor Vitae

Armoire

Arts and Crafts

Ash

Bahut

Bamboo

Baroque

Barry, Sir Charles

Basin-stand

Basket
Bed
Beech
Bérain, Jean
Birch
Bombay Furniture
Bonheur du Jour
Bookcase
Boulle, André Charles
Box
Boxwood
Brass
Brocade
Buffet
Carving and Gilding
Casket
Cassone
Casuarina
Cedar
Chair
Cheffonier
Chenille
Cherry
Chest
Chestnut
Chintz

Chippendale, Thomas
Coco-nut Palm
Coffer
Console
Copal
Copeland, Henry
Corduroy
Cradle
Crash
Cressent, Charles
Cretonne
Crunden, John
Cryptomeria
Cupboard
Curtain
Cushion
Cypress
Damask
Dammar
Date Palm
Design
Desk
Divan
Dresser
Dumb-Waiter
Duramen

Dyeing
Ebony
Electroplating
Elm
Embossing
Encoignure
Etagère
Fir
Footman
Frame
French Polish
Furniture
Gilding
Gillow, Robert
Glue
Gouthière, Pierre
Halfpenny, William
Hazel
Hepplewhite, George
Hickory
Holly
Huon Pine
Ince, William
Ingle-nook
Inlaying
Iron

Ivory
Japan, *Art*
Japanning
Jarrah Wood
Johnson, Thomas
Juniper
Kauri Pine
Lac
Lacquer
Lampstand
Lapis Lazuli
Larch
Leather
Leather, Artificial
Le Pautre, Jean
Lime, or Linden
Linen-press
Liquidambar
Lock
Lock, Matthias
Lowboy
Mahogany
Mammee Apple
Manwaring, Robert
Maple
Maple, Sir John B.

Marble
Marot, Daniel
Marquetry
Mastic, or Mastich
Mayhew, Thomas
Meissonier, J. A.
Mirror
Moreton Bay Chestnut
Morris, William
Nettle Tree
Oak
Oeben, J. F.
Olive
Onyx
Ormolu
Ornament
Osier
Ottoman
Overmantel
Painter-work
Pearl
Pergolesi, M. A.
Pigments
Pine
Plane
Plush

Prie-dieu

Rep

Resin

Riesener, J. H.

Rococo

Röntgen, David

Rosewood

Rousseau de la Rottière, J. S.

Sabicu Wood

Satin Wood

Screen

Sequoia

Settee

Settle

Shearer, Thomas

Sheraton, Thomas

Sideboard

Silk

Sofa

Spruce

Stall

Stool

Table

Tallboy

Tapestry

Tea-caddy

Teak
Tea-poy
Textile Printing
Throne
Ticking
Timber
Tortoiseshell
Tray
Triclinium
Tripod
Turpentine
Upholsterer
Varnish
Velvet
Velveteen
Vernis Martin
Walnut
Wardrobe
Washstand
Weaving
What-not
Willow
Window-cornice
Window-seat
Wine Table
Wood-carving

CHAPTER IX
FOR MERCHANTS AND MANUFACTURERS OF LEATHER AND LEATHER GOODS

The purpose of the department of the Guide in which this chapter appears, addressed to persons engaged in certain important occupations, is not only to show them how Britannica-reading will enlarge their knowledge of some aspects and relations of their business, but also to show how Britannica-reading will help them to realize the importance of *educating the general public* in regard to that business. This education of the public is not necessarily confined to advertising, although the best form of advertising that can be used by anyone who sells a good article, or an article that is good at its price, is probably to tell the public what it really is and how it is really made. In the direct personal intercourse between salesman and purchaser there is opportunity for the imparting of information which, if it possesses genuine interest, will be gladly received and will stimulate trade. Mere praise of an article is uninteresting and unconvincing; while facts that explain *why* that article is adapted to a particular use, and *why* it is better than another article sold at a lower price will always receive attention.

About Selling Leather Goods

All this is especially true of leather goods, for the

public ignorance on the subject of leather is abysmal. Nothing is more universally used, yet ninety-nine out of a hundred who use it not only do not know what lies beneath the surface of it, but do not know that there is any difference in value between a natural grain surface and a mechanically grained false surface, and it is quite certain that nearly all the men and women who walk out of a store after buying skiver would be nonplussed if they were asked whether the upper or lower part of a split skin was the best.

Both the leather merchant and the public would be delighted to hear some of the curious things that the Britannica tells about leather, which is, from any point of view, one of the most interesting of all commodities; although few of those who use it, and perhaps as few of those who deal in it, ever stop to think how curious a relation there is between the original nature of the material and the qualities of the finished product. In cattle and sheep, the hide is a garment that covers every part of the body but the feet. Adapted to our own use, its most important service as a garment is to cover our feet. It is so far a natural product that no imitation of it possesses any of its chief merits, and yet so far an artificial product that when the hide has been removed from an animal, it requires treatment in order that it may not lose the flexibility which makes it, for a thousand purposes, more valuable than wood or metal, and in order that it may not decay.

What Skin Is

Skin is waterproof because its surface consists of scales, and although in most quadrupeds, as in man, these scales are so small as to be invisible, they will so resist the entrance of any tan liquor or other

preservative fluid that they must be scraped away before the skin can be treated. Under these horny scales there is a layer of soft cells, and under this a membrane which makes the natural grain surface of leather. Under this, again, lies the “true” skin, in In the upper of these two, the white fibres lie parallel with the grain. In the lower, the white fibres, which are here coarser, lie in bundles, bound together by yellow fibres, so that this layer is really a woven fabric. The spaces in the weave are filled with a soft jelly, and the fibres do not multiply among themselves, as cells do, but are developed, as they are needed, from this jelly. Tan liquor has the peculiar property of converting this jelly into a “leathery” substance, which although it does not then assume the shape of fibres, becomes nearly as tough as the fibres themselves, and thus makes leather more solid and stronger than the original skin; and the virtue of leather depends largely on the presence of this jelly. **Naturally Woven Fibres** two layers. The body of an old bull will have absorbed it, just as fat is absorbed in old age, so that the spaces in the weave of the fibre are left vacant, and (as the scaly outer surface of the skin has been scraped away to admit the tan liquor) any water with which the hide comes into contact will be soaked up. That is why old bull leather is not waterproof and is lacking in substance. Again, the weave of this innermost layer of skin, lying next to the flesh, varies in different animals. In sheepskin the fibres are very loosely woven, and for this reason great care is needed in preparing the leather, and when the skin is split, the under half is only fit for the light usage to which “chamois” leather is restricted. But however the quality, surface or thickness of the skin may differ, its true structure is the same in all animals

used for leather, save the horse, which is exceptional in possessing, over the loins, a third skin, very closely woven and very greasy, which makes horsehide taken from this part of the body peculiarly waterproof, pliable and durable.

As you are in the leather business, you probably knew all these facts already, but perhaps they were not arranged in your mind in a form in which you could explain them to others as clearly as you will be able to do after reading the articles in the Britannica from which this general statement is summarized. And when you are reading about any other business, or about any other subject of any kind, you will find that the Britannica *goes to the root of the subject* in the same thorough way in which it deals with the fibres and the jelly that make up the substance of leather. Now for the articles in detail—or the principal ones; the others are sufficiently indicated by the list at the end of this chapter.

SKIN (Vol. 25, p. 188), by Dr. F. G. Parsons, vice-president of the Anatomical Society of Great Britain and Ireland, with illustrations from microscopic enlargements, covers the comparative anatomy of the skin in all groups of animals, and the process of skin development in the embryo. The articles mentioned in the chapter *For Stock-Raisers* tell you about the domestic animals whose hides are chiefly used for leather. The chapter on *Zoology* in this Guide gives a list of the articles on the other animals whose skins are tanned for fancy leathers. The main article LEATHER (Vol. 16, p. 330), equivalent to 50 pages of this Guide, is by Dr. James G. Parker, principal of the Leathersellers' Technical College, London, and author of *Principles of Tanning* and other standard trade text-books. After explaining the distinctions between tanned, tawed, and chamoised

leathers, it takes up the subject of sources and qualities of hides and skins, and describes the structure of skin in relation to the finished product. The characteristics and peculiarities of hides and skins from different parts of the world are thoroughly explained. We learn why hides from animals bred in mountainous districts are the best, and where the finest sheep- and goat-skins come from.

Processes of Tanning

Tanning Materials is the subject of the next section. These are classified into pyrogallols, catechols, and subsidiary materials; and the article describes their composition and preparation by grinding, with explicit directions for their testing, including the latest official method of the International Association of Leather Trades Chemists. The processes of making heavy leathers are next discussed. We learn the many ways of cleaning, softening, depilating, and fellmongering (or dewooling) by liming, rounding and scudding, and finally the process of actual tanning in its three steps of colouring, handling, and laying away. In connection with depilation, it is interesting to note that it has been discovered that it is not the lime but the action of bacteria in the lime which causes the hair to fall out. The finishing of sole leather, harness leather and other grades is explained, also the theory of the formation of the "bloom" and its removal, as well as the process of "scouring." The art of *Currying* has a section to itself, and the preparations for tanning or dressing hides for trunks and suit cases by bating, puering, scudding, plumping, drenching and splitting, receive detailed attention. The tanning of light leathers, and all the varieties of basils, skivers, Russia leather, seal,

alligator, snake, frog and kangaroo leathers, Japan and enamel leathers are fully treated. *Tawing*, *Wooling*, *Dressing*, *Chrome Tanning*, *Combination Tannages*, *Oil Tanning* (Chamoising), *Preller's Helvetia* or *Crown Leather*, *Transparent Leather*, *Parchment*, *Tar and Peat Tanning*, *Dyeing*, *Staining* and *Finishing*, *Glove Leathers*, and *Bookbinding Leathers* are some of the other sections of this excellent treatise. LEATHER, ARTIFICIAL (Vol. 16, p. 345) is a separate article.

Chemistry of Leather Manufacture

TANNIN, or TANNIC ACID (Vol. 26, p. 399) is a general account of the vegetable products which have the property of converting raw hide into leather. Specific information about the materials from which the pyrogallol tannins are obtained will be found under MYROBALANS (Vol. 19, p. 114), CHESTNUT (Vol. 6, p. 112), DIVIDIVI (Vol. 8, p. 332), SUMACH (Vol. 26, p. 70), OAK (Vol. 19, p. 931), GALLS (Vol. 11, p. 422) a full and interesting account of the insect produced vegetable excrescence which yields a high percentage of tannin, by Francis H. Butler, of the Royal School of Mines; and WILLOW (Vol. 28, p. 688). For the catechol tannins see HEMLOCK (Vol. 13, p. 262), CATECHU (Vol. 5, p. 507), MANGROVE (Vol. 17, p. 572), MIMOSA (Vol. 18, p. 500), LARCH (Vol. 16, p. 211), BIRCH (Vol. 3, p. 958), which yields the empyreumatic oil used in the preparation of Russia leather, to which the pleasant odor is due.

There are numerous articles in the Britannica on the chemicals used in the process of tawing, chrome tanning, etc., such as ALUM (Vol. 1, p. 766), ACETIC ACID (Vol. 1, p. 135), GLAUBER'S SALT (Vol. 12, p.

114), BICHROMATES AND CHROMATES (Vol. 3, p. 912).

Dyeing

The chief classes of dyes used for leather are the acid; basic, or tannic; direct, or cotton; and mordant dyes, and these are described at great length in a valuable article DYEING (Vol. 8, p. 744), equivalent to 20 pages of this Guide, by the late J. J. Hummel, professor of Dyeing, University of Leeds, and Dr. Edmund Knecht, professor of Technological Chemistry, University of Manchester. The section on the *Theory of Dyeing* shows how the dyeing property of a substance depends upon its chemical composition. Separate articles go more deeply into the chemistry of dyeing materials used with leather, and some of the more important of these are SULPHONIC ACIDS (Vol. 26, p. 60), SULPHURIC ACID (Vol. 26, p. 65), FORMIC ACID (Vol. 10, p. 668), ANTIMONY (Vol. 2, p. 127), TITANIUM (Vol. 26, p. 1017), IRON (Vol. 14, p. 796), LOGWOOD (Vol. 16, p. 922), FUSTIC (Vol. 11, p. 375), BRAZIL WOOD (Vol. 4, p. 463), and TUMERIC (Vol. 27, p. 474). Comparatively few of the coal-tar colours have as yet been adapted to leather manufacture, but their characteristics are discussed in such articles as AZO-COMPOUNDS (Vol. 3, p. 81), ANILINE (Vol. 2, p. 47), INDULINES (Vol. 14, p. 507), FUCHSINE (Vol. 11, p. 273), and SAFRANINE (Vol. 23, p. 1000).

Special Leathers

PARCHMENT (Vol. 20, p. 798), by Sir E. Maunde Thompson, Principal Librarian, British Museum, is an interesting historical account of the skins and their preparation. Their use as writing material was widespread at a very early period. “The Jews made use of them,” says the article “for their sacred books,

and it may be presumed for other literature also; and the old tradition has been maintained down to our own day, requiring the Synagogue rolls to be inscribed on this time-honoured material." The difference between parchment and vellum is explained. SHAGREEN (Vol. 24, p. 769) tells about a species of untanned leather used for ornamental purposes. It is a curious fact that the addition of the word "chagrin," for anxiety or annoyance, to the English language was due to the unpleasant sensation that came from touching the rasping surface of this leather. Stamped leather for wall hangings is described in the section *Stamped Leather* of the article MURAL DECORATION (Vol. 19, p. 19), by William Morris and Walter Crane. SHOE (Vol. 24, p. 992) contains an illustrated section on the *Manufacture of Leather Shoes*. SADDLERY AND HARNESS (Vol. 23, p. 988), by Cecil Weatherly, and GLOVE (Vol. 12, p. 135) are treated both from an historical and a practical point of view. BOOKBINDING (Vol. 4, p. 216), illustrated, by C. J. H. Davenport, of the British Museum, has a great deal of interesting information about the leathers used in this art. The flexible binding, which has been applied for the first time on a large scale in the new Britannica, originated when vellum instead of paper was used for books, and it possesses the great advantage that a volume sewed in this way can be opened flat, and lies flat without being held.

ALPHABETICAL LIST OF ARTICLES AND OF SUBJECTS IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO THOSE IN THE MANUFACTURE AND SALE OF LEATHER AND LEATHER GOODS

Acetic Acid
Acid dyes
Aldehyde tanning
Algarobilla
Alligator Leather
Alum
Angols
Aniline
Antimony
Azo Compounds
Barkometer
Basic, or Tannin dyes
Basils
Bates
Bating
Bichromates and Chromates
Birch
Bleaching
Bloom
Bookbinding
Bookbinding Leathers
Bottle-tanning
Brazil Wood
Canaigre
Catechols
Catechu

Chamoising
Chestnut
Chestnut Oak
Chrome Box
Chrome Tanning
Colouring Pits, or Suspenders
Combination Tannages
Crust Stock
Currying Apparatus
Currying Processes
Dash-wheel
Depilation
Direct, or Cotton, Dyes
Dividivi
Dongola Leather
Drenching
Dressing
Drum Dyeing
Dusting Material
Dyeing
Enamel Leather
Erodin
Fatliquoring
Fellmongering, or Dewooling
Finishing
Formic Acid

Frog Skin

Fuchsine

Fustic

Galls

Gambier

Glauber’s Salt

Glazing (Glacé leather)

Glove

Glove Leathers

Grinding Machinery and Leaching

Handlers, or Floaters

Heavy Leathers

Hemlock

Hide Mill, or Double-Acting Stocks

Hide-powders

Hides and Skins

Indulines

Iron

Iron Tannage

Janus Colours

Japan Leather

Kangaroo Leather

Kaspine Leather

Kips

Larch

Leather

Leather, Artificial
Levant Morocco
Liming
Logwood
Mangrove
Mimosa, or Golden Wattle
Mordant dyes
Morocco Leather
Myrobalans
Oak bark
Oak wood
Oil Tanning
Parchment
Payne and Pullman Process
Peat Tanning
Pigskin
Portmanteau
Power Transmission, *Belts*
Preller’s Helvetia or Crown Leather
Puering
Pyrogallols
Quebracho
Roans
Russia Leather
Saddlery and Harness
Safranine

Sammying
Scudding
Seal Leathers
Setting
Shagreen
Shoe
Skin
Skivers
Snakeskin
Splitting Machines
Staining
Sulphonic Acids
Sulphuric Acid
Sumach
Sweating
Tan Liquors
Tanner’s Beam
Tanner’s Hook
Tanner’s Knives
Tannin, or Tannic Acid
Tawing
Tiffany Bate
Titanium
Transparent Leather
Tray Dyeing
Turmeric

Upper Leather

Valonia

Vellum

Vidal Colours

Waxing

Willow

Willow Calf

Tannin Precipitation

Tanning Materials

Tar Tanning

Wilson Scouring Machine

Wool-rug Dressing

CHAPTER X
FOR JEWELLERS, CLOCK AND WATCH MAKERS AND MERCHANTS

By long established custom, watches and the higher grade of clocks form part of the jeweller's stock, and he sells a few other articles of utility, such as purses and bags, but to all intents and purposes he shares with the artist and art-dealer the distinction of making a living by adding pleasure to the lives of others. The very word "jewelry" carries, in its root form, the idea of joy; and when a Senwosri princess, 43 centuries ago, smiled happily as she raised her brown arms to fasten the clasp of a new necklace,

the jeweller of Memphis on the Nile no doubt took his little profit, as the jeweller of Memphis on the Mississippi takes his to-day, all the more gladly for being, in the oriental phrase, a "Distributor of delights." Sour philosophers have always sneered at women for loving jewels, and most of all for piercing their ears and noses to vary its display, but the nose-ring that overhangs a thick Nubian lip is an expression of the same charming instinct that makes a child diversify the arrangement of her daisychains. And jewelry plays its part in the higher emotions as well as in the pretty vanities; witness the engagement ring, the marriage ring and all the uses, described in the Britannica, of jewels as religious symbols.

Specimens Reproduced

The article JEWELRY (Vol. 15, p. 364), by A. H. Smith, the official in charge of the great jewel collection in the British Museum, contains nearly a hundred illustrations, half of them on plate paper, which include examples of every period and every variety of the jeweller's art, and these, with the illustrations in other articles mentioned in this chapter, are so full of interest to the jeweller's customers that he ought really to keep his Britannica at his place of business rather than at his house. It is, at any rate, amusing to recall that in a speech made by the Editor-in-chief of the Britannica, on the occasion of a banquet given to celebrate the completion of the new edition, he remarked that when he had chanced to take home the proof sheets of this article, to read them at night, he carefully kept them out of his wife's sight lest they might suggest too tempting possibilities. The article divides

modern jewelry into three classes:

(1) objects in which gems and stones form the principal portions, and in which the work in silver, platinum or gold is really only a means for carrying out the design by fixing the gems or stones in the position arranged by the designer, the metal employed being visible only as a setting;

(2) when gold work plays an important part in the development of the design, being itself ornamented by engraving (now rarely used) or enamelling or both, the stones and gems being arranged in subordination to the gold work in such positions as to give a decorative effect to the whole;

(3) when gold or other metal is alone used, the design being wrought out by hammering in repoussé, casting, engraving, chasing or by the addition of filigree work, or when the surfaces are left absolutely plain but polished and highly finished.

The "Personal Art" Movement

The second of these three classes includes the work which has completely revolutionized the theory of design, so far as the best class of trade is concerned, since the Paris International Exposition of 1900 first drew general attention to the exquisite creations of Lalique and his school. L. C. Tiffany, in the United States, and Philippe Wolfers, in Belgium, have done more than any designers other than the French to extend this new movement; but in England, Germany, Austria, Russia and Switzerland there has been a notable increase of individual effort and purpose, and a recognition of the possibilities of personal art as at any rate an important factor in the business. Side by side with this development new standards have been established in mechanical work. "Nearly every kind of gold chain now made is manufactured by machinery, and nothing like the beauty of design or perfection of workmanship could

be obtained by hand at, probably, any cost." The article, equivalent in length to about 35 pages of this Guide, contains a full review, amplified by the results of the most recent excavations (some of them undertaken expressly for the archaeological purposes of this edition of the Britannica) of the history of jewelry, Egyptian, Assyrian, Mycenean, Greek, Etruscan, Roman, Merovingian, Oriental and Renaissance.

Rings for Love and Murder

RING (Vol. 23, p. 349), of which Prof. Middleton, long art director of the South Kensington Museum, is the chief contributor, is another copiously illustrated article. Among the curious items of information it contains, there is the unromantic origin of the engagement ring (which may be cited by the jeweller to prove that it should always be a costly one), the ancient Romans regarding it as a pledge to assure the donor's fulfilment of his promise; the fact that the modern rheumatism ring had its medieval forerunner in the rings, blessed by the sovereign, which were worn as a preservative against cramp; and the description of the old poison rings, which were of two kinds: those merely affording, in the bezel, a secret receptacle so that the poison might be always at hand for suicide, and those provided with a hollow point to which, on touching a spring, the venom ran as in a snake's fang, so that the murderer could give a fatal scratch while shaking hands with his victim. BROOCH (Vol. 4, p. 641) traces, with many illustrations of typical specimens, the "fibula" or safety pin from its origin in Central Europe during the Bronze Age, through the modifications which introduced the bow shape, providing space for

thicker folds of cloth, to the modern ornament. The long brooch is not a new fashion, for silver brooches no less than 15 inches in length have been found in Viking hoards of the 7th, 8th and 9th centuries. EAR-RING (Vol. 8, p. 798) describes ear "ornaments" of the most grotesque size. In Borneo the hole in the ear lobe is stretched to a calibre of 3¾ inches, but the Masai tribes in equatorial Africa far outdo this, stretching the lobes, year after year, until they can wear stone ear-plugs weighing 2 lbs. 14 ozs. each, with a diameter of 4½ inches; and they thus achieve the supreme elegance of making the two long flaps of flesh meet above their heads. It is also curious to note the custom of some oriental tribes of wearing one ear-ring only. BRACELET (Vol. 4, p. 359) describes the three distinct models worn by the Israelites, all of which the Authorized Version calls "bracelet," although the original Hebrew has separate names for them. Armlets have always been conspicuous in the regalia of Eastern kings, and the pair captured at Delhi and taken to Persia by Nadir Shah in 1739 contain jewels valued at more than $5,000,000, including the famous "Sea of Light" diamond, which, although it weighs only 186 carats as against the 516½ of the largest fraction into which the Cullinan stone was cut, is unique as possessing the finest lustre of any known specimen. The 24 plate illustrations in the article SCANDINAVIAN CIVILIZATION (Vol. 24, p. 287), by Miss B. S. Phillpotts, show some exquisite designs of clasps, collars and pins exhumed in Denmark, Norway and Sweden, and supposed by some authorities to antedate the oldest Egyptian jewelry.

Precious Metals

The article GOLD (Vol. 12, p. 192) is a thorough

workshop treatise, as well as a detailed study of existing mines and of the influence their production exerts upon the "price," if it can be so called, of a metal which is its own standard of value. SILVER (Vol. 25, p. 112) and PLATINUM (Vol. 21, p. 805) are treated with similar comprehensiveness. The articles ALLOYS (Vol. 1, p. 704), ASSAYING (Vol. 2, p. 776), METAL (Vol. 18, p. 198), METALLOGRAPHY (Vol. 18, p. 202), and METALLURGY (Vol. 18, p. 203), all by noted authorities, are full of information useful to the jeweller. METAL-WORK (Vol. 18, p. 205), fully illustrated, incidentally touches upon the art of the silver- and gold-smith; and this branch of the subject is also treated in such articles as PLATE (Vol. 21, p. 789), with over 30 typical illustrations—a most interesting historical account, by several well-known experts, of works in gold and silver which belong to any class other than those of personal ornament and coins; and DRINKING VESSELS (Vol. 8, p. 580), illustrated, by Dr. Charles H. Read of the British Museum, which discusses gold and silver cups. Mention must also be made of the description of American work in precious metals before the time of Christopher Columbus, in the section *Archaeology* of the article AMERICA (Vol. 1, p. 812), by the late Dr. O. T. Mason, of the National Museum, Washington; also of MEXICO, *Ancient Civilization* (Vol. 18, p. 335), by the famous ethnologists, Dr. E. B. Tylor of Oxford and Dr. Walter Lehmann, of the Royal Ethnographical Museum, Munich; EGYPT, *Ancient Art* (Vol. 9, p. 73), by W. M. Flinders Petrie; GREEK ART (Vol. 12, p. 470), illustrated, by Dr. Percy Gardner, of Oxford; ROMAN ART, *Work in Precious Metals* (Vol. 23, p. 483), illustrated, by H. Stuart Jones, director of the British School at Rome; JAPAN, *Art, Sculpture and Carving* (Vol. 15, p. 176), by Capt. Frank

Brinkley, author of *A History of the Japanese People*; and CHINA, *Bronzes* (Vol. 6, p. 215), by C. J. Holmes, formerly Slade professor of fine art at Oxford.

FILIGREE (Vol. 10, p. 343) describes the delicate jewel work of twisted gold and silver threads, and also the "granulated" work which consists of minute globules of gold soldered to form patterns on a metal surface. In India the filigree worker has retained the patterns used by the ancient Greeks and works in the same way they did. Wandering workmen are given so much gold, coined or rough. This is weighed, heated and beaten into wire, and worked in the courtyard or on the verandah of the customer's house. The worker reweighs the complete work when finished and is paid at a specified rate for his labor. Repoussé (Vol. 23, p. 108), by M. H. Spielmann, editor *Magazine of Art*; CHASING (Vol. 5, p. 956) and INLAYING (Vol. 14, p. 574) are other articles dealing with certain processes in jewel work. The jeweller also must not overlook two superb articles, MEDAL (Vol. 18, p. 1), illustrated, by M. H. Spielmann, and NUMISMATICS (Vol. 19, p. 869), which is by three specialists, and is most fully illustrated by designs inviting practical use. ENAMEL (Vol. 9, p. 362), illustrated, by Alexander Fisher, author of *The Art of Enamelling on Metals*, goes very fully and practically into this interesting subject, which is further discussed in JAPAN, *Cloisonné Enamel* (Vol. 15, p. 189). MOSAIC (Vol. 18, p. 883), illustrated, by Professor Middleton and H. Stuart Jones, deals in part with the ornamentation of jewelry by this method. In BRAZING and SOLDERING (Vol. 4, p. 463) the composition of silver solder used for jewelry is described, and in CEMENT there is an account of *Jeweller's* or *Armenian Cement* (Vol. 5, p. 659).

Precious Stones

The article GEM treats the subject in two sections, of which the first (Vol. 11, p. 560), by F. W. Rudler, of the Museum of Practical Geology, London, deals with *Mineralogy* and *General Properties*. Here are discussed hardness, specific gravity, crystaline forms and cleavage, colour, refraction, chemical composition, etc., and there is an interesting section on superstitions in regard to gems, the medical and magical powers with which they were reputed to be endowed. These beliefs are very remarkable, and it has even been suggested by archaeologists that jewelry did not have its origin so much in a love for personal decoration, as in the belief that the objects used possessed magical virtue. The article MINERALOGY (Vol. 18, p. 509), by L. J. Spencer, of the British Museum, and editor of the *Mineralogical Magazine*, will be found especially valuable for reference in the workshop. It gives, among other things, the scale of hardness, and nomenclature and classification of minerals. The crystal formation of gems as well as their optical properties—characteristics by which the genuineness of precious stones may be tested—are discussed and explained in the article CRYSTALLOGRAPHY (Vol. 7, p. 569), with over 100 illustrations, also by L. J. Spencer. The cutting of gem stones is treated under LAPIDARY AND GEM CUTTING (Vol. 16, p. 195), by Dr. George F. Kunz, the famous gem expert to Tiffany & Co., New York,—an article of uncommon historical interest and practical value, in which diamond cutting is considered at much length.

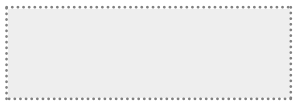
The second section of the article GEM, *Gems in Art* (Vol. 11, p. 562), by Dr. A. S. Murray, the famous British archaeologist, and A. H. Smith, gives an account of precious stones engraved with designs. The illustrations show more than 90 examples,

including Cretan and Mycenaean intaglios, Greek, Phœnician and Etruscan scarabs and scarabæoids, cameos, seals, Oriental, Christian, and modern gems. This subject is further discussed in separate articles, such as SCARAB (Vol. 24, p. 301), by Dr. F. Ll. Griffith, the Egyptologist, an account of the designs which, originating in Egypt during the Fourth Dynasty, have exercised a lasting influence on the design and shape of gems; CAMEO (Vol. 5, p. 104), INTAGLIO (Vol. 14, p. 680), SEALS (Vol. 24, p. 539), illustrated, by Sir E. Maunde Thompson, formerly principal librarian, British Museum, as well as in the articles on ancient and Oriental civilizations, already mentioned.

Synthetic Stones

The artificial duplication of certain gems by chemical processes which yield products identical in composition and physical properties with the natural stones is a subject of growing importance to the jeweller, and the latest developments are described in GEM, ARTIFICIAL (Vol. 11, p. 569), by Sir William Crookes. This famous chemist and authority on precious stones does not hesitate to declare that although the artificial diamonds so far produced have been microscopic in size, scientists have now found the right method and that "there is no reason to doubt that, working on a larger scale, larger diamonds will result." The artificial production of rubies, sapphires, Oriental emeralds, amethysts, topazes and zircons is also discussed. Descriptions of the several gem stones are found under their respective headings, for example DIAMOND (Vol. 8, p. 158), illustrated, by H. A. Miers, principal of the University of London, and former editor of the *Mineralogical Magazine*. Here are given its scientific

characters, its uses (especially for faceting softer precious stones), distribution, and mining, and the wonderful history of the most famous diamonds of the world. RUBY (Vol. 23, p. 812), the most valued of gem stones, is often called “Oriental ruby” to distinguish it from SPINEL (Vol. 25, p. 684), an aluminate stone of inferior hardness, density and value. It is interesting to note that many historic stones described as monster rubies were really spinels. The great ruby set in the Maltese Cross in front of the Imperial State Crown of England is a spinel. SAPPHIRE (Vol. 24, p. 201) was known to the Greeks as “hyacinthus,” and the present name was formerly applied to lapis lazuli. ASTERIA or STAR STONE (Vol. 2, p. 792) tells how the luminous star comes to be seen in sapphires, rubies and topazes. The name EMERALD (Vol. 9, p. 332) is used for a number of stones, of which the most valued is not a true emerald at all; see CORUNDUM (Vol. 7, p. 207). The same is true of the TOPAZ (Vol. 27, p. 48), the more prized Oriental topaz being a yellow corundum, harder and denser than the stone from which it takes its name. “Scotch” or “Spanish” topazes are yellow or smoke-tinted quartz, or cairngorm. The AMETHYST (Vol. 1, p. 852) is violet or purple quartz, and the sapphire of a purple colour is often called an Oriental amethyst. The many varieties of the beautiful ZIRCON (Vol. 28, p. 989), such as HYACINTH (Vol. 14, p. 25) and JARGOON (Vol. 15, p. 276) are carefully described and distinguished. These valuable articles on the precious stones have been contributed by F. W. Rudler, of the Museum of Practical Geology, London. PEARL (Vol. 21, p. 24) discusses the results of the latest researches on the cause of pearl formation, and gives a graphic account of pearl-fishing.



Semi-Precious Stones

The material in the Britannica on the semi-precious stones is as complete. There are many articles, specified in the list at the end of this chapter. ALEXANDRITE (Vol. 1, p. 576) is remarkable for its property of appearing dark green by daylight, and red by candle-light, which makes it especially popular in Russia where green and red are the military colors; CHRYSOBERYL (Vol. 6, p. 320), of which alexandrite is a variety; CHRYSOLITE (Vol. 6, p, 320), often mistaken for chrysoberyl; PERIDOT (Vol. 21, p. 147), like chrysolite, a variety of olivine; BERYL (Vol. 3, p. 817), much prized by the ancients as a gem stone, and of which the EMERALD (see above) and the AQUAMARINE (Vol. 2, p. 237) are the chief "precious" varieties; TOURMALINE (Vol. 27, p 103), the remarkable stone of as much interest to the physicist as to the jeweller, on account of its optical and electrical properties; and RUBELLITE (Vol. 23, p. 804), its much prized red variety GARNET (Vol. 11, p. 470), together with ALMANDINE (Vol. 1, p. 712), which, when cut with a convex face is known as carbuncle; CINNAMON-STONE (Vol. 6, p. 376), the light red garnet, so easily mistaken for a variety of zircon (the article tells how to distinguish them); DEMANTOID (Vol. 7, p. 979), the green garnet from the Urals, and PYROPE (Vol. 22, p. 695), usually known as Bohemian garnet; JADE (Vol. 15, p. 122), which occupies in China the highest place as a jewel, and whose many varieties are here clearly distinguished; JET (Vol. 15, p. 358); HAEMATITE (Vol. 12, p. 804); MOONSTONE (Vol. 18, p. 807); CAT'S-EYE (Vol. 5, p. 537), a term applied to several distinct minerals of which CROCIDOLITE (Vol. 7, p. 477) has recently become very popular; OPAL (Vol.

20, p. 120), an article in which the brilliant flashes of colour in this stone are explained; QUARTZ (Vol. 22, p. 715), with its many ornamental varieties such as AGATE (Vol. 1, p. 368), AMETHYST (Vol. 1, p. 852), AVENTURINE (Vol. 3, p. 54), BLOODSTONE (Vol. 4, p. 85), CAIRNGORM (Vol. 4, p. 952), CARNELIAN (Vol. 5, p. 365), CHALCEDONY (Vol. 5, p. 803), CHRYSOPRASE (Vol. 6, p. 320), HELIOTROPE (Vol. 13, p. 232), MOCHA STONE (Vol. 18, p. 637), ONYX (Vol. 20, p. 118), ROCK-CRYSTAL (Vol. 23, p. 433), SARD (Vol. 24, p. 209), and SARDONYX (Vol. 24, p. 2.18).

Watches and Clocks

The article WATCH (Vol. 28, p. 362), illustrated, by Lord Grimthorpe, the great authority on watches and clocks, and Sir H. H. Cunynghame, vice-president of the British Institute of Electrical Engineers, is full of interest. There is a very valuable historical account beginning with the invention of portable time pieces in the 15th century. The parts of a modern watch are described, with details as to the mainspring, different types of escapement, the balance-wheel and hair-spring, compensation adjustments and secondary compensation. Methods of correcting temperature errors are discussed, and a simple means for demagnetizing a watch which has been near a dynamo is given. The proper materials used for jewelled bearings are described in the articles DIAMOND, CORUNDUM, etc. LUBRICANTS (Vol. 17, p. 88) contains a valuable paragraph on the properties and preparation of the fluid oils used on the spindles of watches and clocks.

The article CLOCK (Vol. 6, p. 536) is by the same distinguished authorities as WATCH, with an

additional section on *Decorative Aspects* (p. 552), by James Penderel-Brodhurst. It is equivalent to 55 pages of this Guide and is fully illustrated. Among the topics considered are the earliest clocks and their gradual improvement; the essential components of a clock; the mechanics of the pendulum; methods of compensation, including the use of the new nickel-steel alloy—described in the article INVAR (Vol. 14, p. 717)—the barometrical error, and methods of counteraction; suspension of pendulums; balance, anchor, dead, pinwheel, detached or free, and gravity escapements; the remontoire systems for abolishing errors in the force driving the escapement; testing of clocks; clock wheels; striking mechanism; the watchman's clock, church and turret clocks, electrical clocks, miscellaneous clocks, including magical clocks and other curious designs. The section on *Decorative Aspects* tells about styles of cases and mountings, the origin and development of the "grandfather" clock, etc. In connection with long-period clocks, attention should be given to the new and ingenious, if not commercially practical, device invented by the Hon. R. J. Strutt. Electrified particles emitted by a radioactive substance separate two strips of gold leaf, and these, falling together after the charge has been conducted away upon contact with metal, are extended again, the process being constantly repeated. If some way could be found to utilize this motion to work an escapement, we should have a clock that would go on indefinitely, since 1000 years must elapse before even half the small amount of radium used has disappeared. A description of this so-called "radium" clock will be found in PERPETUAL MOTION (Vol. 21, p. 181).

ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO MANUFACTURERS OF AND DEALERS IN JEWELRY, CLOCKS, AND WATCHES

Agate

Aigrette

Aiguillette

Albite

Alexandrite

Alloys

Almandine

Amazon-stone

Amber

America, *Archaeology*

Amethyst

Andalusite

Anhydrite

Apatite

Apostle Spoons

Aquamarine

Arabesque

Arts and Crafts

Assaying

Asteria, or Star-stone

Aventurine

Axinite

Azurite
Bead
Benitoite
Beryl
Beryllonite
Biddery
Bloodstone
Bort
Bracelet
Brazing and Soldering
Britain, *Ornaments*
Bronzite
Brooch
Cairngorm
Cameo
Campani-Alimenis, M.
Carbonado
Carnelian
Cat’s-eye
Cellini, Benvenuto
Cement
Chain
Chalcedony
Chasing
Chessylite
China, *Art*

Chrysoberyl
Chrysolite
Chrysoprase
Cinnamon-stone
Clock
Collar
Congreve, Sir William
Coral
Corundum
Costume
Cressent, Charles
Crocidolite
Cross
Crown
Crystallography
Cyanite
Demantoid
Diallage
Diamond
Dioptase
Drinking Vessels
Dumortierite
Ear-ring
Egypt, *Ancient Art*
Electroplating
Emerald

Emery
Enamel
Epidote
Euclase
Felspar
Filigree
Finiguerra, Maso
Fluorescence
Fluor-spar
Franklin, Benjamin
Galileo Galilei
Garnet
Gem
Gem, Artificial
Gold
Gold beating
Göthite
Gouthière, Pierre
Greek Art
Grimthorpe, 1st Baron
Haematite
Hiddenite
Hyacinth, or Jacinth
Hypersthene
Inlaying
Intaglio

Invar
Iolite
Ivory
Jade
Japan, *Art*
Jargoon
Jasper
Jet
Jewelry
Knighthood and Chivalry
Kunzite
Labradorite
Lapidary and Gem Cutting
Lapis Lazuli
Leucite
Line-engraving
Lubricants
Malachite
Marot, Daniel
Meissonier, J. A.
Medal
Metal
Metallography
Metallurgy
Metal-Work
Mexico, *Ancient Civilization*

Microcline
Mineral Deposits
Mineralogy
Miniature
Mint
Mocha-stone
Monogram
Monteith
Moonstone
Morel-Ladeuil, Léonard
Mosaic
Nepheline
Niello
Numismatics
Oligoclase
Olivine
Onyx
Opal
Orthoclase
Palladium
Paste
Pearl
Peridot
Perpetual Motion
Phenacite
Phosphorescence

Plagioclase
Plate
Plated Ware
Platinum
Pollaiuolo
Prehnite
Pyrope
Pyroxene
Quartz
Regalia
Repoussé
Ring
Rock-crystal
Roman Art
Rubellite
Ruby
Sapphire
Sard
Sardonyx
Scandinavian Civilization
Scarab
Seals
Sheffield Plate
Silver
Sphene
Spinel

Spodumene
Staurolite
Sunstone
Tassie, James
Tiffany, C. L.
Time, Measurement of
Time, Standard
Topaz
Tourmaline
Turquoise
Variscite
Vesuvianite
Watch
Weighing Machines
Weights and Measures
Wyon, Thomas
Zircon
Zoisite

CHAPTER XI
FOR MERCHANTS AND MANUFACTURERS OF ELECTRICAL MACHINERY AND SUPPLIES



Construction and Operation

Electrical machinery and supplies include three main groups of appliances: The apparatus by which electricity is originally generated; the apparatus by which current is transmitted and, if necessary, modified before it is used; and the infinitely various appliances for its final employment. In connection with any one of the latter, information may be needed as to its structure and its mechanical or electrochemical method of operation, or as to its uses, and in the treatment of these two aspects of a vast number of subjects the advantages of the encyclopaedic plan of the Britannica are obvious. One article will explain the method by which the same principles are applied to a number of different machines. Another article will deal with a group of appliances all used for similar purposes; and a reference to the Index of 500,000 entries (Vol. 29) will at once guide the reader who turns to the name of any electrical appliance to either kind of information he desires at the moment, whether he wants to know how the machine is made and operated, or what kind of work it does and how efficiently it does it.

The reader to whom this chapter is addressed is already familiar with the general subject of electricity, but he may at any moment desire to review or to supplement his general knowledge in connection with some new appliance which, for the first time, applies to commercial use one of the many and intricate laws of electrical vibration. The whole subject of the nature and action of electricity is outlined in the article ELECTRICITY (Vol. 9, p. 179), by Prof. J. A. Fleming, of the University of London, one of the world's foremost authorities. In a space

equivalent to hardly more than 30 pages of this Guide, the field covered in detail by many other articles is so concisely and clearly surveyed that you get a complete view of the theoretical and practical developments by which electrical science and industry have reached their present position. The same contributor then considers ELECTROSTATICS (Vol. 9, p. 240) and ELECTROKINETICS (Vol. 9, p. 210); and, in CONDUCTION, ELECTRIC (Vol. 6, p. 855), deals with metallic, non-metallic, dielectric and gaseous conductors. One section of this article is by Sir J. J. Thomson, winner, in 1906, of the Nobel Prize for Physics. The form in which metal is chiefly employed for the conduction of electricity is the subject of a separate article, WIRE (Vol. 28, p. 738); and the articles on the individual metals deal with their electrical properties.

Batteries and Dynamos

The whole subject of the chemical production of electricity is discussed in ELECTROLYSIS (Vol. 9, p. 217), by W. C. D. Whetham, of the technical staff of Cambridge University. BATTERY (Vol. 3, p. 531), fully illustrated, deals with all the forms of primary battery, and ACCUMULATOR (Vol. 1, p. 126), also illustrated, by Walter Hibbert, of the London Polytechnic, with all the secondary types. The alkaline accumulators, of which the Edison apparatus is a well known type, are the subject of a special section. Turning to mechanically produced electricity, the first article to read is ELECTROMAGNETISM (Vol. 9, p. 226). This brings you naturally to the article DYNAMO (Vol. 8, p. 764), by C. C. Hawkins, author of one of the best practical text-books on the subject. This copiously illustrated

article, in length equivalent to 50 pages of this Guide, discusses *continuous current dynamos*, *lap-winding*, *commutators*, *field-magnets*, *forgings and castings for magnets*, *air-gaps*, *armature cores*, *carbon brushes*, *cooling surfaces* and *alternators*.

Having thus covered the subject of obtaining current, the group of articles next to be considered is that dealing with its measurement and the examination of resistances. The general article UNITS, PHYSICAL (Vol. 27, p. 740), contains a section on *electrical units*. Then come POTENTIOMETER (Vol. 22, p. 205); METER, ELECTRIC (Vol. 18, p. 291); VOLTMETER (Vol. 28, p. 206), illustrated; AMPEREMETER (Vol. 1, p. 879), illustrated; OHMMETER (Vol. 20, p. 34); WATTMETER (Vol. 28, p. 419); GALVANOMETER (Vol. 11, p. 428), illustrated; ELECTROMETER (Vol. 9, p. 234), illustrated; ELECTROSCOPE (Vol. 9, p. 239), illustrated; WHEATSTONE'S BRIDGE (Vol. 28, p. 584), illustrated; and OSCILLOGRAPH (Vol. 20, p. 347), illustrated.

Lighting Appliances

The commercial supply of current is covered by a series of articles of which the first to be read is ELECTRICITY SUPPLY (Vol. 9, p. 193), to which Emile Garcke, the famous electrical engineer, contributes a section. POWER TRANSMISSION, *Electrical* (Vol. 22, p. 233), is by Louis Bell, chief engineer of the General Electric Co., Boston; and contains full details as to the use of both two-phase and three-phase generators in transmission. INDUCTION COIL (Vol. 14, p. 502) and TRANSFORMERS (Vol. 27, p. 173) are both fully illustrated. LIGHTING, *Electric* (Vol. 16, p. 659) deals with arc, incandescent and vapour lamps, and with

wiring. The section on household work gives excellent practical information about the best arrangements of lights. A special class of electric light supplies is discussed in LIGHTHOUSE (Vol. 16, p. 627), by W. T. Douglass, who erected the new Eddystone and the Bishop's Rock lights, and by N. G. Gedye, another practical expert.

The appliances used to convert current back again into the mechanical energy from which it had been derived are described in the article MOTORS, ELECTRIC (Vol. 18, p. 910). This article divides continuous current motors into five classes: *Separately excited*; *series-wound constant current*; *series-wound constant potential*; *series-wound interdependent current and potential*; and *shunt-wound constant potential*. Alternating current motors are similarly classified as *Synchronous constant potential*; *induction-polyphase constant potential*; *induction monophase constant potential*; *repulsion commutating*, and *series-commutating*.

Trolley Cars and Railroads

Machinery for applying electric power to transportation, both for trolley cars and heavy railroad traffic, is described in the article TRACTION (Vol. 27, p. 118), by Prof. Louis Duncan, who designed the first electric locomotives employed with large loads—those introduced in 1895 by the Baltimore & Ohio R.R. for its track in the tunnel under Baltimore. The article gives, with many mechanical diagrams, accounts of the appliances by which the current is taken from trolley wires, conduits and third rails, and of the types of motors and controllers employed. CRANE (Vol. 7, p. 368), by Walter Pitt, describes the peculiar type of "crane-

rated" motor, by the aid of which steam and hydraulic cranes can be displaced. The electric furnaces used for the reduction of ores and for manufacturing processes in which exceptionally high temperatures are required, are treated in ELECTROMETALLURGY (Vol. 9, p. 232), by W. G. M'Millan, lecturer on metallurgy at Mason College, Birmingham. Electric machinery for the refining of metals is dealt with in the article ELECTROCHEMISTRY (Vol. 9, p. 208). Under SURGICAL INSTRUMENTS (Vol. 26, p. 133) there is a description of the apparatus used for cautery and for illuminating parts of the interior of the body. The appliances used in ELECTROTHERAPEUTICS are dealt with under that heading (Vol. 9, p. 249). Information as to other medical and surgical apparatus will be found under RÖNTGEN RAYS (Vol. 23, p. 694), X-RAY TREATMENT (Vol. 28, p. 887), by Dr. H. L. Jones, of St. Bartholomew's Hospital, London; and FLUORESCENCE (Vol. 10, p. 575), by Prof. J. R. Cotter, of Trinity College, Dublin.

Telegraph and Telephone

TELEGRAPH (Vol. 26, p. 510), equivalent in length to 70 pages of this Guide, and fully illustrated, is by a number of contributors, and discusses both land lines and submarine cables. The section on instruments, by H. R. Kempe, electrician to the General Post Office, London, includes a full description of the transmitters and receivers employed in the various systems of wireless telegraphy. TELEPHONE (Vol. 26, p. 547) deals with the fixed and portable instruments, the batteries and switchboards, the new automatic exchange "selectors," and with special applications of the

microphone.

A number of other electric appliances are discussed in separate articles, such as BELL (Vol. 3, p. 692), by H. M. Ross, in which burglar alarm devices are described; and VENTILATION, *Fan* (Vol. 27, p. 1011), by James Bartlett; while sparking plugs and other ignition appliances are treated under OIL ENGINE (Vol. 20, p. 35).

There are also a number of appliances used mostly in experimental and educational work. Such, for instance, are ELECTRICAL OR ELECTROSTATIC MACHINE (Vol. 9, p. 176), with many illustrations; ELECTROPHORUS (Vol. 9, p. 237), and LEYDEN JAR (Vol. 16, p. 528).

The metals, chemicals and other materials sold by dealers in electrical supplies, and their properties and uses, are described in COPPER (Vol. 7, p. 102), ZINC (Vol. 28, p. 981), LEAD (Vol. 16, p. 314), SULPHURIC ACID (Vol. 26, p. 65), SODIUM, *Compounds* (Vol. 25, p. 341); CHROMIUM (Vol. 6, p. 296); NITROGEN, *Compounds* (Vol. 19, p. 715); SAL AMMONIAC (Vol. 24, p. 59), BICHROMATES AND CHROMATES (Vol. 3, p. 912), CARBON (Vol. 5, p. 305), RUBBER (Vol. 23, p. 795), and GUTTA PERCHA (Vol. 12, p. 743).

The following is a partial list, in alphabetical order, of articles of peculiar interest to dealers in electrical supplies.

Accumulator

Amperemeter, or Ammeter

Armature

Battery

Bell

Bichromates and Chromates
Carbon
Chromium
Condenser
Conductor, Electric
Copper
Dielectric
Dynamo
Electricity
Electrical, or Electrostatic, Machine
Electricity Supply
Electrokinetics
Electrolysis
Electromagnetism
Electrometer
Electrophorus
Electroscope
Electrotherapeutics
Fluorescence
Fuze, or Fuse
Galvanometer
Gutta Percha
Induction Coil
Lead
Leyden Jar
Lighting

Meter, Electric
Motors, Electric
Nitrogen, *Compounds*
Ohmmeter
Oil Engine
Oscillograph
Potentiometer
Power Transmission
Röntgen Rays, *Apparatus*
Rubber
Sal Ammoniac
Sodium, *Compounds*
Sulphuric Acid
Surgical Instruments
Telegraph
Telephone
Thermometry, *Electrical*
Traction, *Electric*
Tramway
Transformers
Units, Physical
Vacuum Tube
Ventilation
Voltmeter
Wattmeter
Wheatstone’s Bridge

Wire

Zinc

CHAPTER XII
FOR MERCHANTS AND MANUFACTURERS OF CHEMICALS AND DRUGS

A Factor in All Industries

The chemical and drug industry is not only in itself an enormous business, but it supplies essential materials for almost every branch of manufacturing. Chemical products are employed in our buildings, our clothing, our food; we come into the world and go out of the world with the odour of chemicals about us. The manufacturer or dealer cannot analyze all the influences that affect his market, and when he tries, as he must, to consider the future of the trade, to reckon with the channels of demand that will arise in the course of new applications of chemical products, he is facing all the problems of all the industries.

The variety of raw materials from which chemical products are derived, and the activity with which new sources are discovered and developed, are almost as bewildering. Only a century has passed since coal-tar was first distilled, and to-day no

chemist would venture to fix the limits of its industrial possibilities. Electrolysis has been in use since 1804, and yet the future of the world's wheat supply probably depends upon processes, as yet hardly beyond the experimental stage, of utilizing atmospheric nitrogen.

In connection with so comprehensive an industry, the uses of the Britannica are so manifold that this whole Guide might be devoted to them. Articles on every manufacturing process touch upon the use of chemicals. The articles on countries, states and cities are full of relevant information; and there is hardly a scientific article that would not be helpful. But the 40 general articles on chemistry, the 350 on chemical compounds, and the 75 on manufactured products call most immediately for attention; and, with the aid of other chapters in the Guide, the reader who desires to go further will easily find his way.

Articles on Chemicals

The article CHEMISTRY (Vol. 6, p. 33), equivalent to 135 pages of this Guide, is divided into 6 sections. The first, *History*, traces the general trend of the science from its infancy to the foundations of the modern theory. The second section, *Principles*, treats of nomenclature, formulæ, chemical equations and chemical changes. It provides a brief but complete introduction to the terminology and methods of the chemist, and there is not a line in it which will not prove of value in some way or other to the chemical manufacturer. Sections 3 and 4 are devoted to *Inorganic and Organic Chemistry*, giving a history of the subjects and the principles underlying the structure of compounds, with cross references to all

articles dealing with their preparation and properties. Sections 5 and 6 deal, respectively, with *Analytical* and *Physical Chemistry*.

Dr. Walter Nernst, professor of physical chemistry, University of Berlin, is the author of CHEMICAL ACTION (Vol. 6, p. 26), which deals specifically with the nature of chemical forces and deduces the laws of chemical statics and kinetics. Of interest and importance in connection with the manufacture of chemicals is SOLUTION (Vol. 25, p. 368), by W. C. D. Whetham, of Cambridge University, author of *Theory of Solution*, etc. Another theoretical article which will be found widely useful is THERMOCHEMISTRY (Vol. 26, p. 804), by Prof. James Walker, of Edinburgh University. For further details see the chapter on CHEMISTRY in this Guide.

Manufacture of Chemicals

It is possible here to mention only a small amount of the material dealing with the manufacture of chemicals. At the end of this chapter there is a fuller alphabetical list. It may be noted, however, that the articles on the elements, metallic and non-metallic, give much consideration to their compounds, how these are made and how used in the arts and in medicine. But in addition to this there are many noteworthy contributions dealing with chemical manufacture. For instance, ALKALI MANUFACTURE (Vol. 1, p. 674), by Dr. Georg Lunge, professor of technical chemistry, Zurich Polytechnic, 11 pages in length and with 10 illustrations. The chief processes described are the Leblanc, ammonia-soda, and electrolytic, together with others dependent upon them. The facts about the manufacture of the carbonate, hydrate, and sulphate of soda, chlorine,

hydrochloric acid, etc., are fully given. POTASSIUM (Vol. 22, p. 197) treats of the commercial compounds of this metal in the same manner. NITROGEN (Vol. 19, p. 714) explains the new process for the commercial manufacture of nitric acid from atmospheric air—a matter of enormous industrial importance—and also the conversion of nitrogen into ammonia, which has been done successfully only within the past few years.

The manufacture of chemical products by the use of electricity is the subject of ELECTROCHEMISTRY (Vol. 9, p. 208), and a still larger field is covered by ELECTROMETALLURGY (Vol. 9, p. 232). Both of these valuable articles are by W. G. M'Millan, formerly secretary of the Institute of Electrical Engineers of Great Britain. SULPHURIC ACID (Vol. 26, p. 65), illustrated, by Dr. Lunge, describes the properties, reactions and manufacture of the most important of all chemicals, including the more modern contact processes.

Drugs, Origin and Manufacture

As a key to the subject of the origin and manufacture of drugs, the article PHARMACOLOGY (Vol. 21, p. 347), by Dr. Ralph Stockman, professor of materia medica and therapeutics in the University of Glasgow, presents a great amount of interesting and valuable information on the action of chemical substances (apart from foods) on all kinds of animals, from bacteria up to man. A short history of pharmacology is given and a large part of the article concerns the action of drugs. There is also a classification of drugs according to the latest and most scientific methods into twenty-eight groups, describing the effects of each group. An appendix to

the article, by Dr. H. L. Hennessy, is entitled *Terminology in Therapeutics*, and is a general explanation of the common names used in the therapeutic classification of drugs.

Since therapeutics is concerned with the remedial power of drugs and the conditions under which they are to be used, the article THERAPEUTICS (Vol. 26, p. 793), by Dr. Sir Lauder Brunton, of St. Bartholomew's Hospital, London, and author of the well-known treatise, *Modern Therapeutics*, should not be overlooked, nor POISON (Vol. 21, p. 893), by Dr. Sir Thomas Stevenson, lecturer on chemistry and forensic medicine at Guy's Hospital, London, wherein all poisons are classified and their antidotes are indicated.

PHARMACY (Vol. 21, p. 355), by E. M. Holmes, of the Pharmaceutical Museum, London, is largely historical in its nature, and yields much interesting and valuable information about the pharmacist. We learn that an Egyptian papyrus of the date 2300 B.C. gives direction as to the preparation of prescriptions, and that diachylon plaster, invented by Menecrates in A.D. 1, is used for the same purposes to-day. A great deal of curious knowledge about ancient remedies, such as the thigh bone of a hanged man, moss grown on a human skull, the ashes of the head of a coal-black cat, etc., renders this article especially entertaining. PHARMACOPŒIA (Vol. 21, p. 353), also by Mr. Holmes, tells about the pharmacopœias in use in different countries, the standardization of drugs, etc.

In the list at the end of this chapter are noted the numerous separate articles on drugs, their preparation and use that appear in the Britannica. Mention should be made of the articles on the elements, such as IRON (Vol. 14, p. 799), ARSENIC

(Vol. 2, p. 653), MERCURY (Vol. 18, p. 158), IODINE (Vol. 14, p. 725), BROMINE (Vol. 4, p. 633), SODIUM (Vol. 25, p. 343), POTASSIUM (Vol. 22, p. 200), MAGNESIUM (Vol. 17, p. 321), BISMUTH (Vol. 4, p. 11). Separate sections dealing with pharmacology are found in the articles on very many plants, such as ALOE (Vol. 1, p. 720), ANISE (Vol. 2, p. 55), ARROWROOT (Vol. 2, p. 649), *Iceland Moss* (Vol. 14, p. 241), CINCHONA (Vol. 6, p. 369), COCA (Vol. 6, p. 614), COLCHICUM (Vol. 6, p. 661), DANDELION (Vol. 7, p. 801), HOP (Vol. 13, p. 678), HOREHOUND (Vol. 13, p. 692), LOBELIA (Vol. 16, p. 837), MINT (Vol. 18, p. 557), MUSTARD (Vol. 19, p. 97), PEPPERMINT (Vol. 21, p. 128), etc.

Biographies of Eminent Scientists

The scientific biographies include not a few subjects which will be of interest, owing to familiarity with the names, to those engaged in the chemical and drug business. Among these are LISTER, BARON JOSEPH L. (Vol. 16, p. 777), to whose work and teaching the present importance of the manufacture of antiseptics is largely due; PASTEUR, LOUIS (Vol. 20, p. 892); CURIE, PIERRE, and MME. MARIE CURIE (Vol. 7, p. 644), the physicists who first announced the existence of radium; LIEBIG, BARON J. VON (Vol. 16, p. 590), the great physiological chemist; LUNGE, GEORG (Vol. 17, p. 126), the noted expert in technical chemistry, already mentioned as a contributor to the Britannica, and GLAUBER, J. R. (Vol. 12, p. 114), the German chemist who made a living chiefly by the sale of secret chemical and medicinal preparations.

ALPHABETICAL LIST OF ARTICLES IN THE

ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO THOSE ENGAGED IN THE MANUFACTURE AND SALE OF CHEMICALS AND DRUGS

Abel, Sir Frederick A.

Acacia

Acenaphthene

Acetic Acid

Aceto-Acetic Ester

Acetone

Acetophenone

Acetylene

Achard, F. C.

Acid

Acid Amides

Aconite

Acorus Calamus

Acridine

Adenine

Adipocere

Affinity, Chemical

Albumin, or Albumen

Alcohol

Alcohols

Aldehydes

Alembic

Algaroth, Powder of
Alizarin
Alkahest
Alkali
Alkali Manufacture
Alkaline Earths
Alkaloid
Alkanet
Allantoin
Alloxan
Alloxantin
Allyl Alcohol
Almond
Aloe
Alum
Aluminium
Amidines
Amines
Ammonia
Ammoniacum
Amygdalin
Amyl Alcohols
Amyl Nitrite
Anaesthesia and Anaesthetics
Analysis
Anatto

Andrews, Thomas
Angelica
Aniline
Animé
Anise
Anthracene
Anthraquinone
Antimony
Antipyrine
Antiseptics
Apothecary
Araroba Powder
Archil
Argol
Aristolochia
Arnica
Arrowroot
Arsenic
Asafetida
Asparagine
Aspen
Asphodel
Azo Compounds
Azoximes
Baeyer, Adolf von
Balard, Antoine J.

Balsam
Barium
Base
Baumé, Antoine
Bdellium
Becher, J. J.
Bell, Jacob
Belladonna
Benzaldehyde
Benzine
Benzidine
Benzoic Acid
Benzoin
Benzophenone
Benzyl Alcohol
Berberine
Bergman, Torbern Olof
Berthelot, M. P. E.
Berthollet, C. L.
Beryllium, or Glucinum
Berzelius, J. J.
Betaine
Betel Nut
Bhang
Bibirine or Bebeerine
Bichromates and Chromates

Bismuth
Bittern
Black, Joseph
Borage
Borax
Boric Acid or Boracic Acid
Boron
Boussingault, J. B. J. D.
Brande, William Thomas
Bromine
Brown, S. M.
Brucine
Buchu
Bunsen, P. W. von
Butyl Alcohols
Butyric Acid
Cadmium
Caesium
Caffeine
Cajuput Oil
Calabar Bean
Calcium
Calomel
Calvert, F. Crace
Camphors
Cannizzaro, Stanislao

Cantharides
Capsicum
Capsule
Caraway
Carbazol
Carbide
Carbohydrate
Carbolic Acid
Carbon
Carbonates
Carbon Bisulphide
Carbonic Acid
Cardamon
Carvacrol
Cassia
Castor Oil
Catalysis
Catechu
Caustic
Cavendish, Henry
Cayenne Pepper
Cellulose
Cerium
Chamomile, or Camomile Flowers
Charcoal
Chemical Action

Chemistry
Chevreul, M. F.
Chloral
Chlorates
Chlorine
Chloroform
Chlorpicrin
Chromium
Chrysene
Cimicifuga
Cinchona
Cinnamic Acid
Cinnamon
Cinnolin
Citric Acid
Clark, Thomas
Cloves
Coal-tar
Cobalt
Coca, or Cuca
Cocaine
Coco-nut Palm
Cod-liver Oil
Colchicum
Colcothar
Collodion

Colocynth
Colt's-Foot
Columbium
Combustion
Condenser
Conine
Copaiba
Copal
Copper
Copperas
Coriander
Corrosive Sublimate
Coumarin
Coumarones
Creosote
Cresols
Crookes, Sir William
Crotonic Acid
Croton Oil
Crystallization
Cubebs
Cumin
Curie, Pierre
Cyanamide
Cyanic Acid and Cyanates
Cyanide

Cyanogen
Cytisine
Dalton, John
Dammar
Dandelion
Daniell, John F.
Davy, Sir Humphry
Decolourizing
Depilatory
Dessication
Dewar, Sir James
Dextrine
Diazo Compounds
Didymium
Digitalis
Dill
Diphenyl
Disinfectants
Distillation
Dividivi
Döbereiner, J. W.
Dragon’s Blood
Drug
Dulong, Pierre Louis
Dumas, J. B. A.
Durene

Earth
Ecgonine
Elaterium
Elecampine
Electrochemistry
Electrolysis
Electrometallurgy
Element
Elixir
Elm
Epsom Salts
Equivalent
Erbium
Erdmann, Otto Linné
Ergot, or Spurred Rye
Erythrite
Esters
Ether
Ethers
Ethyl
Ethyl Chloride
Ethylene
Eucalyptus
Eugenol
Euphorbium
Eupion

Europium
Fehling, Hermann von
Fennel
Fenugreek
Fig
Filter
Fir
Fischer, Emil
Fittig, Rudolf
Flamel, Nicolas
Flavin
Fluoranthene
Fluorene
Fluorescein
Fluorine
Formalin, or Formaldehyde
Formic Acid
Formula
Fourcroy, A. F., Comte de
Foxglove
Frankland, Sir Edward
Frémy, Edmond
Fresenius, Karl R.
Friedel, Charles
Fructose, or Fruit-sugar
Fuchs, Johann N. von

Fulminic Acid
Fumaric and Maleic Acids
Fumitory
Furazanes
Furfurane
Fusel Oil
Gadolinium
Galangal
Galbanum
Gallic Acid
Gallium
Gamboge
Gannal, J. N.
Garlic
Gay-Lussac, J. L.
Geber
Gelatin
Gelsemium
Gentian
Geoffroy, E. F.
Gerhardt, Charles F.
Germanium
Gibbs, Oliver Wolcott
Gilbert, Sir Joseph H.
Ginger
Ginseng

Gladstone, John Hall
Glaser, Christopher
Glauber, Johann R.
Glauber's Salt
Glucinum
Glucose
Glucoside
Glutaric Acid
Glycerin, or Glycerol
Glycols
Gmelin (family)
Gold
Graham, Thomas
Grains of Paradise
Greenheart
Guaco, Huaco or Guao
Guaiacum
Guanidine
Guarana
Guelder Rose
Guimet, Jean B.
Gum
Guyton de Morveau, Baron
Harcourt, W. Vernon
Hartshorn, Spirits of
Hashish

Hellebore
Helmont, Jean B. van
Hemp
Henbane
Henna
Henry, William
Herb
Hippuric Acid
Hofmann, A. W. von
Homberg, William
Homoeopathy
Hop
Horehound
Houseleek
Hydantoin
Hydracrylic Acid
Hydrastine
Hydrate
Hydrazine
Hydrazone
Hydrocarbon
Hydrochloric Acid
Hydrogen
Hydroxylamine
Hyposulphite of Soda
Hyssop

Iatrochemistry
Iceland Moss
Imidazoles, or Glyoxalines
Indazoles
Indene
Indicator
Indigo
Indium
Indole
Indulines
Inulin
Iodine
Iodoform
Ipecacuanha
Iron
Isatin
Isomerism
Isoxazoles
Jaborandi
Jalap
Juniper
Kámalá
Kekulé, F. August
Kelp
Kermes
Ketenes

Ketones
Kino
Klaproth, M. H.
Kolbe, A. W. Hermann
Kopp, Hermann F. M.
Kousso
Kunkel, or Kunckel von Lowenstjern, J.
Lactic Acid
Lactones
Laevulinic Acid
Lanolin
Lanthanum
Laudanum
Lavender
Lavoisier, A. L.
Lead
Le Blanc, Nicolas
Lemery, Nicolas
Lemon
Liebig, Baron J. von
Lime
Linseed
Liquorice
Lister, Baron
Lithium
Litmus

Lobelia
Lunge, Georg
Madder
Magnesium
Magnus, H. G.
Malic Acid
Mallow
Malonic Acid
Malt
Mammee Apple
Mandelic Acid
Mandrake
Manganese
Mangosteen
Manna
Marggraf, Andreas S.
Marignac, Jean C. G. de
Mastic
Mayow, John
Medical Jurisprudence
Medicine
Mellitic Acid
Mandeléeff, Dmitri I.
Mercaptans
Mercury
Mesoxalic Acid

Methyl Alcohol
Meyer, J. Lothar
Meyer, Victor
Microcosmic Salt
Mineral Waters
Mint
Mitscherlich, E.
Mohr, K. Friedrich
Moissan, Henri
Molybdenum
Mond, Ludwig
Morphine
Mucic Acid
Murexide
Murray, John
Musk
Muspratt, J. and J. S.
Mustard
Mustard Oils
Myrrh
Myrtle
Naphtha
Naphthalene
Naphthols
Naphthylamines
Nepenthes

Newlands, John A. R.
Nickel
Nightshade
Niobium
Nitre
Nitric Acid
Nitrobenzene
Nitro Compounds
Nitrogen
Nitroglycerin
Nobel, Alfred B.
Nux Vomica
Officinal
Oils
Olefine
Oleic Acid
Opium
Orcin
Orpiment
Orris-root
Oxalic Acid
Oxazoles
Oxide
Oximes
Oxygen
Oxyhydrogen Flame

Palladium
Palmitic Acid
Paraffin
Paraldehyde
Pasteur, Louis
Pelouze, T. Jules
Pennyroyal
Peppermint
Pepsin
Perfumery
Perkin, Sir W. H.
Pettenkofer, Max J. von
Pharmacology
Pharmacopoeia
Pharmacy
Phenacetin
Phenanthrene
Phenazine
Phenol
Phenolphthalein
Phosphates
Phosphorus
Phthalazines
Phthalic Acids
Picene
Picric Acid

Picrotoxin
Pilocarpine
Pimento
Pine
Piperazin
Piperine
Piperonal
Platinum
Plattner, K. F.
Podophyllin
Poison
Polymethylenes
Pomade
Potashes
Potassium
Priestley, Joseph
Primuline
Propiolic Acid
Propyl Alcohols
Proust, Joseph Louis
Prout, William
Prussic Acid
Pumice
Purin
Purslane
Pyrazines

Pyrazoles
Pyrene
Pyrethrum
Pyridine
Pyrimidines
Pyrocatechin
Pyrogallol
Pyrones
Pyrophorous
Pyrrol
Pyruvic Acid
Quassia
Quercitron
Quinazolines
Quinine
Quinoline
Quinones
Quinoxalines
Radium
Ramsay, Sir William
Raoult, François M.
Rare Earths
Regnault, H. V.
Resorcin
Retene
Rhamnus Purshiana

Rhatany, or Krameria Root
Rhodium
Rhubarb
Richter, J. B.
Roebuck, John
Roscoe, Sir H. E.
Rose
Rouelle, G. F.
Rouge
Rubidium
Ruthenium
Saccharic Acid
Saccharin
Safflower
Saffron
Safranine
Sainte-Claire Deville, E. H.
Sal Ammoniac
Salep
Salicin, Salicinum
Saliscylic
Salt
Saltpetre
Samarium
Sandalwood
Sandarach

Santonin
Sarsaparilla
Scammony
Scandium
Scheele, K. W.
Schlippe’s Salt
Schönbein, C. F.
Schützenberger, P.
Senega
Senna
Sesame
Silica
Silicon
Silliman, Benjamin
Silver
Snake-root
Soap
Soap-bark
Sodium
Solution
Spectroscopy
Spikenard, or Nard
Spirits
Sponges
Squill
Stahl, G. E.

Stas, J. S.
Stearic Acid
Sterochemistry
Stero-isomerism
Stoichometry
Stramonium
Strontium
Strophanthus
Strychnine
Styrolene
Succinic Acid
Sugar
Sulphonal
Sulphonic Acids
Sulphur
Sulphuric Acid
Sumbul, or Sumbal
Supra-renal extract
Talc
Tamarisk
Tannin or Tannic Acid
Tantalum
Tar
Taraxacum
Tartar
Tartaric Acid

Tellurium
Tennant, Charles
Tennant, Smithson
Terbium
Terpenes
Tetrazines
Tetrazoles
Thénard, L. J.
Therapeutics
Thermochemistry
Thiazines
Thiazoles
Thiophen
Thomsen, Julius
Thomson, Thomas
Thorium
Thymol
Thyroid
Tin
Tincture
Titanium
Toilet Powders
Toluene
Tonqua Bean
Tooth Powders and Pastes
Triazines

Triazoles
Triphenylmethane
Trophine
Tungsten
Turmeric
Upas
Uranium
Urea, or Carbamide
Urethane
Urotropin
Valency
Valerian
Valeric Acid
Vanadium
Vanilla
Van’t Hoff, J. H.
Vaseline
Vauquelin, L. N.
Veratrum
Veronal
Viburnum
Vitriol
Weighing Machines
Weights and Measures
Weldon, Walter
Wenzel, K. F.

Williamson, A. W.
Wine
Wintergreen
Winter’s Bark
Wislicenus, J.
Witch-hazel
Wöhler, Friedrich
Wollaston, W. H.
Wormwood
Wurtz, C. A.
Xanthic Acid
Xanthone
Xylene
Yew
Young, James
Ytterbium
Yttrium
Zinc
Zirconium

CHAPTER XIII
FOR MERCHANTS AND MANUFACTURERS OF FOOD PRODUCTS

The manufacturer of or dealer in food products must of necessity be interested in questions of transportation by land and sea, of taxation, of agriculture, stock-raising and fishing, for example. For all such subjects as these he is referred to other chapters of this Guide. Here he will find only the chief articles on the subjects most closely related to the study of food products. But on these he may glean a wealth of information that will be of greatest value to him, and from them he can turn readily and with profit to a survey of the larger area covered by other chapters.

As a general introduction to the subject the student should read DIETETICS (Vol. 8, p. 214), by the late Dr. W. O. Atwater, who was in charge of the Nutrition Investigation of the U. S. Department of Agriculture, and R. D. Milner, also of that Department. This article deals with the composition and nutritive values of foods, their fuel value, quantities of nutriments needed, hygienic and pecuniary economy of foods (with tables showing the percentage composition of common food materials), conditions of digestibility, and other matters of equal importance. NUTRITION (Vol. 19, p. 920), by Prof. D. N. Paton and Dr. E. P. Cathcart, both of the University of Glasgow, discusses more particularly digestion and the utilization of the different food constituents.

Food Preservation

After establishing the value and relative importance of the various substances used as food, it is of great interest to everyone in the business to consider the subject of FOOD PRESERVATION (Vol. 10, p. 612), an article by Otto Hehner, formerly president of the Society of Public Analysts, in which there are separate sections on *Preservation by Heat* (which includes all canning processes); *by Chemicals*; *by Drying*; *by Refrigeration*; *by Pickling*. The sterilization of milk, condensed milk and milk powder all fall within the scope of this article. The preservation of food by cold is described in fuller detail in the article REFRIGERATING AND ICE MAKING (Vol. 23, p. 30), by T. B. Lightfoot, author of the standard technical book on that subject. Among the separate articles on preservative materials are VINEGAR (Vol. 28, p. 96), ACETIC ACID (Vol. 1, p. 135), CITRIC ACID (Vol. 6, p. 397), OILS (Vol. 20, p. 43), SALT (Vol. 24, p. 87), SALTPETRE (Vol. 24, p. 93), SUGAR (Vol. 26, p. 32), BORAX (Vol. 4, p. 243), FORMALIN OR FORMALDEHYDE (Vol. 10, p. 667), BENZOIC ACID (Vol. 3, p. 756), SALICYLIC ACID (Vol. 24, p. 69), SULPHUR, *Compounds* (Vol. 26, p. 63), ALCOHOL (Vol. 1, p. 525).

Adulteration

The objections to the use of some of these chemicals are discussed in ADULTERATION (Vol. 1, p. 218), by Otto Hehner. This article is about as long as 50 pages of this Guide. There is an interesting historical introduction, from which we learn that the first legal statute in which the adulteration of food is noticed dates from the reign of King John in England (1203). There is an elaborate account of all the

subsequent legislation in Great Britain, the United States, and Germany. The effects upon digestion of the chemical preservatives mentioned above are shown in the light of the very latest investigations. There is a section on colouring matter in food, with information about harmless and harmful dyes; and the last part of the article considers adulteration as recently applied to the more important articles of food, such as milk (with tests for borax and formaldehyde), cream, butter, cheese, lard, oils, flour and bread, sugar, marmalade and jams, tea, coffee, cocoa and chocolate, wine, beer, spirits, non-alcoholic drinks, and vinegar.

The properties of adulterants and colouring matters are described in separate articles, such as GLUCOSE (Vol. 12, p. 141); SACCHARIN (Vol. 23, p. 970); PARAFFIN (Vol. 20, p. 752), which is sometimes added to coffee when it is roasted; ALUM (Vol. 1, p. 766), often used with weak and unstable flours in bread making, and unwholesome, although not strictly speaking an adulterant; SAGO (Vol. 23, p. 1003) and ARROWROOT (Vol. 2, p. 649), which provide adulterants of cocoa; CHICORY (Vol. 6, p. 131), which many consumers insist upon using in their coffee; COPPER, *Compounds* (Vol. 7, p. 109), which describes the copper salts used for colouring canned vegetables; ANATTO (Vol. 1, p. 943) and TURMERIC (Vol. 27, p. 474), two harmless vegetable colouring matters, much employed; and ANILINE (Vol. 2, p. 47). A full list of the various other colouring matters will be found in the article DYEING (Vol. 8, p. 744).

Another group of articles will be found particularly useful in connection with the manufacture of certain classes of food products. Among these are FERMENTATION (Vol. 10, p. 275), by J. L. Baker, the

noted English analytical and consulting chemist; FUNGI (Vol. 11, p. 333), illustrated, with its information about molds; BACTERIOLOGY (Vol. 3, p. 156), illustrated, especially for the material relating to the nature of toxins (p. 174)—both of these articles by the late Professor Ward of Cambridge and Professor Blackman of the University of Leeds; MEDICAL JURISPRUDENCE, *Food Poisoning* (Vol. 18, p. 29), by Prof. H. H. Littlejohn, of the University of Edinburgh, and T. A. Ingram; and POISON (Vol. 21, p. 893), by the late Dr. Sir Thomas Stevenson, of Guy's Hospital, London.

The diseases of animals which affect meat are described in the article VETERINARY SCIENCE (Vol. 28, p. 2), by George Fleming, author of *Animal Plagues*, and Prof. John MacQueen of the London Veterinary College, which contains sections on diseases of cattle, sheep and pigs as well as on the principal parasites of domestic animals; and there are separate articles on ANTHRAX (Vol. 2, p. 106); FOOT AND MOUTH DISEASE (Vol. 10, p. 617), PLEURO-PNEUMONIA, or LUNG PLAGUE (Vol. 21, p. 838), and RINDERPEST (Vol. 23, p. 348).

Special Foods

The article FLOUR AND FLOUR MANUFACTURE (Vol. 10, p. 548), by George F. Zimmer, not only describes the processes of milling and of dressing and bleaching the flour, but also gives the history of milling from the earliest times, and deals with the special customs of different countries. There is a very full article BREAD (Vol. 4, p. 465), by the same contributor. It is not generally known that there are in existence remains of cakes made by the Swiss lake-dwellers in the Stone Age. The author says that, in all probability, they were baked on hot stones. The

machine bakeries of the present day are described; and there are sections on sanitation of bakehouses, quality, flavour and colour of flour, baking powders, methods of dough making (the ferment-and-dough, the sponge-and-dough, and other systems), leavened, unleavened and aerated bread, and the recently invented Apostolov process, which among other advantages, permits the utilization of about 87½% of the wheat berry in bread making. A complete modern bread-making plant is described, together with the latest types of machine kneaders, dough dividers and mixers, and baking ovens. There are also articles on BISCUIT (Vol. 3, p. 992), MACARONI (Vol. 17, p. 192), VERMICELLI (Vol. 27, p. 1024), and GLUTEN (Vol. 12, p. 145).

The article STARCH (Vol. 25, p. 794) treats of the manufacture of this most important alimentary substance. The materials from which the chief food starches are made are described in MAIZE (Vol. 7, p. 448), ARROWROOT (Vol. 2, p. 649), with illustrations showing the appearance under the microscope of the substances which pass commercially under the name of arrowroot or farina; SAGO (Vol. 23, p. 1003), TAPIOCA (Vol. 26, p. 413), and CASSAVA (Vol. 5, p. 457). OAT (Vol. 19, p. 938) has information about the manufacture of oatmeal.

The article SUGAR (Vol. 26, p. 35) is by two practical experts, Alfred and Valentine W. Chapman. It deals with the chemistry, manufacture, history and statistics of this important food product as well as with the cultivation of the sugar cane and beet.

Among articles on the products in the manufacture of which sugar is employed is JAMS AND JELLIES (Vol. 15, p. 150), by Otto Hehner. The author points out many things of interest, for example why starch-glucose is an ingredient and not an adulterant of

these products, and he shows the baselessness of the prejudice against the use of beet sugar in their manufacture. The manufacturer of jellies and preserves will find separate articles on all the fruits employed, and other information in GELATIN (Vol. 11, p. 554); in IRISH MOSS (Vol. 14, p. 795) as to the properties of vegetable gelatin; and in ISINGLASS (Vol. 14, p. 872), which, besides its gelatinous qualities, possesses the property of clarifying wines, beers, and other liquids. CONFECTIONERY (Vol. 6, p. 898) describes an important industry—which until the middle of the 19th century was part of the druggist's business. See also CHOCOLATE (Vol. 6, p. 259) and JUJUBE (Vol. 15, p. 546).

SALT (Vol. 24, p. 87) covers the manufacture of salt very fully. It is curious to note that the termination "wich" in English place-names points to localities of ancient salt manufacture, for "wich" is an old English word meaning saltspring. This article contains an interesting section on the *Ancient History and Religious Symbolism* of salt (p. 90), by the late Dr. William Robertson Smith. The preservative qualities of salt were held to make it a peculiarly fitting symbol of any enduring compact, and in more than one part of the world cakes of salt have been used as money.

Dairy Products

Butter and cheese manufacture fall under the article DAIRY AND DAIRY FARMING (Vol. 7, p. 737), illustrated, by the late Dr. William Fream, of Edinburgh University. There are sections on *Milk Production*; *Cheese and Cheesemaking*, including Canadian and American factory practice and the Babcock and Russell investigations in Wisconsin which have opened up a new field for commercial

exploitation (the varieties of English, French, German, and Italian cheeses being also described); *Butter and Butter-making*, *Dairy Factories*, *Adulteration of Dairy Produce*; *The Milk Trade*, *American Dairying*, etc. MARGARINE, the "perfectly wholesome butter substitute" is the subject of a separate article (Vol. 17, p. 704).

There is an article on LARD (Vol. 16, p. 214), showing what real leaf lard is, and how the term is applied in commerce. OILS (Vol. 20, p. 43), by Dr. Julius Lewkowitsch, author of *Chemical Technology and Analysis of Oils, Fats, and Waxes*, deals with the fixed oils and fats, and essential, etheral or volatile oils. Some of these are among the most important articles of food, and the oil and fat industry may be considered as old as the human race itself. The three processes of oil extraction are described, also refining and bleaching, methods of testing, etc. A list of all oils and fats, including those that are edible, is given. For the chief oils used as food see OLIVE (Vol. 20, p. 85), COTTON, *Cotton-seed* (Vol. 7, p. 260), SESAME (Vol. 24, p. 701), SUNFLOWER (Vol. 26, p. 102), POPPY OIL (Vol. 22, p. 91).

Other articles on foods deal with the preparation for the market of such products as GINGER (Vol. 12, p. 27), MUSTARD (Vol. 19, p. 97), PEPPER (Vol. 21, p. 127), with the different varieties distinguished, CAYENNE PEPPER (Vol. 5, p. 589), VINEGAR (Vol. 28, p. 96), PIMENTO (Vol. 21, p. 614), CLOVES (Vol. 6, p. 562), CINNAMON (Vol. 6, p. 376), CURRY (Vol. 7, p. 649), CAVIARE (Vol. 5, p. 582), from which we learn that the finer grades rarely find their way out of Russia; KETCHUP (Vol. 15, p. 761), CHUTNEY (Vol. 6, p. 350), PICKLE (Vol. 21, p. 584), VANILLA (Vol. 27, p. 894), RAISIN (Vol. 22, p. 864), CURRANT (Vol. 7, p. 648), PRUNE (Vol. 22, p. 518), FIG (Vol. 10, p.

332), and GUAVA (Vol. 12, p. 665).

Beverages, Tea and Coffee

The same completeness is displayed in the Britannica articles on beverages. TEA (Vol. 26, p. 476), by John McEwan, has an admirable historical introduction. It was not until the middle of the 17th century that the English began to use tea. It is a curious fact that whereas 35 years ago China practically supplied the world with tea, to-day Russia alone takes half of her export. The reason for this is explained. The characteristics of all varieties of tea are given and the main facts about the cultivation and manufacture. *Tea Adulteration* and *Effects on Health* are other sections of this valuable article.

COFFEE (Vol. 6, p. 646) is treated in very similar fashion by A. B. Rendle and W. G. Freeman. This beverage, in spite of fierce religious opposition, became the national beverage of the Arabians, and finally appeared in Europe in the 17th century. The physiological action of coffee has a section all to itself. Coffee consumption, roasting and adulteration are also discussed. It is of interest to note that while one branch of the Anglo-Saxon race, namely the people of the United States, is near the head of the list of coffee consumers, others, especially Great Britain, Canada and Australia "are almost at the foot, using only about 1 lb. of coffee per head each year." In the United States "the average consumption per head is about 11 or 12 lbs. per annum."

COCOA (Vol. 6, p. 628) is an interesting and valuable article on "the food of the gods"—the great beverage and dietary substance which America has given the world. Modern lovers of chocolate as a beverage (which is the same as cocoa save that the

fat has not been extracted) will envy the digestive powers of the Emperor Montezuma of Mexico who had, each day, 50 jars of chocolate prepared for his personal consumption.

BEER (Vol. 3, p. 642), by Dr. Philip Schidrowitz, member of the Institute of Brewery Council, confines itself to the history of this important beverage, the chemical composition of beers of different types, and information in regard to production and consumption. In BREWING (Vol. 4, p. 506) this same author enters very fully into the manufacturing operations. The English and foreign systems are described and there are many illustrations. It is curious to note that Pliny, who is the earliest writer to mention beer, describes it as scorned by the Romans, who looked upon it as only fit for barbarians, and he thought it a more sinful drink than wine. “So exquisite,” he says, “is the cunning of mankind in gratifying their vicious appetites, that they have invented a method to make water itself produce intoxication.” The section on *Brewing Chemistry* is very valuable. In connection with Brewing there is an article on MALT (Vol. 17, p. 499), illustrated and very complete in its treatment, by Arthur R. Ling, editor *Journal of the Institute of Brewing*, and one on HOP (Vol. 13, p. 677), by the late Dr. Wm. Fream. Dr. Schidrowitz also contributes the article WINE (Vol. 28, p. 716). The art of wine-making is thoroughly described, and there are most interesting sections on the wines of France, Spain, Portugal, Germany, Italy, Austria-Hungary, United States, classifying the different varieties and affording a full survey of the industry.

SPIRITS (Vol. 25, p. 694), illustrated, and also by Dr. Schidrowitz, is a general article covering the subject of the distillation of fermented saccharine

and starchy liquids. The account is both historical and technical, and there are separate and more specific articles on BRANDY (Vol. 4, p. 428), RUM (Vol. 23, p. 825), ARRACK (Vol. 2, p. 642), WHISKY (Vol. 28, p. 591), in which the difference between three main types—Scotch, Irish and American—is carefully explained; VODKA (Vol. 28, p. 170), GIN (Vol. 12, p. 26). The many flavoured and sweetened forms of alcohol are described in the article LIQUEURS (Vol. 16, p. 744), where we also learn the difference between a "cordial" and a "liqueur." There are separate articles on ABSINTHE (Vol. 1, p. 75), BENEDICTINE (Vol. 3, p. 721), CHARTREUSE (Vol. 5, p. 954), CURAÇOA (Vol. 7, p. 636), KIRSCH (Vol. 15, p. 834), and VERMOUTH (Vol. 27, p. 1029).

MINERAL WATERS (Vol. 18, p. 517) classifies all the great springs according to their mineral constituents, and discusses the effects upon digestion of their use, and their value in medical treatment.

The appended list includes a large number of articles of interest to the food producers, including chemical compounds and flavouring extracts.

ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO THOSE ENGAGED IN THE MANUFACTURE OR SALE OF FOOD PRODUCTS

Absinthe

Acetic Acid

Acorus Calamus

Adulteration

Aerated Waters

Alcohol
Aldehydes
Ale
Almond
Alum
Anatto
Anchovy
Angelica
Aniline
Anise
Anthrax
Apple
Apricot
Arrack
Arrowroot
Artichoke
Asparagus
Aspic
Avocado Pear
Bacon
Bacteriology
Bael Fruit
Banana
Bannock
Barley
Barm

Bean

Bee, *Bee-keeping*

Beef

Beer

Beet

Benedictine

Benzoic Acid

Bilberry, or Whortleberry

Biltong

Birch

Biscuit

Bisque

Bitters

Blackberry

Bohea

Boletus

Borax

Brandy

Brazil Nut

Bread

Bread Fruit

Brewing

Buckwheat

Butter

Butter-nut

Cabbage

Caffeine
Candle
Capers
Caraway
Cardamon
Carrot
Cassava
Cassia
Cattle
Caviare
Cayenne Pepper
Celery
Chanterelle
Chartreuse
Chasse
Cheese
Cherry
Chestnut
Chicory
Chive
Chocolate
Chupatty
Chutney
Cider
Cinnamon
Citric Acid

Citron
Claret
Cloves
Cocoa
Coco-nut Palm
Cod
Coffee
Confectionery
Cookery
Copper
Cotton
Crab
Cranberry
Cucumber
Curaçoa
Currant
Curry
Date Palm
Dietary
Dietetics
Dyeing
Eel
Enzyme
Esters
Extract
Fennel

Fenugreek
Fermentation
Fig
Fisheries
Flour and Flour Manufacture
Food
Food Preservation
Foot and Mouth Disease
Formalin, or Formaldehyde
Fructose
Fruit
Fruit and Flower Farming
Fungi
Furfurane
Garlic
Gelatin
Gentian
Ghee
Gin
Ginger
Glucose
Gluten
Gooseberry
Grain Trade
Ground Nut
Gumbo

Guava
Haddock
Herring
Hippocras
Honey
Hop
Horseradish
Huckleberry
Hyssop
Indian Corn
Iris
Irish Moss
Isinglass
Jams and Jellies
Jujube
Juniper
Junket
Kava
Ketchup
Kipper
Kirsch
Koumiss
Kvass, or Kwass
Lactic Acid
Lard
Lemon

Lentil
Liqueurs
Loaf
Lobster
Macaroni
Mackerel
Maize
Malmsey
Malt
Maple
Marchpane
Margarine
Marmalade
Maté
Meal
Mealie
Meat
Medical Jurisprudence
Medlar
Melon
Milk
Mineral Waters
Mint
Molasses
Mulberry
Mulligatawny

Mushroom
Mustard
Nasturtium
Negus
Nut
Nutmeg
Nutrition
Oat
Oils
Okra
Oleic Acid
Olive
Onion
Orange
Oyster
Palmitic Acid
Paraffin
Pea
Peach
Pear
Pemmican
Pepper
Pepsin
Perry
Pickle
Pig

Pilchard
Pimento
Pine-apple
Pistachio-nut
Plants, *Pathology*
Pleuro Pneumonia
Plum
Poison
Pomegranate
Poppy Oil
Potato
Poultry and Poultry Farming
Prune
Pudding
Puff-ball
Pulque
Pumpkin
Punch
Quince
Radish
Raisin
Raspberry
Ratafia
Rice
Rinderpest
Rum

Rye
Saccharin
Sago
Saké
Salicylic Acid
Salmon
Salsify
Salt
Saltpetre
Scone
Sea Kale
Sesame
Shaddock
Sheep
Sherbet
Sherry
Shrimp
Sorghum
Spirits
Sprat
Starch
Steak
Stearic Acid
Strawberry
Sturgeon
Suet

Sugar
Sulphur
Sunflower
Syrup
Tamarind
Tapioca
Tart
Tea
Terpenes
Thyme
Tomato
Treacle
Trichinosis
Truffle
Tunny
Turmeric
Vanilla
Venison
Vermicelli
Vermouth
Veterinary Science
Vine
Vinegar
Vodka
Walnut
Wheat

Whisky

Wine

Wintergreen

Wormwood

Yeast

CHAPTER XIV
FOR INSURANCE MEN

For the insurance man, whether veteran or tyro, the new ENCYCLOPAEDIA BRITANNICA has much of value and importance, *and it has it in quickly available form so that the desired information may be readily found*, whether the experienced student wants an authoritative statement on a difficult point, or the beginner wishes an outline course of the subject. This availability, whether for the expert or the novice, is secured by the Index (the 29th volume), which guides the reader immediately to desired information, if he does not find it in the alphabetically arranged articles in the body of the book upon first turning up the article in which he expects the subject to be treated.

To be more concrete—if you want to know something about insurance, turn first to the article INSURANCE in Volume 14, beginning on p. 656. You find an elaborate article, which would occupy about 75 pages if printed in type and on a page like this Guide.

In other encyclopaedias you would have no clue to

the whereabouts of any information about insurance except what would be given in the article INSURANCE or in articles to which it might refer you in that article. For anything else you would have to guess how the editor's mind had worked to find where in the book he had put other information about insurance; and to guess how each contributor's mental processes have been related to his interest in insurance so that you might know whether in some article, on a topic apparently not related to insurance at all, the contributor had put in some interesting and important fact about insurance.

But in the Britannica you have one entire volume, the 29th, which was made for the sole purpose of increasing the practical efficiency of the other 28 volumes. Under the heading *Insurance* in this index, you will find references to many articles and cross references to Title Insurance and to Title Guarantee Companies.

Apart from the fact that he has the initial *assurance* that what he gets from the Britannica in the first place is fuller and better than he would get from another work of reference, what are the advantages offered by the index in this particular instance?

First: Instead of having a reference to volume 14 only he has references to volumes 2, 3, 4, 9, 10, 11, 12, 14, 15, 16, 18, 19, 20, 22, 24, 25, 26, 27 and 28, —nineteen volumes in all,—say a gain of 1800% in efficiency.

Second: Instead of having one article Insurance to refer to, he has reference to specific information in the following articles:

Annuity,

Austria,

Average,
Barratry,
Bonus,
Employers' Liability,
Fire and Fire Extinction,
Friendly Societies,
Gaming and Wagering,
Guarantee,
Income Tax,
Infanticide,
Japan,
Land Registration,
Lloyds,
Mensuration,
Novation,
Old Age Pensions,
Post Office,
Probability,
Shipbuilding,
Socialism,
Switzerland,
Title Guarantee Companies,
Tontine,
Underwriter,
Unemployment,
Warranty.

That is, to 28 new articles,—say 2800% additional gain.

Observe, too, that this is a gain that cannot be expressed in figures. The index references are classified. First there is a main head *Insurance*; then subheads, *Fire*, *Life*, *Marine*, *Title*, *Workmen's*; and under the subheads special topics arranged alphabetically.

In brief, the Index facilitates and accelerates reference to anything in the Britannica that bears on any desired topic.

The article INSURANCE opens with a definition of that word and with drawing a distinction between it and "assurance." The general history of insurance traces marine insurance back to Greek commerce in the 4th century B.C., but shows that modern methods of marine insurance were unknown until the 14th century; that fire insurance dates from the 17th century and especially from the Great Fire of London in 1666; and that, although there were a few instances of life insurance in the 16th and 17th centuries, it did not become a regular business until the 18th century and was not widely extended until the 19th century. Separate sections of the article deal with *Casualty* (or accident) and *Miscellaneous Insurance*, *Fire Insurance*, *Life Insurance*, *British Post Office Insurance*, and *Marine Insurance*.

The section on British Post-Office Insurance will give to the American insurance man a knowledge of this innovation in the post-office to which the American post-office seems to be tending, if one may judge by the introduction of postal savings-banks and the adoption of the parcels-post system.

In the same way the article OLD AGE PENSIONS will make you acquainted with another radical

measure which has been adopted in Great Britain, Germany, France, Denmark, Victoria and notably New Zealand, with fuller description in the article NEW ZEALAND. The importance of the subject to the American insurance man lies in the fact that similar schemes are under consideration or actual operation in Massachusetts, New Jersey, and other states of the United States. In the same way the article on EMPLOYERS LIABILITY and WORKMEN'S INSURANCE will give him a wider grasp of the subject of state insurance, mandatory or elective, for workmen.

The principal articles on insurance topics have already been mentioned. It is to be noted, however, that the actuary will find important information in the mathematical articles MENSURATION and PROBABILITY; that the article FRIENDLY SOCIETIES is supplemented by such special articles as FREE MASONRY, B'NAI BRITH, BUILDING SOCIETIES, BURIAL SOCIETIES, ODD FELLOWS, etc.

In the *Classified List of Articles* in the Index Volume the student of insurance will find on page 893 a list of articles in the field of economics and social science, many of which will bear more or less directly on the subject. Among these articles and sub-articles are:

Abandonment

Accident

Actuary

Annuity

Assets

Austria

Average

Baby-Farming
Barratry
Boarding-out System
Bonus
Bounty
Casualty Insurance
Census
Charity
Co-insurance
Combination
Communism
Conflict of Insurance Laws
Co-operation
Emigration
Employers' Liability
Eugenics
Fire and Fire Extinction
Fire Insurance
Foundling Hospitals
F. P. A. Liabilities
Friendly Societies
Gaming and Wagering
General
Guarantee
Halley's Table
Housing

Illegitimacy
Income Tax
Industrial Insurance
Infanticide
Insurance
Interest factor
Japan
Labour Legislation
Land Registration
Liability
Life Insurance
Lloyd’s
Maritime Insurance
Mendicancy
Mensuration
Mutual Insurance
Mortality Rates
Negative Values
Net Liability
Net Premium
Non-forfeiture
Northampton Table
Novation
Old Age Pensions
Pauperism
Pawnbroking

Policy
Poor Law
Population
Post Office
Premium
Probability
Production
Profit Sharing
Rates of Mortality
Reserve
Salvage
Selection
Shipbuilding
Socialism
Social Settlements
Subrogation
Suicide
Sumptuary Laws
Surplus
Surrender Values
Switzerland
Tariff
Taxation of Insurance
Title Guarantee Companies
Tontine
Trade Unions

Tramp

Trusts

Underwriter

Unemployment

Usury

Wages

Warranty

Wealth

CHAPTER XV
FOR ARCHITECTS

Although architecture is more and more coming to be recognized as one of the fine arts, it is at the same time so largely practical and utilitarian that its theory and methods may to a great extent be gathered from systematic reading. In the article Fine Arts in the Britannica, by Sir Sidney Colvin, it is well said that “The original or rudimentary type of the architect, considered not as a mere builder but as an artist, is the savage, who, when his tribe had taken to live in tents or huts instead of caves, first arranged the skins and timbers of his tent or hut in one way because it pleased his eye, rather than in some other way which was as good for shelter.” Whether the architect wishes to learn how the eye may be pleased, to study critically the history of architecture, or, like the less imaginative savage who failed of being the first inspired architect, to consider

comfort and shelter rather than beauty and charm, he will find much to help him in the Britannica. If his interest is chiefly practical, he should consult the chapter *For Builders* in this Guide.

The architect should read first—and he will constantly be referring to it afterwards—the article ARCHITECTURE (Vol. 2, p. 369), equivalent in length to 235 pages of this Guide and illustrated by 140 figures, about one-third of which are photogravures. The article is historical in the main and a brief outline of it is as follows:—

Egyptian

Assyrian

Persian

Greek

Parthian

Sassanian

Etruscan

Roman

Byzantine

Early Christian

Coptic Church in Egypt

Romanesque and Gothic in

- Italy
- France
- Spain
- England
- Germany
- Belgium and Holland

Renaissance: Introduction

- Italy
- France
- Spain
- England
- Germany
- Belgium and Holland

Mahommedan

Modern

- Classical Revival in British Architecture
- Classical Revival in Germany
- French Classicism
- Barry's "Commonsense" Style
- Gothic Revival in England

Gothic Revival in France

Queen Anne Style

"Free Classic" Style

Arts allied to Architecture

Craftsmanship Ideal

Architecture in United States (Figures 97, 98, 99, 131, 132, 133, 134, 135, 136, 137, 138)

English Churches

English Public Buildings

English Domestic and Street Architecture

Recent French Architecture

Germany

Other Countries

The part of the article dealing with Modern Architecture is by H. H. Statham author of a well-known book on the subject. Earlier sections are by R. Phené Spiers, late master of the Royal Academy's Architectural School, with sections on the Romanesque and Gothic in France by W. R. Lethaby, principal of the Central (London County) School of Arts and Crafts.

Before continuing his more systematic historical readings the student may well read the article HOUSE (Vol. 13, p. 810), illustrated with 12 figures (3 plates), including four particularly fine examples of "half timbered buildings," and one English house, the Jew's House at Lincoln, dating from the 12th century. An interesting article on MURAL DECORATION (Vol. 19, p. 16) is by a remarkably distinguished trio: William Morris, poet, craftsman and painter, John Henry Middleton, late Slade professor of fine art, Cambridge, and Walter Crane, the well-known illustrator and decorator. This is illustrated with 16 figures in black and white and with a reproduction in colours of a wall-painting from a Roman villa of the early Empire. The article deals with: reliefs in marble and stone; marble veneer; glazed bricks or tiles; hard stucco; sgraffito; stamped leather; painted cloth; printed hangings and wall-papers; and painting.

If the student of architecture would know about the buildings of prehistoric times, in which there was little architecture in the sense of a fine art, he should read the articles ARCHAEOLOGY, (Vol. 2, p. 344), LAKE DWELLINGS (Vol. 16, p. 91), STONEHENGE (Vol. 25, p. 961) and STONE MONUMENTS, PRIMITIVE (Vol. 25, p. 962),—the last two of particular interest to the building engineer because it is so puzzling a problem how these great blocks

could have been brought such distances and set in place without modern appliances.

Early Oriental Architecture

Engineering problems will be the most interesting in a large part of the student's reading about Egyptian architecture. Supplementing the 4,000 or 5,000 words on this subject under ARCHITECTURE, accompanied by seven illustrations, there is much information in the articles EGYPT (Vol. 9, p. 21); ABYDOS (Vol. 1, p. 81) and KARNAK (Vol. 15, p. 680); and in the articles PYRAMID (Vol. 22, p. 683), (by W. M. Flinders Petrie) and SPHINX (Vol. 25, p. 662) by Francis Llewellyn Griffith, another well-known Egyptologist. In the former article the author points out that the outside and inside work on all the pyramids was excellent and that the casings were not a mere veneer but were "of massive blocks, usually greater in thickness than in height, and in some cases (as at South Dahshur) reminding the observer of horizontal leaves with sloping edges." The massive character of the roofing of the sepulchral chambers is indicated by Prof. Petrie's estimate that "in Pepi's pyramid it is of three layers of stone beams, each deeper than their breadth, resting one on another, the thirty stones weighing more than 30 tons each." But neither Stonehenge nor the pyramid was really an engineering problem. Here, and as in all his studies of early architecture, artist or engineer will find religion and worship the aim and the reason of the building even more, if that is possible, than in the great European cathedrals of comparatively recent times.

In the article BABYLONIA and ASSYRIA there is a brief section (Vol. 3, p. 108) on *Art*, supplementing

the treatment under ARCHITECTURE. It is interesting to note that even in Assyria architecture was trammelled, reactionary, governed by Babylonian styles and using brick and clay because Babylon did, although there was stone in Assyria, and none in Babylonia; and keeping the heavy brick platform foundation which the Babylonian architects had adopted because of the marshy character of their country, although there was no need of such construction in Assyria. Here too the function of architecture was largely as an aid to religion: as shown in the article NIPPUR (Vol. 19, p. 707), with its description of the "ziggurat" or artificial mountain in the shrine, built probably 40 or 45 centuries B. C. One temple was 272 ft. square, with seven storeys, each smaller than the one below and thus surrounded by a terrace, each dedicated to a planet, each coloured a separate tint, the first probably 45 ft. high, and the total height 160 ft.

In Assyria great palaces of the 9th, 8th and 7th centuries B. C. have been found, and these are probably the earliest large buildings of any architectural importance not religious in their purpose; but this distinction must not be carried too far, for the king was sacrosanct, half priest and half god, and his palace was a shrine.

Greece and Rome

Although the main treatment of Greek and Roman architecture is in the article ARCHITECTURE, the student should read the articles GREEK ART (Vol. 12, p. 470; equivalent to 70 pages in this Guide; written by Percy Gardner, author of *Grammar of Greek Art*) and ROMAN ART (Vol. 23, p. 474; equivalent to 40 pages of this Guide; written by H. Stuart Jones, director of the British School at Rome). The article

on GREEK ART contains 82 illustrations, many of them halftones. It makes clear the dependence of the other fine arts in Greece on architecture—and on religion—in showing that the greatest sculptures were adjuncts to temples, and (p. 471–472) in a discussion of the architecture of Greek temples calls attention to four basal principles of Greek architecture:

(1) Each member of the building has one function and only one, and this function controls even the decoration of that member. Pillars support architraves; their perpendicular flutings emphasize this. Moulding at a column's base suggests the support of a great weight.

(2) Simple and natural relations prevailed between various members of a construction.

(3) Rigidity of simple lines is avoided; scarcely any outline is actually straight. Columns are not equidistant.

(4) Elaborate decoration is reserved for those parts of the temple which have, or seem to have, no strain laid upon them.

The article TEMPLE (Vol. 26, p. 603) gives plans and general information about Greek and Roman sacred architecture, as well as Hebrew, Egyptian and Assyrian temples; and the reader should study the article PARTHENON (Vol. 20, p. 869) and the diagram in that article, and the article PERGAMUM (Vol. 21, p. 142) and the two plates which accompany it.

The article ROMAN ART (Vol. 23, p. 474) is probably the first brief and authoritative treatment of a topic long overshadowed in popular interest by the earlier art of Greece and the later art of Italy. It begins with a history of recent research. Architecture, pre-eminently the most Roman of the arts as combining utility with beauty, is outlined (pp. 476–477 especially) and the main point in regard to

Roman architecture is brought out as follows: “the specific achievement of the Roman architect was the artistic application of a new set of principles—those which are expressed in the arch, the vault and the dome,” as contrasted with the rectilinear buildings of the Greeks. The arch, particularly the triumphal arch, is specifically a Roman product and is specifically Roman besides in being an expression of reverence for governmental authority,—which, it should, however, be remembered, cannot be separated from religion. Among the most important of Roman sculptures and particularly reliefs are those of the arches, described in the articles ARCH (Vol. 2, p. 342) and TRIUMPHAL ARCH (Vol. 27, p. 297), the latter with eight figures. The part of the article AQUEDUCT which deals with Roman aqueducts (Vol. 2, pp. 241–243, with 2 plates, 6 illustrations) will interest the architect as well as the contractor or engineer. And he should read the article on the Roman architect and writer on architecture, VITRUVIUS (Vol. 28, p. 150), whose book so strongly affected the Renaissance.

Before taking up modern architecture as distinguished from ancient, the student will do well to examine the architecture of some more remote peoples—for instance,

Aztec (Vol. 5, p. 441 and p. 677)

Abyssinian (Vol. 12, p. 232)

Hittite (Vol. 13, p. 537)

Indian (Vol. 14, p. 428, with 4 plates)

Japanese (Vol. 15, pp. 181–182)

Chinese (Vol. 6, p. 214)

Byzantine (Vol. 4, p. 906, with 2 plates), and the

article CONSTANTINOPLE (Vol. 7, p. 3)

Modern Architecture

The last topic will serve as a transition to the modern architecture of Europe, especially because the influence of the Byzantine was so strong in the early church.

The study of the Italian Romanesque and Gothic in an elaborate section of ARCHITECTURE (Vol. 2, p. 391) may well be supplemented by reading the articles on the Italian cities in which this art is preserved. The following list is roughly chronological, the cities named first being those in which there are the oldest churches.

Ravenna, Pisa and Venice, for Byzantine Romanesque.

MILAN PAVIA BRESCIA BERGAMO PIACENZA PARMA MODENA	for Lombard Romanesque
BARI MOLFETTA	for Southern Romanesque
PALERMO MESSINA MONREALE CEFALU	for Sicilian Romanesque
WÜRZBURG, for Romanesque in Germany	
GENOA ASSISI	

ORVIETO
VERONA
PERUGIA
SIENA

In the same way, for Gothic in other countries, the student should read:

AIX-LA-CHAPELLE LE PUY ANGOULÊME ARLES NIMES ST. DENIS NOYON SENLIS SENS REIMS LE MANS	for French Gothic
OVIEDO LEON AVILA SEGOVIA LERIDA TOLEDO BURGOS SEVILLE SALAMANCA	for Spanish Gothic
DURHAM LINCOLN SALISBURY GLOUCESTER, etc.	for English Gothic
AIX	

MAINZ
WORMS
SPIRES
COLOGNE

TOURNAI, LOUVAIN, etc., for Belgian,

and in general, the articles CATHEDRAL, NAVE, AISLE, CHOIR, APSE, CHEVET, LADY-CHAPEL, VAULT, FLYING BUTTRESS, PINNACLE, CLERESTORY and TRIFORIUM. The article Cathedral has plans of Canterbury, Salisbury, Durham, Ely, Chartres, Sens and Angoulême and a perspective of Amiens cathedral.

In the same way the student of the Renaissance architecture may supplement the section in the article ARCHITECTURE (p. 408, etc.) by reference to the articles on the cities in which the great Renaissance buildings stand. But now "the career of the individual has to be taken into consideration," so true is it that the Renaissance in architecture as in scholarship was intensely individualistic. The article ARCHITECTURE points this out and in this section is largely biographical in its treatment. The reader should study the following separate articles also

For Italian Renaissance

FILIPPO BRUNELLESCHI

FLORENCE

LEONE BATTISTA ALBERTI

MICHELOZZO DI BARTOLOMMEO

BRAMANTE

ROME (for St. Peters: see Fig. 51 in ARCHITECTURE)

BORGOGNONE

BACCIO D'AGNOLO

SANGALLO

POLLAIULO

MICHELANGELO

JACOPO SANSOVINO

MICHELE SANMICHELE

ANDREA PALLADIO

BAROCCHIO DA VIGNOLA

GALEAZZO ALESSI

LOMBARDO

DOMENICO FONTANA

BALDASSARE PERUZZI

The French Renaissance

For this period, less individual than in Italy, the reader will find it best to study the geographical articles. Let him read

BLOIS (noting Plate VIII, fig. 84, in the article ARCHITECTURE)

TOURS

CHAMBORD

ORLEANS

CHENONCEAUX

FONTAINEBLEAU

PARIS

Spanish Renaissance

GRANADA

VALLADOLID

SARAGOSSA

MALAGA

SALAMANCA (Plate V., fig. 73 in *Architecture*)

SEVILLE (Plate V., fig. 74 in *Architecture*)

ESCORIAL (with plan)

MADRID (Palacio Royal)

English Renaissance

JOHN THORPE

INIGO JONES

SIR CHRISTOPHER WREN

ST. PAUL'S CATHEDRAL (see Fig. 53 in ARCHITECTURE)

GREENWICH (for Hospital)

NICHOLAS HAWKSMOOR

SIR JOHN VANBRUGH

DEAN HENRY ALDRICH

GEORGE AND JAMES DANCE

WILLIAM KENT

ROBERT ADAM

SIR WILLIAM CHAMBERS

German Renaissance

ROTHENBURG (town-hall)

AUGSBURG (town-hall)

HEIDELBERG (see Plate VII in ARCHITECTURE)

Renaissance in Belgium and Holland

ANTWERP

AMSTERDAM

ROTTERDAM

HAARLEM

On *Mahommedan Architecture* the student should read not only the section (Vol. 2, pp. 422–427) in the article ARCHITECTURE, with eight illustrations, but the separate articles

INDIAN ARCHITECTURE (with 4 plates, 17 figures)

MOSQUE (with 3 diagrams)

MINARET

CAIRO

CONSTANTINOPLE

DAMASCUS

JERUSALEM

MECCA

KAIRAWAN

CORDOVA

ALHAMBRA

TABRIZ

ISFAHAN

On the more recent period, the 19th century, roughly, the student should supplement the last part of the article ARCHITECTURE by reading the following articles

For the Classical Revival in the British Isles

DUBLIN (see also Fig. 85 in ARCHITECTURE)

EDINBURGH

SIR JOHN SOANE

English Gothic Revival

A. W. N. PUGIN

SIR GEORGE GILBERT SCOTT

GEORGE S. STREET

WILLIAM BUTTERfIELD

JOHN LOUGHBOROUGH PEARSON

ALFRED WATERHOUSE

France (Figs. 122–129 in article Architecture)

L. P. BALTARD

J. L. C. GARNIER

The Last 50 Years

George Frederick Bodley R. Norman Shaw William Morris Harvey L. Elmes Charles R. Cockerell Liverpool (and Fig. 86 in Architecture)	England
H. H. Richardson Richard M. Hunt Charles F. McKim Stanford White William R. Mead Russell Sturgis Steel Construction	United States (and see Plates XV and XVI, and Figs. 97, 98, 99 in article Architecture)

Classical Revival in Germany

Karl Friedrich Schinkel

Berlin (and Fig. 87 in Architecture)

Potsdam (and Fig. 88 in Architecture)

Munich (and Fig. 89 in Architecture)

Gottfried Semper

French Classicism

Adolphe Theodore Brongniart

Jacques Ignace Hittorff (Plate XII in Architecture)

English "Commonsense"

SIR CHARLES BARRY

HALIFAX (Fig. 90 in ARCHITECTURE)

WESTMINSTER (Houses of Parliament; see Fig. 91 in ARCHITECTURE)

BUDAPEST (Fig. 92 in ARCHITECTURE)

The sections of the article ARCHITECTURE dealing with France and Germany in the last two generations may best be supplemented by a study of the articles PARIS, BERLIN, VIENNA, and BUDAPEST.

The following is a brief alphabetical list of architectural articles and topics in the *Britannica*, including topics for the builder and contractor.

Abacus

Abated

Abbey

Abutment

Acroterium

Adam, Robert

Aedicula

Aisle

Aiwan

Leone Battista Alberti

Alcove

Galeazzo Alessi

Alley

Almery

Almonry
Almshouse
Alure
Ambo
Ambulatory
Amphiprostyle
Amphitheatre
Andron
Angel-lights
Antae
Ante-chapel
Ante-choir
Ante-fixae
Anthemion
Apophyge
Apollodorus of Damascus
Apse
Apteral
Aqueduct
Araeostyle
Araeosystyle
Arcade
Arch
Architrave
Archivolt
Arcosolium

Arena
Arris
Ashlar
Astragal
Astylar
Atrium
Attic
Attic Base
Baccio d’Agnolo
Back-choir
Bailey
Balcony
Ball-flower
L. P. Baltard
Balustrade
Banker-marks
Baptistery
Barbican
Bargeboard
Giacomo Barocchio
Bartizan
Base
Basement
Basilica
Batement-lights
Baths

Batter
Battlement
Bay
Bed-mould
Belfry
Bell-cot
Belvedere
Bema
Bench-table
Bevel
Bezantée
Sir A. W. Blomfield
G. W. Bodley
Bonding
Giuseppi Bonomi
Francesco Borromini
Bowtell
Bracket
Bramante
Brattishing
Sir Reginald Bray
Brick, and Brickwork
Bridges
Broach
Sir I. M. Brunel
Filippo Brunelleschi

Building
Charles Bulfinch
Bungalow
William Butterfield
Buttress
Cable moulding
Luigi Cagnola
Caissons
Camber
Campanile
N. le Camus de Mézières
Canal
Canalis
Cancelli
Candelabrum
Canephorae
Canopy
Cantilever Foundations
Capital
Carpentry
Cartouche
Caryatides
Casement
Castle
Cathedral
Cathetus

Cauliculus
Cavaedium
Cavea
Cavetto
Ceiling
Cella
Cements
Chalcidicum
Sir William Chambers
Chamfer
Chancel
Chapter-house
Charnel-house
Chateau
Chersiphron
Chevet
Chevron
Chimney
Chimney-piece
Choir
Chresmographion
Cinque Cento
Cleithral
Clerestory
Cloaca
Cloister

C. R. Cockerell
Coenaculum
Coffer, and Coffer Dams
Cogging
Colonnade
Placido Columbani
Column
Compluvium
Composite Order
Compound pier
Conch
Concrete, Concrete Piers, etc.
Consisterium
Construction
Coping
Corbel
Corbie
Cornice
Counterfort
Coursed Rubble
Cramps
Crenelle
Crest
Crocket
Crossing
Cross springer

Crypt
Crypto-porticus
Cubicle
Cuneus
Cupola
Curvilinear
Cusp
François de Cuvilles
Cyclopean Masonry
Cyclostyle
Cyma
Cyrto-style
Cyzicenus
Daedalus
Dais
Dance (family)
Decastyle
Decorated Period
Dentil
Diaconicon
Diastyle
Diaulos
Diazomata
Dikka
Dinocrates
Dipteral

Philibert De l’Orme
Discharging Arch
Distyle
Docks
Dodecastyle
Dog-tooth
Dome
Donjon
Door
Doorway
Dormer
Dormitory
Dosseret
Dovetail
Dowels
Drafted masonry
Dredging
Dripstone
Dromos
Dungeon
Early English Period
Eaves
Echinus
Eiffel Tower
Elevator
Elizabethan Style

H. L. Elmes
James Elmes
Embrasure
Engaged Column
Entablature
Entasis
Ephebeum
Epi
Epinaos
Epistyle
Estrade
Eupalinus
Eustyle
Exedra
Extrados
Façade
Facing
Fan Vault
Femerell
Fenestration
Feretory
James Fergusson
Festoon
Fillet
Finial
Flamboyant Style

Flèche
Floor
Flue
Flying Buttress
Pierre F. L. Fontaine
Domenico Fontana
Footing
Foot-stall
Formeret
Foundation
Fountain
Charles Fowler
Frater
Freestone
Fret
Frieze
Frigidarium
Frontispiece
Gable
Gablets
Galilee
Gallery
Gargoyle
J. L. C. Garnier
Garret
Garretting

Gate
Gatehouse
Gazebo
Girder
Glazing
Glyph
Glyptothek
Godroon
Gothic
Grange
Granite
Griffe
Groin
C. G. Guarini
Guilloche
Gutta
Gutter
Joseph Gwilt
Gynaeceum
Hagioscope
Half-timber Work
Hall
Halving
Hammerbeam Roof
J. A. Hansom
Nicholas Hawksmoor

Heating
K. A. von Heideloff
Helix
Hemicycle
Herring-bone
Hexastyle
Hip-knob
Hipped roof
Hippodamus
Hippodrome
J. I. Hittorff
Hôtel-de-Ville
Hôtel-Dieu
Hot-water Heating and Supply
House
Hypaethros
Hypocaust
Hypostyle
Hypotrachelium
Ichnography
Iconostasis
Ictinus
Imbrex
Impluvium
Impost
In-antis

Indian Architecture
Intercolumniation
Interlaced arches
Intrados
Jacobean Style
Jamb
Jesse
Joinery
Joints
Joggles
Inigo Jones
Owen Jones
Jubé
Keel-moulding
Keep
Keystone
Label
Labrum
Laconicum
Lacunar
Lady-Chapel
Lancet
Lantern
Lanterns of the Dead
Lectern
Libon

Lighting
Lightning Conductor
Limestone
Lintel
Loft
Louver (Louvre)
Lucarne
Lunette
C. F. McKim
Machicolation
Maksoora
Manor-house
Marble
Mastaba
Mausoleum
Megaron
Merlon
Meshrebiya
Meta
Metope
Mezzanine
Mihrab
Minaret
Minbar
Minster
Modillion

Module
Monotriglyph
Mortar
Mortice
Mosque
Mouldings
Moving Stairs
Mullion
Mural Decoration
Mutule
Narthex
Nave
W. E. Nesfield
Newel
Niche
Notching
Nymphaeum
Obelisk
Octastyle
Odeum
Oecus
Ogee
Ogive
Oillets
Order
Ordinance

Oriel
Orientation
Orthostatae
Orthostyle
Oubliette
Ovolo
Pagoda
Painter-work
Palace
Palaestra
Andrea Palladio
Palladian
Panel
Pantheon
Parament
Parapet
Parascenium
Parclose
Pargetting
John Henry Parker
Parquetry
Parthenon
Parvis
Patera
Patio
Pavement

Pavilion
J. L. Pearson
Paruzzi
Pedestal
Pediment
Pendant
Pendentive
Pergamum
Peripteral
Peristyle
Perpendicular Period
Perpent Stones
Perron
Philon
Piazza
Pier
Pilaster
Pile Foundations
Pillar
Pinacotheca
Pinnacle
Piscina
Plan
Planceer
Plaster
Plinth

Podium
Poppy Heads
Porch
Porticullis
Portico
Postern
Presbytery
Prick Posts
Propylaea
Proscenium
Prostyle
Prothesis
Pseudo-dipteral
Pseudo-peripteral
Pteron
Philon
A. W. N. Pugin
Pulpit
Purlin
Pycnostyle
Pyramid
Pyramidion
Pythis
Quadriga
Quatrefoil
Quoins

Rag-stone
Random
Rear vault
Refectory
Regula
Reredos
Respond
Rib
George Richardson
H. H. Richardson
Thomas Rickman
River Engineering
Road
Rood
Rough Cast
Rubble
Rustication
Sacristy
Saddle
Sangallo (family)
Sanmichele
Scabbling
Scaffold
Scamilli impares
K. F. Schinkel
Sir G. G. Scott

Scotia
Sedilia
Gottfried Semper
Sepulchre, Easter
Severy
Sewerage
Sexpartite vault
Shaft
R. Norman Shaw
Shoring
Sill
Skeleton Construction
Slaking
Slip Joints
Slype
Sir John Soane
Soffit
Solar (Soller)
Sommer
Spandril
Sphaeristerium
Spina
Spire
Spire light
Springer
Squinch

Squint
Stag Bars
Stage
Stained Glass
Staircase
Stairn
Stall
Stanchion
Steam-Heating
Steel Construction
Steeple
Stele
Stereobate
Stillicidium
Stilted
Stoa
Stone, Stone Wash
Storey
G. E. Street
Russell Sturgis
Style
Stylobate
Bartolommeo Suardi
Sudatorium
Surbase
Surveying

Suspensura
Systyle
Tabernacle
Tablinum
Tabularium
Taenia
Talar
Talus
Tambour
Taper
Tas-de-charge
Tegula
Telamones
Temenos
Temple
Tenon
Tepidarium
Terminal Figures
Terrace
Tessellated
Tetrastoön
Tetrastyle
Thatch
Theatre
Thesaurus
Tholobate

Tholos
John Thorpe
Timber
Sir William Tite
Toran
Torus
Tower
Trabeated
Tracery
Trachelium
Transept
Transom
Transverse Rib
Trapezophoron
Trefoil
Trial Boring
Tribune
Triforium
Triglyph
Triumphal arch
Tudor flower
Tudor period
Tunnel
Tunnel-vault
Turning-piece
Turret

Under-croft
Vane
Vault
Ventilation
Verandah
Verge
Vesica Piscis
Vestibule
Vignette
Villa
Viollet-le-Duc
Vitruvius
Volute
Voussoir
Wall, and Walling, and Wall Coverings
Alfred Waterhouse
Water Spray Ventilation
Wattle and dab
Wedging
Well Foundations
Wind braces
Window
Sir Christopher Wren
James Wyatt
Xystus

CHAPTER XVI
FOR BUILDERS AND CONTRACTORS

The Builder's Problems

The rapid increase in population, and especially in its density, the congestion in great cities, with the consequent building up of suburbs; and the equally rapid upward tendency in the scale of comfort, are factors of modern civilization which make the work of the builder and contractor increasingly complex. The good builder is probably much commoner than ever before, in spite of the popular impression that building materials are poorer and that construction work is more often "scamped" than they used to be. Increased transportation facilities make the builder much less dependent on local and often inadequate materials. And there has been a change in the theory and practice of government: the old easy-going policy has been abandoned, and new laws, strictly enforced, have resulted in such inspection and control of building operations as would have seemed tyranny to the builder of a generation ago and as make modern buildings, especially in cities, much safer than ever before. Insurance companies have done much to the same end.

There is a general prejudice against the modern builder on the part of the temperamental "praiser of the past." Occasionally similar complaints are made even against the builders of the past. Kipling sings:

Who shall doubt the secret hid
Under Cheops' pyramid
Was that a contractor did

Cheops out of several millions?
Or that Joseph's sudden rise
To Comptroller of Supplies
Was a fraud of monstrous size
On King Pharaoh's swart civilians?

The mere duration of the pyramids, undamaged except by the hand of man, is an answer to such a charge; and in the Britannica article PYRAMID the reader will find (Vol. 22, p. 683) that even where the hidden material was rubbly or of mud bricks, "the casings were not a mere veneer, but were of massive blocks, usually greater in thickness than in height"—in other words, that the construction was of the best character.

But the builder must be a far better-informed man under present conditions than ever before. To give him the necessary information there is a large and growing literature ranging from builders' and contractors' pocket manuals to special periodicals. This literature is expensive, and like all special literature puts the intending purchaser in a difficult position, for *if he buys it all*, he must pay much more than the returns from his purchase warrant, and he will then have to *read it all* and use his own judgment in deciding what is best. If he does not buy all, he must be an expert, not merely in every branch of his business but in the bibliography of his business, to make a wise selection,—and if he is sufficiently expert for this he will probably need no such library. But he will find, to a remarkable degree, the best of all that there is in such special literature in the Encyclopaedia Britannica, with the strongest assurance of its being authoritative, and with the certainty that for an outlay, small in comparison with what he would make for such special information elsewhere, he will get the

guidance that he needs for his work and also information as excellent on any other subject that he or any member of his family may wish to pursue.

The key or foundation article for the builder or contractor is BUILDING (Vol. 4, p. 762), by James Bartlett, lecturer on construction, etc., King's College, London, who has contributed other articles on related topics. The article deals with:

The relation of building to architecture and with building laws and special types of plans according to local governmental requirements

The conditions necessary for a successful building, namely—ease of access, good light, good service, pleasing environment and approaches, minimum cost with true economy, and, for office buildings, ease of arrangement to suit tenants

Construction, its general principles

Materials of construction, especially stone and brick

Particular objects of construction

Foundation walls

Footings to walls

General procedure for an intended building

Builder's sphere

American building acts

Fire-resisting construction.

This general article is supplemented by the following articles:

FOUNDATION, containing 13 diagrams and paragraphs on: load on foundation; trial boring; construction; types—concrete piers, pile foundations, concrete piles, plank foundations, caissons, well foundations, coffer dams, dock foundations, cantilever foundations, building on sand (at Cape Henlopen, Delaware)

CAISSON

MASONRY, with 18 diagrams, and with special treatment of tools, including hammers, mallets, saws,

chisels, setting tools, hoisting appliances; of seasoning stone; of setting stones; of use of mortar; of bonding; slip joints; footings; walling; random; coursed rubble, ashlar, etc.; backing to stone work; pointing and stonewash. There is also a brief vocabulary of technical terms and a discussion of methods of facing; joints; cramps; dowels; joggles; stone arches; tracery and carving; and the articles ASHLAR, RAG-STONE, RANDOM

CEMENT, with 3 figures; description and analysis of Pozzuolanic and Portland cement; mixing; loading of kilns; types of kilns; cement clinker; testing; hydraulic lime; Roman cement; natural cements; Passow cement; uses of hydraulic cement; calcium sulphate cements

CONCRETE, with 16 illustrations and paragraphs on constituents; proportions; mixing; moulds; depositing; strength; durability; convenience and appearance; resistance to fire; cost; artificial stones; steel concrete, including columns, piles, beams, floor slabs, etc.; concrete arches

MORTAR, with sections on slaking; hardening; magnesia in mortar; strengths; adhesion, decay, effects of salt and frost; legal restrictions; limes and cements for mortar

LIME

BRICK, with sections on brick-clays and brick-making

BRICKWORK, with 15 diagrams; sections on hollow walls; materials and labor; varieties of bricks; strength of brickwork; mortar; pointing; footing; binding; prevention of damp; arches and plates; chimneys and flues; brick paving

BASEMENT

HOUSE, with 17 illustrations

BUNGALOW

CARPENTRY, with 36 diagrams showing joints, notching, cogging, dovetail, housing, halving, mortise, tenons, wedging, dowelling, turning-piece, lintel, floors, strutting, partition, half timber construction, braced frame; and descriptive text on these and other topics

STEEL CONSTRUCTION, with 4 illustrations; sections on skeleton and steel-cage construction; local laws; protection from corrosion; columns; girders; floors; windbracing; materials; floor-filling; partitions; time and cost of construction

STONE, with sections on constitution, colour, testing, preservatives, natural bed, seasoning, varieties, artificial stone

MARBLE, a descriptive article, about 4000 words long

GRANITE, with descriptions and analyses of typical granites

LIMESTONE, about 2500 words

TIMBER, with paragraphs on: felling timber, conversion of timber—with diagram of bastard and quarter sawing; seasoning; defects; decay; preservation of timber; varieties, with description of the principal coniferous and hard woods—and separate articles on PINE, FIR, LARCH, CEDAR, BIRCH, BEECH, CHESTNUT, WALNUT, ELM, TEAK, MAHOGANY, MAPLE, etc.

HALF-TIMBER WORK

CHIMNEY-PIECE

SCAFFOLD, with 4 figures; sections on bricklayers' and masons' scaffolds, material, erection, gantries, derrick towers, cradles, chimney scaffolds, accidents

SHORING, with 8 figures; sections on raking shores; braces, horizontal or flying shores; needle, vertical and dead, shoring; rules and sizes for all shores

STAIRCASE, divided into architecture and construction, the latter having 4 diagrams, description of dog-legged or newel stair, open newel stair, geometrical stair, circular stair, spiral stairs; a defining vocabulary of technical terms; concrete and stone; moving inclines; local building laws

BALUSTER

BALUSTRADE

ELEVATOR, with 3 illustrations; paragraphs on history; construction, essentials of design; safety devices; traveling staircases; freight elevators

PARQUETRY

CEILING

ROOFS, with 23 figures and two plates; with sections on forms of roof, trusses, open timber roofs, mansards; iron roofs, covering materials—felt corrugated iron, zinc, lead, copper, "tin," slate, tiles, miscellaneous—weight of roofs, building laws; and separate articles on SLATE, TILE, TIN, TIN PLATE, etc.

PLASTER WORK, with paragraphs on lathing, metal lathing, limes, hair, substitutes for hair, sand, external work, rough stucco, roughcast or pebble-dash, sgraffito, internal work, three coats, moulding, cracks, slabs, fibrous plaster.

JOINERY, with 13 illustrations, and treating such topics as: tools and materials; joints, mitre, dovetail, etc.; warping; moulding; flooring, including wood block and parquet; skirting, dados; picture rails; windows, bay windows; shutters; shop-fronts; doors; church work; ironmongery, including hinges, locks, etc.

DOOR

DOORWAY

CASEMENT

WINDOWS

GLAZING

STAINED GLASS

WALL COVERINGS, with sections on marble wall-lining, mosaic, tiles, metal sheeting, tapestry, wall-papers—and see MURAL DECORATION.

PAINTER-WORK, dealing with paint bases, vehicles, thinners, driers, pigments, enamel, paints, woodwork paints, varnish, gums, French polishes, putty, tools, workmanship, graining, marbling, painting on plaster and on iron, repainting on old work, blistering and cracking, distemper, gilding, etc.

SEWERAGE

LIGHTING, with sections on oil, gas and electric lighting

LIGHTNING CONDUCTOR

HEATING, with sections on open fires, closed stoves, gas fires, electrical heating, oil stoves, low pressure hot water, high pressure hot water, steam heating, hot water supply, safety valves, geysers, incrustation, Lockport central steam supply

VENTILATION, with sections on rate of air consumption, ventilation of buildings, with table; chimney draught; other outlets; inlets; window and door ventilation; arrangements in barracks, in public buildings, exhaust cowls; extraction of vitiated air; fans; water spray ventilation; extraction by hot-air shaft; measurement of air; systems in public buildings

Both the builder and contractor will find valuable information to govern their financial relations with their clients in the article BUILDING SOCIETIES, of which the American part is by Carroll D. Wright, late United States Commissioner of Labor.

The contractor will find the following articles of importance to him, in addition to those of more particular interest for the builder:

SURVEYING

GEODESY

BRIDGES

CANTILEVER

CAISSON

COFFERDAM

RIVER ENGINEERING

HARBOUR

DIVERS AND DIVING APPARATUS

DOCKS

DREDGES

BREAKWATER

TUNNEL

CANAL

ROAD

LIGHTHOUSE

IRRIGATION

RECLAMATION OF LAND

and the article RAILWAY, with the other articles on railway construction listed in the chapter *For Railroad Men* in this Guide.

For an alphabetical list of the principal articles and topics of interest to builders and contractors, see the end of the chapter *For Architects* in this Guide.

CHAPTER XVII
FOR DECORATORS AND DESIGNERS

All the Arts in One

The decorator and designer is a specialist in his purposes rather than in his methods, and his taste and judgment must be based upon a wide range of information. His selection and combination of decorative factors call for a knowledge of architectural design, of painting, sculpture, furniture, textiles, pottery, enamels, embroideries, laces and all the other arts, crafts and products that contribute to the perfecting of “the house beautiful.” The variety

of the materials at his command offers him infinite possibilities of successful achievement, and as many temptations to incoherence and exuberance. The highest success in decoration can be attained only when the designer possesses the resources of all these arts and crafts, and failure perhaps comes oftenest through too exclusive a use of one medium of expression because it is the one with which the designer feels he can most competently deal. The ideal should be not only to employ, but to enlarge, the scope of every contributory medium of form or colour, as Wagner found new possibilities in the use of every musical instrument in one orchestra. This practical usefulness of versatility is clearly indicated in one of the articles, characteristic of the Britannica, where one great expert writes about the work of another. William Morris and Walter Crane have been the leaders of the modern revival of artistic interest in the daily accessories of life; and Crane in the Britannica (Vol. 2, p. 701) says of Morris that his influence is to be attributed to his having "*personally mastered the working details and handling of each craft he took up in turn, as well as to his power of inspiring his helpers and followers. He was painter, designer, scribe, illuminator, wood-engraver, dyer, weaver and, finally, printer and paper-maker; and, having effectively mastered these crafts he could effectively direct and criticize the work of others.*" Obviously, few men can afford to devote forty years, as Morris did, to the close study and actual practice of all these pursuits, and still fewer could hope to develop so many manual dexterities. But any earnest student can become a competent critic in all these varied fields, and can retain an equal appreciation of all the materials and methods employed, if he will enlarge and refresh his knowledge by constant reading of the

best authorities. The comprehensiveness of the Britannica makes it, for such purposes, invaluable to the designer and decorator, no matter how many technical books his working library may contain.

The Influence of Architecture

Since harmony of proportion, the essence of architecture, is also the primary law of interior decoration, the reader of the present chapter may well begin his reading with a number of the articles described in the chapter *For Architects*, of which only those dwelling most upon the use of ornament and colour need be separately mentioned in this connection. The article ARCHITECTURE (Vol. 2, p. 369) is by R. Phené Spiers, formerly master of the Architectural School of the English Royal Academy, with sections on special periods and schools of architecture by other famous authorities. Oriental architecture, with its elaboration of detail, is peculiarly suggestive to the decorator, who may be surprised to find, in the Britannica, treatises so highly specialized as INDIAN ARCHITECTURE (Vol. 14, p. 428), by Dr. James Burgess, editor of the standard book on the subject, the *History of Indian Architecture*; the architectural part of CHINA, *Art* (Vol. 6, p. 214), by Lawrence Binyon, whose work in the great British Museum collection has made his reputation as one of the foremost modern critics; and JAPAN, *Art* (Vol. 15, p. 181), by Capt. Frank Brinkley, whose many years of study in Japan have given him an exceptional mastery of the subject. Among other articles dealing with the decorative aspects of architecture are ORDER (Vol. 20, p. 176), CAPITAL (Vol. 5, p. 275), and HOUSE (Vol. 13, p. 810), with its exquisite full page plates.

Design and Mural Painting

The article DESIGN (Vol. 8, p. 95), by W. R. Lethaby, principal of the Central School of Arts and Crafts, London, contains a passage which the decorator may well bear in mind when he has to contend against the typical client's unreasoning demand for the sensationalism which, for the moment, is accepted as an evidence of originality, but is always the cause of subsequent dissatisfaction and complaint. "Modern use has tended to associate design with the word 'original' in the sense of new or abnormal. The end of design, however, is properly utility, fitness and delight. *If a discovery, it should be a discovery of what seems inevitable*, an inspiration arising out of the conditions, and parallel to invention in the sciences." These fifty words are but a millionth part of the contents of the Britannica; but alone they show that the work can practically serve the designer. MURAL DECORATION (Vol. 19, p. 16), with its delightful reproduction in colour of a wall painting preserved in the National Museum at Rome, and its other illustrations, is by William Morris and Walter Crane, with a section on classical wall paintings by Prof. J. H. Middleton, Slade professor of fine art at Cambridge University. The "furnishing" point of view is considered under other headings (see below). Here the distinguished contributors give an interesting account of marble and stone reliefs, the oldest method of wall decoration; marble veneer, especially appropriate to 14th and 15th century Italian style; wall-linings of glazed brick or tiles; coverings of hard stucco; the recently revived sgraffito method; stamped leather, much used in rooms of the 16th–18th century period; painted cloth; printed hangings and wall-papers, of great

antiquity among the Hindus and Chinese but not common in Europe until the 18th century; wall-painting, with description of the characteristic schemes of mural art in ancient and modern times, and methods of execution.

In further connection with this subject the reader should turn to EGYPT, *Art and Archaeology* (Vol. 9, p. 65), by the noted Egyptologist, W. M. Flinders Petrie; GREEK ART (Vol. 12, p. 470), by Percy Gardner; ROMAN ART (Vol. 23, p. 474), by H. Stuart Jones; PAINTING (Vol. 20, p. 459), by Prof. G. B. Brown, of Edinburgh University, and other authorities; SCULPTURE (Vol. 24, p. 488), by Professor Middleton and other authorities; MOSAIC (Vol. 18, p. 883), by Professor Middleton and H. Stuart Jones, with a practical section on *Modern Mosaic* (p. 888), by Sir William Blake Richmond, noted for his accomplishments in decorative art. All of these articles are richly illustrated. See further, the chapters on *Fine Arts*, *Painting* and *Sculpture*.

The Wall and the Floor

WALL-COVERINGS (Vol. 28, p. 279), by James Bartlett, of Kings College, London, deals with the subject in its practical relation to house furnishing, with reference to the conditions of the room, the use to which it is to be put, its lighting aspect, and its outlook. There is much information about the employment of marble, mosaic, tiles, metal sheeting, tapestry, and wall-papers; and separate articles will be found on the following materials: MARBLE (Vol. 17, p. 676), by J. S. Flett; TILE, *Wall and Floor* (Vol. 26, p. 971), illustrated, by William Burton; LEATHER (Vol. 16, p. 330), illustrated, by Dr. J. G. Parker; TAPESTRY (Vol. 26, p. 403), by A. S. Cole, an

admirable historical account, fully illustrated, and giving information on varieties of design, indications of date, the marks of makers, modern tapestry weaving, etc. BAYEUX TAPESTRY (Vol. 3, p. 555) is an interesting historical account by the antiquarian, J. H. Round, of this venerable relic executed by order of the half-brother of William the Conqueror; it is illustrated with two plates containing 11 views of the tapestry.

In the matter of Floor-coverings there are the articles FLOOR-CLOTH (Vol. 10, p. 527), PARQUETRY (Vol. 20, p. 861), and CARPET (Vol. 5, p. 392), illustrated, by A. S. Cole, devoted to descriptions of carpets and rugs as designed and manufactured in Europe and Oriental countries.

Furniture

The next group of topics begins with the article FURNITURE (Vol. 11, p. 363) with 36 illustrations by J. G. Penderel-Brodhurst. The classified Table of Articles in the Britannica (Vol. 29, p. 888) indicates over 75 articles on separate pieces of furniture, but in this general treatise we have a concise history, describing periods and styles, with many interesting facts about the origin and use of different pieces of furniture from the earliest time to the “art nouveau” of very recent date. Some of the noteworthy separate articles, which have been written by Mr. Penderel-Brodhurst, are CHAIR (Vol. 5, p. 801); DESK (Vol. 8, p. 95); TABLE (Vol. 26, p. 325), and BED (Vol. 3, p. 612). See also MARQUETRY (Vol. 17, p. 751). For those who wish to preserve unity of style in furnishing a room, these articles will prove of the highest value. A full list is appended to this chapter; and the reader should consult the chapter in this Guide *For the Manufacturer of Furniture*.

Textile Fabrics

The decorator and designer must be familiar with all manner of fabrics, and the Britannica contains an immense fund of information in regard to the nature, manufacture and use of textiles. For purposes of study a beginning would perhaps here be made with the article Weaving, which is in two parts. The first, *Industrial Technicology and Machinery* (Vol. 28, p. 440) with 28 illustrations, is by T. W. Fox, professor of textiles in the University of Manchester. Very useful will be found the classification of weaving schemes into groups, from which we learn the distinctive weaves of plain cloth, twills, satins, damasks, compound cloths, repps, piled fabrics, chenille, velvets and plushes, gauze, etc. All weaving machinery is described. The second part, *Archaeology and Art*, is written by A. S. Cole. It is a most interesting and valuable account of the origin of various textiles, and the periods to which they are appropriate. There are many illustrations of typical designs of silk, brocade and flax weavings.

The investigation of woven fabrics reveals the fact that the almost endless variety of effects obtained is due in part only to the method of weaving. Consequently, it is necessary for the student, in order to acquire an expert knowledge of the character and effect on any textile product which he wishes to employ, to have access to the information in the articles BLEACHING (Vol. 4, p. 49) illustrated; MERCERIZING (Vol. 18, p. 150); DYEING (Vol. 8, p. 744) illustrated, and with an elaborate classification of colouring matters—acid, direct, and developed colours; FINISHING (Vol. 10, p. 378) illustrated, and TEXTILE PRINTING (Vol. 26, p. 694), illustrated. The fact that this fine series of articles has been prepared by Dr. Edmund Knecht, professor of technological

chemistry, University of Manchester, assisted by noted authorities like the late J. J. Hummel, professor of dyeing, University of Leeds, and A. S. Cole, is a guarantee of their great interest and value.

In the matter of the fabrics themselves, under COTTON, *Cotton Goods and Yarn* (Vol. 7, p. 275) will be found descriptions of many cotton fabrics, and see also SILK (Vol. 25, p. 96) illustrated, by Arthur Mellor and other authorities; WOOL, WORSTED, AND WOOLEN MANUFACTURES (Vol. 28, p. 805) illustrated, by Prof. A. F. Barker of Bradford Technical College; LINEN AND LINEN MANUFACTURES (Vol. 16, p. 724) by Thomas Woodhouse, head of the weaving and textile designing department, Technical College, Dundee. Those who desire a closer scientific knowledge of fibres may obtain it from FIBRES (Vol. 10, p. 309), illustrated, by the well-known English analytical chemist, C. F. Cross. There are separate articles on BROCADE (Vol. 4, p. 620); MUSLIN (Vol. 19, p. 93); CANVAS (Vol. 5, p. 223); CHINTZ (Vol. 6, p. 235); CRETONNE (Vol. 7, p. 431); GAUZE (Vol. 11, p. 357) and other textiles. A full list of these materials is appended.

The article LACE (Vol. 16, p. 37) is one of the most notable contributions to the Britannica. It is written by A. S. Cole, author of *Embroidery and Lace*, *Ancient Needle Point and Pillow Lace*, etc., and has over 60 illustrations. A full history of lacemaking is given, and the article is of the highest interest throughout. There exists no better manual on the subject than this, and the pictures alone will enable the student to distinguish the different varieties. EMBROIDERY (Vol. 9, p. 309) by A. F. Kendrick, keeper of the Victoria and Albert Museum, and A. S. Cole, has 18 illustrations and describes the characteristics of the

art as practised by different nationalities. GOLD AND SILVER THREAD (Vol. 12, p. 200), also by A. S. Cole, is a general and historical account of the gold and silver strips, threads and gimp used in connection with varieties of weaving, embroidery and twisting and with plaiting or lace-work.

Arts and Crafts

Before taking up the specific objects of art used in interior decoration and furnishing, attention must be called to the many articles of great value to those engaged in all arts and crafts-work whose success depends upon a sound knowledge of methods and the principle of design. In ARTS AND CRAFTS (Vol. 2, p. 700) Mr. Walter Crane gives an account of the recent movement in the arts of decorative design and handicraft that has for its object the adornment of the house. Handicraft workers will find valuable material, discussing designs, methods and tools, in NEEDLEWORK (Vol. 19, p. 339); WOOD-CARVING (Vol. 28, p. 791) fully illustrated, by F. A. Crallan, author of *Gothic Wood-carving*; CARVING AND GILDING (Vol. 5, p. 438); METAL-WORK (Vol. 18, p. 205) illustrated, by Professor Middleton of Cambridge University, with sections on *Modern Art Metal-work* by John S. Gardner, and on *Industrial Metal Work* by J. G. Horner, author of *Practical Metal Turning*; MEDAL (Vol. 18, p. 1) illustrated, by M. H. Spielmann, formerly editor of *The Magazine of Art*; GLASS, STAINED (Vol. 12, p. 105) illustrated, by Lewis Foreman Day, late vice-president of the Society of Arts; SPINNING (Vol. 25, p. 685) by Professor Fox; BASKET (Vol. 3, p. 481) with an account of the basket-making industry and methods employed, by Thomas Okey, examiner in basket-work for the City of London Guilds and Institute; EMBOSSING (Vol. 9,

p. 308); CHASING (Vol. 5, p. 956); REPOUSSÉ (Vol. 23, p. 108); ENAMEL (Vol. 9, p. 362) a very complete historical and technical article, fully illustrated, by Alexander Fisher, author of *The Art of Enamelling on Metals*; JAPAN, *Cloisonné Enamel* (Vol. 15, p. 189); INLAYING (Vol. 14, p. 574). Much knowledge about primitive shapes and designs may be obtained from ARCHAEOLOGY (Vol. 2, p. 344) by Dr. Charles H. Read of the British Museum, AEGEAN CIVILIZATION (Vol. 1, p. 245) by D. G. Hogarth, the explorer, SCANDINAVIAN CIVILIZATION (Vol. 24, p. 287), and AMERICA, *Archaeology* (Vol. 1, p. 810) by the late O. T. Mason, of the National Museum, Washington. These articles are beautifully illustrated.

Portable Ornaments

Some of the articles on art objects have already been mentioned; in addition to them there is CERAMICS (Vol. 5, p. 703), equivalent to 133 pages of this Guide, with over 100 illustrations including 10 full-page plates, six of which are colour. This magnificent article is the joint contribution of six special authorities and describes the art of pottery and porcelain manufacture, potter's marks, etc., in all countries and at all periods, with the exception of Japanese ceramics, for which see JAPAN, *Art, Ceramics* (Vol. 15, p. 183). GLASS (Vol. 12, p. 86) has a section on the *History of Glass Manufacture* (p. 97) in which glassware from the primitive vessels of ancient Egypt to modern wares is discussed and illustrated. The authors of this valuable account are Alexander Nesbitt, who wrote the descriptive catalogue of glass vessels for the South Kensington Museum, and H. J. Powell, of the Whitefriars Glass Works, London. PLATE (Vol. 21, p. 789) illustrated, is

the joint product of H. Stuart Jones, formerly director of the British School at Rome; H. R. H. Hall, of the British Museum, and E. Alfred Jones, author of *Old English Gold Plate*. It contains unusually full information about hall-marks. There are also separate articles on PEWTER (Vol. 21, p. 338) and SHEFFIELD PLATE (Vol. 24, p. 824) by Malcolm Bell, author of *Pewter Plate*, etc.

CLOCK has a section *Decorative Aspects* (Vol. 6, p. 552), by J. G. Penderel-Brodhurst. FAN (Vol. 10, p. 168) by the late J. H. Pollen, author of *Ancient and Modern Furniture and Woodwork*, devotes special attention to styles of fan painting. IVORY has a well-illustrated section on *Ivory Sculpture and the Decorative Arts* (Vol. 15, p. 95) by A. O. Maskell, author of *Ivories*, etc. MIRROR (Vol. 18, p. 575); FRAME (Vol. 10, p. 773), and SCREEN (Vol. 24, p. 477) are likewise useful articles for the decorator and furnisher. TERRACOTTA (Vol. 26, p. 653) illustrated, by H. B. Walters of the British Museum, and William Burton, deals with the use of this material in architecture and sculpture, describes its manufacture, and contains an historical and critical discussion of subjects and types. BYZANTINE ART by W. R. Lethaby contains a section, *Metal Work, Ivories, and Textiles* (Vol. 4, p. 910).

The subject of LACQUER (Vol. 16, p. 53) is further treated under JAPAN, *Lacquer* (Vol. 15, p. 188), a part of a very elaborate discussion of all forms of Japanese art, including especially *Painting and Engraving* (Vol. 15, p. 172), which, as well as CHINA, *Art* (Vol. 6, p. 213), will be referred to constantly by all who are interested in Oriental handiwork and design.

Biographies

A great number of the biographies in the Britannica will possess much interest for the decorator and designer. Some of the noteworthy names of modern times are MORRIS, WILLIAM (Vol. 18, p. 871); CRANE, WALTER (Vol. 7, p. 366); TIFFANY, LOUIS C. (Vol. 26, p. 966); LA FARGE, JOHN (Vol. 16, p. 64); RICHMOND, SIR WILLIAM BLAKE (Vol. 23, p. 307); CHIPPENDALE, THOMAS (Vol. 6, p. 237); HEPPLEWHITE, GEORGE (Vol. 13, p. 305); SHERATON, THOMAS (Vol. 24, p. 841); GIBBONS, GRINLING (Vol. 11, p. 936).

ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO THOSE ENGAGED IN DECORATING, DESIGNING, INTERIOR FURNISHING AND ALL FORMS OF ART HANDICRAFT

Abbey, E. A.

Acroliths

Adam, Robert

Aegean Civilization

Ainmuller, M. E.

Alb

Alexander, J. W.

Almuce

Alto-Relievo

America, *Archaeology*

Amice

Amphora

Andiron
Angerstein, J. J.
Antimacassar
Apostle Spoons
Aquarelle
Aquatint
Arabesque
Arch
Archaeology
Architecture
Armoire
Art
Arts and Crafts
Art Teaching
Bagging
Bahut
Baize
Ball-flower
Baroque
Basin-stand
Basket
Basso-relievo
Bead
Beaker
Bed
Bérain, Jean

Bezel
Biretta
Bleaching
Blondel, J. F.
Blum, R. F.
Bombay Furniture
Bombazine or Bombasine
Bonelace
Bonheur du Jour
Bookbinding
Bookcase
Book-plates
Boulle, André Charles
Box
Bracelet
Bracket
Brasses, Monumental
Brazier
Brocade
Brooch
Buckram
Buffet
Bunting
Byzantine Art
Cable-moulding
Caffieri, Jacques

Calender
Calico
Cambric
Cameo
Candelabrum
Candle
Candlestick
Canopy
Canvas
Capital
Capronnier, Jean Baptiste
Carding
Carpet
Cartoon
Cartouche
Carving
Carving and Gilding
Caryatides
Casket
Cassock
Cassone
Ceiling
Cellaret
Cellini, Benvenuto
Ceramics
Chair

Chandelier
Chasing
Chasuble
Chatelaine
Cheese-cloth
Cheffonier
Chenille
Chest
Chevron
Chimere
Chimney-piece
China, *Art*
Chintz
Chippendale, Thomas
Cimabue, Giovanni
Cinque Cento
Cloth
Coffer
Column
Composite Order
Console
Cookworthy, William
Cope
Copeland, Henry
Copper
Corduroy

Corner Copiae
Cornice
Corregio
Cosmati (family)
Costume
Cotton
Cotton Manufacture
Cotton-spinning Machinery
Cowl
Cox, Kenyon
Cradle
Crane, Walter
Crape
Crash
Cressent, Charles
Crest
Cretonne
Cross
Crozat, Pierre
Crunden, John
Cupboard
Curtain
Cushion
Dais
Dalmatic
Damascening, or Damaskeening

Damask
Darly, Matthias
Decorated Period
Delacroix, F. V. E.
Della Robbia
Denim
Design
Desk
Diaper
Die
Dimity
Diptych
Dog-tooth
Domenichino, Zampieri
Doulton, Sir Henry
Dowlas
Drawing
Drill
Drinking Vessels
Duck
Dumbwaiter
Dwight, John
Dyeing
Early English Period
Ear-ring
Egypt, *Archaeology*

Electrolier
Electroplating
Embossing
Embroidery
Enamel
Encaustic Painting
Encoignure
Engraving
Etagère
Etching
Faience
Fan
Felt
Fender
Festoon
Fibres
Filigree
Fine Arts
Finiguerra, Maso
Finishing
Fireback
Fire-irons
Flag
Flamboyant Style
Flannel
Flannelette

Flock
Floor
Floorcloth
Footman
Frame
French Polish
Fresco
Frieze
Furniture
Fustian
Ganté
Gargoyle
Gauze
Gem
Gem, Artificial
Gesso
Ghiberti, Lorenzo
Ghirlandajo
Gibbons, Grinling
Gilding
Gillow, Robert
Gimp
Gingham
Giotto
Girandole
Girdle

Glass
Glass Cloth
Glass, Stained
Glue
Gobelin
Goblet
Gold
Gold and Silver Thread
Goldbeating
Gouache
Gouthière, Pierre
Graffito
Grate
Greco, El
Greek Art
Grisaille
Grotesque
Guéridon
Guido Reni
Gunny
Halfpenny, W.
Hallstatt
Hamerton, P. G.
Hepplewhite, George
Heraldry
Hessian

Hiroshige
Hokusai
Holland
Honeycomb
Horn
Hosiery
House
Huckaback
Icon
Illuminated Manuscripts
Illustration
Impressionism
Ince, William
India, *Costume*
Indian Architecture
Ingle-work
Inlaying
Intaglio
Iron-work
Ivory
Jack
Jacobean Style
Japan, *Art*
Japanning
Jewelry
Johnson, Thomas

Jug
Jute
Kashi
Knitting
Lac
Lace
Lacquer
Lacrymatory
La Farge, John
Lampstand
Lantern
Lawn
Leather
Leather, Artificial
Lectern
Leonardo da Vinci
Le Pautre, Jean
Line Engraving
Linen, and Linen Manufactures
Linen-press
Lithographing
Lock, Matthias
Longcloth
Lowboy
Macabre
Majolica

Manwaring, Robert
Marble
Marot, Daniel
Marquetry
Matting
Mayhew, Thomas
Mazer
Medal
Meissonier, J. A.
Mercerizing
Metal-work
Mezzotint
Michelangelo
Miniature
Mirror
Mohair
Moleskin
Monogram
Monteith
Morel-Ladeuil, L.
Mosaic
Mouldings
Mull
Mural Decoration
Museums of Art
Muslin

Nankeen
Needlework
Net
Niello
Numismatics
Oeben, F. F.
Order
Ormolu
Ornament
Osnaburg
Ottoman
Overdoor
Overmantel
Padding
Pagoda
Painting
Palissy, Bernard
Pantograph
Papier Maché
Parchment
Parquetry
Pastel
Pearl
Pedestal
Pediment
Pendant

Pergolesi, M. A.
Perpendicular Period
Perugino, Pietro
Pewter
Photography
Phylactery
Pigments
Plaque
Plate
Plated Ware
Platinum
Plumbago Drawings
Plush
Poplin or Tabinet
Poppy-heads
Porcelain
Portière
Poster
Pot-hook
Prie-Dieu
Print
Process
Puvis de Chavannes, P. C.
Raphael Sanzio
Relief
Rep

Repoussé
Reredos
Ribbons
Richmond, Sir W. B.
Riesener, J. H.
Ring
Robes
Rococo
Roman Art
Röntgen, David
Rousseau de la Rottiere, J. S.
Rubens, Peter Paul
Rug
Sacking and Sack Manufacture
Salt cellar
Salver
Samovar
Sampler
Sargent, J. S.
Scandinavian Civilization
Scarab
Scarf
Sconce
Screen
Scrim
Sculpture

Seals
Servan, J. N.
Settee
Settle
Shagreen
Shawl
Shearer, Thomas
Sheffield Plate
Sheraton, Thomas
Sideboard
Silk
Silver
Sofa
Soutane
Spinning
Spit
Spoon
Stencil
Stole
Stool
Sun Copying or Photo-Copying
Surplice
Table
Tallboy
Tankard
Tapestry

Tarpaulin
Tartan
Tassie, James
Tazza
Tea-caddy
Tea-poy
Tempera
Terracotta
Textile-printing
Throne
Ticking
Tiepolo, G. B.
Tiffany, C. L.
Tile
Tintoretto
Titian
Tool
Torchère
Torque
Tortoiseshell
Tracery
Tray
Triclinium
Tripod
Triptych
Trivet

Tudor Period
Tulle
Twill
Uniforms
Utamaro
Varnish
Vase
Velvet
Velveteen
Veneer
Vernis Martin
Vestments
Walker, H. O.
Wall-coverings
Wardrobe
Washstand
Wax Figures
Weaving
Wedgwood, Josiah
What-not
Window-cornice
Window-seat
Wine Table
Wood-carving
Wood Engraving
Wyon, Thomas

Yarn

CHAPTER XVIII
FOR RAILROAD MEN

There are no less than six distinct classes of articles in the new Encyclopædia Britannica which contain information of peculiar interest to railroad men:—

1. Articles on continents contain authoritative and original accounts of trans-continental routes and traffic. For example the article EUROPE has a table in which the 19 chief avenues of trade are analyzed, showing the direct distance, the distance by sea and the distance by rail from point to point; another table comparing railroad developments in the various parts of Europe, and also an account of the contour of Europe from the railroad man's point of view, discussing the mountain ranges pierced by tunnels and the passes over which lines have been carried wholly or largely in the open.

Six Classes of Articles

2. The articles on separate countries, on the individual states of the Union, and on colonies contain detailed accounts of the railway systems. For example, the article FRANCE describes the six great French railroads, traces their lines and explains the financial system by which they were constructed, the concessions granted to them by the French government, and the extent to which direct state ownership and management has been adopted.

3. The articles on cities show the relation of each centre to the general railroad system of the country and describe the terminals and the methods of urban communication. For example, in the article BERLIN there is an account of the Stadtbahn, carried through the heart of the city, 20 feet above the street, providing for through traffic as well as for suburban service.

4. The maps as well as the many plans of cities, all of which were specially prepared for the Britannica, show much more clearly than does an ordinary atlas, the present development of railroads in all parts of the world.

5. The articles on various branches of engineering and mechanics, described in other chapters of this Guide, are complete treatises on the technical subjects connected with railroad construction and management.

6. The articles devoted exclusively to the subject, of which a brief account is given in the present chapter, are those to which railroad men will naturally first turn.

The key article is RAILWAYS (Vol. 22, p. 819), equivalent in length to more than 120 pages of this Guide. It is written by the foremost authorities on the subject both in the Old World and in the New, including:

Technical Authorities

ARTHUR TWINING HADLEY, president of Yale University, and author of *Railroad Transportation*.

HUGH MUNRO ROSS, author of *British Railways* and editor of the *Engineering Supplement* of the London Times.

RAY MORRIS, formerly managing editor of the *Railway Age Gazette* of New York and author of *Railroad*

Administration.

LT. COL. H. A. YORKE, C.B., chief inspecting officer of railways of the English Board of Trade.

PROF. FRANK HAIGH DIXON, of Dartmouth College, author of *State Railroad Control*.

BRAMAN BLANCHARD ADAMS, associate editor of New York *Railway Age Gazette*.

WILLIAM ERNEST DALBY, professor of engineering in the South Kensington Central Technical College, and author of *The Balancing of Engines*, etc.

WILLIAM BARCLAY PARSONS, formerly chief engineer to the New York City Rapid Transit Commission and advisory engineer of the Royal Commission on London Traffic.

MAJ. GEN. C. E. WEBBER, founder of the Institute of Electrical Engineers.

EMILE GARCKE, managing director of the British Electric Traction Co., Ltd., author of *Manual of Electrical Undertakings*.

The Key Article

The article opens with an introductory historical summary which describes the use of railways or tramways before the invention of the steam locomotive in mining districts in England (just as in the article *Mauch Chunk*, Vol. 17, p. 903, early mine transportation in America is described) and the way in which their use induced the development of high speed locomotives and how the first American trans-continental railroads were built. The student will find next a section of general statistics of railway mileage for the world, with a summary of American railway building, especially in the Far West since 1896. The following section is on economics and legislation in general, followed by separate treatment of British railway legislation and of American railway legislation. The great problem of government

control and operation of railways as practised in various European countries is also discussed and is of interest in connection with contemporary American tendencies. The safety of railway transportation is treated in a section containing in compact form the most valuable classified statistics. A section on *Financial Organization* compares American and British conditions in a most illuminating way.

Of even greater importance to the technical student are the remaining sections of this great article, namely:

(1) CONSTRUCTION, with subsections on *Location*, *Cuttings and Embankments*, *Gradients*, *Curves*, *Gauge*, *Permanent Way* (including ballast, ties, fish-plates and other rail joints, and rails), *Bridges*, *Rack* (or cog) *Railways*, *Cable Railways*, *Mono-Rail Systems*, *Switches and Cross-overs*, *Railway Stations* (for passengers and for freight), *Round Houses for Locomotives*, and *Switching Yards*. This treatise on construction is equivalent to 22 pages of the type and size of this Guide, and is in itself an adequate brief manual for the use of the construction engineer, with valuable illustrations in the text.

(2) LOCOMOTIVE POWER, including subsections on *Fundamental Relations*, *Methods of Applying Locomotive Power*, *General Locomotive Efficiency*, *Analysis of Train Resistance*, *Vehicle Resistance*, *Engine Resistance*, *Maximum Boiler Power*, *Draught*, *The Steam Engine*, *Tractive Force*, *Engine Efficiency*, *Piston Speed*, *Compound Locomotives*, *Balancing of Locomotives*, *Classes of Locomotives*, *Current Developments*. This section of the article is a little longer than the preceding,—it would fill 25 pages of this Guide,—and has illustrations, tables, and formulae. It is written by Prof. Dalby, the principal British authority on locomotives.

(3) ROLLING STOCK, dealing with dining, sleeping, passenger and vestibule cars, wood and metal, their heating and lighting and their weight and speed; with freight cars, their weight and speed; and with car-couplers and brakes.

(4) INTRA-URBAN, or city street railways, elevated and underground, by W. B. Parsons, formerly chief engineer of the New York Rapid Transit Commission.

(5) LIGHT RAILWAYS for rural and interurban service and portable railways.

Other Major Articles

The next article to be read is *Tramway* (Vol. 27, p. 159), dealing with the earliest railways used in coal mines, American and English, without locomotive power; and with modern street railways,—surface lines, steam, cable and electric, the last being subdivided into three classes, overhead or trolley, open conduit and closed conduit. The different types of street cars are discussed, and there are summaries of legislation and of commercial results, with general statistics.

The article TRACTION (Vol. 27, p. 118, equivalent to more than 20 pages of this Guide) is by Louis Duncan, formerly head of the department of electrical engineering in the Massachusetts Institute of Technology. It deals principally with electric traction and thus supplements the article TRAMWAY. *Steam* traction, as treated in the section on *Locomotive Power* in the article RAILWAYS, by Prof. Dalby, may be studied further in the article STEAM-ENGINE (Vol. 25, p. 818), and especially that part of the article which deals with locomotives (§ 104, p. 841).

The civil engineer engaged in railway work will

profit by reading, besides the articles already mentioned: Professor W. C. Unwin's article (Vol. 4, p. 533) on BRIDGES, especially pp. 545 and 547 seq., dealing with railway bridges; and the article TUNNEL (Vol. 27, p. 399), by H. A. Carson, engineer-in-charge of the Boston Subway and of the East Boston Tunnel, which would make about 30 pages if printed in the form of this Guide. This article classifies tunnels into river, mountain and town (subway) tunnels, and gives special information about rail corrosion and ventilation in tunnels.

The equipment engineer will add to the topics already listed (cars, engines, etc.) the article SIGNAL, § *Railway Signalling* (Vol. 25, p. 73; as long as 15 pages of this Guide), by B. B. Adams, of the *Railway Age Gazette*, and H. M. Ross, of the London *Times* Engineering Supplement; and BRAKE (Vol. 4, p. 414).

Legislation

On the history of railroading and on statistics there is much information in the Britannica in local articles. It has already been remarked that each article dealing with a state of the United States, or any of the commercial countries of the world, has a section on *Communications*, giving railway mileage and describing the principal railway lines in the area; and that articles on cities and towns give accurate and minute information about railway service. In pursuing the study of legislation bearing on railways, and especially on rate legislation, the student should read the article INTERSTATE COMMERCE (Vol. 14, p. 711), by Prof. Frank A. Fetter of Princeton University, a part at least of the article TRUSTS (Vol. 27, p. 334), by Prof. J. W. Jenks, of New York University (formerly of Cornell), parts of the article on the history of the United States, in the same

volume, especially pp. 315, 316, 353, 367, 394, 395, 396, 406, 407, and, in separate state articles, the sections on laws and history, notably NORTH CAROLINA for the rate cases of 1907 (Vol. 19, p. 778), NEBRASKA for the maximum freight rate of 1893 (Vol. 19, p. 329), WISCONSIN on radical rate legislation and on physical valuation for *ad valorem* tax of railways (Vol. 28, p. 744).

Biographies

The biographical articles in the new Britannica also have much important information for the student of railways.

Among the names of inventors whose lives are outlined are: THOMAS NEWCOMEN (Vol. 19, p. 475), JAMES WATT (Vol. 28, p. 414), MATTHEW BOULTON (Vol. 4, p. 324), GEORGE and ROBERT STEPHENSON (Vol. 25, pp. 888 and 889), RICHARD TREVITHICK (Vol. 27, p. 256), OLIVER EVANS (Vol. 10, p. 2), JOHN ERICSSON (Vol. 9, p. 740), PETER COOPER (Vol. 7, p. 80), and SIR MARC I. BRUNEL (Vol. 4, p. 682); among the names of engineers and railway and bridge builders GEORGE PARKER BIDDER (Vol. 3, p. 918), THOMAS BRASSEY (Vol. 4, p. 435), JOHN COCKERILL (Vol. 6, p. 625), ERASTUS CORNING (Vol. 7, p. 174), JAMES BUCHANAN EADS (Vol. 8, p. 789), SIR WILLIAM FAIRBAIRN (Vol. 19, p. 129), SIR JOHN FOWLER (Vol. 10, p. 761), JAMES HENRY GREATHEAD (Vol. 12, p. 398), SIR JOHN HAWKSHAW (Vol. 13, p. 99), WILLIAM KINGSFORD (Vol. 15, p. 817), SIR ROBERT GILLESPIE REID (Vol. 23, p. 50), JOHN RENNIE (Vol. 23, p. 101), and J. A. ROEBLING (Vol. 23, p. 450); and among railway financiers,—to take only a few American names,—the VANDERBILTS (Vol. 27, p. 885), JAY GOULD (Vol. 12, p. 284), ASA PACKER (Vol. 20, p. 441) and E. H. HARRIMAN (Vol.

13, p. 18).

In such articles as STRIKES AND LOCK OUTS (Vol. 25, p. 1024) and TRADE UNIONS (Vol. 27, p. 140), each with American sections by Carroll D. Wright, late U. S. Commissioner of Labor, the reader will find valuable assistance in studying railway economics as affected by the relations of labour and capital.

For marine transportation see the next chapter in this Guide.

The following is a brief list of articles, and of sections of articles, of interest to all railroad men:

Analysis of Train Resistance

Anthracite

Atmospheric Railway

Ballast

Balancing of Locomotives

Blasting

Bearings

Bogie

Boiler

Boring

Brake

Brickwork

Bridges

Cable Railways

Caisson

Canal

Cantilever

Car
Cement
Classes of Locomotives
Coal
Cog Railways
Compound Locomotives
Concrete
Conveyors
Cranes
Cross-overs
Curves
Current Developments
Cuttings
Dock
Draught
Dredge
Elevators
Embankments
Engine
Engine Efficiency
Engine Resistance
Felloe
Fire brick
Fish-plates
Foundations
Freight

Fuel
Gauge
General Locomotive Efficiency
Gradients
Horse Power
Hydraulics
Iron and Steel
Location
Locomotive Power
Maximum Boiler Power
Masonry
Methods of applying Locomotive Power
Monorail Systems
Mortar
Motors, Electric
Oil Engine
Permanent Way
Pier
Piston Speed
Rack Railways
Rafter
Rail
Railways
Railway Stations
River Engineering
Roads and Streets

Roadbeds
Rolling Stock
Roof
Semaphore
Sewerage
Shaft Sinking
Shoring
Shovel
Signalling
Siphon
Sleeper
Smoke
Steam Engines
Steel Construction
Stone
Strength of Materials
Switches (or points)
Switching Yards
Ties
Timber
Traction
Tractive Force
Tramway
Tunnels
Vehicle Resistance
Ventilation

Welding

CHAPTER XIX
FOR MARINE TRANSPORTATION MEN

Problems of the Near Future

The immediate future of marine commerce cannot fail to be very greatly affected by changed conditions. No one believes that England, Germany, France, Russia, Austria, Japan and China will be able, before the middle of the century, to establish a stable adjustment of the international difficulties which surround them. No one knows what changes the Panama Canal may make in the movement of freights within the first ten years of its operation. No one knows to what industry the United States may next apply the methods by which the country has created the age of steel.

Coal and the steam engine may both, within a few years, be displaced as factors in marine transportation. Sweeping tariff changes in the United States, in Great Britain and in Germany may vitally affect the movement of freights. Transatlantic passenger traffic, not only a huge business in itself, but also important, so long as it is sea-borne, in its effects upon transatlantic freights, may become aerial instead of marine.

Technical Subjects

Confronted by the approach of a period so full of changes, the uttermost alertness of outlook is merely elementary prudence on the part of everyone engaged in the business of marine transportation; and the new Britannica reviews all the many fields of knowledge which are of importance in this connection. It supplies technical information regarding the construction of ships, the management of shipping lines, marine engines of every kind, shipboard and waterside appliances for the handling of cargo, the development of harbours and the dredging and embankment of rivers, the building of docks, warehouses and dry docks, ship canals and canal locks, navigation, lighthouses, lightships, buoys, lanes of traffic, marine insurance, cold transport—every conceivable subject with which shipping men are concerned. Articles by contributors in twenty different countries, deal with all the world's ports, industries, exports, imports and shipping. The financial and legal aspects of the business are exhaustively covered. Tariffs, legislation affecting marine transportation, and such questions of international policy as the command of the sea, the right of search, and the position of neutrals in wartime are discussed by the highest authorities.

In addition to all this, the Britannica articles on these and similar subjects contain historical sections which, in conjunction with the articles on the history of all countries, *show how past changes, as sweeping as these which are now anticipated, have affected commerce*. Whether your present position—or the position you are endeavouring to make for yourself—in relation to shipping is such that this coming period of transition promises to affect you favourably or unfavourably, you need to be forewarned and

forearmed, prepared to keep what you have or get what you want.

An Outline of Sea Trade

A course of reading should always begin with the study of general principles, in order that in your subsequent and more detailed examination of the field, the relative importance of each fact that you master may be appreciated. The Britannica provides, in the article COMMERCE (Vol. 6, p. 766), a bird's-eye view of the whole subject of marine transportation. The article would not fill more than 16 pages of this Guide; you can read it (and digest it as you read it, so clear is it) in an hour, and yet it will give you such a grasp of the whole science—for it is a science—of international trade that you will spend another hour in assorting and classifying, in your own mind, a mass of impressions you had received before, at school or in the course of casual reading, impressions which have not been so useful to you as they should have been because they had not been systematically arranged. There is no text book in existence which outlines the subject so fully and clearly as does this one brief article—about one five-thousandth part of the total contents of the Britannica.

This article will arouse your interest in the direct relation between commerce, past, present and future, and the progress of civilization. You will realize that the man who has any part in the vast shifting of cargoes from one part of the world to another is distributing ideas and ideals and ambitions as well as commodities, and in the article CIVILIZATION (Vol. 6, p. 403), by Dr. Henry Smith Williams, editor of *The Historians' History of the World*, you will see how

harbours receive and send on to the inlands the influences as well as the manufactures of the more advanced communities.

From these articles you should turn to the three great articles which deal with the methods by which these wonderful results are accomplished. These three are SHIP, SHIPBUILDING and SHIPPING, all in volume 24, and equivalent to about 420 or 425 pages of this Guide. These three articles contain hundreds of illustrations, more than forty being full page plates. They are by the most eminent authorities. Sir Philip Watts, director of naval construction for the British Navy, designer of the Dreadnoughts and the Super-Dreadnoughts of the British Navy, as well as of the "Mauretania" and the "Lusitania," chairman of the Federation of Shipbuilders, and naval architect and director of the warshipbuilding department of Armstrong, Whitworth & Co., Ltd., wrote the articles SHIPBUILDING and SHIP (except the history of ships before the invention of steamships, which is by Edmund Warre, provost of Eton, well-known as a writer on nautical history). The article SHIPPING is by Douglas Owen, lecturer at the Royal Naval War College and author of *Ports and Docks*.

In brief, these three articles in length, contents,—both text and illustrations,—and authorship, make up a remarkable book on the subject, valuable either as a text-book or a work of reference for the ship builder, the marine engineer or the student of shipping.

Story of the Ship

Taking the articles separately, the article SHIP begins with a section of nearly 10,000 words on the early development of ships. It suggests that shells

floating on the water or the nautilus may first have suggested the use of a hollowed tree-trunk for transportation—the first boat or "ship" (the word comes from the same root as "scoop") as distinct from a raft. The evolution of boat building is traced, —from dug-out to bark- or skin-covered frame, built like modern racing-shells sometimes ribs first and then skin laid on and sometimes shell first and then ribs inserted. In spite of the great length of the period during which such boats were used—of course they are still used by more primitive peoples,—it is interesting to notice that there were local variations which never became general, such as the outrigger and weather platform, used in the South Pacific and not found elsewhere.

Egyptian vessels we may study in the excellent early tomb-paintings still preserved, and one of these shows a ship, not a canoe or large boat, such as was in use from 3000–1000 B. C., fitted with oars and a mast in two pieces which could be lowered and laid along a high spardeck.

The Phoenicians did more than the Egyptians to develop ship and navigation, and a Phoenician galley of the 8th century B. C. is shown in an Assyrian wall painting. The Phoenicians probably sailed out of the Mediterranean, to Britain for tin, or even around Africa.

Greek ships and shipbuilding we know from a full and varied national literature, from the figures on coins and vases, and from the discovery in 1834 at the Peiraeus, the port of Athens, of records of Athenian dockyard superintendents for several years between 373 and 324 B.C. We have besides descriptions, partly technical, showing the point of view of the engineer or architect, written by Roman authors. The article gives a critical account of the

Greek types of vessels. The growth of Roman shipping seems to have been due primarily to political reasons and to have advanced slowly but surely,—practical devices being introduced to solve special difficulties in a field and on an element where the Romans were far from being at home. A five-tiered Carthaginian galley which had drifted ashore served the Romans as a model for their first war-ship, and with crews taught to row in a framework set up on dry land they manned a fleet which was launched in sixty days from the time that the trees were felled.

Mast and Sail

Passing quickly over the remainder of the earlier period, which the reader will find treated in full in the article SHIP, he should notice that the sailing vessel came into use gradually for merchant use, but that galleys (propelled by oars) were long the only type for warships. There were some galleys even in the Spanish Armada of 1588. In the meantime the invention of gunpowder and the development of artillery brought about changes in size and in form, with a notable tendency to more masts and a greater spread of sail. The discoveries of the 15th and 16th centuries and especially the consequent expansion of trade in the 17th century, all tended to increase the size and efficiency of sailing ships. The end of the 18th and the beginning of the 19th century marked the highest point in the development of American sailing ships. “The Americans with their fast-sailing ‘clippers’ taught the English builders a lesson, showing that increased length in proportion to beam gave greater speed, while permitting the use of lighter rigging in proportion to tonnage, and the employment of smaller crews. The English shipyards

were for a long time unequal to the task of producing vessels capable of competing with those of their American rivals, and their trade suffered accordingly. But after the repeal of the Navigation Laws in 1850, things improved and we find clippers from Aberdeen and the Clyde beginning to hold their own on the long voyages to China and elsewhere."

The revolution in marine transportation by the introduction of steam is summed up by Sir Philip Watts as follows:

> Before steam was applied to the propulsion of ships, the voyage from Great Britain to America lasted for some weeks; at the beginning of the 20th century the time had been reduced to about six days, and in 1910 the fastest vessels could do it in four and a half days. Similarly, the voyage to Australia, which took about thirteen weeks, had been reduced to thirty days or less. The fastest of the sailing tea-clippers required about three months to bring the early teas from China to Great Britain; in 1910 they were brought to London by the ordinary P. & O. service in five weeks. Atlantic liners now run between England and America which maintain speeds of 25 and 26 knots over the whole course, as compared with about 12 knots before the introduction of steam.

Iron Hulls

The introduction of iron for wood began about the same time as the substitution of steam for sails, and there was even more prejudice against it. This was due not merely to the sentiment attaching to the oaken timbers that typified "hearts of oak," or to the "Wooden Walls of England." In all seriousness it was objected that iron would not float! It was feared that iron bottoms would be more easily perforated when ships grounded; but this was found not to be the case when construction was careful. It was proved that fouling of iron bottoms from weeds and barnacles

might be remedied by frequent cleaning and repainting. The most serious objection against iron was that it affected the compass; but in 1839 Sir G. B. Airy laid down rules for the correction of compass errors due to iron in construction. But even to-day wood is preferred for the construction of ships for scientific expeditions to the Polar regions where the slightest disturbance of the compass is to be avoided. Iron and steel (first used in shipbuilding to any extent in 1870–75) have three advantages over wooden ships: less weight; greater durability; greater ease in securing the necessary general and local strengths. But while iron was coming into use largely because it is more durable, there was a great increase in the durability of wooden ships, due to the improved knowledge of wood-preservation. At the end of the 18th century 15 or 20 years was the average life of a wooden ship; but there are several instances of ships built in the first decade of the 19th century—or even earlier—which were still in commission at the beginning of the 20th century.

Early Steamships

Full details are given in regard to the first ships used for canal and river navigation in Great Britain and the United States; the comparatively rapid adoption of steam vessels on the Irish and English channels; and the first steamships to make long trips —the American-built “Savannah” which crossed the Atlantic in 1819 in 25 days using steam only a part of the time, the “Enterprise” which went from London to Calcutta in 1825 in 103 days (64 under steam), the “Sirius,” the “Great Western,” etc. All these were propelled by paddle-wheels. Jet propulsion had been suggested by Benjamin Franklin in 1775 and was tried several times with some

success. But the greater success of the screw-propeller, perfected by Colonel John Stevens and Captain John Ericsson, soon caused jet-propulsion to be abandoned. The screw-propeller made possible—and was quickly followed by—great improvements in engines; the gearing used with paddles was soon given up for direct-acting engines—compound about 1854, triple-expansion in 1874.

Statistics of shipping for all countries are given in tables and diagrams equivalent to 18 or 20 pages of this Guide.

A brief summary outline of the remainder of this article SHIP is all that can be given here.

Merchant Vessels

Sailing Ships

Barges, Smacks or Cutters, Schooners, Brigs and Brigantines

Steamships

Types: Turtle-back, etc. Cargo Ships: Modern Developments, Great Lake Freighters, Oil Tank Steamers, Motor Tank Vessels. Passenger Steamers: Ferries, River and Sound, Cross-Channel, Ocean Liners (Atlantic: Canadian, Emigrant Vessels, Liners on other Routes; Pacific Liners). Special Vessels (Dredge, Train Ferries, Ice Breakers, Surveying Vessels, Lightships, Coastguard and Fishery Cruisers, Salvage and Fire Vessels, Lifeboats, Yachts). Propulsion by Electricity, by Naphtha Engines, by Internal Combustion Engines

War Vessels

Battleships and Armour Protection; Sir E. J. Reed and the British Navy Turret Ships; American Monitor; Sir Nathaniel Barnaby in England; the work of Sir W. H. White; Development from 1885 to 1902; The "Dreadnought" type—in England, United States, Germany, France, Japan, Russia, Italy, Austria, Brazil, Argentina, etc., with Table, "Development of Some of the

Leading Features of Notable Armored Battleships from 1860 to 1910."

Cruisers, Second-Class Cruisers, Third-Class, Armored Cruisers, Dreadnought Cruisers, Cruisers in Different Navies

Gunboats and Torpedo Craft and Torpedo-boat Destroyers

Submarines: American experiments in the 18th Century; inventions of Holland and Nordenfeldt; the Goubet System in France; Submarines in different navies.

History of Shipping

The article SHIPPING (Vol. 24, p. 983) is devoted to the history and practice of maritime transportation. It outlines the early period of trade, and the contest for trade among Spain, Portugal, the Netherlands and England, especially in the period after the discovery of America, when the prizes of commerce became suddenly so much richer. The Navigation Act of 1651, confining the trade between England and her colonies and the British coasting trade to English ships, was followed by a rapid growth of English shipping. The tonnage doubled between 1666 and 1688. In the 18th century and into the 19th, the history of shipping was primarily a contest for trade between France and England, finally won by the latter. The 19th century, as has already been seen in the article SHIP, was marked by the adoption of steam as a motive power. The struggle for supremacy in the Atlantic trade and in commerce with China and the Far East between the United States and Great Britain was won by the latter largely for this reason—the American ship-builders clung to the sailing clipper too long—and they were too slow in adopting iron instead of wooden hulls. The American Civil War was an additional set-back

to American commerce. Other great factors during the last 50 years in the development of shipping, treated in the article, may be catalogued here:

The opening of the Suez Canal in 1869.

Improved apparatus for fire prevention.

Refrigerating machinery, making possible the shipment of meats and other foods.

Germany's merchant marine.

Japanese merchant vessels.

French efforts to get trade.

The shipping combine of 1902.

"Liners" and "Tramps."

The freight rate question and increased tonnage.

Special passenger transport: tourists, emigrants, etc.

Instructions for the Ship-Builder

The third of the main articles is SHIPBUILDING (Vol. 24, p. 922) by Sir Philip Watts. The article is equivalent to 200 pages of this Guide, and the illustrations include more than 120 working drawings. A brief outline of the article is all that can be given here.

Stability: Equilibrium, Stability of Equilibrium, Transverse Stability, Small Inclinations, Metacentric Heights, Inclining Experiment, Large Inclinations, Curves of Stability, Effect of Freeboard, Effect of Beam, Effect of Position on Centre of Gravity, Geometrical Properties, Dynamical Stability, Sailing Ships, Longitudinal Stability, Stability when Damaged, Stability in any Direction.

Rolling of Ships: Unresisted Rolling—Froude's Theory, Resisted Rolling, Methods of Reducing Rolling (Bilge-Keels, Water Chambers, Gyroscope).

Resistance: Components of Force, Wake, Frictional Resistance, Law of Comparison, Model Experiments, Experimental Results.

Propulsion: Experimental Results, Cavitation.

Strength: Longitudinal Bending, Transverse Bending.

Steering: Nature of Forces when Turning, Heel when Turning, Types of Rudders, Experimental Results.

Process of Design

Registration Societies

Board of Trade Supervision

Load line and Freeboard

Loading of Grain and Timber

Ship-yard Work

Structural Parts

Materials

Cranes and Gantries

Course of Construction

Models

Laying-off

Sheer Drawing

Fairing the Body

Contracted Method of Fairing

Fairing the End

Stern Mould

Displacement Calculation

Frame Lines

Cant Frames

Double Canted Frame

Swell for Propeller Shaft

Mould for Boss Frame Casting

Shaft Struts

Sight Edges in Body Plan

Inner Bottom

Inner Surface of Frames

Outside Double Bottom

Deck Lines

Framing and Plating behind

Armour

Laying off Armour of a Warship

Order of Work

Keel

Transverse Frames

Scrive-Board

Shoring Ribbands

Deck Beams

Longitudinals

Bilge Keel

Drawings

Laying Keel Blocks

Keels and Frames

Shell or Outside Plating

Structural Arrangements

Longitudinal System as used in New London, Conn.; Great Lake steamer; British cargo steamer; Atlantic liner; Differences between war and merchant ships; Auxiliary Machinery.

A Dictionary of Ships and Shipping

The student should read the article NAVY AND

NAVIES (Vol. 19, p. 299) and refer to the Chapter *For Naval Officers*.

The following is a partial list of the articles in the Britannica of particular value to the marine transportation man.

Anchor

Ballast

Barge

Belay

Berth

Bilge

Binnacle

Boat

Bowline

Bumboat

Buoy

Burgee

Cable

Cabotage

Caique

Canoe

Capstan

Catamaran

Cleat

Coble

Commerce

Coracle
C. H. Cramp
Sir Samuel Cunard
Dahabeah
Dhow
Dinghy
John Ericsson
Felucca
John Fitch
Robert Fulton
Gimbal
Hawser
Holystone
T. H. Ismay
Junk
Kayak
Keel
Lateen
Life-saving Service
Lighthouse
Log
Mast
Navigation
Navigation Laws
Oars
Pilot

Pinnace
Pirogue
Polacca
Poop
Pram
Proa
Punt
Quarterdeck
Quay
Random
Rigging
Rowlock
Rudder
Sail, and Sailcloth
Sampan
Schooner
Seamanship
Seamen, Laws of
Semaphore
Ship
Shipbuilding
Ship Money
Shipping
Sloop
Smack
Starboard

Steamship Lines

Tonnage

Trinity House

Turbine

Wharf

Sir William H. White

Yawl

CHAPTER XX
FOR ENGINEERS

What "Engineering" Includes

The history of a word will sometimes supply the key to the gradual development of an art. "Engineering" was originally used to describe a mere branch of military science, the construction of fortifications and the trenching and sapping needed for their capture. Then about a century and a half ago the use of the phrase "civil engineering" came into use to indicate the broadening of the engineer's functions to civil pursuits, but even then it served for a long time chiefly to describe surveying, road-making and bridge building. To-day, the specialized knowledge of engineers of one kind or another directs or facilitates every branch of industry. Consider for a

moment the handling of iron, which, as the Britannica article IRON AND STEEL shows, has become the most indispensable of all substances save air and water, because we can find no substitute for it that possesses its strength, the hardness and the pliability we can give to it, and its magnetic properties, upon which all our electrical work depends. The mining engineer is concerned with the ore, the mechanical engineer with the machinery employed in its treatment; the transportation of the finished iron or steel depends upon the skill of the engineers who construct railroads and ships; the structural engineer shapes our buildings from the girders and erects them on the sites indicated by the surveying engineer; the sanitary engineer makes them wholesome, and the electrical engineer provides them with the many convenient appliances we need. Various primitive races have believed that the earth is supported upon the back of a tortoise, an elephant, or a fish; but when we begin to look into the origin of the surroundings we have made for ourselves, we cannot carry our examination very far before we find that almost everything we possess begins with a blueprint.

It seems a paradox, and yet it is true, that the more a man's profession tends to specialization, the more help he can get from the comprehensiveness of the Britannica. He finds it necessary to dig so deep that the shaft he sinks must perforce be of narrow diameter, limiting his daily vision to but a small circle of the broad sky above him. The engineer of each class has his own text books, but at any moment his work may bring him into temporary relation with allied subjects which they do not cover, and in connection with which he may need trustworthy information. There is certainly no other book which

surveys so authoritatively and minutely as does the Britannica the whole field of applied science. The services rendered by the 73 engineering experts—German, American, English, French and Italian—who collaborated in the production of the work are not to be measured only by the articles they wrote; for the advice and assistance many of them gave the editors in planning the book as a whole, ensured such treatment as an engineer would desire of many subjects indirectly connected with his work.

Mathematical Articles

The engineer will naturally turn first to the mathematical articles, which may be described as text-books of the most concise and useful nature, written by leading mathematicians of the age. ALGEBRA (Vol. 1, p. 599) is by Dr. Sheppard, and G. B. Mathews, formerly professor of mathematics, University College of North Wales; ALGEBRAIC FORMS (Vol. 1, p. 620) by Major P. A. Macmahon, formerly president of the London Mathematical Society; GEOMETRY (Vol. 11, p. 675), *Euclidean*, *Projective*, *Descriptive*, by Dr. Henrici, professor of mathematics, Central Technical College of the City and Guilds of London Institute; *Analytical*, by E. B. Elliott, Waynflete professor of pure mathematics, Oxford; *Line*, by B. A. W. Russell, author of *Foundations of Geometry*, etc., and Dr. A. N. Whitehead of Trinity College, Cambridge; *Axioms*, by Dr. Whitehead; TRIGONOMETRY (Vol. 27, p. 271) by Dr. E. W. Hobson of Cambridge University; SURVEYING (Vol. 26, p. 142), *Geodetic Triangulation, Levelling, Topographical Surveys, and Geographical Surveying*, by Sir Thomas Holdich, formerly superintendent of Frontier Surveys, India; *Nautical*,

by Vice-Admiral A. M. Field, R.N., author of *Hydrographical Surveying*, etc.; GEODESY (Vol. 11, p. 607) by Col. A. R. Clarke of the British ordinance survey, and Prof. F. R. Helmert of the University of Berlin; LOGARITHM (Vol. 16, p. 868) by Dr. J. W. L. Glaisher, editor of the *Quarterly Journal of Pure and Applied Mathematics*; MECHANICS (Vol. 17, p. 955), *Statics*, *Kinetics*, by Dr. Horace Lamb, professor of mathematics, University of Manchester; *Theory of Structures*, *Theory of Machines*, *Applied Dynamics*, by Dr. W. J. M. Rankine, late professor of civil engineering, Glasgow University, and W. E. Dalby, professor of civil and mechanical engineering, City and Guilds of London Institute; DYNAMICS (Vol. 8, p. 756) by Professor Lamb; DIFFERENCES, CALCULUS OF (Vol. 8, p. 223), by Dr. W. F. Sheppard; INFINITESIMAL CALCULUS (Vol. 14, p. 535) by Dr. A. E. H. Love, secretary of the London Mathematical Society; VARIATIONS, CALCULUS OF (Vol. 27, p. 915), by Dr. Love; QUATERNIONS (Vol. 22, p. 718) by Alexander McAulay, professor of mathematics and physics, University of Tasmania; DIAGRAM (Vol. 8, p. 146), by Dr. James Clerk Maxwell, the noted physicist; MENSURATION (Vol. 18, p. 135) by Dr. Sheppard; TABLE, MATHEMATICAL (Vol 26, p. 325), by Dr. J. W. L. Glaisher; UNITS, PHYSICAL (Vol. 27, p. 738), by Dr. J. A Fleming, professor of electrical engineering, University of London; UNITS, DIMENSIONS OF (Vol. 27, p. 736), by Sir Joseph Larmor, secretary of the Royal Society, England; and CALCULATING MACHINES (Vol. 4, p. 972), with 24 illustrations, is by Professor Henrici.

These admirable treatises as well as the article DRAWING, *Drawing-Office work* (Vol. 8, p. 556), by Joseph G. Horner, will be useful to all engineers, and in the special field of civil engineering the following

partial list of articles will convey some idea of the scope of the material to which the professional man has immediate access.

Articles for Civil Engineers

BRIDGES (Vol. 4, p. 533), with 72 illustrations, diagrams, etc., is a thorough discussion of the subject by Dr. William C. Unwin, emeritus professor of engineering, Central Technical College, City and Guilds of London Institute, author of *Wrought Iron Bridges and Roofs*, etc. This article covers the whole theory of bridge design, and describes all the typical structures from the timber Pons Sublicius of ancient Rome, the bridge Horatius defended, to the Manhattan Bridge over the East River at New York. ROADS AND STREETS (Vol. 23, p. 388); RIVER ENGINEERING (Vol. 23, p. 374), with 26 illustrations, by the late L. F. Vernon-Harcourt, professor of civil engineering, University College, London, and author of *Rivers and Canals*, etc.; JETTY (Vol. 15, p. 359), with 6 illustrations, and PIER (Vol. 21, p. 588), illustrated, also by Prof. Vernon-Harcourt; DREDGE AND DREDGING (Vol. 8, p. 562), with 13 illustrations, by William Hunter, consulting engineer for Waterworks to Crown agents for the Colonies.

HYDRAULICS (Vol. 14, p. 35), with 213 illustrations, is by Prof. W. C. Unwin—an article in which the whole theory and practice of water-power, including discussions of water-motors and turbines, are brought fully up to date by the designer of the first water-motors at Niagara, the section dealing with hydraulic machines occupying 25 pages; HYDROMECHANICS (Vol. 14, p. 115) by Sir Alfred George Greenhill, formerly professor of mathematics in the Ordnance College, Woolwich; VENTILATION

(Vol. 27, p. 1008), illustrated, by James Bartlett; WATER SUPPLY (Vol. 28, p. 387), with 20 illustrations, diagrams, and maps, by Dr. G. F. Deacon, formerly engineer-in-chief for the Liverpool Water Supply; AQUEDUCT, *Modern Construction* (Vol. 2, p. 244), by E. P. Hill; SEWERAGE (Vol. 24, p. 735), with 29 illustrations, by James Bartlett; IRRIGATION (Vol 14, p. 841).

CANAL (Vol. 5, p. 168), by Sir E. Leader Williams, chief engineer of Manchester Ship Canal during construction, is an interesting article. There are also separate articles on great engineering undertakings, such as PANAMA CANAL (Vol. 20, p. 667); MANCHESTER SHIP CANAL (Vol. 17, p. 550) by Sir E. Leader Williams; SUEZ CANAL (Vol. 26, p. 22). It will surprise many readers to learn that the project of a ship canal across Central America was considered as early as 1550, when a book demonstrating its feasibility was published in Portugal. Only a year later the King of Spain was strongly urged, in a memorial presented by De Gomara, the Spanish historian, to undertake the work.

Railways and Transportation

TUNNEL (Vol. 27, p. 399), with many plans and illustrations, by H. A. Carson, in charge of designing and constructing the Boston Subway; DOCK (Vol. 8, p. 353), with illustrations and plans; CAISSON (Vol. 4, p. 957); BREAKWATER (Vol. 4, p. 475), with 16 illustrations; HARBOUR (Vol. 12, p. 935), illustrated; RECLAMATION OF LAND (Vol. 22, p. 954), with 13 illustrations. The last five articles are by Professor Vernon-Harcourt; LIGHTHOUSE (Vol. 16, p. 627), with 59 illustrations, by W. T. Douglass, who erected the Eddystone and Bishop Rock Lighthouses, and

Nicholas G. Gedye, chief engineer to the Tyne Improvement Commission; SHIPBUILDING (Vol. 24, p. 922), with 125 illustrations—a complete treatise on the subject by Sir Philip Watts, director of naval construction for the British Navy; TRACTION (Vol. 27, p. 119), illustrated, by Prof. Louis Duncan, of the Massachusetts Institute of Technology; TRAMWAY (Vol. 27, p. 159), illustrated, by Emile Garcke, managing director of the British Electric Traction Co., Ltd.; RAILWAYS (Vol. 22, p. 819), a magnificent composite article, fully illustrated, in which the *Introduction* and the sections on *Construction and Rolling Stock* are by H. M. Ross, editor of *The Times Engineering Supplement*; *General Statistics and Financial Organization*, by Ray Morris, formerly of the *Railway Age Gazette*, New York, and author of *Railroad Administration*; *Economics and Legislation*, by Arthur T. Hadley, president of Yale University; *American Railway Legislation*, by Prof. Frank H. Dixon, of Dartmouth College, author of *State Railroad Control*; *Accident Statistics*, by B. B. Adams, associate editor, *Railway Age Gazette*; *Intra Urban Railways*, by W. B. Parsons, formerly chief engineer, Rapid Transit Commission, New York, and *Light Railways*, by C. E. Webber of the Royal Engineers, and Emile Garcke. No book on the subject has ever before contained so great a collection of expert knowledge as this article presents.

Structural Engineering

In regard to construction, engineers will find most valuable for reference and study the elaborate treatises STRENGTH OF MATERIALS (Vol. 25, p. 1007), with 42 diagrams and illustrations, by Prof. J. A. Ewing, and ELASTICITY (Vol. 9, p. 141), with 32

diagrams, by Prof. A. E. H. Love. Notable articles in this connection are IRON AND STEEL (Vol. 14, p. 801), illustrated, by Dr. H. M. Howe, professor of metallurgy, Columbia University; and STEEL CONSTRUCTION (Vol. 25, p. 861), illustrated. It is interesting to note that early in the 19th century a tall shot-tower was built in New York city by erecting a braced cage of iron and filling in the panels with masonry. STONE (Vol. 25, p. 958); MASONRY (Vol. 17, p. 841), with 18 illustrations; BRICKWORK (Vol. 4, p. 521), with 15 illustrations—these four articles by James Bartlett, lecturer on construction at King's College, London; CEMENT (Vol. 5, p. 653), illustrated, by Bertram Blount, hon. president, Cement Section of International Association for Testing Materials, Budapest; CONCRETE (Vol. 6, p. 835), with 16 illustrations, by F. E. Wentworth-Shields, dock engineer of the London and South-Western Railway; MORTAR (Vol. 18, p. 875); FOUNDATIONS (Vol. 10, p. 733), with 13 illustrations; TIMBER (Vol. 26, p. 978); ROOFS (Vol. 23, p. 697), with 23 illustrations; SCAFFOLD (Vol. 24, p. 279) illustrated; SHORING (Vol. 24, p. 1004), illustrated—the last six by James Bartlett.

For the Mechanical Engineer

The Engineering Section of the new Britannica provides an equal wealth of authentic material for members of other branches of the profession. It is impossible to indicate the exact lines of demarcation between these branches, and many articles are of use to all engineers alike; but in the special field of mechanical engineering there are THERMODYNAMICS (Vol. 26, p. 808) by Dr. H. L. Callendar, professor of

physics, Royal College of Science, London; STEAM ENGINE (Vol. 25, p. 818) by Prof. Ewing, more than 30 pages long, with 68 illustrations. This article, with its up-to-date section on turbines, is one of the many in the engineering department of the Britannica which have been said by technical critics to merit separate publication as text-books. But such articles are all the more useful because they form part of one great library of universal knowledge. Other mechanical articles are AIR ENGINE (Vol. 1, p. 443), illustrated, also by Professor Ewing; GAS ENGINE (Vol. 11, p. 495), illustrated, by Dugald Clerk, inventor of the Clerk Cycle Gas Engine; OIL ENGINE (Vol. 20, p. 35), illustrated, also by Dugald Clerk; BOILER (Vol. 4, p. 141), with 20 illustrations, by James T. Milton, chief engineer surveyor to Lloyd's Registry of Shipping, and Joseph G. Horner, author of *Plating and Boiler Making*; INJECTOR (Vol. 14, p. 570); WATER MOTORS (Vol. 28, p. 382), illustrated, by T. H. Beare, Regius professor of engineering in the University of Edinburgh; WINDMILL (Vol. 28, p. 710), illustrated, by Professor Unwin; FUEL (Vol. 11, p. 274), illustrated, *Solid Fuels* by Hilary Bauermann, of the Ordnance College, Woolwich; *Liquid Fuel*, by Sir James Fortescue-Flannery, formerly president of the Institute of Marine Engineers; *Gaseous Fuel*, by Dr. Georg Lunge, professor of technical chemistry at the Zurich Polytechnic; GAS, *Gas for Fuel and Power* (Gas producers) (Vol. 11, p. 490), illustrated, also by Professor Lunge.

POWER TRANSMISSION (Vol. 22, p. 224), illustrated, *Mechanical*, by Professor Dalby; *Hydraulic*, by Edward B. Ellington, chief engineer of the General Hydraulic Power Co., Ltd.; *Pneumatic*, by A. de W. Foote, superintendent of the North Star Mining Co., California; PULLEY (Vol. 22, p. 641), illustrated, by

Dr. Ernest G. Coker, professor of mechanical Engineering in the City and Guilds of London Technical College; PUMP (Vol. 22, p. 645), illustrated; BRAKE (Vol. 4, p. 413), illustrated; TOOL (Vol. 27, p. 14), with 79 illustrations, by Joseph G. Horner; CRANES (Vol. 7, p. 368), with 21 illustrations, by Walter Pitt; ELEVATORS (Vol. 9, p. 263), illustrated, by G. F. Zimmer, author of *Mechanical Handling of Material*; LUBRICANTS (Vol. 17, p. 89) by R. M. Deeley, joint author of *Lubrication and Lubricants*; PNEUMATIC DESPATCH (Vol. 21, p. 865) by H. R. Kempe, electrician to the General Post Office, London; GYROSCOPE AND GYROSTAT (Vol. 12, p. 769), illustrated, by Sir Alfred Greenhill; MOTOR VEHICLES (Vol. 18, p. 914), with 37 illustrations—*Light*, by the Hon. C. S. Rolls, late managing director of the Rolls Royce Co., Ltd.; *Heavy Commercial Vehicles*, by Edward S. Smith, editor of *The Commercial Motor*; RAILWAYS, *Locomotive Power* (Vol. 22, p. 842) by Professor W. E. Dalby.

For the Electrical Engineer

The key article describing the general principles of electrical engineering is ELECTRICITY SUPPLY (Vol. 9, p. 192), illustrated, by Emile Garcke, but at the immediate service of the electrical engineer there also stand DYNAMO (Vol. 8, p. 764), with 42 illustrations, by C. C. Hawkins, author of *The Dynamo*; POWER TRANSMISSION, *Electrical* (Vol. 22, p. 233) by Dr. Louis Bell, chief engineer, Electric Power Transmission Dept., General Electric Co.; CONDUCTION, ELECTRIC (Vol. 6, p. 855), *Conduction in Solids* by Professor Fleming; *in Liquids*, by W. C. D. Whetham; in Gases, by Sir J. J. Thomson, a Nobel prize-winner and professor of experimental physics

at Cambridge; ELECTROLYSIS (Vol. 9, p. 217) by W. C. D. Whetham; ELECTROKINETICS (Vol. 9, p. 210), illustrated; ELECTROSTATICS (Vol. 9, p. 240); ELECTROMAGNETISM (Vol. 9, p. 226), illustrated; UNITS, PHYSICAL, *Electrical Units* (Vols. 27, p. 740); GALVANOMETER (Vol. 11, p. 428), illustrated; ELECTROMETER (Vol. 9, p. 234), illustrated; AMPEREMETER (Vol. 1, p. 879), illustrated; VOLTMETER (Vol. 28, p. 206), illustrated; OHMMETER (Vol. 20, p. 34), illustrated; WATTMETER (Vol. 28, p. 419)—all of these by Professor Fleming; POTENTIOMETER (Vol. 22, p. 205); ACCUMULATOR (Vol. 1, p. 126), with 24 illustrations and diagrams, by Walter Hibbert, of the London Polytechnic; TRANSFORMERS (Vol. 27, p. 173), with 15 illustrations and diagrams, and WHEATSTONE'S BRIDGE (Vol. 28, p. 584), illustrated, by Professor Fleming; MOTORS, ELECTRIC (Vol. 18, p. 910), by Dr. Louis Bell; METER, ELECTRIC, (Vol. 18, p. 291), by Professor Fleming; LIGHTING, *Electric* (Vol. 16, p. 659), with 16 illustrations, by Professor Fleming, and a chapter on its commercial aspects, methods of charging, wiring of houses, testing meters, etc., by Emile Garcke; TELEGRAPH (Vol. 26, p. 510), fully illustrated, *Land and Submarine Telegraphy*, by H. R. Kempe; *Wireless Telegraphy*, by Professor Fleming, and *Commercial Aspects*, by Emile Garcke; TELEPHONE (Vol. 26, p. 547), illustrated, by H. R. Kempe and Emile Garcke; TRACTION, *Electric* (Vol. 27, p. 120), illustrated, by Professor Duncan. An admirable historical sketch of electricity will be found in ELECTRICITY (Vol. 9, p. 179), by Professor Fleming, which contains also an account of the development of electric theory.

American Practice in Mining

It is typical of the policy pursued in making the new Britannica that the Editor placed the mining section in the hands of American experts, since they are universally regarded as the best in the world. This entire section is a worthy monument to American learning and practice.

The key-article MINING (Vol. 18, p. 528), fully illustrated, is by Dr. Henry Smith Munroe, professor of mining in Columbia University. This covers every branch of the subject, but further discussion of its special phases is continued in MINERAL DEPOSITS (Vol. 18, p. 504) by Dr. James F. Kemp, professor of geology, Columbia University; QUARRYING (Vol. 22, p. 712) by Dr. F. J. H. Merrill, formerly state geologist of New York; ORE-DRESSING (Vol. 20, p. 238), illustrated, by Dr. R. H. Richards, professor of mining and metallurgy, Massachusetts Institute of Technology; SHAFT-SINKING (Vol. 24, p. 766), illustrated; BORING (Vol. 4, p. 251), illustrated; BLASTING (Vol. 4, p. 44), illustrated—the last three by Robert Peele, professor of mining in Columbia University.

The Metallurgical Section

METALLURGY (Vol. 18, p. 203) describes in outline the general sequence of operations. ASSAYING (Vol. 18, p. 776) is by Andrew A. Blair, formerly chief chemist U. S. Geological Survey. See also METAL (Vol. 18, p. 198). METALOGRAPHY (Vol. 18, p. 202), illustrated, is an account of the new and important method of microscopical examination of alloys and metals by Sir William Chandler Roberts-Austen; and Francis H. Neville. ALLOYS (Vol. 1, p. 704), with unique photomicrographs of alloys and metals, is also by the authors of the article METALLOGRAPHY.

ANNEALING, HARDENING AND TEMPERING (Vol. 2, p. 70), illustrated, is by Joseph G. Horner, who also writes FORGING (Vol. 10, p. 663), which has 19 illustrations, FOUNDING (Vol. 10, p. 743), with 11 illustrations, and ROLLING-MILL (Vol. 23, p. 468), with 8 illustrations. The material on FUEL has already been mentioned. FURNACE (Vol. 11, p. 358) describes and illustrates all the latest designs. WELDING (Vol. 28, p. 501) is by J. G. Horner and Elihu Thomson, who writes on his own invention, *Electric Welding*.

The mining engineer or metallurgist will have in the new Britannica constantly at his elbow a complete series of articles dealing with the mining and metallurgy of all minerals and metals. Professor Howe's exhaustive article IRON AND STEEL has already been noted in another part of this chapter. A few of the other important articles are COPPER (Vol. 7, p. 103); GOLD (Vol. 12, p. 192); SILVER (Vol. 25, p. 112); LEAD (Vol. 16, p. 314); TIN (Vol. 26, p. 995); ZINC (Vol. 28, p. 981); MANGANESE (Vol. 17, p. 569); ALUMINUM (Vol. 1, p. 767) by E. J. Ristori, member of Council, Institute of Metals. SAFETY-LAMP (Vol. 23, p. 998) is written by Hilary Bauermann. The latest mining statistics of all countries are to be found under their respective headings.

Biographies of Engineers

Military men are familiar with the lives and deeds of great soldiers; lovers of art and literature know something of the careers of their favorites; but as a rule the engineer knows little or nothing about the lives of the great ornaments of his profession, the splendid heroes of peace who have done much more than the soldier and the artist to create the world of

to-day. The reason for this is that engineering biographies are very scarce, and in this connection the new Britannica *fills a positive gap* in the engineer's library. There are considerably more than 100 biographies of great engineers, living and dead, written in the most interesting fashion by authoritative contributors. Among these articles are WATT, JAMES (Vol. 28, p. 414) by Professor Ewing; ARKWRIGHT, SIR RICHARD (Vol. 2, p. 556); STEPHENSON, GEORGE (Vol. 25, p. 888); BESSEMER, SIR HENRY (Vol. 3, p. 823); WHITWORTH, SIR JOSEPH (Vol. 28, p. 616); RENNIE, JOHN (Vol. 23, p. 101); LESSEPS, FERDINAND DE (Vol. 16, p. 494) by Henri G. S. A. de Blowitz; EADS, JAMES B. (Vol. 8, p. 789); EDISON, THOMAS A. (Vol. 8, p. 946); ERICSSON, JOHN (Vol. 9, p. 740); MAXIM, SIR HIRAM (Vol. 17, p. 918); ROEBLING, JOHN A. (Vol. 23, p. 450); SIEMENS, SIR WILLIAM (Vol. 25, p. 47) by Professor Ewing; TELFORD, THOMAS (Vol. 26, p. 573); MCADAM, JOHN L. (Vol. 17, p. 190), and TREVITHICK, RICHARD (Vol. 27, p. 256).

ALPHABETICAL LIST OF THE PRINCIPAL ARTICLES IN THE ENCYCLOPÆDIA BRITANNICA OF SPECIAL INTEREST TO ENGINEERS

Aberration

Abrasion

Abscissa

Absorption of Light

Acceleration

Accumulator

Achromatism

Acoustics
Actinometer
Adhesion
Adjutage
Adze
Aeronautics
Aether, or Ether
Aggregation
Agonic Lines
Air Engine
Algebra
Algebraic Forms
Aliquot
Alloys
Aluminium
Amicable Numbers
Amperemeter, or Ammeter
Anchor
Angle
Annealing, Hardening and Tempering
Anthracite
Anvil
Aperture
Aqueduct
Archimedes, Screw of
Architecture

Arkwright, Sir Richard
Armature
Armour Plates
Armstrong, 1st Baron
Artesian Wells
Assaying
Atmospheric Electricity
Atmospheric Railway
Auger
Autoclave
Awl
Axe
Axis
Axle
Baird, James
Baker, Sir Benjamin
Ballast
Ballistics
Balloon
Banket
Barker’s Mill
Barometer
Barometric Light
Battery
Bazalgette, Sir Joseph William
Bearings

Bell, Henry
Bellows and Blowing Machines
Bench-mark
Berlin
Berthon, Edward Lyon
Berthoud, Ferdinand
Bessel Function
Bessemer, Sir Henry
Bicycle
Bidder, George Parker
Biddery
Binocular Instrument
Binomial
Biquadratic
Bisectrix
Blasting
Bloom
Bogie
Boiler
Boring
Boulton, Matthew
Brachistochrone
Bradawl
Brake
Bramah, Joseph
Brass

Brassey, Thomas
Brazing and Soldering
Breakwater
Brick
Brickwork
Bridges
Bridgewater, 3rd Duke of
Bright, Sir Charles
Brindley, James
Bronze
Bronzing
Brown, Sir John
Brunel, I. K.
Brunel, Sir Marc
Buoy
Building
Burns, Sir George
Bush
Cab
Cable
Caisson
Caisson Disease
Calculating Machines
Caledonian Canal
Calorescence
Calorimetry

Camera Lucida
Camera Obscura
Camus, F. J. des
Canal
Cantilever
Capillary Action
Car
Cardioid
Carnegie, Andrew
Carpentry,
Cart
Cartwright, Edmund
Cash Register
Catenary
Causeway
Caustic
Cautley, Sir Proby Thomas
Cement
Chain
Chappe, Claude
Chart
Chisel
Chronograph
Chubb, Charles
Cinematograph
Circle

Cissoid
Clark, Josiah Latimer
Clock
Coal
Cockerill, W. (and J.)
Cofferdam
Cold
Colour
Combinational Analysis
Compass
Conchoid
Concrete
Condensation of Gases
Conduction, Electric
Conduction of Heat
Cone
Congreve, Sir William
Conic Section
Conoid
Continued Fractions
Contour, Contour-line
Conveyors
Coode, Sir John
Copper
Copying Machines
Cordite

Corning, Erastus
Coxwell, Henry Tracey
Cramp, Charles Henry
Cranes
Crank
Crompton, Samuel
Cube
Cubitt, Thomas
Cubitt, Sir William
Cunard, Sir Samuel
Curricle
Curve
Cycloid
Cyclometer
Cylinder
Damascening or Damaskeening
Damask Steel or Damascus Steel
Density
Destructors
Determinant
Diagonal
Diagram
Diamagnetism
Diameter
Dielectric
Differences, Calculus of

Differential Equation
Diffraction of Light
Diffusion
Dimension
Dispersion
Divers and Diving Apparatus
Dock
Dodecahedron
Drawing
Dredge and Dredging
Drill
Drummond, Thomas
Dry Rot
Dupuy de Lôme, S.C.H.L.
Dynamics
Dynamite
Dynamo
Dynamometer
Eads, James Buchanan
Earth Currents
Earth, Figure of the
Edison, Thomas Alva
Elasticity
Electrical, or Electrostatic Machine
Electricity
Electricity Supply

Electric Waves
Electrochemistry
Electrokinetics
Electrolysis
Electromagnetism
Electrometallurgy
Electrometer
Electron
Electroplating
Electroscope
Electrostatics
Electrotyping
Electrum
Elevators, Lifts or Hoists
Ellipse
Ellipsoid
Embankment
Employers' Liability
Energetics
Energy
Engine
Engineering
Epicycloid
Equation
Ericsson, John
Evans, Oliver

Explosives
Fairbairn, Sir William
Felloe
Ferguson, James
Figurate Numbers
File
Filter
Finlay, Sir George
Fire and Fire Extinction
Firebrick
Firth, Mark
Fitch, John
Flight and Flying
Flume
Flux
Focus
Folium
Forging
Fortification and Siegecraft
Fossick
Foundations
Founding
Fourier’s Series
Fowler, John
Fowler, Sir John
Friction

Frustum
Fuel
Fulton, Robert
Function
Furnace
Fusible Metal
Fusion
Fuze, or Fuse
Galvanized Iron
Galvanometer
Gas Engine
Gatling, Richard Jordan
Gauge, or Gage
Geodesy
Geoid
Geometrical Continuity
Geometry
Gimlet
Girard, Philippe Henri de
Glazing
Gnomon
Gold
Gooch, Sir Daniel
Goodyear, Charles
Gouge
Graduation

Gramophone
Graphical Methods
Gravitation
Greathead, James Henry
Grimthorpe, 1st Baron
Groups, Theory of
Guncotton
Gyroscope and Gyrostat
Gunpowder
Hachure
Hammer
Harbour
Harmonic
Harmonic Analysis
Harrison, John
Hartley, Sir Charles Augustus
Hawkshaw, Sir John
Hawksley, Thomas
Hawser
Heat
Heathcoat, John
Heating
Heliostat
Hodgkinson, Eaton
Hodograph
Holden, Sir Isaac

Horse-Power
Hose-pipe
Hydraulics
Hydrodynamics
Hydrography
Hydromechanics
Hydrometer
Hydrostatics
Hyperbola
Hypsometer
Hysteresis
Icosahedron
Illumination
Inclinometer
Induction Coil
Infinitesimal Calculus
Ingot
Injector
Interference of Light
Interpolation
Invar
Inversion
Involution
Iron and Steel
Irrigation
Ismay, Thomas Henry

Jacquard, Joseph Marie
Jenkin, H. C. F.
Jetty
Joinery
Joints
Joist
Kaleidoscope
Kiln
Kinematics
Kinetics
Kingsford, W.
Knife
Knot
Krupp, Alfred
Labour Legislation
Ladder
Lamp
Lantern
Lath
Lathe
Latitude
Latten
Lead
Lemniscate
Lens
Lesseps, Ferdinand de

Lever
Leyden Jar, or Condenser
Life-boat
Light
Lighthouse
Lighting
Lightning Conductor
Limaçon
Lindley, William
Line
Liquid Gases
Lock
Locus
Logarithm
Logocyclic Curve, Strophoid, or Foliate
Longitude
Loxodrome
Lubricants
Lubrication
Magic Square
Magnetism
Magnetism, Terrestrial
Magnetograph
Magnetometer
Magneto-Optics
Manchester Ship Canal

Manganese
Manometer
Map
Masham, Baron
Masonry
Mathematics
Matter
Maxima and Minima
Maxim, Sir Hiram
McAdam, John Loudon
McCormick, Cyrus Hall
Mechanics
Mensuration
Meridian
Metal
Metallography
Metallurgy
Meter, Electric
Metric System
Microscope
Mill
Mineral Deposits
Mining
Mirror
Model
Molecule

Mortar
Mortise, or Mortice
Motion, Laws of
Motors, Electric
Motor Vehicles
Murdock, William
Myddelton, Sir Hugh
Nasmyth, James
Navigation
Newcomen, Thomas
Nitro-glycerine
Nixon, John
Noble, Sir Andrew
Number
Numbers, Partition of
Numeral
Objective, or Object Glass
Octahedron
Ohmmeter
Oil Engine
Optics
Ordinate
Ore Dressing
Oscillograph
Oval
Painter-work

Palanquin
Palmer, Sir Charles Mark
Panama Canal
Pantograph
Parabola
Parachute
Parallel Motion
Pedometer
Perkins, Jacob
Permeability, Magnetic
Permeameter
Perpetual Motion, or Perpetuum Mobile
Perspective
Phonograph
Photography
Photometry
Physics
Pier
Piston
Plaster-work
Pneumatic Despatch
Pneumatics
Polarity
Polarization of Light
Pole, William
Polygon

Polygonal Numbers
Polyhedral Numbers
Polyhedron
Porism
Potentiometer
Power Transmission
Prism
Probability
Projection
Prony, G. C. F. M. R. de
Pulley
Pump
Pyrometer
Quadratrix
Quarrying
Quaternions
Radiation, Theory of
Radiometer
Rafter
Railways
Random
Rankine, W. J. M.
Rawlinson, Sir Robert
Reclamation of Land
Reflection of Light
Refraction

Refrigerating and Ice Making
Reid, Sir Robert G.
Rennie, John
River Engineering
Rivet
Roads and Streets
Roebling, J. A.
Rolling-mill
Roofs
Roulette
Safes, Strong-rooms and Vaults
Safety-lamp
Saw
Scaffold, Scaffolding
Scantling
Schichau, Ferdinand
Science
Scissors
Screw
Semaphore
Seppings, Sir Robert
Series
Serpentine
Sewerage
Sewing Machines
Sextant

Shadoof
Shadow
Shaft-sinking
Shears
Ship
Shipbuilding
Shoring
Shovel
Shuttle
Siemens, Sir William (Karl Wilhelm)
Sieve
Signal
Silver
Siphon, or Syphon
Sleeper
Sleigh, Sled, or Sledge
Smeaton, John
Smoke
Solder
Sound
Sounding
Spade
Spectroscopy
Speculum
Sphere
Spherical Harmonics

Spheroid
Sphereometer
Spiral
Starley, James
Statics
Steel Construction
Steam Engine
Stephenson, George
Stephenson, Robert
Stereoscope
Stevenson, Robert
Stone
Strength of Materials
Strutt, Jedediah
Stucco
Suez Canal
Sun Copying, or Photo Copying
Surface
Surveying
Table, Mathematical
Tacheometry
Tangye, Sir Richard
Technical Education
Telegraph
Telephone
Telford, Thomas

Tetrahedron
Theodolite
Thermodynamics
Thermoelectricity
Thermometry
Thomas, Sidney Gilchrist
Tide
Timber
Time, Measurement of
Time, Standard
Tin
Tin-plate and Terne-plate
Tire
Tongs
Tool
Topography
Traction
Tramway
Transformers
Tredgold, Thomas
Trevithick, Richard
Triangle
Tricycle
Trigonometry
Trisectrix
Trumpet, Speaking and Hearing

Tube
Tunnel
Turbine
Tweezers
Typewriter
Units, Dimensions of
Units, Physical
Vacuum Tube
Valve
Vaporization
Variations, of Calculus
Vector Analysis
Ventilation
Vernier
Vision
Voltmeter
Wagon or Waggon
Water Motors
Water Supply
Watt, James
Wattmeter
Wave
Wedge
Weighing Machines
Weights and Measures
Weir

Welding

Well

Wheatstone's Bridge

White, Sir William H.

Whitney, Eli

Whitworth, Sir Joseph

Wilkinson, John

Windmill

Witch of Agnesi

Zero

Zinc

CHAPTER XXI
FOR PRINTERS, BINDERS AND PAPER-MAKERS AND ALL WHO LOVE BOOKS

From Manuscript to Book

Supply and Demand Interacting

"An author, even an immortal genius, is, from the economic point of view, a producer of raw material," says the Britannica article PUBLISHING, and from the

educational point of view, his product, until it has undergone the industrial and commercial processes of reduplication and distribution, is as undeveloped as the seed lying hidden in the winter soil. The history of civilization might, indeed, be divided into four stages: the period before writing; the period before printing, when libraries of manuscripts were almost exclusively the property of kings and priests; the period of costly, hand-printed books; and the period of the power-press, which began less than a hundred years ago. Of these four periods, the first is almost unimaginable. You are sometimes brought into contact with absolutely illiterate people. But they live in shadow, not in total darkness; they get the diffused light of our age of culture. The second period, the era of books in manuscript we can, however, to some extent reconstruct; and by one fantastic supposition we can even bring it into the focus of our 20th century. Let it be assumed that for some reason the printing of the new Britannica had been enjoined by the law courts, but that the original typoscript was available for consultation—say in a public library at New York or Chicago. Instead of your 29 volumes, weighing only 80 lbs. and occupying only about two cubic feet of space, the walls of a large room would be lined with partitioned shelves on which the 300,000 typed sheets and the 7,000 illustrations, on cardboard, would be ranged. What a mob of students there would be, waiting their turns to read the 40,000 articles, what a mass of notebooks would be filled each day! The impossibility of accomplishing, without the use of printing, all that the Britannica does, will present itself very forcibly to your mind, in another aspect, if you try to imagine 1,500 separate audiences, assembled each day to listen to lectures by the 1,500

contributors to the book. Any attempt to imagine the Britannica doing its work in any way but the way in which it does makes you realize, too, that if it were not for modern methods of *spreading* knowledge, there would be no such system of *assembling* and co-ordinating knowledge as finds its fullest development in the Britannica. It is not only for commercial reasons that the demand must be sufficient to justify the supply; the 1,500 specialists who laid aside their usual work in order to write these articles would never have combined their efforts if this vast public of all educated English speaking people were not to have been enabled to avail themselves of the result.

The industrial arts which make it possible to produce books swiftly and to sell them at low prices are obviously subjects of interest not only to those who do the producing and selling, but to all who profit by the use of books. And, as the articles mentioned in this chapter show, these arts are in themselves among the most ingenious and curious of all processes; so that in a double sense they merit the attention of everyone to whom the chapters on *Literature* in this Guide would appeal. As the warp of cloth carries the weft, so the raw material of printers' paper and printers' ink carries the "raw material" of the writer's thoughts.

The article on PAPER (Vol. 20, p. 725) is equivalent to 35 pages of this Guide and is illustrated with 15 diagrams. The article is divided into three parts: *History*, by Sir Edward Maunde Thompson, director of the British Museum; *Manufacture*, by J. W. Wyatt, author of *The Art of Making Paper*; and *India Paper*, by W. E. Garrett Fisher.

History of Paper

The history of paper, like that of so many other

great inventions, dates back to an early period in China; and, as is the case with almost every great contribution to civilization which came from China, paper came to the Western world only after many years and only by chance. In the 8th century of the Christian era, when paper had been made in China for 1000 years, some Chinese paper-makers were taken captives in Samarkand by Arabs, who thus learned the methods of its manufacture. The Arabs and the Persians used linen as a base for the paper instead of the cotton the Chinese used; and the name "paper" was transferred from the Egyptian rush and the writing material made from its fibres to the new product. Paper was manufactured in Europe first by the Moors in Spain at Xativa, Valencia and Toledo in the 12th century; and into Italy also it seems to have been brought by the Arab occupation of Sicily. Among other interesting points in regard to the history of paper are: water-marks as a sign of age; old papers; variation in prices of paper; blotting-paper, wrapping paper, etc. The articles PAPYRUS (Vol. 20, p. 743) and PARCHMENT (Vol. 20, p. 798), both by Maunde Thompson, deal with these earlier writing materials. PALIMPSEST (Vol. 20, p. 633) describes the processes by which writings which have been scraped or washed from sheets of vellum, so that the material might be used again, can sometimes be chemically restored and deciphered.

Paper Manufacture

In taking up the study of paper manufacture, the first article to be read is FIBRES by C. F. Cross, the well-known analytical and consulting chemist, and especially the section in it on *Paper-making* (Vol. 10, p. 312). This describes the treatment of cotton and

flax for writing and drawing papers, wood pulp, esparto, cellulose and cereal straws for printing-paper, etc. See also the article CELLULOSE (Vol. 5, p. 606) by C. F. Cross. The section on *Manufacture* in the article PAPER, already mentioned, should next be read. Here it is stated that rags, linen or cotton, were the principal materials used for paper in Europe until the middle of the 19th century; and then when prices rose, because the necessarily inelastic supply was no longer sufficient, esparto-grass, wood and straw began to be used as substitutes. The change from hand-making to machinery began in France in 1798 and was accomplished in England in 1803, with the result that hand-made paper is now used only where great durability is the chief requisite, as for bank-notes and drawing paper.

Actual paper manufacture may be divided into two processes: the preliminary cleaning and reduction to pulp; and the methods of converting pulp to paper—including beating, sizing, colouring, making the sheet or web, surfacing, cutting, etc. Reduction to pulp is described in the treatment of esparto, straw and wood, and there are cuts showing rag-boiler, rag-breaking engine, esparto boiler, press-pâte or half-stuff machine, esparto bleaching and beating plant, and the Porion evaporator and the Yaryan multiple-effect evaporator for soda recovery.

Paper-making proper, after the pulp has been prepared, is next described. The first process is beating; and besides the esparto bleaching and beating plant, described under bleaching, there are drawings of the Taylor and Jordan beaters and a description of them and of the Kingsland beater. Sizing, loading and colouring are then explained. The other main topics of the section on manufacture are: hand manufacture (with two illustrations), paper

machine, with pictures of the paper machine, of the dandy roll, of super-calender and of reel paper cutters, and paragraphs on straining, forming the sheet, shake, water marking and couching, pressing and drying, surfacing, machine power, tub-sizing, glazing or surfacing for better grades, cutting, sheeting, sizes (with table), standards of quality, the paper trade, and a list of the best books on paper.

India Paper

The article PAPER closes with a brief history and description of India paper, which is of particular interest because of the adoption and successful use of this paper in the new Encyclopaedia Britannica. In this true India paper, "the material used is chiefly rag," but "the extraordinary properties of this paper are due to the peculiar care necessary in the treatment of the fibres, which are specially beaten in the beating engine." The first India paper was brought to England from the Far East in 1841 by an Oxford graduate, and the name India was used merely to express this Oriental origin, as in "Indian ink" or in the name "Indians" as applied to the American aborigines when their home was thought to be a part of the East. Just where the paper came from is not known. It was given to the Oxford University Press and was used in printing a very small English Bible in 1842. This book was only one-third the usual thickness, and attracted much attention by its lightness and by the opacity of the thin tough paper.

In 1874 a copy of this Bible fell into the hands of Henry Frowde, and experiments were instituted at the Oxford University paper mills at Wolvercote with the object of producing similar paper. On the 24th of August 1875 an impression of the Bible, similar in all respects to that of 1842, was placed on sale by the Oxford University

Press. The feat of compression was regarded as astounding, the demand was enormous, and in a very short time 250,000 copies of this "Oxford India paper Bible" had been sold. Many other editions of the Bible, besides other books, were printed on the Oxford India paper, and the marvels of compression accomplished by its use created great interest at the Paris Exhibition of 1900. Its strength was as remarkable as its lightness; volumes of 1500 pages were suspended for several months by a single leaf, as thin as tissue; and, when they were examined at the close of the exhibition, it was found that the leaf had not started, the paper had not stretched, and the volume closed as well as ever. The paper, when subjected to severe rubbing, instead of breaking into holes like ordinary printing paper, assumed a texture resembling chamois leather, and a strip 3 in. wide was found able to support a weight of 28 lb. without yielding. The success of the Oxford India paper led to similar experiments by other manufacturers, and there were, in 1910, nine mills (two each in England, Germany and Italy, one each in France, Holland and Belgium) in which India paper was being produced. India paper is mostly made upon a Fourdrinier machine in continuous lengths, in contradistinction to a hand-made paper, which cannot be made of a greater size than the frame employed in its production.

In addition to technical information in regard to paper the student of the manufacture of books must know something about ink.

Ink

The necessary information he will find in the article INK (Vol. 14, p. 571) with special descriptions of writing inks, tannin inks, China or Indian ink, logwood ink, aniline ink, copying ink, red and blue ink, marking ink, gold and silver inks, indelible or incorrodible ink, sympathetic ink, and, of the most importance for our present purpose, printing inks.

The process of putting ink on paper is a subject

which in the Britannica takes much more ink and paper than the subject of ink or of paper.

Printing

This topic is treated in two main articles: one dealing with type and the other with presses. The former, TYPOGRAPHY (Vol. 27, p. 509), is a good sized treatise in itself, being equivalent to more than 135 pages of this Guide. It is divided into two parts: *The History of Typography*, by John Henry Hessels, author of *Gutenberg: an Historical Investigation*; and *Modern Practical Typography*, by John Southward, author of *A Dictionary of Typography and its Accessory Arts*, and Hugh Munro Ross, editor of *The* (London) *Times Engineering Supplement.*

The former part of the article, and the longer, is a very important and elaborate contribution to the knowledge of early printing. On these first developments the student should read the same writer's article GUTENBERG (Vol. 12, p. 739) and should notice the great difficulty surrounding the whole question of the "invention," obscured by the fact that so many of the documents on Gutenberg exist only in copies, while others seem to be forgeries by two librarians of the city of Mainz who were eager to prove the claims of their fellow citizen Gutenberg to be the inventor of printing with movable metal types. See also Mr. Hessel's article on JOHANN FUST (Vol. 11, p. 373). The honour of the invention of typography, Mr. Hessels decides, belongs to Lorens Janszoon Coster of Haarlem and its date was somewhere between 1440 and 1446. In Mexico printing was established in 1544, in Manila in 1590, and in Cambridge, Massachusetts, in 1638 or 1639. The early printers had only a few types of each character in a fount, and they printed books,

even small quartos, page by page.

This whole treatment of the history of typography is too elaborate to be summarized here, but it is interesting to note that the article gives information about the history of the earliest types—Gothic, Bastard Italian, Roman, Burgundian, etc., with facsimiles of 13 different and characteristic faces between 1445 and 1479; and of different styles and alphabets—Italic, Greek, Hebrew, Arabic, Syriac, Armenian, Ethiopic, Coptic, Samaritan, Slavonic, Russian, Etruscan, Runic, Gothic, Scandinavian, Anglo-Saxon, Irish, Music, Characters for the Blind, Initials, Ornaments and Flowers.

Practical Typography

The second part of the article TYPOGRAPHY, on *Modern Practical Typography*, will be of more value, probably, to most students of printing and bookmaking. It deals with the following topics:—

Material characteristics of Type. Fount may consist of 275 “sorts” or characters. Numbers of sorts vary with different languages—and with different styles and writers; Dickens draws heavily on vowels, Macaulay on consonants. Bill of type or scheme—how computed.

Logotypes or word character as distinct from letters.

Parts of a type—face, stem, serif, beard, shoulder, shank, belly, back, counter, nick, kern, feet, burr and batter.

Species of letter—short, ascending, descending, long, superior, inferior, fat-faced, lean-faced, bastard.

Sizes: classification by names and by point-system.

Varieties of face: Roman, sanserifs or grotesques; black; script; old style; Caslon; influence of William Morris and the Kelmscott Press; Vale Press.

Manufacture of type: type metal; punch, drive and matrix (with illustrations); type-casting—by hand and

machine; inventions of Bruce, Barth, Wicks, with description and picture of the Wicks rotary type-casting machine.

Type-setting by hand. Type case, with illustration. Composition, justifying. Imposition. Signatures. Forme, quoin, side-stick, foot-stick, shooting-stick. Distributing.

Type-setting by machine. Linotype and Monotype. Earlier machines—the Paige (in which Mark Twain lost a fortune). Distributing machines—Delcambre, Fraser, Empire, Dow, Thorne, Simplex (with cut). Linotype—with diagrams and description. Monotype (the machine used for the Encyclopaedia Britannica) with illustrations of perforated strip.

Electrotyping and Stereotyping. Shells. Turtle, Flong. Wood's Autoplate process. See also the articles ELECTROTYPING (Vol. 9, p. 252) and ELECTROPLATING (Vol. 9, p. 237).

The reader should next turn to the articles ENGRAVING (Vol. 9, p. 645), LINE-ENGRAVING (Vol. 16, p. 721), WOOD-ENGRAVING (Vol. 28, p. 798)—special reference to America where this method is still used for some book and magazine illustration—to LITHOGRAPHY (Vol. 16, p. 785) including offset printing; and PROCESS (Vol. 22, p. 408), for further information in regard to "printing" apart from (and before) actual press work. The last-named of these articles is by Edwin Bale, art director of Cassell & Company, Ltd.; it would occupy about 20 pages of this Guide; and it is illustrated by a plate showing the three-colour process. The article describes:

(1)—relief processes, line blocks, swelled gelatin process, typographic etching, halftone processes, three colour blocks, colour filters;

(2)—intaglio processes, monotype, electrotype, steel-facing, blanketing, changes in machinery;

(3)—planographic processes, including woodburytype, stannotype, collotype or phototype, heliotype and

photolithography. In relation to lithography there is further information in the biographical sketch of Senefelder, its inventor.

Press-Work

The article PRINTING (Vol. 22, p. 350) deals entirely with the subject of press-work, thus using printing in the narrower and more correct sense of the word. In length this article is equivalent to 25 pages of this Guide; and it contains 9 illustrations of presses. The article is by C. T. Jacobi, author of *Printing*, and *The Printer's Handbook of Trade Recipes*. The article gives a history of the printing press, which was practically unchanged for a century and a half, until the Dutch map-maker Blaeu greatly simplified it. The first important metal press—earlier ones were of wood—was invented by Lord Stanhope nearly two hundred years later. It had greater power with smaller expenditure of labour, and its workings, as well as that of the Blaeu press, and of the Albion, which was used by William Morris at Kelmscott, may be readily understood from the illustrations in the article. Another hand press is the Columbian, invented in 1816 by a Philadelphian, George Clymer, and still in use for heavy hand work. Power presses began to be made at the end of the 18th century, but the presses invented by William Nicholson (1790) and Friedrich König (adopted by the London *Times* in 1814) printed only on one side at a time, as did the "double platen" machine of a little later date. The cylindrical eight feeder built by Augustus Applegath in 1848 for the London *Times* and the Hoe Type Revolving Machine are described in the section on the history of power presses, which closes with the story of Bullock's machine (1865) for printing from a continuous web of paper.

Modern Presses

The closing section of the article on printing is devoted to a description of modern presses. It opens with a list of the principal types of presses still in use, which are classified under the following seven heads:—

(1)—iron hand-presses like the Albion or Columbian, for proof-pulling or limited editions;

(2)—small platen machines for job or commercial work;

(3)—single cylinder machines ("Wharfedales") printing one side only;

(4)—perfecting machines, usually two cylinder, printing both sides, but with two distinct operations;

(5)—two-revolution machines with one cylinder;

(6)—two-colour machines, with one cylinder usually, but two printing surfaces and two sets of inking apparatus;

(7)—rotary machines for printing from curved plates upon an endless web of paper—principally for newspapers or periodical work.

These seven classes are next described in detail and the article illustrates them all. A cut of an Albion press is given in an early part of the article, and the other six presses shown in the cuts are:

The Golding jobber platen machine

Payne & Sons' Wharfedale stop-cylinder machine

Dryden & Foord's perfecting machine

The Miehle two-revolution cylinder machine

Payne & Sons' two-colour single cylinder machine

Hoe's double-octuple rotary machine

The article closes with a discussion of the following very practical topics: the preparation or "make ready" for printing; recent development in printing with cross references to the article PROCESS;

and a paragraph on the management of a printing house.

Proof-Reading

From this closing paragraph and the article on PRINTING, the student is referred to the article PROOF-READING (Vol. 22, p. 438) which is by John A. Black, head press reader of the 10th edition of the Encyclopaedia Britannica, and John Randall, sub-editor of the *Athenaeum* and of *Notes and Queries* and former secretary of the London Association of Correctors of the Press, so that this article, like all the other articles on the subject of book-making, is written by eminent practical authorities on the subject.

Bookbinding

The same is true of the article BOOKBINDING (Vol. 4, p. 216), which naturally follows in a systematic course of study. This is by Cyril J. H. Davenport, assistant keeper of books in the British Museum and author of *History of the Book*, etc. This article is illustrated with 14 figures, including 8 in halftone, showing typical fine bindings. The other illustrations show machines and processes used in binding. Besides a historical sketch of book-binding the article treats of the following topics:

Modern methods and modern binding designers; machine binding, machine sewing, rounding and backing, casing, wiring, and blocking. A case-making machine, a casing-in machine and a blocking machine are shown in the illustrations.

A bookbinder or a student of the subject will find a great deal of very valuable information elsewhere in the book, particularly in the article LEATHER (Vol. 16, p. 330) by Dr. J. Gordon Parker, principal of the

Leathersellers Technical College, London, and author of *Leather for Libraries*, etc. The article occupies the equivalent of 55 pages of this Guide; and the possessor of the Britannica will be interested to know that the leather bindings used for its volumes were all made according to specifications drawn up by Dr. Parker, the greatest authority in the world on tanning, curing and dyeing leather for book-bindings.

Publishing and Book-Selling

The last stages in getting the author's raw material "from him to the ultimate consumer" are those in which the publisher and bookseller play their part; and for a description of their functions the student should refer to the articles on publishing and book-selling in the Britannica. The article PUBLISHING (Vol. 22, p. 628) explains that publishing and book-selling were for a long time carried on together since "booksellers were the first publishers of printed books, as they had previously been the agents for the production and exchange of authentic manuscript copies." The separation of publishing from book-selling is due to "the tendency of every composite business to break up, as it expands, into specialized departments." As publishers became a separate class the work of their literary assistants also broke up into specialized departments—proof-reading and the reading of manuscripts submitted by authors—or the work of *printers'* readers and *publishers'* readers.

The importance of the work of the publisher's reader is dwelt upon in this article which sketches besides the growth of the Society of Authors in England and of the formation there of the Publishers' Association and the Booksellers' Association. The article also outlines the methods of publishing in the

United States and gives particular prominence to the effect on the British market of the introduction of American books and of American book-selling methods.

Historical and Miscellaneous Articles

Among other articles of interest to the manufacturer of books are the following: BOOK (Vol. 4, p. 214) by Alfred William Pollard, assistant keeper of books in the British Museum, gives a general historical description of books and in particular calls attention to the great change in book-prices in the last thirty years. “About 1894 the number of medium-priced books was greatly increased in England by the substitution of single-volume novels at 6s. each (subject to discount) for the three-volume editions at 31s. 6d.... The preposterous price of 10s. 6d. a volume had been adopted during the first popularity of the Waverley Novels and had continued in force for the greater part of the century.” To-day, well printed copies of these novels sell for 1s. in England and for 35 cents in the United States.

It may be added that one of the most striking lessons to be learned from the Britannica, in relation to the improvements and economies effected by the application of the most modern processes to the manufacture of books, is supplied by the consideration of the Britannica itself. The extent of the composition and machinery involved, the accuracy of the proof-reading, the novel employment —upon a large scale—of India paper and flexible bindings, the beauty of the illustrations, and, above all, the low price at which the product is sold, form a combination of the very latest perfections of every

department of the industry.

Read too BOOK-COLLECTING (Vol. 4, p. 221) also by A. W. Pollard; the article BOOK PLATES (Vol. 4, p. 230) by Egerton Castle, illustrated with ten cuts of book plates (which are so well chosen that book plate collectors have not infrequently asked the publishers of the Encyclopaedia Britannica for extra copies so that they might include them in their collections); the article BOOKCASE (Vol. 4, p. 221) from which the reader may be surprised to learn that "the whole construction and arrangement of bookcases was learnedly discussed in the light of experience by W. E. Gladstone in the *Nineteenth Century* for March 1890;" and the article BIBLIOGRAPHY AND BIBLIOLOGY (Vol. 3, p. 908) by A. W. Pollard, supplemented by the article INCUNABULA (Vol. 14, p. 369).

The following alphabetical list of articles and sections of articles, although it does not profess to be complete, will give the student some idea of the large number of topics connected with the general subject of the manufacture of books:

Albion Press

Aniline Ink

Applegath, Augustus

Autoplate Process

Backing

Barth, Henry

Bastard Letter

Batter

Bibliography and Bibliology

Bill of Type
Binding
Black Type
Blaeu Press
Blanketing
Bleaching
Blocking
Blue Ink
Boiling
Book
Book-Binding
Bookcase
Book-collecting
Book-Plates
Bookselling
Bourgeois
Breaking
Brevier
Bruce, David
Burr
Case-making Machine
Casing
Casing-in machine
Caslon Type
Casting
Cellulose

China Ink
Chinese Paper-makers
Chiswick Press
Clymer, George
Collotype
Colour Filters
Colour Process
Columbian Press
Composition
Copying Ink
Coster
Couching
Cutter
Dandy Roll
Delcambre Machine
Distributing
Distributing Machines
Dow Machine
Drive
Drying
Electroplating
Electrotyping
Empire Machine
English Type
Engraving
Esparto

Evaporator
Face
Flong
Forme
Fount
Fraser Machine
Fust
Glazing
Golding Machine
Gold Ink
Goodson
Gutenberg
Half Stuff
Half-tone
Heliotype
Hoe, Robert
Imposition
Incunabula
Indelible Ink
Indian Ink
India Paper
Ink
Intaglio Process
Italic Type
Jordan Beaters
Justifying

Kelmscott Press
Kern
Kingsland Beater
König, Friedrich
Lanston Monotype
Leather
Line-Engraving
Linotype
Lithography
Logwood Ink
Machine Presses
Marking Ink
Matrices
Miehle Press
Minion
Monoline
Monotype
Morris, William
Nicholson, William
Nick
Nonpareil
Octuple Rotary Machine
Off-set Printing
Old-style Type
Paige Composing Machine
Paper

Papyrus
Parchment
Pearl (type)
Perfecting Machine
Photolithography
Phototype
Pica
Planographic Process
Platen
Point System
Porion Evaporator
Power Presses
Pressing
Press Plate
Press-work
Primer
Price of Paper
Printing
Printing Ink
Process
Proof-reading
Publishing
Pulp
Punch
Quality, Standards of Paper
Rag

Red Ink
Reel Paper Cutter
Relief Process
Roman Type
Rotary Presses
Rounding
Ruby
Scheme of Type
Senefelder
Serif
Sewing
Shake
Sheeting
Shells
Signature
Silver Ink
Simplex Machine
Sizes of Paper
Sizing
Soda Recovery
Stanhope Press
Stannotype
Steel-facing
Stem
Stereotyping
Straining

Super Calender
Surfacing
Swelled Gelatin Process
Sympathetic Ink
Tachytype
Tannin Ink
Thorne Machine
Three Colour Process
Tub-sizing
Turtle
Type-case
Typograph
Typography
Vale Press
Water mark
Wharfedale Presses
Wicks, Frederick
Wiring
Woodbury Process
Wood Engraving
Wood’s Autoplate
Writing Ink
Yaryan Evaporator

CHAPTER XXII
FOR JOURNALISTS AND AUTHORS

The Development of Style

No writer can consider the use he will make of the tools of his trade—and the Britannica is certainly the chief among them—unless he has very definite views as to the particular kind of work he is trying to do. Where writing is regarded as a business, the art of writing is the art of being read, and the art of being read lies, nowadays, in convincing the reader that you have something fresh to say, rather than in arousing his admiration of your way of saying it. Writing is none the less one of the fine arts: the modern writer must form his style with the utmost care, and always guard himself against the temptation to relax his standards. But the juggling with words, the "rhythmical sequences of recurring consonants," the musical prose in which sounds are adjusted as artfully as in verse, presuppose readers to whom these elaborations are delightful. Such readers are rare, to-day. Thirty or forty years ago it was a matter of course, in thousands of homes, for some one member of the household to read aloud to the others. The custom has almost disappeared, and there has been a change in public taste, due, perhaps, in great measure to a change in the *pace* at which people read. A book does not "last" as it did. Newspaper reading has trained the eye and the mind to swifter consumption. The modern professional writer adapts himself to the existing conditions. He knows that those who ride in automobiles do not peer under tufts of leaves to look for roadside violets.

But he also knows that they want a straight, smooth road. He endeavors to write as concisely as possible, yet to write so clearly that every point he makes is made once for all; and he can work fully as hard, and apply talents fully as great, in forming a style that pleases by its simple directness—or, better, that pleases because the reader does not think of it as "style,"—as if he were aiming at the most elaborate ornament.

"Vitalized Observation"

In developing the power of clear and concise statement, the first essential is to form the habit of getting your "something to say" absolutely plain to your own mind before you attempt to say it. A writer deliberately strives to be wordy and vague when he is trying to misrepresent facts, and it is impossible, when he is groping for his facts, that he should avoid wordiness and vagueness. The Britannica article on Rudyard Kipling speaks of his "powers of observation vitalized by imagination." It would be difficult to find a phrase more tersely describing the ideal equipment of a writer, and Kipling's observation is rapid observation *amplified by deliberate investigation*. He gets a swift impression of the complex framework of a ship or of the intricate machinery of a locomotive, and then, before he writes "The Ship that Found Herself" or ".007," he makes as elaborate a technical study as if he were writing an engineering article instead of a story. His imagination so vitalizes the result that when you read the story, although it describes beams and valves you never saw, you recognize the accuracy of his technical description as you recognize, in an art gallery, the fidelity of a portrait, although you never

saw the person portrayed. In using the Britannica, the investigation by which you amplify your personal observation helps you in four ways. *First*, you correct your facts if they need correction. Whatever your subject may be, you find information so authoritative that you cannot question it. *Second*, you amplify your own observations; you discover the underlying causes and relations of the events or opinions you are about to discuss. *Third*, the reading by which you have, consciously or unconsciously, been influenced in forming your style, is rendered more profitable and stimulating by your study of the Britannica articles in which the work of all the world's great writers, past and present, is analyzed by the most brilliant critics. **Models of Style** *Fourth*, you have in the Britannica itself such examples of scholarly, forcible, compacted English as cannot often be found in contemporary books. It is not within the province of this Guide to institute detailed comparisons between these articles by the leading literary men of the day and other writings from the same pens. But the reader will discover for himself that the editorial policy which demanded rigorous concision has stimulated, not hampered, the distinguished writers whose Britannica articles are, in case after case, the best of their productions.

Practical Tests

The foregoing summary of the uses of the Britannica to writers is based upon reviews of the work which have appeared in the daily and weekly press; and it may be supplemented by brief extracts from one or two letters to the publishers, written by men whose reputations give their opinions great weight. In one of these Horace White, formerly editor of the *Evening Post* of New York, spoke highly

of the practical utility of the Britannica. Joseph Pulitzer, of the New York *World*, shortly before his death wrote: “I want to thank you for the intellectual pleasure I enjoyed this winter in examining this extraordinary production. I have already distributed a dozen sets in America as presents among *editors* and my children. [He afterwards ordered six more sets.] The work is a liberal education.” John Habberton wrote: “The new edition of the Britannica has already cost me hundreds of hours that I should have given to my work, but I do not regret the outlay, for I have been richly repaid. There never was a handier book for a desk or a more readable one.”

It is not only true that no ordinary library would supply the information to be found in the Britannica, but it is as true, and as relevant, that no ordinary library presents information in a form as stimulating to the writer who uses books as the tools of his trade. The editor-in-chief of the Britannica had all the world’s greatest experts in all fields of human knowledge and endeavour to choose from. He chose in each instance the expert whose knowledge was so thorough, and whose correlation of his special knowledge with related branches was so complete, that his articles are not merely “last word” information but interesting and alive. You may remember the new interest you felt in natural science when you first read an essay by Huxley, because he had the power of creating enthusiasm. It is a justifiable figure of speech to say that, in this sense, the Britannica has been written by Huxleys. Perhaps you have ransacked a public library for some out-of-the-way fact and finally found it, in skeleton form, and in crabbed German, in *Meyer* or *Brockhaus* or some other German encyclopaedia. Or did your

search end by finding the fact in *Larousse* or *La Grande Encyclopédie*, in some clever phrase, so brilliantly written, so strikingly put, that it was the phrase and not the fact that you had got—and you felt that the Frenchman had hidden the fact, if he ever had had it, in his epigram? You may have wished, then, for a third type of encyclopaedia which should be "German-thorough" and "French-interesting." Such a combination is the Britannica,—more authoritative, more up-to-date, more interesting, than any other book.

The Journalist's Needs

A newspaper man, reporter or editor, must be informed at a moment's notice on any one of so large a number and so wide a range of topics that the best library of reference obtainable can be none too good for him. This is especially true of the man on the smaller newspaper which does not have the luxury of specialists on its editorial staff, or of many reporters dividing among them the work of gathering news on such lines that each may work in a field with which he is intimately acquainted and in which he is particularly versed. And the rural newspaper is, besides, further from good public libraries and financially less able to have a large office library. The authority, the scope, the interest and the convenience of the Britannica make it just the book to fill these varied needs of the newspaper man. If he has to write a "murder story" in which some unusual poison has been used, he can find a full description of the origin, the use, the action and the tests of the drug by turning to the Britannica—instead of hunting for (and then through) a text book on medicine. And if, on the same day, or the next, he must write an editorial on the tariff, he will find in the article TARIFF, in the articles FREE TRADE and PROTECTION, and in that part of the article UNITED STATES which deals with the country's economic history, the information that he wants; and he can get it quickly, and can be sure of its being authoritative.

If the Britannica is evidently *the* work of reference for the writer, how is he to use it?

It has already been suggested that he will find authoritative and recent information on any topic

connected with the subject on which he is writing. It would be interesting to see—or at least to imagine—how largely the Britannica might be used as a source for fiction. A novelist with an appetite for human documents like Balzac's or like that of Charles Reade —with his many albums full of newspaper clippings, —could satisfy himself with the Britannica, taking his characters "from life" in its biographical and historical articles and his setting from its geographical articles.

Literary Criticism

It has already been suggested that the writer will find in the Britannica the clearness and conciseness of style which he cannot but wish to attain in his own work. Here he has the writings of great masters of English. He may remember Robert Louis Stevenson's story of how he played "the sedulous ape" to the great stylists; and in the Britannica he can read not only an excellent sketch of Stevenson by Edmund Gosse, his friend and a well-known essayist, but Stevenson's own article on Béranger. He may read Matthew Arnold on Sainte-Beuve; Walter Besant on Froissart and on Richard Jefferies; John Burroughs on Walt Whitman; G. W. Cable on William Cullen Bryant; Edmund Kerchever Chambers on Shakespeare: Ernest Hartley Coleridge on Byron; Sidney Colvin on Giotto, Leonardo, etc.; Austin Dobson on Fielding, Hogarth, Richardson, etc.; Henry van Dyke on Emerson; John Fiske on Francis Parkman; Richard Garnett on T. L. Peacock and on Satire; Israel Gollancz on "The Pearl"; Edmund Gosse on many literary *genres*, on Ibsen, etc.; Edward Everett Hale on James Freeman Clarke and on Edward Everett; Frederic Harrison on Ruskin; W. E. Henley on James Fenimore Cooper; William Price

James on Barrie, Henley and Kipling; Prince Karageorgevitch on Marie Bashkirtseff; Stanley Lane-Poole on Richard Burton; Andrew Lang on Ballads, Molière, etc.; Henry Cabot Lodge on Albert Gallatin; E. V. Lucas on Jane Austen and Charles Lamb; Lord Macaulay on Bunyan, Goldsmith, Johnson and Pitt; David Masson on Milton; Brander Matthews on Mark Twain; Alice Meynell on Mrs. Browning; William Minto on Dryden, Pope, Spenser and Wordsworth; John Nichol on Robert Burns; Charles Eliot Norton on George William Curtis; Mark Pattison on Casaubon, Erasmus, Macaulay and Thomas More; W. H. Pollock on Thackeray and de Musset; Quiller-Couch on Thomas Edward Brown; Whitelaw Reid on Greeley; C. F. Richardson on Bronson Alcott and John Fiske; W. M. Rossetti on Shelley; Viscount St. Cyres on Fénelon and Madame Guyon; Saintsbury on French literature, Balzac, Montaigne, Rabelais, etc.; Carl Schurz on Henry Clay; H. E. Scudder on Lowell and Harriet Beecher Stowe; Thomas Seccombe on Boswell, Dickens, Charles Lever, etc.; William Sharp ("Fiona McLeod") on Thoreau; Clement Shorter on the Brontës, Crabbe, Cowper and Mrs. Gaskell; W. W. Skeat on Layamon; E. C. Stedman on Whittier; Sir Leslie Stephen on Browning and Carlyle; Richard Henry Stoddard on Hawthorne; Swinburne on Beaumont and Fletcher, Congreve, Hugo, Landor, Marlowe, Mary, Queen of Scots; John Addington Symonds on the Renaissance, Machiavelli, Tasso, etc.; Arthur Symons on Hardy, Mallarmé, Verlaine; W. P. Trent on Sidney Lanier; A. W. Ward on Drama; Mrs. Humphry Ward on Lyly; Theodore Watts-Dunton on Poetry, Sonnet, Borrow, Wycherley, Matthew Arnold; Arthur Waugh on William Morris, Walter Pater; and G. E. Woodberry on American Literature.

The more you know of the subjects or authors in this list the more likely you will be to say what a Western professor of theology said, in reviewing the articles in the Britannica dealing with the Bible: "They are the very authorities that I would have chosen to write these articles!"

But the Britannica will serve the professional author in other ways than by giving him information in special fields and by keeping before him admirable models of style. He might well follow any of the courses suggested in the chapter on *Literature* in this Guide; and if he will read the articles on great authors written by great authors, already mentioned, he will have a doubly valuable course in biographical criticism by the ablest of literary critics.

Any newspaper writer or contributor to the periodical press should read such articles as:

Newspapers and Magazines

NEWSPAPERS (Vol. 19, p. 544; equivalent to 125 pages of this Guide), by Hugh Chisholm, editor-in-chief of the Britannica, with sections on the price of newspapers by Lord Northcliffe, on illustrated papers by Clement Shorter, general information on American newspapers, and an elaborate historical account of British, American and foreign newspapers.

PERIODICALS (Vol. 21, p. 151; equivalent to 40 pages in this Guide), by Henry Richard Tedder, librarian of the Athenaeum Club of London, treats the subject under the heads: *British*, *United States*, *Canada*, *South Africa*, *Australia and New Zealand*, *West Indies and British Crown Colonies*, *India and Ceylon*, *France*, *Germany*, *Austria*, *Italy*, *Belgium*, *Holland*, *Denmark*, *Norway*, *Sweden*, *Spain*, *Portugal*, *Greece*, *Russia*, and *other Countries*.

SOCIETIES, LEARNED (Vol. 25, p. 309), also by H. R. Tedder, deals with the publications of such societies and classifies them (with geographical sub-classification for each head) under *Science Generally*, *Mathematics*, *Astronomy*, *Physics*, *Chemistry*, *Geology*, *Mineralogy* and *Palaeontology*, *Meteorology*, *Microscopy*, *Botany and Horticulture*, *Zoology*, *Anthropology*, *Sociology*, *Medicine and Surgery*, *Engineering and Architecture*, *Naval and Military Science*, *Agriculture and Trades*, *Literature*, *History and Archaeology*, and *Geography*.

Local information in regard to newspapers and journalism will be found in separate local articles. Thus under Boston, Philadelphia, New York City, New Orleans, San Francisco, etc., there is valuable information in regard to these cities as literary centers and about their principal periodical publications, including newspapers; and in the articles on smaller cities, such as Albany and Springfield, Mass., there are valuable historical sketches of the local press of each.

Literary Biographies

The newspaper man should read the biographies of great American printers and editors: WILLIAM BRADFORD (Vol. 4, p. 370); BENJAMIN FRANKLIN (Vol. 11, p. 24; equivalent to 20 pages of this Guide); ISAIAH THOMAS (Vol. 26, p. 867); NOAH WEBSTER (Vol. 28, p. 463); WILLIAM CULLEN BRYANT (Vol. 4, p. 698); JAMES G. BIRNEY (Vol. 3, p. 988); GAMALIEL BAILEY (Vol. 3, p. 217); W. L. GARRISON (Vol. 11, p. 477); JAMES GORDON BENNETT (Vol. 3, p. 740); THURLOW WEED (Vol. 28, p. 466); GIDEON WELLES (Vol. 28, p. 506); JOHN BIGELOW (Vol. 3, p. 922); HORACE GREELEY (Vol. 12, p. 531); HENRY J.

RAYMOND (Vol. 22, p. 933); GEORGE RIPLEY (Vol. 23, p. 363); C. A. DANA (Vol. 7, p. 791); GEORGE WILLIAM CURTIS (Vol. 7, p. 652); CARL SCHURZ (Vol. 24, p. 386); SAMUEL BOWLES (Vol. 4, p. 344); JOSEPH R. HAWLEY (Vol. 13, p. 101); WHITELAW REID (Vol. 23, p. 52); GEORGE W. CHILDS (Vol. 6, p. 141); E. L. GODKIN (Vol. 12, p. 174); and HENRY WATTERSON (Vol. 28, p. 418).

The reading of these biographies will give the student many interesting starting-points for studies in American politics, economics, literature, reform movements as widely separated as abolition and the introduction of the merit system into the civil service. The author should also read the article AMERICAN LITERATURE (Vol. 1, p. 831; equivalent to 35 pages of this Guide), by Professor G. E. Woodberry, and, if his field is that of the publicist, he should read the article on the history of the UNITED STATES (Vol. 27, p. 663), equivalent to 225 pages of this Guide; and the allied articles to which he is referred from that.

The advertising writer will find a valuable and stimulating article on ADVERTISEMENT (Vol. 1, p. 235, equivalent to 20 pages in this Guide), which gives a history of the subject, deals with posters and signs, circulars, periodical advertising, and legal regulation and taxation. For a full list of articles of particular usefulness for the author, see the chapter *Literature* in this Guide. The following brief list may serve as the basis for a preliminary course of reading.

Alliteration

Ana

Anecdote

Anthology

Anticlimax
Antithesis
Aphorism
Apologue
Apophthegm
Archaism
Assonance
Bathos
Belles-Lettres
Biography
Book
Book-Collecting
Bookselling
Burlesque
Comedy
Criticism
Dialogue
Drama
Elegy
Encyclopaedia
Epic Poetry
Epigram
Epilogue
Epistle
Essay
Euphemism

Fable
Feuilleton
Gazette
Humour
Hyperbole
Idyll
Impromptu
Index
Irony
Lampoon
Laureate
Legend
Libraries
Limerick
Litotes
Lyrical Poetry
Manuscript
Melodrama
Metaphor
Metonymy
Metre
Monologue
National Anthems
Newspapers
Novel
Ode

Pamphlets
Parable
Paradox
Paraphrase
Parody
Pasquinade
Periodicals
Philippics
Plagiarism
Pleonasm
Poetry
Proof-Reading
Prose
Prosody
Proverb
Psalm
Pseudonym
Pun
Quatrain
Quotation
Reporting
Rhetoric
Rhyme
Rhythm
Romance
Saga

Satire

Song

Sonnet

Squib

Stanza

Style

Tale

Tract

Treatise

Verse

CHAPTER XXIII
FOR TEACHERS

The Teacher's "Factor of Safety"

Every teacher has one pupil who tries harder than any of the others to absorb knowledge, and yet is never content with the progress made, who knows how hard the teacher works, and yet is never satisfied with the teacher—and that pupil is the teacher's self. For every other learner there is a limit to the amount of knowledge to be acquired, but in the case of the teacher a "standard" is supposed to indicate no more than an indispensable minimum. When you are trying to make your pupils master a

text-book, the volume seems to contain a most stupendous mass of learning, and when one of them asks you a question about the subject with which the text-book deals, that particular point is sure to be one that the text-book does not cover. What engineers call the “factor of safety,” the margin by which the strength of materials must exceed the stress it is expected to encounter, is, for the teacher, incalculable. It is, of course, a favorite pastime of parents to send a child to school primed with some question “to ask Teacher,” selecting an enigma that has been for centuries a battle-ground for scholars or scientists. And, apart from these malicious pitfalls, children themselves seem, quite innocently, to hit upon questions of extraordinary difficulty. A rebuff, a careless response, or, worst of all, an ingenious evasion of the issue, is fatal to the teacher’s authority and influence. “Ask me that again, to-morrow morning,” is the phrase with which a conscientious teacher often meets such a contingency. And then how a fagged brain is tormented that evening, how the few books available (and they are likely to be a very few if there is no public library at hand) are searched in vain! That is not all. If it be true that the teacher is the most diligent, yet always the least satisfied, of all the teacher’s pupils, it is equally true that many of the most puzzling questions with which the teacher is confronted arise in the teacher’s own mind.

Answers to All Questions

The question-answering power of the Britannica is therefore of cardinal importance to the teacher, and is to be considered not only in connection with the use of the work for reference, but also in the

selection of such courses of reading as may be expected to supply information of the kind that questions most often demand. And this question-answering power lies in three characteristics of the work, and may be measured by the extent to which the three are found in it: broad scope, unimpeachable authority and convenient arrangement. Its scope covers the whole range of human knowledge, everything that mankind has achieved, attempted, believed or studied. Its authority is doubly vouchsafed. The fact that the Britannica is published by the University of Cambridge (England), one of the world's oldest and most famous seats of learning, in itself gives such a guarantee as no other Encyclopaedia has ever offered, and the assurance thus given may be regarded as showing, chiefly, that there are no errors of omission, for against the existence of the errors of commission there is a further guarantee. The articles are signed by 1,500 contributors, including the foremost specialists in every department of knowledge. Among this army of collaborators, chosen from twenty countries, there are no less than 704 members of the staffs of 146 universities and colleges. This means that by means of the Britannica the youngest teacher in the most isolated village is brought into stimulating contact with the great leaders of the teaching profession. Its arrangement gives it the advantages of a universal library, providing the varied courses of reading outlined in this Guide, and those also of a work of reference which yields an immediate answer to every conceivable question. The index of 500,000 entries instantly leads the enquirer to any item of information in the 40,000 articles. No teacher could hope to form, in the course of a lifetime, a collection

of separate books which would contain anywhere near as much information.

A Library of Text-Books

In another relation, the Britannica is of daily service to anyone engaged in educational work. It has already been remarked that the teacher needs a "factor of safety," a reserve of knowledge beyond that which is directly called for in the ordinary routine of the class room. But in the very course of that routine, there is also a need for co-ordinated knowledge, presented in a form available for use in teaching, of a more advanced kind than that in the text-books with which pupils are provided. And the Britannica is, in itself, a vast collection of text-books.

Professor Shotwell, of Columbia University, recently wrote to the publishers a letter in which he said: "I shall use the articles in the Encyclopaedia Britannica which deal with industrial processes as a substitute for a text-book in one of my courses in Social and Industrial History and have especially in mind the splendid treatment of the cotton industry by Professor S. J. Chapman and others." A large number of Britannica articles have, by permission, been reprinted, word for word, for use as text-books; and it is impossible to say how many have been paraphrased, and, in a form less clear and vivid than the originals, similarly employed. The writers of the Britannica have, among them, done so large a share of the world's recent work in research and criticism, that no one who is engaged in writing a text-book or in preparing a course of lectures should fail to use the work as a check to test the completeness and the accuracy of independent investigation.

Fortunately, the system of monthly payments has

enabled teachers to purchase the Britannica to an extent which, in view of their limited resources, is a striking evidence of their earnest desire to perfect their professional equipment. In some cases two and even three teachers have combined their efforts in order that they might jointly possess the work. But whatever may be the difficulties to be overcome, it is certain that the Britannica is, for the teacher, an instrument as directly productive as a technical library is for a doctor or a lawyer.

A professor in an eastern college wrote to the publishers: “It has become ‘the collection of books’ which Carlyle might term ‘the true university’”; and the practical head of a business school in Pennsylvania says: “By its purchase, I have secured access to a university education.” A well known professor of German calls it “a *Hausschatz* of amazing richness and variety,” and adds: “I hope you will not be sued at law for an attempt to monopolize the market for profitable and entertaining literature.” The president of a southern university wrote: “It is the first book to consult, the one book to own, if you can own but one.” And a Harvard professor says: “I have been particularly interested in some of the recent phases of European history. Concerning some movements, about which it is as yet extremely difficult to find material in books, I have found the Encyclopaedia most useful.” A teacher in a theological seminary exclaims: “What a university of solid training it would be for a young student, if he would spend an hour each day reading the work, volume by volume, and including all the articles except those of a technical nature belonging to other departments than his own!”

This is what teachers have said of the value to them of the Encyclopaedia Britannica. Specialists in

school-hygiene and school librarians have also noted the advantage of the light, handy volumes printed on India paper—one weighs no more than two monthly magazines—, which may be easily held at the proper angle for eye-focus on a large page.

The teacher will find in this Guide valuable suggestions about particular subjects which he may wish to teach or study,—such as history, literature, language and biology. In this chapter we suggest a general course.

The Theory of Education

Let him begin with the article EDUCATION (Vol. 8, p. 951), which is the equivalent in length of 120 pages of the size and type of this Guide, and of which the first part is by James Welton, professor of education in the University of Leeds and author of *Logical Bases of Education*, etc., the sections on national systems by G. B. M. Coore, assistant secretary of the London Board of Education, and that on the United States by Nicholas Murray Butler, president of Columbia University. This valuable article begins with a discussion of the meaning of the term "Education," excludes John Stuart Mill's extension to everything which "helps to shape the human being," and narrows the meaning to definitely personal work,—the true "working" definition for the practical teacher.

The section on educational theory might equally well be styled a sketch of the history of education and will prove valuable to the teacher preparing for a licence-examination in this subject or for a normal training course. It discusses old Greek education with special attention to Spartan practice, Plato's theory and Aristotle's, and the gradual change from the

point of view of the city-state to Hellenistic cosmopolitanism. The older Roman education, practical and given by father to son, is contrasted with the later Hellenized training, largely by Greek slaves, largely rhetorical and largely summed up in Quintilian's *Institutio*. The contest between the pagan system and Christianity is shown to have culminated in monasticism; and barbarian inroads stifled classical culture until the Carolingian revival under Alcuin in the 8th century and the scholastic revival (11th to 13th centuries) of Abelard, Aquinas and Arabic workings over of Aristotle. Scholastic education is considered especially in relation to the first great European universities and the schools of the Dominicans, Franciscans and Brethren of the Common Life, and in contrast to chivalry, the education of feudalism. The Renaissance is treated at greater length, and this is followed by sections on the influence of the Reformation on education, and the consequent growth of Jesuit schools. The keynote of the story thereafter is reform,—the movement away from the classics, toward natural science, and, especially after the French Revolution, by means of new methods and theories, notably those of Rousseau, Pestalozzi, Froebel and Herbart.

The remainder of the article EDUCATION deals with national systems of education: French, German, Swiss, Belgian, Dutch, Scotch, Irish, English, Welsh and American, with an excellent bibliography. These, and other, national systems are also treated from another point of view in the articles on the separate countries.

Articles on Great Schools

The article EDUCATION should naturally be

followed by a study of the article UNIVERSITIES (Vol. 27, p. 748—about 100 pages, if printed in the style of this Guide) by James Bass Mullinger (author of the *History of Cambridge*, *The Schools of Charles the Great*, etc.) and, for American universities, by Daniel Coit Gilman, late president of Johns Hopkins University; and by a reading of articles on the great universities, as for instance, Oxford, Cambridge, Aberdeen, Glasgow, St. Andrews, Dublin, Harvard, Yale, Columbia, Cornell, Princeton, Pennsylvania, Michigan, Wisconsin, California, Leland Stanford, Jr., etc. The student should then turn to the article SCHOOLS (Vol. 24, p. 359; equivalent to about 40 pages of this Guide) by Arthur Francis Leach, author of *English Schools at the Reformation*, who gives a summary of what is known of Greek, Roman and English schools.

Then,—to supplement these general articles,—he should read—

On *Greek* education:

PLATO (Vol. 21, p. 808), especially p. 812 (on *Meno*) and 818 (on the *Republic*).

ARISTOTLE (Vol. 2, p. 501).

SPARTA (Vol. 25, p. 609, particularly p. 611).

On *Roman* education:

CATO (Vol. 5, p. 535).

QUINTILIAN (Vol. 22, p. 761).

On *early Christian* education:

CLEMENT OF ALEXANDRIA (Vol. 6, p. 487, particularly p. 488, on the *Paedagogus*).

AUGUSTINE (Vol. 2, p. 907) and JEROME (Vol. 15, p. 326), with especial attention to their early pagan education and their attitude toward it as Christians.

AMBROSE (Vol. 1, p. 798).

MARTIANUS CAPELLA (Vol. 5, p. 249).

BOETIUS (Vol. 4, p. 116).
CASSIODORUS (Vol. 5, p. 459).
ISIDORE (Vol. 14, p. 871).
ST. GREGORY (Vol. 12, p. 566).
BEDE (Vol. 3, p. 615).
MONASTICISM (Vol. 18, p. 687).

On the *Carolingian revival*:

ALCUIN (Vol. 1, p. 529).
ANGILBERT (Vol. 2, p. 9).
CHARLEMAGNE (Vol. 5, p. 891, especially p. 894).
FRANCE (Vol. 10, p. 810).

On the *Scholastic revival*:

SCHOLASTICISM (Vol. 24, p. 346).
ABELARD (Vol. 1, p. 40).
JOHN OF SALISBURY (Vol. 15, p. 449).
ALBERTUS MAGNUS (Vol 1, p. 504).
GROSSETESTE (Vol. 12, p. 617).
THOMAS AQUINAS (Vol. 2, p. 250).
ROGER BACON (Vol. 3, p. 153).

On the *Renaissance*:

RENAISSANCE (Vol. 23, p. 83).
DANTE (Vol. 7, p. 810).
PETRARCH (Vol. 21, p. 310).
BOCCACIO (Vol. 4, p. 102).
MANUEL CHRYSOLARAS (Vol. 6, p. 320).
MANUTIUS (Vol. 17, p. 624).
THOMAS MORE (Vol. 18, p. 822).
ERASMUS (Vol. 9, p. 727).
JOHN COLET (Vol. 6, p. 681).
THOMAS LINACRE (Vol. 16, p. 701).

On the *Reformation period and Counter-Reformation*:

REFORMATION (Vol. 23, p. 4).
MELANCTHON (Vol. 18, p. 88).

LUTHER (Vol. 17, p. 133).
TROTZENDORff (Vol. 27, p. 308).
REUCHLIN (Vol. 23, p. 204).
ASCHAM (Vol. 2, p. 720).
RABELAIS (Vol. 22, p. 769).
JESUITS (Vol. 15, p. 337), especially p. 342.
LA SALLE (Vol. 16, p. 231).

On the *Modern period*:

COMENIUS (Vol. 6, p. 759).
ROUSSEAU (Vol. 23, p. 775).
VOLTAIRE (Vol. 28, p. 199).
PESTALOZZI (Vol. 21, p. 284).
FROEBEL (Vol. 11, p. 238).
HERBART (Vol. 13, p. 335).
WILHELM VON HUMBOLDT (Vol. 13, p. 875).
ANDREW BELL (Vol. 3, p. 684).
JOSEPH LANCASTER (Vol. 16, p. 147).
SIR JOHN FITCH (Vol. 10, p. 438).
JAMES BLAIR (Vol. 4, p. 34).
T. H. GALLAUDET (Vol. 11, p. 416).
F. A. P. BARNARD (Vol. 3, p. 409).
HENRY BARNARD (Vol. 3, p. 410).
HORACE MANN (Vol. 17, p. 587).
MARK HOPKINS (Vol. 13, p. 684).
WILLIAM T. HARRIS (Vol. 13, p. 21).
JUSTIN S. MORRILL (Vol. 18, p. 869).
ALEXANDER MELVILLE BELL (Vol. 3, p. 684).
S. C. ARMSTRONG (Vol. 2, p. 591).
BOOKER T. WASHINGTON (Vol. 28, p. 344).
CO-EDUCATION (Vol. 6, p. 637).
BLINDNESS (Vol. 4, p. 66).
DEAF AND DUMB (Vol. 7, p. 887).
INFANT SCHOOLS (Vol. 14, p. 533).

KINDERGARTEN (Vol. 15, p. 802).

MUSEUMS OF ART (Vol. 19, p. 60).

MUSEUMS OF SCIENCE (Vol. 19, p. 64).

POLYTECHNIC (Vol. 22, p. 38).

TECHNICAL EDUCATION (Vol. 26, p. 487), an elaborate article, about 40 pages in the form of this Guide, by Sir Philip Magnus, author of *Industrial Education*, member of the Royal Commission on technical instruction (1881–1884) and, in 1907, president of the education section of the British Association.

The Study of Psychology

Of equal importance with this course on the history of education, for the student taking the licence-examination or for a teacher taking an examination for a higher grade licence or a principalship, is a course in Psychology in the Britannica. This will be found largely in the great article on PSYCHOLOGY (Vol. 22, p. 547; equivalent in length to 200 pages of this Guide) by James Ward. The systematic treatment of the subject in this article is particularly valuable to the teacher, whether the object desired is to review the entire subject, sharpening one's impressions from a longer course of reading; to get a general grounding in the subject—for which a careful study of this one article will suffice; or to make one's self more certain of his comprehension of any part of the subject. It is not practicable to give an outline of this article here, but a few of its special topics are listed below:

General analysis of the subject

Attention

Theory of presentations

Sensation

Perception

Imagination or Ideation

Mental Association

Reminiscence and Expectation

Experimental Investigations on Memory and Association

Feeling

Emotion and Emotional Action

Intellection

Self-Consciousness

Relation of Body and Mind

Comparative Psychology

Besides the general article with its systematic summary of the subject, the Britannica contains many briefer articles on special topics, so that the teacher will find not only an excellent text-book of the subject in Prof. Ward's article, but also an elaborate dictionary or encyclopaedia of psychological terms or topics. Among the topics treated in this "Dictionary of Psychology" are:

Affection

Apperception

Association of Ideas

Attention

Category

Cognition

Concept

Connotation

Deduction

Definition
Denotation
Dream
Extension
Hearing
Idea
Imagination
Imitation
Immortality
Individualism
Induction
Instinct
Intellect
Introspection
Intuition
Mnemonics
Motive
Noümenon
Object, Subject
Parallelism
Perception
Personality
Phenomenon
Pleasure
Psychophysics
Recept

RELATIVITY

REMINISCENCE

RETRO-COGNITION

SELF

SENSATIONALISM

SMELL

SUGGESTION

TASTE

TOUCH

VISION

WEBER'S LAW

WILL

Furthermore, the teacher will find the Britannica a valuable biographical dictionary. This he will already have realized, if he has looked up the biographical articles mentioned in connection with the history of education. The following is a brief outline course in psychological biography:

Adamson, Robert

Aristotle

Bain, Alexander

Baldwin, James Mark

Beneke, F. E.

Berkeley, George

Clifford, Wm. K.

Democritus

Epicurus

Fechner, G. F.
Geulincx, Arnold
Hamilton, William
Hartley, David
Helmholtz, Herman von
Herbart, Johann F.
Hobbes, Thomas
Höffding, Harold
Hume, David
Hucheson, Francis
James, William
Kant, Immanuel
Ladd, G. T.
Lange, F. A.
Leibnitz, G. W.
Lewes, George Henry
Locke, John
Lotze, R. H.
Mill, James
Mill, J. S.
Müller, Johannes Peter
Münsterberg, Hugo
Reid, Thomas
Ribot, T. A.
Spencer, Herbert
Sully, James

Ward, James

Wundt, W. M.

CHAPTER XXIV
FOR MINISTERS

The Great Preachers

The minister or candidate for the ministry will find a valuable course of reading laid out for him in this Guide under the heading *Bible Study*, and it might be said with little exaggeration that *any* systematic course of reading in the Encyclopaedia Britannica should add to the efficiency and power of one who would be an ideal pastor. If the schools of the Middle Ages could truly call all the arts and sciences hand-maids and helpers to Theology, much more truly, in the present age, should the minister, in order that he may minister truly, know not merely the history of the Bible and of the Church, the results of modern criticism, and of comparative religion and folk-lore, but, almost as fully, general history, literature, philosophy, psychology, education, something of the fine arts, much of law and political science, and still more of social science and economics. In a period of specialization he cannot afford to be a specialist—or, it might be nearer the truth to say that, like every other true specialist, he must make all knowledge, all the circle of the sciences, tributary to his specialty, which is the knowledge and the improvement of the

human soul. The suggestions that follow must necessarily be fragmentary, and should be considered as including merely a few topics not covered in the chapter on *Bible Study* nor in the other courses which, as has just been suggested, a minister might profitably pursue.

The article SERMON (Vol. 24, p. 673) is by Edmund Gosse, librarian of the House of Lords, biographer of John Donne, Jeremy Taylor and Dr. Thomas Browne. The writer is especially conversant with the English literature of the 17th century, in the middle of which, to quote his article, "the sermon became one of the most highly-cultivated forms of intellectual entertainment in Great Britain, and when the theatres were closed at the Commonwealth it grew to be the only public form of eloquence."

Each name on the following list of great preachers is accompanied by volume and page reference to the biographical sketch in the Britannica, containing criticism of the preacher and a bibliography of his works and of works about him, so that the articles supply the basis for a study of the world's great preachers.

British.

JOHN WYCLIFFE (Vol. 28, p. 868)

JOHN FISHER (Vol. 10, p. 427)

HUGH LATIMER (Vol. 16, p. 242)

JOHN KNOX (Vol. 15, p. 878)

RICHARD HOOKER (Vol. 13, p. 672)

JOHN DONNE (Vol. 8, p. 417)

JOSEPH HALL (Vol. 12, p. 847)

JOHN HALES (Vol. 12, p. 834)

Edmund Calamy (Vol. 4, p. 967)
Benjamin Whichcote (Vol. 28, p. 587)
Thomas Adams (Vol. 1, p. 180)
Richard Baxter (Vol. 3, p. 551)
Thomas Manton (Vol. 17, p. 607)
John Owen (Vol. 20, p. 392)
Ralph Cudworth (Vol. 7, p. 612)
Robert Leighton (Vol. 16, p. 398)
Jeremy Taylor (Vol. 26, p. 469)
Isaac Barrow (Vol. 3, p. 440)
Robert South (Vol. 25, p. 463)
John Tillotson (Vol. 26, p. 976)
Edward Stillingfleet (Vol. 25, p. 921)
Benjamin Hoadly (Vol. 13, p. 542)
Joseph Butler (Vol. 4, p. 882)
Thomas Boston (Vol. 4, p. 289)
John Wesley (Vol. 28, p. 527)
George Whitefield (Vol. 28, p. 603)
Thomas Chalmers (Vol. 5, p. 809)
Edward Irving (Vol. 14, p, 854)
Charles Haddon Spurgeon (Vol. 25, p. 742)
Edward Bouverie Pusey (Vol. 22, p. 667)
John Keble (Vol. 15, p. 710)
John Henry Newman (Vol. 19, p. 517)
Henry Edward Manning (Vol. 17, p. 589)
John Clifford (Vol. 6, p. 507)

GEORGE MÜLLER (Vol. 18, p. 961)

FREDERICK TEMPLE (Vol. 26, p. 600)

ARCHIBALD CAMPBELL TAIT (Vol. 26, p. 363)

BENJAMIN JOWETT (Vol. 15, p. 527)

ARTHUR PENRHYN STANLEY (Vol. 25, p. 777)

J. F. D. MAURICE (Vol. 17, p. 910)

HUGH PRICE HUGHES (Vol. 13, p. 860)

ANDREW M. FAIRBAIRN (Vol. 10, p. 129)

NORMAN MACLEOD (Vol. 17, p. 262)

American.

COTTON MATHER (Vol. 17, p. 883)

INCREASE MATHER (Vol. 17, p. 884)

RICHARD MATHER (Vol. 17, p. 885)

JONATHAN EDWARDS (Vol. 9, p. 2)

JOHN CARROLL (Vol. 5, p. 409)

J. L. A. M. L. DE CHEVERUS (Vol. 6, p. 114)

S. W. G. BRUTÉ (Vol. 4, p. 695)

JOHN WITHERSPOON (Vol. 28, p. 759)

JOHN WOOLMAN (Vol. 28, p. 817)

SAMUEL SEABURY (Vol. 24, p. 531)

FRANCIS ASBURY (Vol. 2, p. 715)

PETER CARTWRIGHT (Vol. 5, p. 435)

MATTHEW SIMPSON (Vol. 25, p. 135)

DEMETRIUS A. GALLITZIN (Vol. 11, p. 421)

ALEXANDER CAMPBELL (Vol. 5, p. 127)

JOHN WINEBRENNER (Vol. 28, p. 729)

WILLIAM A. MUHLENBERG (Vol. 18, p. 957)
WILLIAM ELLERY CHANNING (Vol. 5, p. 843)
G. W. DOANE (Vol. 8, p. 349)
EDWARD PAYSON (Vol. 21, p. 2)
ADONIRAM JUDSON (Vol. 15, p. 543)
JOHN HUGHES (Vol. 13, p. 860)
ARCHIBALD ALEXANDER (Vol. 1, p. 564)
MOSES STUART (Vol. 25, p. 1048)
NATHANIEL W. TAYLOR (Vol. 26, p. 472)
LEONARD BACON (Vol. 3, p. 152)
JAMES FREEMAN CLARKE (Vol. 6, p. 444)
HENRY WARD BEECHER (Vol. 3, p. 639)
HOSEA BALLOU (Vol. 3, p. 282)
HORACE BUSHNELL (Vol. 4, p. 873)
PHILLIPS BROOKS (Vol. 4, p. 649)
EDWARD EVERETT HALE (Vol. 12, p. 832)
R. S. STORRS (Vol. 25, p. 969)
CHARLES FORCE DEEMS (Vol. 7, p. 921)
EDWARDS AMASA PARK (Vol. 20, p. 825)
DAVID SWING (Vol. 26, p. 237)
MICHAEL AUGUSTINE CORRIGAN (Vol. 7, p. 197)
JAMES GIBBONS (Vol. 11, p. 936)
T. DEWITT TALMAGE (Vol. 26, p. 380)
ISAAC T. HECKER (Vol. 13, p. 194)
ROBERT COLLYER (Vol. 6, p. 694)
HENRY C. MCCOOK (Vol. 17, p. 205)

JOHN FLETCHER HURST (Vol. 13, p. 960)

DWIGHT L. MOODY (Vol. 18, p. 802)

WASHINGTON GLADDEN (Vol. 12, p. 63)

JOHN IRELAND (Vol. 14, p. 742)

JOHN JOSEPH KEANE (Vol. 15, p. 706)

MINOT J. SAVAGE (Vol. 24, p. 239)

REUBEN ARCHER TORREY (Vol. 27, p. 61)

French.

JOHN GERSON (Vol. 11, p. 904)

JOHN CALVIN (Vol. 5, p. 71)

THEODORE BEZA (Vol. 3, p. 839)

ST. FRANCIS OF SALES (Vol. 10, p. 940)

J. B. BOSSUET (Vol. 4, p. 287)

LOUIS BOURDALOUS (Vol. 4, p. 329)

ESPRIT FLÉCHIER (Vol. 10, p. 491)

JULES MASCARON (Vol. 17, p. 836)

JEAN BAPTISTE MASSILLON (Vol. 17, p. 867)

JEAN SIFFREIN MAURY (Vol. 17, p. 915)

These lists could easily be made longer and fuller, but the articles mentioned give such a view of the great preachers of the world as cannot fail to stimulate any minister. Supplementing what has been said above about the necessity of the minister's being a well-rounded man, it may be worth while to notice that Donne and Keble and, in a less degree, Doane and Muhlenberg, were poets as well as preachers; that Cudworth was known as the founder of the Cambridge Platonists, and Jowett as the translator of Plato, Barrow as a mathematician,

second, in his day, only to Isaac Newton, Edward Everett Hale as an essayist and writer of short stories, and McCook as a great naturalist.

The minister will find the Britannica an excellent encyclopaedia of comparative religion and of church history, with the newest and most authoritative information on any subject in this field. For a brief outline course in these topics let him read:

The article RELIGION (Vol. 23, p. 61; equivalent to 50 pages of this Guide), by Dr. Joseph Estlin Carpenter, principal of Manchester College, Oxford, and Robert R. Marett, fellow and tutor of Exeter College, Oxford, author of the *Threshold of Religion* and contributor to the Britannica of articles on PRAYER, RITUAL, etc. This article is made up of: a general introduction sketching the history of the study of religions, especially in the last century, and concluding that "the origin of religion can never be determined archaeologically or historically; it must be sought conjecturally through psychology"; a section on primitive religion, which is a remarkable summary of all that is known of this subject; and a section on the higher religions which discusses developments of animism, transition to polytheism, polytheism, the order of nature (a half-way stage to monotheism), monotheism, classification of religions, revelation, ethics and eschatology and bibliography.

Another class of articles comprises ANCESTOR WORSHIP, ANIMAL WORSHIP, ANIMISM, FETISHISM, FOLKLORE, MAGIC, MYTHOLOGY, PRAYER, RITUAL, SACRIFICE, SERPENT-WORSHIP, TOTEMISM and TREE-WORSHIP, written by such authorities as N. W. Thomas, author of *Kinship and Marriage in Australia*, etc., Andrew Lang, Stanley Arthur Cooke and R. R. Marett.

Certain primitive religions are separately treated, as in the article INDIANS, NORTH AMERICAN (Vol. 14, especially pages 471–473), by A. F. Chamberlain, assistant professor of anthropology, Clark University, Worcester; in the article AUSTRALIA (Vol. 2, especially p. 957); in the article *Hawaii* (Vol. 13, pages 87, 88).

On higher religions there are the following separate articles (among many):

BABYLONIAN AND ASSYRIAN RELIGION, by Morris Jastrow of the University of Pennsylvania; and the articles ANAI, ISHTAR, EA, MARDUK, ASSUR and GILGAMESH,—all by the same author and all of particular value as throwing sidelights on Hebrew Religion.

EGYPT (Vol. 9, pp. 48–56), by Allan H. Gardiner, editor of the *New* (Berlin) *Hieroglyphic Dictionary*.

HEBREW RELIGION (Vol. 13, p. 176; equivalent to 40 pages of this Guide), by Dr. Owen Charles Whitehouse, professor of Hebrew, Cheshunt College, Cambridge; and the articles *Hebrew Literature*, *Jews*, etc.

BRAHMANISM (Vol. 4, p. 381) and HINDUISM (Vol. 13, p. 501), by Julius Eggeling, Professor of Sanskrit, Edinburgh.

BUDDHISM, BUDDHA and LAMAISM, by T. W. Rhys Davids, author of *Buddhist India*, etc.

CONFUCIUS, by James Legge, author of *The Religions of China*.

SIKHISM, by Max Macauliffe, whose book *The Sikh Religion* is accepted by the Sikhs as authoritative.

ZOROASTER, by Karl Geldner, professor at Marburg, and the article PARSEES.

MAHOMMEDAN RELIGION (Vol. 17, p. 417;

equivalent to 45 pages in this Guide), by G. W. Thatcher, warden of Camden College, Sydney.

MAHOMET, by D. S. Margoliouth, Laudian professor of Arabic, Oxford; MAHOMMEDAN INSTITUTIONS and MAHOMMEDAN LAWS, by D. S. Macdonald, professor of Semitic languages, Hartford Theological Seminary.

BÁBIISM, by E. G. Browne, professor of Arabic, Cambridge, and author of *History of the Báb*.

GREEK RELIGION (Vol. 12, p. 527), by L. R. Farnell, fellow of Exeter College, Oxford, author of *Cults of the Greek States*; and such articles as DEMETER, HECATE, HERA, HERMES, HESTIA, NIKE, PHOEBUS, THEMIS and ZEUS.

ROMAN RELIGION (Vol. 23, p. 577), by Cyril Bailey, fellow of Balliol College, Oxford, and author of *The Religion of Ancient Rome*; and such articles as ANNA PERENNA, ARVAL BROTHERS, BONA DEA, CONCORDIA, FAMA, FAUNUS, JUNO and JUPITER; and the valuable articles on Eastern cults in Rome, GREAT MOTHER OF THE GODS, ATTIS, MITHRAS, etc., by Professor Grant Showerman of the University of Wisconsin.

CHRISTIANITY (Vol. 6, p. 280; equivalent to 35 pages of this Guide), by G. W. Knox, professor of philosophy and history of religion, Union Theological Seminary, New York; JESUS CHRIST (Vol. 15, p. 348; equivalent to 35 pages of this Guide), by the Very Rev. Joseph Armitage Robinson, Dean of Westminster; GOSPEL (Vol. 12, p. 265), by Rev. V. H. Stanton, Ely professor of divinity, Cambridge; articles on the separate gospels; PAUL THE APOSTLE (Vol. 20, p. 938), by the Rev. James Vernon Bartlett, professor of church history, Mansfield College, Oxford.

ON CHURCH HISTORY there is an excellent key

article in volume 6 (p. 331; equivalent to 45 pages of this Guide). It begins with an outline of the work of the great church historians and divides the subject into three parts: *first*, up to 590 B.C.,—this part and the general introduction are by A. C. McGiffert, professor of church history in Union Theological Seminary, New York City; *second*, the Church in the Middle Ages, by Albert Hauck, professor of church history at Leipzig; and The Modern Church, by W. Alison Phillips, author of *Modern Europe*. This sketch may be filled in by reference to the following articles (among many):

Abyssinian Church

Armenian Church

Roman Catholic Church

Papacy

Orthodox Eastern Church

Reformation

England, Church of

Ireland, Church of Scotland, Church of

Scotland, Episcopal Church in

Lutherans

Baptists

Presbyterianism

Cameronians

Congregationalism

Methodism

Friends, Society of

Calvinistic Methodists

Disciples of Christ

German Baptist Brethren

Mennonites

Moravian Brethren

Doukhobors

German Catholics

Old Catholics

United Brethren

United Presbyterian Church

A brief course in theology and dogma is contained in the following articles:

Theology (Vol. 26, p. 772; equivalent to 45 pages in this Guide), by the Rev. Dr. Robert Mackintosh of Lancashire Independent College, Manchester.

Atonement

Baptism

Confession

Confirmation

Conversion

Dogmatic Theology

Eschatology

Eucharist

Excommunication

Grace

Immaculate Conception

Infallibility

INSPIRATION

PENANCE

PREDESTINATION

PURGATORY

SIN

TRANSUBSTANTIATION

WORSHIP

On Religious Orders:

ABBEY

FRIARS

MONASTICISM

MONK

NUN

SISTERHOODS

and see also the names of different orders and hundreds of biographical articles on saints and heretics, preachers and theologians.

The following alphabetical list includes only a part of the articles in the Britannica on religious topics; but it will serve to show the value of the book to a clergyman in his own field:

Abbess

Abbey

Abbot

Abbreviators

Abecedarians

Abgar
Ablution
Abrahamites
Absolution
Abstemii
Abyssinian Church
Acephali
Acerra
Acoemeti
Acolyte
Adamites
Adiaphorists
Adoptianism
Advent
Adventists, Second
Advocatus Diaboli
Agape
Agapemonites
Agapetae
Agapetus
Agnoetae
Agnosticism
Agnus Dei
Agrapha
Alb
Albigenses

Allah
All Saints
All Souls Day
Allocution
Almoner
Almuce
Altar
Ambrosians
Ambrosiaster
Amen
Amice
Amora
Ampulla
Anabaptists
Anathema
Angel
Angelus
Anglican Communion
Anglo-Israelite Theory
Annates
Annunciation
Anthropomorphism
Antichrist
Antinomians
Antitype
Apocalypse, Knights of

Apologetics
Apostasy
Apostle
Apostolic Canons
Apostolic Fathers
Apostolical Constitutions
Apostolici
Apotactites
Apotheosis
Aquarii
Arabici
Archbishop
Archdeacon
Arches, Court of
Archimandrite
Archpriest
Aristides, Apology of
Arius
Ark
Armenian Church
Artemon
Asaph
Ascension, Feast of
Asceticism
Ascitans
Ash-Wednesday

Asperges
Assassins
Assumption, Feast of
Asterius of Cappadocia
Atheism
Athos, Mount
Atonement
Attrition
Augsburg, Confession of
Augustinians
Augustinians Canons
Augustinian Hermits
Autocephalous
Auto da Fé
Auxentius of Cappadocia
Azan
Azymites
Bábiism
Babylonian Captivity
Bagimond's Roll
Bairam
Bambino, Il
Bangorian Controversy
Baphomet
Baptism
Baptists

Basel, Confession of
Basel, Council of
Basilian Monks
Beatification
Beguines
Benedictines
Benediction
Benedictus
Bethlehemites
Bible Christians
Bidding-Prayer
Biretta
Bishop
Black Veil
Bogomils
Bollandists
Boy’s Brigade
Breviary
Bridgebuilding Brotherhood
Bridgittines
Brothers of Common Life
Cadi
Calf, The Golden
Calvary
Calvinistic Ministers
Camaldulians

Cameronians
Candlemas
Canon
Canoness
Canon Law
Canonization
Capuchins
Cardinal
Carmathians
Carmelites
Carnival
Carthage, Synods of
Carthusians
Cassock
Catechism
Catechumen
Cathars
Catholic
Catholic Apostolic Church
Celestines
Celibacy
Cenobites
Cerdonians
Chalcedon, Council of
Chaldee
Chalice

Chambre Ardente
Chant
Chantry
Chapel
Chapter
Chaplain
Chasuble
Chiliasm
Chimere
Chrism
Christ
Christadelphians
Christian Catholic Church
Christian Connection
Christian Endeavour Societies
Christianity
Christian Science
Christmas
Church
Church Army
Church Congress
Church History
Churching of Women
Churchwarden
Ciborium
Cistercians

Clares, Poor
Clergy
Clerk
Clementine Literature
Cluny
Cohen
Commendation
Common Order, Book of
Conclave
Concord, Book of
Concordat
Confession
Confessional
Confessor
Confirmation
Confirmation of Bishops
Congregation
Congregationalism
Consistory
Consistory Courts
Constance, Council of
Constantinople, Councils of
Consuetudinary
Convent
Conversion
Convocation

Cope
Copts
Corban
Corporal
Corpus Christi, Feast of
Council
Cowl
Cowley Fathers
Creatianism and Traducianism
Credence
Creeds
Cross and Crucifixion
Crozier
Culdees
Curia Romana
Curate
Cyprus, Church of
Dalmatic
Davidists
Deacon
Deaconess
Dean
Decretals
Dedication
Deism
Dervish

Devil
Didache, The
Diocese
Diognetus, Epistle to
Dionysius Areopagiticus
Diptych
Dirge
Disciples of Christ
Dispensation
Dissenter
Docetae
Dogma
Dogmatic Theology
Dominicans
Donation of Constantine
Donatists
Dort, Synod of
Dossal
Doukhobors
Doxology
Easter
Ebionites
Ecclesiastical Jurisdiction
Ecclesiastical Commissioners
Elder
Elvira, Synod of

Ember Days
Encyclical
Energia
England, Church of
Enthusiasm
Ephesus, Council of
Ephod
Epiphany, Feast of
Episcopacy
Eschatology
Essenes
Establishment
Eucharist
Evangelical Alliance
Evangelical Association
Evangelical Church Conference
Evangelical Union
Exarch
Excommunication
Exorcist
Extreme Unction
Fakir
Faldstool
Familists
Fasting
Fathers of the Church

Feasts and Festivals
Febronianism
Ferrara-Florence, Council of
Flagellants
Font
Franciscans
Frankincense
Fraticelli
Free Baptists, or Freewill Baptists
Free Church of England
Free Church of Scotland
Free Church Federation
Friars
Friends, Society of
Gallicanism
Gaon
German Baptist Brethren, or German Brethren (U. S. A.)
German Catholics
German Evangelical Synod of North America
Ghazi
Giaour
Glasites
Glory
Gnosticism
Golden Rose

Good Friday
Grace
Gradual
Grandmontines
Great Awakening
Gustavus Adolphus Union
Habdala
Haggada
Hagiology
Hajj
Halakha
Halfway Covenant
Halisah
Hallel
Hanukkah
Haptara
Harem
Hebrew Religion
Heidelberg Catechism
Helvetic Confessions
Hemerobaptists
Heresy
Hermas, Shepherd of
Hermeneutics
Hermit
Hesychasts

Hierarchy
Hieronymites
High Place
Hippolytus, The Canons of
Holy
Holy Water
Holy Week
Homiletics
Homily
Hospice
Houri
Hours, Canonical
Housel
Humanitarians
Humiliati
Hussites
Hymns
Hypostasis
Iblis
Icon
Iconoclasts
Ignorantines
Illuminati
Image
Imam
Imitation of Christ, The

Immaculate Conception
Immortality
In Coena Domini
Incumbent
Independents
Index Librorum Prohibitorum
Indulgence
Indult
Infallibility
Innocents' Day
Inquisition, The
Inspiration
Installation
Institutional Church
Interim
Interdict
Investiture
Ireland, Church of
Islam
Jacobite Church
Jansenism
Jehovah
Jerahmeel
Jerusalem, Synod of
Jesuati
Jesuits

Jesus Christ
Jews
Jihad
Jubilee, Year
Jubilee, Year of
Ka'ba
Kabbalah
Kermesse
Keswick Convention
Kismet
Koran
Koreshan Ecclesia, The
Kosher or Kasher
Kyrie
Labour Church, The
Lamb
Lambeth Conferences
Laodicea, Synod of
Lateran Councils
Laud
Lavabo
Lay
Laymen, Houses of
Lazarites
Lazarus, St., Order of
Lection, Lectionary

Lector
Legate
Lent
Libellatici
Liber Diurnus
Liber Pontificalis
Libertines
Lights, Ceremonial use of
Limbus
Limina Apostolorum
Lincoln Judgment, The
Litany
Liturgy
Logia
Low Churchman
Low Sunday
Lutheran
Luther League
Lyons, Councils of
Mahdi
Mahommedan Institutions
Mahommedan Law
Mahommedan Religion
Mandaeans
Manichaeism
Maniple

Manse
Marabout
Marburg, Colloquy of
Marcion and the Marcionite Church
Maronites
Marprelate Controversy
Martyr
Martyrology
Matins
Maundy Thursday
Maurists
Mechitharists
Melchites
Mendicant Movement and Orders
Mennonites
Messiah
Methodism
Methodist New Connexion
Metropolitan
Midrash
Millennium
Minister
Miracle
Miserere
Missal
Missions

Mitre
Moderator
Monarchianism
Monasticism
Monk
Monophysites
Monothelites
Monsignor
Monstrance
Montanism
Moravian Brethren
Mormons
Morse
Mortuary
Mozarab
Muckers
Mufti
Mysticism
Mythology
Nazarenes
Necrology
Neo-Caesarea, Synod of
Neophyte
Nestorians
New Jerusalem Church
New Year’s Day

Nicaea, Councils of
Nîmes, Councils of
Nonconformist
Nosairis
Novice
Nun
Nuncio
Oblation
Oecumenical
Offertory
Official
Old Catholics
Olivetans
Ophites
Oratory
Oratory of St. Philip Neri, Congregation of the
Order, Holy
Orphrey
Orthodox Eastern Church
Pallium or Pall
Palm Sunday
Pantheism
Party Royal
Passion Week
Pastoral Letter
Pastoral Staff

Patarenes
Paten
Patriarch
Patron
Paulicians
Pax
Pectoral
Peculiar
Peculiar People
Pelagius
Penance
Penitential
Penitentiary
Pentecost
Peter’s Pence
Pew
Philadelphians
Phylactery
Piarists
Pietism
Pilgrim
Pilgrimage
Pirke Aboth
Pisa, Council of
Pistoia, Synod of
Plymouth Brethren

Poissy, Colloquy of
Pope
Prayer, Book of Common
Prayers for the Dead
Preaching
Prebendary
Precentor
Preconization
Predestination
Prelate
Premonstratensians
Presbyter
Presbyterianism
Primate
Primitive Methodist Church
Prior
Procession
Procession Path
Prolocutor
Proselyte
Protestant
Protestant Episcopal Church
Protestantenverein
Provision
Purgatory
Purim

Puritanism
Qaraites
Quakers
Quietism
Rabbi
Ramadan
Ranters
Rawendis
Rector
Recusant
Reformed Churches
Reformed Church in America (Dutch)
Reformed Church in U. S. A. (German)
Reformed Episcopal Church
Regium Donum
Regular
Relics
Religion
Remonstrants
Requiem
Reredos
Retable
Reverend
Ritual
River Brethren
Robber, Synod

Rochet
Rogation Days
Roman Catholic Church
Rood
Rosary
Rota, Court of
Rubric
Rum
Sabbation
Sabians
Sacerdotalism
Sacrament
Sacramentals
Sacramentarians
Sacrarium
Sacred Heart
Saint John of Jerusalem
Salvation Army
Saragossa, Councils of
Sardica, Council of
Schism
Scillitan Martyrs
Scotland, Church of
Scotland, Episcopal Church in
Sect
Secular

See
Sepulchre, Canons Regular of the Holy
Servites
Sexton
Shakers
Shiites
Shrine
Shrove Tuesday
Silvestrines
Sin
Sion College
Sisterhoods
Skoptsi
Soutane
Spanish Reformed Church
Sponsor
Stations of the Cross
Stigmatization
Stole
Suffragan
Sufiism
Sunnites
Supererogation
Superintendent
Surplice
Syllabus

Symbol
Synagogue
Synagogue, United
Synazarium
Syncellus
Synedrium
Synod
Talmud
Tanna
Targum
Templars
Tenebræ
Tertiaries
Testamentum Domini
Tetragrammaton
Teutonic Order
Theism
Theocracy
Theology
Theosophy
Therapeutae
Thurible
Tiara
Tithes
Toledo, Councils of
Tonsure

Transubstantiation
Trappists
Trent, Council of
Trinitarians
Trinity Sunday
Tunicle
Ulema
Ultramontanism
Unction
Unitarianism
United Brethren in Christ
United Free Church of Scotland
United Methodist Church
United Methodist Free Churches
United Presbyterian Church
Universalist Church
Ursulines
Vallombrosians
Vatican, Council of
Venerable
Verger
Vespers
Vestments
Viaticum
Vicar
Vienne, Council of

Vigil

Wahhabis

Waldenses

Wesleyan Methodist Church

Westminister Synods

Whitsunday, or Pentecost

Worship

Yezidis

Young Men's Christian Association

Zenana

CHAPTER XXV
FOR PHYSICIANS, SURGEONS AND DENTISTS

The Britannica adds so largely to medical literature that, in outlining the services which the work can render to those engaged in the prevention and treatment of disease, it is desirable to define the limits, rather than to insist upon the extent, of the plan adopted by the technical assistant editors to whom the Editor-in-chief entrusted the control of this important part of the undertaking. It is true that the 644 medical articles, many of which might be described as books in themselves, cover the whole field of anatomy, physiology, pathology, therapeutics, surgery, pharmacology, medical education, medical jurisprudence and medical

biography. It is also true that the writers who sign these articles are specialists of world-wide authority, and that the total number of words and illustrations in these articles is as great as would be required for a complete encyclopaedic hand-book of medical science. But, notwithstanding all this wealth of matter and of international collaboration, the Britannica does not profess to take the place of the elementary working library in daily use by every professional man. “Working library” is, however, an elastic term, and it is used here to mean only the handbooks which constitute an irreducible minimum, the few without which no beginner would venture to establish himself in practice. Certain manuals are, to the practitioner, what mathematical tables are to the engineer; and it is not the function of the Britannica to duplicate what the practitioner already possesses, nor yet, for example, to include a pharmacopoeia in a book used by the general public.

The Encyclopaedic Method

On the other hand, no professional man restricts himself a day longer than he must to the bare modicum of medical literature with which he may have been forced, at first, to do his best; and when he can add *anything* to it, there is nothing he will use so often, or find so helpful, as the Britannica. It may be well to define in general, its professional uses, before dealing in detail with the articles included in this course of reading.

(1) The system of technical collaboration is, in the Britannica, organized and coördinated with a completeness which gives the medical articles an authority and impartiality often lacking in isolated treatises. The contributors were selected with a view

to their recognized ability only, whereas the publication of medical works is too often an outcome of the writer's ambitions, which, however legitimate they may be, are no proof of his capacity.

(2) The Britannica articles were written for the sole purpose of being used in their present form. A great part of current medical literature originates in lectures to students, and retains too much of its first form to be satisfactory to the professional man.

(3) The articles are all based upon an original and recent survey of knowledge, and thus contain information which cannot be found in reprints of standard medical works insufficiently brought up to date by additions to earlier editions.

(4) In relation to statistics, to administrative and legislative provisions regarding public health, to hospitals and other public institutions, the broadly international character of the Britannica, with its contributions from twenty different countries, gives a scope which the private writer cannot attain.

(5) The great number of biographies of physicians, surgeons and men who devote themselves exclusively to research, gives professional men access to information which they cannot elsewhere obtain.

(6) Chemistry, bacteriology, general biology, botany, psychology and other sciences allied to the more immediate field of medicine are fully treated by specialists of the highest authority.

(7) Apart from the definite occupational diseases (fully discussed in the Britannica), there is often a relation between the pathological results of overwork and the routine of the patient's business life. Every branch of industry and commerce is treated in detail in the Britannica, and the insight which the physician may thus gain will often be of service to

him.

(8) The Britannica not only enlarges the medical library of the practitioner, but gives him, and the members of his family, the use of *the only complete library of general information*.

Scope of the Medical Section

Specifically, the medical and surgical section of the Britannica comprises 3 general articles, constituting broad systematic surveys of the various provinces of the subject: 103 articles on anatomy and physiology, which are partly surgical; 265 articles on pathology; 75 on pharmacology; 21 on public health, in addition to the articles on dentistry and on veterinary science, and 170 biographies. But this comprehensive scheme does not by any means include all the material of value to the medical man. The sister sciences of chemistry, physics, biology, botany, zoology and psychology, have much to offer him. A consultation of the list appended to this section will show how the needs of the physician and surgeon are served by the Encyclopaedia. It must suffice here to call attention briefly to some of the more important contributions.

Taking up, first, the more general articles, there is MEDICINE (Vol. 18, p. 41) containing about 35,000 words. This deals with the history and development of the science. Dr. J. F. Payne of the Royal College of Physicians, London, traces its history from the earliest known times to the middle of the 19th century; and Sir T. C. Allbutt, professor of physic in Cambridge University, completes this review with a section on *Modern Progress* (p. 55). Of high practical value is MEDICAL JURISPRUDENCE or FORENSIC MEDICINE (Vol. 16, p. 25), by H. H. Littlejohn, professor of forensic medicine, University of

Edinburgh, and T. A. Ingram. This deals solely with that branch of the science which has to do with the application of medical knowledge to certain questions of civil and criminal law. There are discussions of questions affecting the civil or social rights of individuals, and injuries to the person, the function of the physician in questions of mutilation, homicide, infanticide, poisoning, etc. MEDICAL EDUCATION (Vol. 18, p. 23) is a useful reference article by Sir John Batty Tuke, Dr. W. H. Howell, dean of the medical faculty, Johns Hopkins University, and Dr. H. L. Hennessy, furnishing data on the educational qualifications necessary to the practice of medicine in Europe and America.

Anatomy, Embryology, and Physiology

Dr. Frederick G. Parsons, vice-president of the Anatomical Society of Great Britain and Ireland, lecturer on Anatomy at St. Thomas's Hospital, London, contributes the general article ANATOMY (Vol. 1, p. 920) which goes deeply into its history, and has further sections on *Modern Human Anatomy* (Anthropotomy) and *Anatomy, Superficial* and *Artistic*. This noted authority also writes detailed and fully illustrated articles on the anatomy and embryology of the BRAIN (Vol. 4, p. 392); HEART (Vol. 13, p. 129); EYE (Vol. 10, p. 91); EAR (Vol. 8, 791); OLFACTORY SYSTEM (Vol. 20, p. 77); LYMPHATIC SYSTEM (Vol. 17, p. 166); VASCULAR SYSTEM (Vol. 27, p. 926); NERVOUS SYSTEM (Vol. 19, p. 400); MUSCULAR SYSTEM (Vol. 19, p. 51); REPRODUCTIVE SYSTEM (Vol. 23, p. 129); and RESPIRATORY SYSTEM (Vol. 23, p. 184) and on the SKELETON (Vol. 25, p. 169); SKIN AND EXOSKELETON (Vol. 25, p. 188);

SKULL (Vol. 25, p. 196); JOINTS (Vol. 15, p. 483); and NERVE (Vol. 19, p. 394). Another valuable anatomical article is CONNECTIVE TISSUES (Vol. 6, p. 958), by Dr. T. G. Brodie of the University of Toronto. Prof. Adam Sedgwick writes a most excellent general and historical account of EMBRYOLOGY (Vol. 9, p. 314); and Dr. Hans A. E. Driesch of Heidelberg University adds to it a section *Physiology of Development* (p. 329), treating of the laws that govern the development of the organism. The general article PHYSIOLOGY (Vol. 21, p. 554) is from the pen of the celebrated Prof. Max Verworn of the University of Bonn, and to this there are closely linked, according to the new plan of the Britannica, extensive and detailed accounts of the physiology of the BRAIN (Vol. 4, p. 403); SYMPATHETIC SYSTEM (Vol. 26, p. 287); SPINAL CORD (Vol. 25, p. 672); MUSCLE AND NERVE (Vol. 19, p. 44); RESPIRATORY SYSTEM (Vol. 23, p. 187); VASCULAR SYSTEM (Vol. 27, p. 929); ALIMENTARY CANAL (Vol. 1, p. 663); BLOOD (Vol. 4, p. 77), etc., by noted specialists, including Dr. Charles S. Sherrington, professor of physiology in the University of Liverpool, Dr. J. S. Haldane of Oxford University, Dr. L. E. Hill, lecturer on physiology at the London Hospital, Dr. P. Chalmers Mitchell, and Dr. T. G. Brodie of the University of Toronto.

Articles on Pathology

Drs. D. J. Hamilton and Richard Muir are the authors of a brilliant summary of the whole subject of PATHOLOGY (Vol. 20, p. 913) with over 50 illustrations, including coloured plates. The whole story of the elevation of the science dealing with the theory and causation of disease from a mere

philosophical abstraction to one of the natural sciences is admirably told. For the pathological details of various diseases and groups of diseases the reader is referred to PARASITIC DISEASES (Vol. 20, p. 770), fully illustrated, by Dr. G. Sims Woodhead, professor of pathology, Cambridge University, one of the notable contributions to the Britannica; METABOLIC DISEASES (Vol. 18, p. 195), by Prof. D. N. Paton of Edinburgh University; DIGESTIVE ORGANS, *Pathology* (Vol. 8, p. 262) by Dr. A. L. Gillespie of Edinburgh and M. Fisher; KIDNEY DISEASES (Vol. 15, p. 784), by Dr. J. R. Bradford of University College Hospital, London, and Dr. Edmund Owen, the famous English surgeon; BLADDER AND PROSTATE DISEASES (Vol. 4, p. 27); VENEREAL DISEASES (Vol. 27, p. 983)—these two also by Dr. Owen; SKIN DISEASES (Vol. 25, p. 190); INSANITY (Vol. 14, p. 597), by Sir John Batty Tuke, president of the Neurological Society of the United Kingdom, and medical director of the New Staughton Hall Asylum, Edinburgh, Dr. J. Macpherson, and Dr. L. C. Bruce, author of *Studies in Clinical Psychiatry*,—for this article the noted American specialist Dr. Frederick Peterson has written a section on *Hospital Treatment* of the insane; NEUROPATHOLOGY (Vol. 19, p. 429), fully illustrated, by Dr. F. W. Mott, the distinguished pathologist to the London County Asylums, and editor of the *Archives of Neurology*; RESPIRATORY SYSTEM, *Pathology* (Vol. 23, p. 195), by Dr. Thomas Harris, author of numerous articles on this subject, and Dr. H. L. Hennessy; BLOOD, *Pathology* (Vol. 4, p. 82), by Dr. G. L. Gulland of Edinburgh; HEART, DISEASE (Vol. 13, p. 132), by Sir J. F. H. Broadbent, author of *Heart Disease and Aneurysm*, etc.; EYE, *Diseases* (Vol. 10, p. 94), by Dr. George A. Berry, hon. surgeon oculist to his Majesty

George V; VISION, *Errors of Refraction and Accommodation* (Vol. 28, p. 142), by Dr. Ernest Clark of the Central London Ophthalmic Hospital; EAR, *Diseases of* (Vol. 8, p. 794), by Dr. E. C. Baber, late senior surgeon, Brighton and Sussex Throat and Ear Hospital.

Dr. Harriet L. Hennessy is the author of GYNAECOLOGY (Vol. 12, p. 764).

For more specific details there is the complete list of articles on different diseases and ailments under their common names. This includes veterinary diseases, to which branch of medicine an admirable introduction is furnished by VETERINARY SCIENCE (Vol. 28, p. 2), by Drs. George Fleming and James MacQueen. In the articles on diseases there will be found accounts of the latest methods of diagnosis and treatment, as, for example, the Calmette eye-test in tubercular diseases, serum treatment and its latest developments, vaccine therapy, etc.

Therapeutics

The general article THERAPEUTICS (Vol. 26, p. 793), by Dr. Sir Lauder Brunton, consulting physician to St. Bartholomew's Hospital, London, author of *Modern Therapeutics*, etc., not only discusses both rational and empirical therapeutics, but, taking up the different parts of the body considers in detail the therapeutic measures most commonly employed in the treatment of disease. The subjects of ELECTROTHERAPEUTICS (Vol. 9, p. 249); BATHS (Vol. 3, p. 514); BALNEOTHERAPEUTICS (Vol. 3, p. 284); HYDROPATHY (Vol. 14, p. 165); AEROTHERAPEUTICS (Vol. 1, p. 270); MASSAGE (Vol. 17, p. 863) and X-RAY TREATMENT (Vol. 28, p. 887) have separate articles devoted to them. The last is by Dr. H. L. Jones, clinical lecturer on medical electricity at St.

Bartholomew's Hospital, London.

In connection with the subject of therapeutics, mention must be made of PHARMACOLOGY (Vol. 21, p. 347), by Professor Stockman of the University of Glasgow, in which will be found an interesting history of drugs, and a classification into 28 groups with a description of the effect of each remedy. To this valuable material Dr. H. L. Hennessy has added a section, *Terminology in Therapeutics* (p. 352)—a general explanation of the common names used in the classification of drugs. The list at the end of this chapter indicates the separate articles on drugs and on materials from which the principal drugs are obtained.

Surgery

Dr. Charles Creighton of King's College, Cambridge, writes on the history of SURGERY (Vol. 26, p. 125) and the famous English Surgeon, Dr. Edmund Owen the section *Modern Practice of Surgery* (p. 129) in which are discussed antiseptic and aseptic surgery, drainage tubes, bloodless operations, Röntgen rays, use of radium, etc. The article SURGICAL INSTRUMENTS AND APPLIANCES (Vol. 26, p. 132) is fully illustrated. Dr. Owen also contributes articles on the surgery of the different organs, the article BONE, *Diseases and Injuries* (Vol. 4, p. 200) and many accounts of diseases and disorders that come within the province of the surgeon, such as APPENDICITIS (Vol. 2, p. 217); PERITONITIS (Vol. 21, p. 171); HERNIA (Vol. 13, p. 372); FISTULA (Vol. 10, p. 438); VARICOSE VEINS (Vol. 27, p. 920), and HAEMORRHOIDS (Vol. 12, p. 805). Sir Alexander R. Simpson, emeritus professor of midwifery and the diseases of women and children, University of Edinburgh, writes on OBSTETRICS (Vol. 19, p. 962);

Dr. Louis Courtauld, formerly research scholar, Middlesex Hospital Cancer Laboratories, on TUMOUR (Vol. 27, p. 370); Dr. Arthur Shadwell, of the Epidemiological Society, on CANCER, with a special account of cancer research; and H. C. Crouch, teacher of anaesthetics at St. Thomas's Hospital, London, on ANAESTHESIA AND ANAESTHETICS (Vol. 1, p. 907).

Medical Biographies

A most interesting, unusual and instructive course of reading on the history and development of medicine may be based on the biographical articles alone. In AESCULAPIUS (Vol. 1, p. 276) we learn how the gods of Greece effected cures. The life story of HIPPOCRATES (Vol. 13, p. 518) is worthy of note, for the "medical art as we now practice it, the character of the physician as we now understand it," both date from him. For information about the theory that disease originated from an irregular or inharmonious motion of the body corpuscles we turn to ASCLEPIADES (Vol. 2, p. 722). An account of the man "out of whom the greater part of medicine has flowed" is found in GALEN (Vol. 11, p. 398). The biography of the great Arab physician and philosopher AVICENNA (Vol. 3, p. 62) should not be overlooked, nor the story of the revolt of PARACELSUS (Vol. 20, p. 749). Important and interesting, too, are the biographies of HARVEY, WILLIAM (Vol. 13, p. 42); SYDENHAM, THOMAS (Vol. 26, p. 277), the father of English medicine, and HALLER, A. VON (Vol. 12, p. 855), whose work marks the beginning of modern physiology. The work of MORGAGNI (Vol. 18, p. 831) in pathological anatomy marks an epoch in medicine, and the description in

CULLEN, WILLIAM (Vol. 7, p. 616) of his new doctrine of "irritability" possesses a distinct interest. The accounts of JENNER, EDWARD (Vol. 15, p. 319), HUNTER, JOHN (Vol. 13, p. 939) and HAHNEMANN, S.C.F. (Vol. 12, p. 819) describe momentous events in the history of medicine at the close of the 18th century, while among the great names of the 19th will be found the chemist PASTEUR (Vol. 20, p. 892), KOCH, ROBERT (Vol. 15, p. 885), LISTER (Vol. 16, p. 777) and VIRCHOW, RUDOLF (Vol. 28, p. 110).

The Allied Sciences

It has already been noted that the Britannica will prove an invaluable help to medical specialists in fields of knowledge other than their own. The regret is often expressed by physicians that it is not easy for them to study subjects outside their profession, even when these are closely connected with their work. It is, unfortunately, only too true, that material for such study is not readily available. But with so complete a work of reference at his disposal, and with its highly authentic information skillfully compressed into reasonable space, the medical man now enjoys a magnificent opportunity to obtain a full acquaintance with many subjects that he knows will assist him in the work.

It would be impossible to name all the articles here, but the alphabetical list at the end of this chapter includes them, and the attention of the physician and surgeon is directed to BACTERIOLOGY (Vol. 3, p. 156), by the late Prof. H. M. Ward of Cambridge and Prof. V. H. Blackman of the University of Leeds, and especially the section *Pathological Importance* (p. 171), which Prof. Robert Muir of Glasgow University has written; BIOLOGY

(Vol. 3, p. 954), a classic article by the late Professor Huxley, revised and brought up-to-date by Dr. P. Chalmers Mitchell; HEREDITY (Vol. 13, p. 350), also by Dr. Mitchell; MENDELISM (Vol. 18, p. 115), a brilliant study of the foundations of an exact knowledge of the physiological process of heredity, by Prof. R. C. Punnett of Cambridge; EVOLUTION (Vol. 10, p. 22) and LONGEVITY (Vol. 16, p. 974), both by Dr. Mitchell; NUTRITION (Vol. 19, p. 921), by Prof. D. N. Paton and Dr. E. P. Cathcart of Glasgow University; DIETETICS (Vol. 8, p. 214), by the world-famous authority on this subject, the late Prof. W. O. Atwater, and R. D. Milner, formerly of the U. S. Dept, of Agriculture; VEGETARIANISM (Vol. 27, p. 967), by Dr. Josiah Oldfield, senior physician to the Lady Margaret Fruitarian Hospital, Bromley; CLIMATE *in the Treatment of Disease* (Vol. 6, p. 526); ACCLIMATIZATION (Vol. 1, p. 114), by the renowned scientist, Dr. A. Russel Wallace; a very complete and up-to-date article on VIVISECTION (Vol. 28, p. 153), by Dr. Stephen Paget; PSYCHOLOGY (Vol. 22, p. 547), by Prof. James Ward of Cambridge; PSYCHICAL RESEARCH (Vol. 22, p. 544), by Andrew Lang, which is the key to a series of 25 remarkably interesting articles covering the entire subject; HYPNOTISM (Vol. 14, p. 201); FAITH HEALING (Vol. 10, p. 135); SUGGESTION (Vol. 26, p. 48); PHRENOLOGY (Vol. 21, p. 534), by Professor Macalister of Cambridge; TEMPERANCE (Vol. 26, p. 578), by Dr. Arthur Shadwell; MICROSCOPE (Vol. 18, p. 392); BLINDNESS, *Causes and Prevention* (Vol. 4, p. 60), by Sir Francis J. Cambell, principal Royal Normal College for the Blind, London; DEAF AND DUMB (Vol. 7, p. 880), by Rev. A. H. Payne, formerly of the National Deaf Mute College, Washington.

The subject of DENTISTRY (Vol. 8, p. 50) is covered

by the highest American authority, Dr. Edward C. Kirk, of the University of Pennsylvania, and a full account of the anatomy of the teeth will be found under TEETH (Vol. 26, p. 499), by Dr. F. G. Parsons. It is, however, in connection with bacteriology, chemistry, metallurgy, mechanics and other subjects with which the dentist is concerned, rather than in connection with the technics of his profession, that he will desire to make use of the Britannica.

ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST AND IMPORTANCE TO MEMBERS OF THE MEDICAL PROFESSION

Abano, Pietro d'.

Abattoir

Abdomen

Abercrombie, J.

Abercromby, D.

Abercromby, P.

Abernethy, J.

Abortion

Abscess

Abscission

Abu-l-qasim

Acclimatization

Acetic Acid

Ackermann, J. C. G.

Acland, Sir H. W.
Acne
Aconite
Acromegaly
Acron
Actinomycosis
Acupressure
Acupuncture
Adam’s Apple
Addison’s Disease
Adenoids
Adolescence
Adulteration
Aegineta, Paulus
Aerotherapeutics
Aesculapius
Aetius
Agnew, David Hayes
Ague
Ala
Albumin, or Albumen
Albuminuria
Alcohol
Aldehydes
Alexander of Tralles
Alienist

Alimentary Canal
Aloe
Alum
Amaurosis
Ambulance
Amman, J. C.
Amman, Paul
Ammonia
Amuck, Running
Amyl Nitrite
Anabolism
Anaemia
Anaesthesia and Anaesthetics
Anatomy
Anderson, Elizabeth G.
Anel, Dominique
Aneurysm, or Aneurism
Angina Pectoris
Animal Heat
Anise
Ankle
Ankylosis
Ankylostomiasis
Anodyne
Anthrax
Antipyrine

Antiseptics
Aphasia
Aphemia
Apnoea
Aponeurosis
Apophysis
Apoplexy
Apothecary
Appendicitis
Apyrexia
Araroba Powder
Aretaeus
Arm
Arnica
Arnott, Neil
Arrowroot
Arsenic
Arteries
Arthritis
Articulation
Arytenoid
Asafetida
Ascites
Asclepiades
Aselli, or Asselio, Gasparo
Asphyxia

Asthma
Astruc, Jean
Athetosis
Athletic Sports
Atrophy
Aurelianus Caelius
Auscultation
Autopsy
Avenzoar
Baby-farming
Bacteriology
Baldinger, E. G.
Baldness
Balneotherapeutics
Balsam
Barthez, P. J.
Bartholinus, Gaspard
Baths
Beddoes, Thomas
Bedlam, or Bethelem Hospital
Bedsore
Bell, Sir Charles
Bell, John
Belladonna
Bellini, Lorenzo
Bence-Jones, Henry

Bennett, John Hughes
Benzoic Acid
Benzoin
Beri-Beri
Bernard, Claude
Bert, P.
Bhang
Bibirine
Bichat, M. F. X.
Bilharziosis
Billroth, A. C. T.
Biology
Bismuth
Blackwater Fever
Bladder
Bladder and Prostate Diseases
Blane, Sir Gilbert
Blindness
Blister
Blood
Blood-letting
Boerhaave, Hermann
Boil
Bone
Borax
Borelli, G. A.

Boric, or Boracic Acid
Bow-leg
Boyer, Alexis
Brain
Brasdor, Pierre
Breast
Bright's Disease
Brocklesby, Richard
Brodie, Sir B. C.
Bromine
Bronchiectasis
Bronchitis
Bronchotomy
Broussais, F. J. V.
Brown, John
Brown-Séquard, C. E.
Bunion
Burdon-Sanderson, Sir John S.
Burns and Scalds
Busk, George
Cabanis, P. J. G.
Caesarean Section
Caffeine
Caisson Disease
Cajuput Oil
Calabar Bean

Caldani, L. M. A.
Calomel
Camphors
Cancer, or Carcinoma
Cantharides
Capsicum
Carbolic Acid, or Phenol
Carbonic Acid
Carbuncle
Cartilage
Carus, K. G.
Castor Oil
Catabolism
Catalepsy
Catarrh
Catechu
Caul
Caustic
Cephalic Index
Chadwick, Sir Edwin
Chamomile
Charcot, Jean Martin
Charity and Charities
Chemistry
Cheselden, William
Chicken-pox

Chilblains
Chirurgeon
Chloral
Chlorates
Chloroform
Cholera
Christison, Sir Robert
Cinchona
Clark, Sir Andrew
Clark, Sir James
Clay, Charles
Cleft Palate and Hare-Lip
Climacteric
Climate
Clinic
Clot, A. B.
Club-foot
Coal-tar
Coca, or Cuca
Cocaine
Cock, Edward
Cod-Liver Oil
Coelom and Serous Membranes
Colchicum
Colic
Collodion

Colon
Colt’s Foot
Coma
Combe, Andrew
Connective Tissues
Connor, Bernard
Conolly, John
Constipation
Convulsions
Cooper, Sir Astley P.
Copaiba
Corn
Cornaro, Luigi
Coroner
Corpulence
Corrosive Sublimate
Craniometry
Cramp
Crèche
Cremation
Creosote
Cretinism
Croton Oil
Croup
Cruveilhier, Jean
Cubebs

Cullen, William
Cupping
Curling, T. B.
Dandelion
Death
Delirium
Dengue
Dentistry
Desault, P. J.
Dextrine
Diabetes
Diaphoretics
Diaphragm
Diarrhoea
Dietary
Dietetics
Digestive Organs
Digitalis
Dilatation
Dill
Diphtheria
Dipsomania
Disinfectants
Diuretics
Dropsy
Drowning and Life Saving

Drug
Drunkenness
DuBois-Reymond, Emil
Duchenne, G. B. A.
Ductless Glands
Dupuytren, G., baron
Dwarf
Dysentery
Dyspepsia
Ear
Eczema
Elaterium
Elbow
Electrocution
Electrotherapeutics
Elephantiasis
Elixir
Elliotson, John
Embalming
Embryology
Emetics
Emphysema
Empyema
Enteritis
Epilepsy
Epistaxis

Epithelial, Endothelial and Glandular Tissues
Epsom Salts
Equilibrium
Ergot, or Spurred Rye
Erichsen, Sir John E.
Erysipelas
Esmarch, J. F. A. von
Esquirol, J. E. D.
Ether
Ethyl Chloride
Ettmüller, Michael
Eucalyptus
Eugenics
Eugenol
Euphorbium
Evolution
Excretion
Extract
Eye
Fabricius, Hieronymus
Face
Faith Healing
Fallopius, or Fallopio, Gabriello
Fusel Oil
Fauces
Favus

Fayrer, Sir Joseph
Fergusson, Sir William
Fermentation
Fernel, Jean François
Feuchtersleben, E. von
Fever
Fibrin
Filariasis
Finger
Fistula
Flint, Austin
Floyer, Sir John
Food
Foot
Foot-and-mouth Disease
Forbes, Sir John
Formalin, or Formaldehyde
Formic Acid
Forster, John C.
Foster, Sir Michael
Fothergill, John
Foundling Hospitals
Fracastoro, Girolamo
Freind, John
Friendly Societies
Frostbite

Fructose, or Fruit Sugar
Fumigation
Galangal
Galbanum
Galen
Gall
Gallic Acid
Galvani, Luigi
Gamboge
Gangrene
Gastric Ulcer
Gastritis
Gelsemium
Giant
Ginseng
Glanders, or Farcy
Glauber’s Salt
Glycerin, or Glycerol
Goitre
Good, John Mason
Goodsir, John
Gout
Gräfe, Albrecht von
Gräfe, K. F. von
Graham, Sylvester
Guaco, Huaco, or Guao

Guaiacum
Guarana
Guinea-worm
Gull, Sir William W.
Gymnastics
Gynaecology
Haematocele
Haemophilia
Haemorrhage
Haemorrhoids
Hahnemann, S. C. F.
Hall, Marshall
Haller, Albrecht von
Hallucination
Hammer-toe
Hand
Hart, Earnest Abraham
Hartshorn, Spirits of
Harvey, William
Hashish
Hawkins, Caesar Henry
Hay Fever
Head
Health
Heart
Heberden, William

Heel
Henle, F. G. J.
Hernia
Herpes
Hewett, Sir Prescott G.
Hilton, John
Hinton, James
Hip
Hippocrates
Hippuric Acid
Hoffmann, Friedrich
Holland, Sir Henry
Homoeopathy
Hop
Horehound
Hospital
Hufeland, C. W.
Humane Society, Royal
Hunger and Thirst
Hunter, John
Hunter, William
Hutchinson, Sir J.
Hydrastine
Hydrocele
Hydrocephalus
Hydrochloric Acid

Hydropathy
Hydrophobia, or Rabies
Hygiene
Hypertrophy
Hypnotism
Hypochondriasis
Hysteria
Iatrochemistry
Ibn Usaibi'a
Icthyosis
Illegitimacy
Imbecile
Incubation and Incubators
Infancy
Influenza
Insanity
Insomnia
Intestinal Obstruction
Intestine
Intoxication
Iodine
Iodoform
Ipecacuanha
Iron
Israeli, Isaac ben Solomon
Jaborandi

Jalap
Jaundice
Jaw
Jenner, Edward
Jenner, Sir William
Joints
Kala-Azar
Kámalá
Kidney Diseases
Kino
Kitazato, Shibasaburo
Knee
Koch, Robert
Kousso
Lactic Acid
Langenbeck, B. R. K. von
Lanolin
Largus, Scribonius
Laryngitis
Laudanum
Lead Poisoning
Leg
Leontiasis Ossea
Leprosy
Lethargy
Lichen

Life
Ligament
Linacre, or Lynaker, Thomas
Ling, Per Henrik
Linseed
Lip
Liquorice
Lister, Joseph Lister, Baron
Liston, Robert
Lithium
Litmus
Liver
Lobe
Lobelia
Locomotor Ataxia
Longevity
Lumbago
Lung
Lupus
Lycanthropy
Lymphatic System
Lymph and Lymph Formation
MacCormac, Sir William
Mackenzie, Sir Morell
Magnesium
Malaria

Malta, or Mediterranean, Fever
Mammary Gland
Marshall, John
Massage
Matrix
Mead, Richard
Measles
Medical Education
Medical Jurisprudence
Medicine
Mendelism
Ménière's Disease
Meningitis
Mercury
Mesmer, F. A.
Metabolic Diseases
Metabolism
Microscope
Midwife
Milk
Mineral Waters
Mitchell, Silas Weir
Monster
Morphine
Mortification
Mott, Valentine

Mouth and Salivary Glands
Mumps
Murrain
Muscle and Nerve
Muscular System
Mushroom
Mustard
Mutilation
Myelitis
Myxoedema
Naevus
Narcotics
Navel
Necrosis
Nepenthes
Nerve
Nervous System
Nettlerash, or Urticaria
Neuralgia
Neurasthenia
Neuritis
Neuropathology
Nicotine
Nightingale, Florence
Nitroglycerin
Nose

Nosology
Nostalgia
Nursing
Nutrition
Nux Vomica
Obstetrics
Oesophagus
Officinal
Oils
Old-age Pensions
Olfactory System
Ophthalmology
Opium
Orfila, M. J. B.
Osteology
Ovariotomy
Oxalic Acid
Oxygen
Ozone
Paget, Sir James
Pain
Palate
Pancreas
Paracelsus
Paraldehyde
Paralysis, or Palsy

Paranoia
Parasitic Diseases
Parasitism
Paré, Ambroise
Pasteur, Louis
Pathology
Pediculosis, or Phthiriasis
Pellagra
Pelvis
Pemphigus
Pennyroyal
Pepper, William
Peppermint
Pepsin
Peritonitis
Perspiration
Phagocytosis
Pharmacology
Pharmacopoeia
Pharmacy
Pharyngitis
Pharynx
Phenacetin
Phlebitis
Phosphorus
Phrenology

Phthisis
Physiology
Picrotoxin
Pinel, Philippe
Pinto
Piperazin
Pitcairne, Archibald
Pityriasis Versicolor
Placenta
Plague
Pleurisy, or Pleuritis
Pleuro-pneumonia, or Lung-plague
Pneumonia
Podophyllin
Poison
Polypus
Possession
Potassium
Pott, Percivall
Poultice
Pringle, Sir John
Prognosis
Protoplasm
Pruritus
Prussic Acid
Psoriasis

Psorospermiasis
Psychical Research
Psychology
Ptomaine Poisoning
Puberty
Public Health, Law of
Puerperal Fever
Pulse
Purpura
Pyrocatechin
Quain, Sir Richard
Quarantine
Quassia
Quinine
Quinsy
Radcliffe, John
Radioactivity
Radium
Raynaud’s Disease
Relapsing Fever
Reproductive System
Resorcin
Respiratory System
Rhamnus Purshiana
Rhatany, or Krameria Root
Rheumatism

Rheumatoid Arthritis
Rhubarb
Rickets
Rinderpest
Ringworm
Rokitansky, C. von
Röntgen Rays
Rush, Benjamin
Saccharin
St. Vitus Dance, or Chorea
Sal-ammoniac
Salep
Salicin, Salicinum
Salicylic Acid
Salt
Sanatorium
Sandalwood
Sandarach
Santonin
Sarsaparilla
Savory, Sir William S.
Scabies, or Itch
Scalp
Scarlet Fever, or Scarlatina
Sciatica
Scrofula, or Struma

Scurvy, or Scorbutus
Sea-sickness
Seborrhoea
Semmelweiss, I. P.
Senega
Senna
Sepsis
Serenus, Sammonicus
Sewerage
Shock, or Collapse
Shoulder
Sibbald, Sir Robert
Simon, Sir John
Simpson, Sir James Y.
Sinew
Skeleton
Skin and Exoskeleton
Skin Diseases
Skull
Slaughter-house
Sleep
Sleeping-sickness
Sloane, Sir Hans
Smallpox
Smith, T. S.
Sneezing

Sodium
Somnambulism
Soranus
Spikenard, or Nard
Spinal Cord
Spirits
Spleen
Sprue
Squill
Stammering, or Stuttering
Starvation
Stethoscope
Stomach
Stramonium
Strophanthus
Strychnine
Sugar
Suggestion
Suicide
Sulphonal
Sulphur
Sumbul, or Sumbal
Sunstroke
Supra-renal Extract
Surgery
Surgical Instruments and Appliances

Sweating-sickness
Sweetbread
Sydenham, Thomas
Syme, James
Sympathetic System
Syncope
Tagliacozzi, Gasparo
Tannic Acid
Tapeworms
Tar
Taraxacum
Tartar
Tartaric Acid
Teeth
Temperance
Terpenes
Tetanus
Therapeutics
Thompson, Sir Henry
Thorax
Throat
Thymol
Thyroid
Tincture
Tongue
Tonsillitis

Toxicology
Tracheotomy
Trachoma
Trance
Trichinosis
Tuberculosis
Tumour
Typhoid Fever
Typhus Fever
Ulcer
Upas
Urea
Urethane
Uric Acid
Urinary System
Urotropin
Vaccination
Valerian
Variation and Selection
Varicose Veins
Vascular System
Vaseline
Vegetarianism
Veins
Venereal Diseases
Verdigris

Veronal
Veterinary Science
Viburnum
Vivisection
Voice
Wakley, Thomas
Wart
Water-supply
Weights and Measures
Wells, Sir Thomas S.
Whitlow
Whooping-cough
Willis, Thomas
Wilson, Sir W. J. E.
Windpipe
Wine
Wintergreen
Witch-hazel
Wound
Wrist
Wry-neck
X-Ray Treatment
Yaws
Yellow Fever
Zinc
Zymotic Diseases

CHAPTER XXVI
FOR LAWYERS

In the days when Marshall and Story, on the bench of the Supreme Court at Washington, were listening to Webster's thunder; when Chancellor Kent was scrutinizing precedents in New York, and Rufus Choate quoting Justinian at Salem, success at the bar depended upon elaborate rhetoric and a close study of the Reports. To-day, sound advice is in greater demand than brilliant oratory, and questions of fact are, as a rule, more important and more perplexing than questions of law.

The Britannica is the one great Digest of Facts. Its articles cover all scientific, industrial, commercial and financial subjects. Fifteen hundred of the world's foremost specialists, chosen from twenty different countries, deal not only with all knowledge, but with the practical application of knowledge in the laboratory, the machine shop, in the mine, on the ship's deck and in the ship's engine-room, in the railroad office and on the railroad line. Bankers and engineers, builders and contractors, physicians and surgeons and manufacturers of every kind describe the work which they have themselves successfully done. They explain to the lawyer the details of his client's own business, which the client is almost always incapable of explaining. They enable the lawyer to test his client's knowledge and his client's good faith. They show the lawyer what he has to hope or to dread from expert evidence.

The Volumes as Used by Lawyers

In a mining town in Alaska, where the workmen were mostly Servians, a lawyer recently had an unusual case. The Servians had a church, which in the absence of the Servian priest, was in the charge of a father or "papa" of the Russian orthodox church, and he tried to exclude from their church the entire congregation because they disobeyed him. The lawyer brought into court the Encyclopaedia Britannica to prove the independence of the Servian Church from the authority of the Russian Church. The Britannica was recognized as an authority by the court, and the Servian congregation won its suit for the use of its church building.

A Buffalo lawyer in a recent letter to the publishers of the Britannica told of his being retained in a case involving the qualities of materials used in the construction of automatic car couplers. He read many technical works to get information on this subject, but "the article that to me was most instructive was that on IRON AND STEEL in the Encyclopaedia Britannica." He adds, "In my opinion the work is invaluable to any person who desires the means of handy reference to, and accurate information on, any topic." Similar testimony from lawyers all over the world to the usefulness of the Britannica could be adduced in great volume.

A brief reference to the different parts of this Guide will show in a general way the contents and value of the Britannica in the many fields in which an attorney may need, in connection with the preparation of a case, immediate and authoritative information on subjects not purely legal.

But on legal topics, also, the lawyer or the law student will find much valuable information.

American Law

He should read the stimulating and suggestive article on AMERICAN LAW (Vol. 1, p. 828), by Simeon E. Baldwin, governor of Connecticut, professor of constitutional and private international law at Yale, and formerly chief justice of the Supreme Court of Errors, Connecticut. Governor Baldwin's article points out the general identity of origin of American and English law, with the important exception of territory formerly French or Spanish,—particularly Louisiana,—a point on which the reader will find fuller information in the articles LOUISIANA (Vol. 17, p. 57) and EDWARD LIVINGSTON (Vol. 16, p. 811). Besides he calls attention to the fact that the state and not the nation is for the most part the legislative unit and the legislative authority. And this leads to a consideration of the great part played in American jurisprudence by the Civil War and the consequent changes in the Federal Constitution, especially the Fourteenth Amendment, which has been the basis of so many recent cases in the Supreme Court and has "readjusted and reset the whole system of the American law of personal rights" by transferring final jurisdiction from state to Federal courts.

Within the Southern states the Reconstruction period affected local law in various ways: by putting political power into the hands of outsiders ("carpet baggers," etc.), by the social revolution consequent on the abolition of slavery, and by the commercial assimilation of the South to the North.

Governor Baldwin points out that the judicial department has been made partly administrative by

the artificial distribution under most state constitutions of governmental powers into executive, legislative and judicial, overlooking the administrative, and making the courts the interpreters of statutes and giving to them the power of deciding whether or not statutes are constitutional.

That the police powers of the states are more and more liberally interpreted by the Federal Supreme Court is an interesting tendency, especially when the student remembers that in the last year or so certain states (notably Washington, c. 74, *Laws* 1911, Compensation of Injured Workmen) have definitely stated the police power as the basis of acts which the state supreme court might otherwise have declared unconstitutional as depriving of property without due process of law.

The article on American law is supplemented:

(a) in a general way by the valuable contribution of James Bryce (author of *The American Commonwealth*, and late British ambassador to the United States) on the Constitution and Government of the United States and of the states (Vol. 27, p. 646—an article which would fill about 50 pages of this Guide).

State Statutes

(b) more particularly, under the articles on the separate states (as well as on Alaska, Hawaii, Philippines and Porto Rico), by the description of the state or local constitution with an outline of characteristic and peculiar statutes. For instance, in the article ALABAMA (Vol. 1, p. 459), the first in the Britannica on a separate state of the Union, there is a general sketch of the constitution and government with particular attention to these points: term of

judiciary, 6 years; legislative sessions, quadrennial; law against lobbying; executive may not succeed himself; sheriffs whose prisoners are lynched may be impeached; grandfather clause, practically disfranchising the negro—with a summary of Giles *v.* Harris, 189 U. S. 474; Jim Crow law; disfranchisement for vote-buying or selling; Australian ballot law; anti-pass law; freight rebate law; homestead exemptions; wife's earnings separate property; women and child labour laws; peonage; liquor laws.

(c) by special articles, such as HOMESTEAD AND EXEMPTION LAWS (Vol. 13, p. 639), ORIGINAL PACKAGE (Vol. 20, p. 273) and INTERSTATE COMMERCE (Vol. 14, p. 711; equal to about 10 pages of this Guide), by Prof. Frank A. Fetter of Princeton (formerly Cornell), which deal with purely American legal topics.

(d) by legal sections in general economic articles, for instance: in RAILWAYS, the section on *American Legislation*, by Prof. F. H. Dixon of Dartmouth, author of *State Railroad Control*; in TRUSTS, by Prof. J. W. Jenks, the great American authority on the subject; in EMPLOYERS' LIABILITY; in TRADE UNIONS and in STRIKES AND LOCKOUTS, both by Carroll D. Wright, late U. S. Commissioner of Labor; BANKRUPTCY, by Edward Manson, author of *Law of Bankruptcy*; and in INSURANCE (Vol. 14, especially p. 662 c).

(e) by general legal articles like: COMMON LAW; CRIMINAL LAW, by W. F. Craies, editor of Archbold *On Criminal Pleading*; LIQUOR LAWS, by Arthur Shadwell, author of *Drink, Temperance and Legislation*; MEDICAL JURISPRUDENCE, by H. H. Littlejohn, professor of forensic medicine in the University of Edinburgh; MILITARY LAW, by Sir John Scott, former deputy judge-advocate-general, British

Army; NAVIGATION LAWS, by James Williams, of Lincoln College, Oxford; PRESS LAWS; SEAMEN, LAWS, RELATING TO, etc.

and (f) by sections and paragraphs on American law in hundreds of articles on legal topics—for list see below.

Biographies of Lawyers

The following list of American jurists does not include all American lawyers about whom there are separate articles in the Britannica, but will serve to suggest a brief course of biographical readings which the lawyer could not duplicate even in a special and expensive work on the American bar:

SAMUEL SEWALL (Vol. 24, p. 733)

JOHN RUTLEDGE (Vol. 23, p. 945)

SAMUEL CHASE (Vol. 5, p. 956)

FRANCIS DANA (Vol. 7, p. 792)

JOHN LOWELL (Vol. 17, p. 76)

OLIVER ELLSWORTH (Vol. 9, p. 294)

JOHN JAY (Vol. 15, p. 294)

ROBERT R. LIVINGSTON (Vol. 16, p. 812)

LUTHER MARTIN (Vol. 17, p. 794)

THEOPHILUS PARSONS (Vol. 20, p. 868)

JOHN MARSHALL (Vol. 17, p. 770)

EDMUND RANDOLPH (Vol. 22, p. 886)

JAMES KENT (Vol. 15, p. 735)

EDWARD LIVINGSTON (Vol. 16, p. 811)

BUSHROD WASHINGTON (Vol. 28, p. 344)

ROGER BROOKE TANEY (Vol. 26, p. 396)
SAMUEL HOAR (Vol. 13, p. 542)
HORACE BINNEY (Vol. 3, p. 949)
JAMES WILSON (Vol. 28, p. 693)
WILLIAM PINKNEY (Vol. 21, p. 627)
LEMUEL SHAW (Vol. 24, p. 813)
DANIEL WEBSTER (Vol. 28, p. 459)
SIMON GREENLEAF (Vol. 12, p. 548)
HENRY WHEATON (Vol. 28, p. 583)
RICHARD RUSH (Vol. 23, p. 857)
JOHN BOUVIER (Vol. 4, p. 336)
JOSEPH STORY (Vol. 25, p. 969)
LEVI WOODBURY (Vol. 28, p. 790)
JAMES HALL (Vol. 12, p. 847)
REVERDY JOHNSON (Vol. 15, p. 462)
HUGH S. LEGARÉ (Vol. 16, p. 373)
RUFUS CHOATE (Vol. 6, p. 258)
BENJAMIN F. BUTLER (Vol. 4, p. 881)
DAVID DUDLEY FIELD (Vol. 10, p. 321)
S. P. CHASE (Vol. 5, p. 955)
JOHN J. CRITTENDEN (Vol. 7, p. 471)
HAMILTON FISH (Vol. 10, p. 427)
BENJAMIN R. CURTIS (Vol. 7, p. 652)
J. S. BLACK (Vol. 4, p. 18)
JUDAH P. BENJAMIN (Vol. 3, p. 739)
JOHN Y. MASON (Vol. 17, p. 840)

GEORGE TICKNOR CURTIS (Vol. 7, p. 651)
R. H. DANA (Vol. 7, p. 792)
SAMUEL J. TILDEN (Vol. 26, p. 970)
SAMUEL F. MILLER (Vol. 18, p. 464).
STEPHEN J. FIELD (Vol. 10, p. 322)
W. M. EVARTS (Vol. 10, p. 4)
FRANCIS WHARTON (Vol. 28, p. 575)
MORRISON R. WAITE (Vol. 28, p. 246)
T. W. DWIGHT (Vol. 8, p. 741)
E. J. PHELPS (Vol. 21, p. 363)
STANLEY MATTHEWS (Vol. 17, p. 899)
L. Q. C. LAMAR (Vol. 16, p. 100)
C. C. LANGDELL (Vol. 16, p. 172)
D. W. VOORHEES (Vol. 28, p. 211)
T. F. BAYARD (Vol. 3, p. 554)
HORACE GRAY (Vol. 12, p. 391)
JOSEPH HODGES CHOATE (Vol. 6, p. 258)
MELVILLE W. FULLER (Vol. 11, p. 296)
WAYNE MACVEAGH (Vol. 17, p. 269)
JOHN MARSHALL HARLAN (Vol. 12, p. 954)
RICHARD OLNEY (Vol. 20, p. 91)
CUSHMAN K. DAVIS (Vol. 7, p. 866)
OLIVER WENDELL HOLMES (Vol. 13, p. 616)
DAVID BENNETT HILL (Vol. 13, p. 464)
ELIHU ROOT (Vol. 23, p. 711)
PHILANDER C. KNOX (Vol. 15, p. 882)

Of great value to the student of law, as widening his scope, would be a course of more general reading. This should include:

(a) the articles LAW, JURISPRUDENCE and COMPARATIVE JURISPRUDENCE, by Paul Vinogradoff, Corpus professor of jurisprudence at Oxford.

(b) articles on national and other legal systems, such as

ENGLISH LAW, *History*, by the late Frederick W. Maitland, Downing professor of English law at Cambridge.

ANGLO-SAXON LAW, by Paul Vinogradoff.

GERMANIC LAWS, EARLY, by Professor Christian Pfister, of the Sorbonne.

CODE NAPOLÉON, by Jean Paul Esmein, professor of law in the University of Paris, and ROMAN LAW, probably one of the most remarkable articles in the new edition and of the utmost importance (as in a less degree are the articles CODE and CODE NAPOLÉON) to the student of civil law. It is based on the well-known article contributed to the Ninth Edition of the Britannica by James Muirhead, professor of civil law, Edinburgh; but the article is actually the work of the reviser, Henry Goudy, regius professor of civil law, Oxford, and it may well be called the best present treatment of the subject. The article is a brief text-book in itself, containing matter equivalent in length to nearly 200 pages of this Guide. The treatment is historical, beginning with the almost mythical regal period and throwing light on the laws before the XII Tables, but this does not mean that the later period, legally more important, is not treated with proper fullness so that the practical as well as the theoretical is considered.

Some Legal

Systems

Slightly remoter systems are the subjects of separate articles: SALIC LAW, by Professor Pfister of the Sorbonne; BREHON LAWS, by Lawrence Ginnell, M. P., author of a monograph on the subject; WELSH LAWS; an elaborate article on the little-known subject GREEK LAW, by John Edwin Sandys of Cambridge, author of *History of Classical Scholarship*; INDIAN LAW, by Sir William Markby, reader in Indian Law at Oxford, formerly judge of the High Court of Calcutta; MAHOMMEDAN LAW (a subject no longer alien to the American because of the large number of Mahommedans in the Philippines), by D. B. Macdonald, professor in Hartford Theological Seminary, and author of *Development of Muslim Theology*; and BABYLONIAN LAW (by C. H. W. Johns, Master of St. Catharine's, Cambridge, author of *The Oldest Code of Laws*, etc.), containing a summary of the famous code of King Khammurabi.

The following list does not include the biographies of lawyers and is not a complete list of all topics pertaining to law in the Encyclopaedia Britannica, but it will give some idea of the scope of the legal department of the work.

Abandonment

Abatement

Abdication

Abduction

Abettor

Abeyance

Abjuration

Abode

Abrogation
Abscond
Abstract of Title
Acceptance
Acceptilation
Access
Accession
Accessory
Accommodation Bill
Accomplice
Accord
Accountant-General
Accretion
Accumulation
Accusation
Acknowledgment
Act
Action
Act of Parliament
Act of Petition
Address, The
Ademption
Adjournment
Adjudication
Adjustment
Administration

Administrator
Admiralty, High Court
Admiralty Jurisdiction
Admission
Adoption
Adscript
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CHAPTER XXVII
FOR BANKERS AND FINANCIERS

Social History

Of all classes of business men, bankers and financiers study most closely the general tendencies of public opinion and the general course of industrial and commercial development. Each day's financial news reports a position which has been reached in the path of a movement of which the origin and earlier course—and therefore the direction—must be sought in the record of past months and years, and sometimes in the record of a past century. But the banker who turns to the standard histories in his library with the desire to trace the course of any gradual and long-continued development is generally disappointed. It is only of late that historical

investigation has been directed to social and commercial activities rather than to politics and wars. Yet the history of civilization may be said to lie in the course of finance and commerce much more than in party strife and in civil and international wars. For the latter always arrest for the moment, even if they ultimately further, the progress of civilization.

International Finance

The new Britannica has been called "the most comprehensive of all surveys of past and present civilization," and its treatment of finance and commerce possesses a breadth and sweep directly due to the international character of the book. The American financier knows that under existing conditions he must take into account the laws and usages of foreign countries in regard to banking, currency, taxation, stock exchange transactions, corporations and all the other methods and appliances used in dealing with money and credit. The Britannica could not have covered this broad field authoritatively if its articles had all been written by Americans instead of being contributed, as they are, by specialists of twenty countries. And the very first step, in examining any question of American finance, may be to consider what has been done abroad. For example, there has been adopted in Louisiana a system of rural credit such as was strongly urged, for more general use, during President Taft's administration. That would seem to be purely a matter of internal policy. But for a description of the actual working of such a system, the sources of information are in the Britannica article RAIFFEISEN (Vol. 22, p. 817), the German

banker who perfected the system of agrarian credits, in the article SCHULZE-DELITZSCH (Vol. 24, p. 383), the Saxon economist who founded the German central bureau of co-operative societies, and in the article CO-OPERATION (Vol. 7, p. 82), where the Danish system of financing farmers is described and compared with the German and French methods.

Systematic reading in the Britannica on financial subjects should begin with the article FINANCE (Vol. 10, p. 347, equivalent to 20 pages of this Guide), by C. F. Bastable, professor of political economy in the University of Dublin, whose books on economics have been largely read in the United States. This article deals with state revenue and expenditure, or *public* finance, after pointing out the prevailing looseness in the use of the word finance. It is interesting to know that "in the later middle ages, especially in Germany, the word *finance* acquired the sense of usurious or oppressive dealing with money and capital." So long ago did an unpopular meaning attach to a term connected with "big business." The same is true of the word *usury*, which originally meant use, or interest; and the Britannica in an article on USURY (Vol. 27, p. 811) says "usury, if used in the old sense of the term could embrace a multitude of modes of receiving interest upon capital to which not the slightest moral taint is attached." In each case there may have been some reason besides chance for the development of the unpleasant meaning, and it has always been the custom of the spendthrift and the gambler to make the wrong use of words as well as of business methods. But what we call public finance was a century ago called political economy, "political" being used strictly to apply to the state, and "economy" in its original sense of housekeeping or house-rule. The word "economy"

has thus become broader, as the word “usury” has become narrower, in significance.

Early Economics

It is curious to see how one page after another of the historical section of this article describes theories of finance which are to-day propounded by popular agitators as if they were absolutely new and not only describes them but shows how they were tried and how they failed. The eastern empires taxed land produce, usually to the extent of one fourth or one fifth (two tithes). In Athens, under a more elaborate system, the state owned and administered agricultural land and silver mines, and yet this state ownership, instead of making for democratic equality, resulted in too rigid a separation of classes; and the Athenian attempt to surtax the rich citizens in order to defray the cost of public games and theatrical performances and to equip ships (in this case a close parallel to certain recent German legislation) led, as class taxation always does, to ingenious evasions and, in the end, increased the power it sought to restrict.

In Rome, home taxes were suspended as soon as conquests brought tribute from Spain and Africa. But taxes were always the curse of the provinces, and the vexatious *method* of the tax “may be regarded as an additional tax.” “The defects of the financial organization were a serious influence in the complex of causes that brought about the fall of the Republic.” The early Empire took its revenues from public lands, from monopolies, from the land tax, from customs, and from taxes on inheritances (5%), sales (10%) and the purchase of slaves (40%). There was no just distribution of taxation among the territorial divisions, and the burden fell too much

upon the actual workers and their employers. In the kingdoms which succeeded the Empire after its fall, Roman customs survived in finance, as in all departments of government; and there was a want of coherent policy until the time of Charlemagne, when centralization produced a better system. But scientific taxation did not really exist until, in the 15th century, under Charles VII, the first French standing army was created, and its needs led to a new and more intelligent system. In England, the co-ordination and control of public revenue and expenditure was similarly due to the growth of the navy. Since then the tendency has been to include taxes in general categories; the need for national credit has developed a system of national debts; and expenditures and receipts are now governed by legislative sanction. Local finance has been revolutionized by modern business methods, too slowly adopted it is true, and by the gradual change from private to public control of water supply, lighting and transportation.

Taxation and Tariff

The articles TAXATION, NATIONAL DEBT and TARIFF should be read after this article on public finance. TAXATION (Vol. 26, p. 458; equivalent to 25 pages of this Guide), by Sir Robert Giffen, formerly Controller-General of the British Board of Trade, classifies taxes, points out that direct and indirect taxes are not intrinsically different and that such a classification is merely a matter of convenience, and the article proceeds to describe the principal taxes. It should be supplemented by reading the sections on finance in the articles on various countries and especially by the article ENGLISH FINANCE (Vol. 9, p.

458; equivalent to 25 pages in this Guide), the section on Finance in the article UNITED STATES (Vol. 27, p. 660) and similar sections in the articles on each of the states of the Union. These articles give definite information about public debts, national or state, but the student should read carefully the main treatment in the article NATIONAL DEBT (Vol. 19, p. 266). The articles TARIFF (Vol. 26, p. 422), by Prof. F. W. Taussig of Harvard, author of *The Tariff History of the United States*; PROTECTION (Vol. 22, p. 464), by Edmund Janes James, president of the University of Illinois and author of the well-known *History of American Tariff Legislation*; and FREE TRADE (Vol. 11, p. 88), by William Cunningham, author of *Growth of English Industry and Commerce*, will be of great interest. The student should read besides the sketches in the Britannica of HENRY CLAY (Vol. 6, p. 470), by Carl Schurz, of WILLIAM MCKINLEY (Vol. 17, p. 256), ROGER Q. MILLS (Vol. 18, p. 475), and of other American tariff-leaders, and, for the tariff reform movement in England, the articles on JOSEPH CHAMBERLAIN (Vol. 5, p. 813) and ARTHUR J. BALFOUR (Vol. 3, p. 250). Before turning from public to private finance the reader should study the articles EXCHEQUER (Vol. 10, p. 54) and TREASURY (Vol. 27, p. 228).

Private Finance

For what may be called *private* finance, the student should turn first to the article BANKS AND BANKING (Vol. 3, p. 334; equivalent to nearly 60 pages in this Guide), by Sir R. H. I. Palgrave, director of Barclay & Co., Ltd., Bankers; Charles A. Conant, author of *The Principles of Money and Banking*; and Sir J. R. Paget, author of the *Law of Banking*. Further information on the early history of banking in the United States will

be found in the historical section of the article UNITED STATES (Vol. 27, especially p. 697), and in the article ANDREW JACKSON (Vol. 15, p. 107) by Prof. W. G. Sumner of Yale.

Currency

Next in his course of reading, he should study the article MONEY (Vol. 18, p. 694; equivalent to 45 pages in this Guide), by C. F. Bastable. This deals with: the functions and varieties of money, including coined money and all else that can take its place *in facilitating exchange*, *in estimating comparative values*, *as a standard of value* or of *deferred payments*, as *a store of value*; the determining causes of the value of money and of the quantity of money required by a country, the credit theory, early forms of currency—greenstones, ochre, shells, furs, oxen, grain; metals as money; coinage and state control; representative money, and credit as money; economic aspects of the production and consumption of precious metals; review of the history of some important currencies—Greek, Roman, medieval, English and French coinages are treated in the article NUMISMATICS (Vol. 19, pp. 869–911, equivalent to 135 pages of this Guide, with 6 plates and 11 other text illustrations); which discusses such questions as the constitution of money; typical currency systems; statistics of production of gold and silver since the discovery of America, and coinage systems. Other relevant articles are BIMETALLISM, and MONETARY CONFERENCES for the relation of the metals; and the articles GOLD, SILVER, SEIGNIORAGE, DEMONETIZATION, GRESHAM'S LAW, TOKEN MONEY and GREENBACKS. In the article on the GEORGE JUNIOR REPUBLIC (Vol. 11, p. 749), the "children's state" at Freeville, N. Y., the student will find an

interesting proof of the relation of “token” to “real” money. “The government issued its own currency in tin and later in aluminium and ‘American’ money could not be passed within the 48 acres of the Republic until 1906, when depreciation forced the Republic’s coinage out of use and ‘American’ coin was made legal tender.”

Banking

For information as to the methods of financial business the reader should study the articles SAVINGS BANKS (Vol. 24, p. 243) by Sir G. C. T. Bartley, founder of the National Penny Bank, and Bradford Rhodes, founder of the 34th St. National Bank, N. Y. FRIENDLY SOCIETIES (Vol. 11, p. 217); TRUST COMPANY (Vol. 27, p. 329), by Charles A. Conant, author of *The Principles of Money and Banking*; CLEARING HOUSE (Vol. 6, p. 476); LETTER OF CREDIT (Vol. 16, p. 501); STOCK EXCHANGE (Vol. 25, p. 930); BILL OF EXCHANGE (Vol. 3, p. 940); EXCHANGE (Vol. 10, p. 50); FUTURES (Vol. 11, p. 375); TIME BARGAINS (Vol. 26, p. 988); MARKET (Vol. 17, p. 731), by Wynnard Hooper, financial editor of *The Times*, London, with sections on Movements of Prices, Cycles, Tendency to Equilibrium, Disturbance of Equilibrium, Future Delivery, Corners, Money Market, The Great Banks, Foreign Loans, and Discount Houses; CONSOLS (Vol. 6, p. 979); COUPON (Vol. 7, p. 318); DIVIDEND (Vol. 8, p. 331); and PREMIUM (Vol. 22, p. 279).

Information on distinctive banking and business laws in the separate states will be found in the section on finance of the article on each state. For instance in the article OKLAHOMA (Vol. 20, p. 60) there is a summary of the bank deposit guaranty fund.

For insurance see the chapter in this Guide *For Insurance Men*.

Lives of Financiers

In financial biography, as in history, theory and practice, the Britannica is valuable because of its full, clear and authoritative treatment. The student will find articles on great financiers, such as the Astors, the Vanderbilts, the Barings, the Rothschilds, James Law, George Peabody, James Fisk, Jay Gould, E. H. Harriman, James J. Hill, J. P. Morgan; and on great authors on the subjects of economics and finance,—for instance, Malthus, Adam Smith, Walter Bagehot, Ricardo, Roscher, Boehm von Bawerk, Thorold Rogers, H. C. Carey, E. R. A. Seligman, F. A. Walker, J. W. Jenks, F. W. Taussig, Richmond Mayo-Smith and A. T. Hadley.

ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF INTEREST TO BANKERS

Account

Accountants

Achenwall, Gottfried

Adams, Henry Carter

Agio

Aguado, A. M.

Alcavala

Aldrich, N. W.

Allport, Sir J. J.

Alstromer, Jonas

Amortization

Angel

Anna
Annuity
Arbitrage
Armour, P. L.
Ashley, W. J.
Assignats
Astor, John Jacob (and family)
Atkinson, Edward
Attwood, Thomas
Audit and Auditor
Backwardation
Bagehot, Walter
Balance of Trade
Bank Notes
Bank Rate
Banks and Banking
Barbon, Nicholas
Baring (family)
Barter
Bastiat, Frédéric
Bates, Joshua
Baudrillart, H. J. L.
Bawbee
Baxter, Robert Dudley
Bemis, E. W.
Bezant

Biddle, Nicholas
Bill of Exchange
Bimetallism
Blanqui, J. A.
Bliss, C. N.
Block, Maurice
Bodin, Jean
Bodle
Boehm von Bawerk
Boisguilbert, Sieur de
Book-keeping
Bourse
Breaking Bulk
Brentano, L. J.
Broker
Bucketshop
Budget
Bullion
Buying in
Cairnes, John Elliott
Call
Capital
Carey, Henry Charles
Carli-Rubbi
Carrying-over
Cash

Chase, S. P.
Cheque, or Check
Chevalier, Michel
Child, Sir Josiah
Circular Note
Claflin, H. B.
Clark, John Bates
Clearing House
Cohn, Gustav
Coin
Coeur, Jacques
Colston, Edward
Combination
Commerce
Commercial Treaties
Consols
Contango
Cooke, Jay
Co-operation
Cooper, Peter
Cossa, Luigi
Coulisse
Coupon
Courcelle-Seneuil, J. G.
Cournot, A.
Coutts, Thomas

Cover
Credit
Crédit Foncier
Crockford, William
Crore
Crown (coin)
Cunningham, William
Custom Duties
Custom House
Davenant, Charles
Decker, Sir Matthew
Decimal Coinage
Delessert, J. P. B.
Delfico, Melchiorre
Demonetization
Dewey, Davis Rich
Dime
Discount
Distribution
Dividend
Dock Warrant
Dollar
Drawback
Drexel, A. J.
Ducat
Ely, Richard Theodore

Engel, Ernst
English Finance
Exchange
Exchequer
Excise
Farr, William
Farrer, Baron
Farthing
Florin
Field, Cyrus West
Fisk, James
Fix, Theodore
Fouquet, Nicolas
Franc
Free Trade
Friendly Societies
Futures
Gabelle
Gallatin, Albert
Ganilh, Charles
Garnier, C. J.
Garnier, Marquis
Genovesi, Antonio
George, Henry
Giffen, Sir Robert
Gilds

Gilbart, James William
Gioja, Melchiorre
Girard, Stephen
Goldsmid (family)
Gould, Jay (and family)
Grain Trade
Greenbacks
Gresham, Sir Thomas
Gresham's Law
Groat
Guinea
Gurney (family)
Hadley, A. T.
Hamilton, Alexander
Hamilton, Robert
Hanna, M. A.
Harriman, Edward H.
Haxthausen, L. von
Hermann, F. B. W. von
Hill, James J.
Horner, Francis
Horton, Samuel Dana
Hudson, George
Hufeland, Gottlieb
Income Tax
Ingram, J. K.

Insurance
Invoice
Jakob, L. H. von
Jenks, J. W.
Jesup, M. K.
Jevons, William S.
Jones, Richard
Kay, Joseph
Laing, Samuel
Lakh
Laveleye, E. L. V. de
Law, John
Lawrence, Amos
Le Play, P. G. Frédéric
Leroy-Beaulieu, P. P.
Leslie, Thomas E. C.
Letter of Credit
Levasseur, Pierre Emile
Levi, Leone
Lingen, Baron
Lipton, Sir T. J.
Lira
List, Friedrich
Lloyd’s
M’Culloch, John R.
Mackay, John William

Macleod, Henry Dunning
Making-up Price
Malthus, Thomas Robert
Mark
Market
Marshall, Alfred
Marx, Heinrich Karl
Mayo-Smith, Richmond
Mint
Mohur
Moidore
Monopoly
Monetary Conferences (International)
Money
Money-lending
Moon, Sir Richard
Moratorium
Morgan, John Pierpont
Morris, Robert
Morton, L. P.
Mun, Thomas
National Debt
Newmarch, William
North, Sir Dudley
Octroi
Overstone, 1st baron

Par
Paterson, William
Pauperism
Pawnbroking
Peabody, George
Pender, Sir John
Penny
Penrhyn, 2nd baron
Peseta
Petty, Sir William
Picayune
Pistole
Poll-tax
Pound
Premium
Price, Bonamy
Production
Profit-sharing
Protection
Proudhon, P. J.
Pyx
Quesnay, François
Raiffeisen, F. W.
Rau, Karl Heinrich
Rebate
Reciprocity

Revenue
Ricardo, David
Rockefeller, J. D.
Rodbertus, K. J.
Rogers, James Edwin
Roscher, W. G. F.
Rothschild (family)
Royalty
Rupee
Sadler, Michael Thomas
Sage, Russell
Saint-Simon, Comte de
Savings Banks
Say, Jean Baptiste
Say, Leon
Schäffle, A. E. F.
Schmoller, Gustav
Schulze-Delitzsch, F. H.
Seigniorage
Seligman, E. R. A.
Senior, Nassau William
Sequin
Shekel
Shell-money
Sherman, John
Shilling

Slater, John Fox
Smith, Adam
Sou
Sovereign (coin)
Spreckels, Claus
Stag
Stamp
Standards Department
Sterling
Steuart, Sir J. D.
Stewart, A. T.
Stock Exchange
Sumner, W. G.
Tael
Tariff
Taxation
Taussig, Frank William
Thornton, Henry
Thornton, W. T.
Time Bargains
Title Guarantee Companies
Token Money
Tonnage and Poundage
Tontine
Tooke, Thomas
Torrens, Robert

Torrens, William Torrens M'Cullagh

Trusts

Trust Company

Tucker, Josiah

Vanderbilt, Cornelius (and family)

Wagner, Adolf

Wages

Walker, Francis Amasa

Walras, M. E. L.

Wanamaker, John

Watkin, Sir E. W.

Wealth

Wells, David Ames

Window Tax

Wolowski, L. F. M. R.

Wright, Carroll D.

Zollverein

CHAPTER XXVIII
FOR CIVIL SERVICE MEN AND WOMEN AND STUDENTS PREPARING FOR SERVICE EXAMINATIONS

Federal, state and municipal civil service includes so many specialized branches that a number of the

chapters in Part 1 of this Guide, devoted to courses of reading adapted to various occupations (such as *For Teachers*, *For Engineers*, *For Builders and Contractors*) will supply useful indications. Part 2 of the Guide, containing classified courses of educational reading, will point to articles especially serviceable to those who are preparing for examinations and, for that reason, desire to review the ground they covered at school or college.

Part 4 of the Guide, with its special references to the subjects to which administration and legislation are chiefly directed, should be carefully examined. There the reader will find lists of articles dealing with schools and institutions; the defective classes; crime and alcohol; revenue and finance; ballot representation and suffrage; trusts, competition, co-operation and socialism; labour and immigration; legislation and the administration of justice; foreign relations and the expansion of the United States.

International Comparisons

The present chapter, in order that repetition may be avoided, deals only with the aspects of federal, state and municipal government which are most closely related to civil service organization. The article CIVIL SERVICE (Vol. 6, p. 412) devotes nearly as much space to the British as to the American service, and its information as to British organization, examinations, salaries and pensions will greatly interest those to whom the details needed for an international comparison have not been elsewhere accessible. Until 1855 all British appointments were by nomination; and although the service was quite free from the abominable system of secretly taxing salaries in order to support party

funds, that was about all that can be said for it. There was hardly a pretense of selection for merit. Influential families and the relatives and personal friends of ministers of state and of ladies whom kings delighted to honor monopolized the appointments. Many posts were pure sinecures, and in many others the work was done by a substitute to whom the nominee paid less than half the salary or fees he received. Under George III the system was at its worst, and the discontent that was aroused in the American colonies by the maladministration of colonial affairs was “one of the efficient causes of the American revolution.” The reforms begun in 1855 had by 1870 been so successful that since then open competition has been the general rule; and where nomination is still required, as in the Foreign Office and the Education Department, searching examinations must be passed. Women are employed in the post-office, board of agriculture, customs, India office, department of agriculture, local government board and home office (factory inspectors, etc.). The age for compulsory retirement is 65, but the commissioners may prolong this five years in exceptional cases. Subjects of examinations, salaries and pensions are described in the article. Since 1859 there has been a superannuation pension of $^{10}/_{60}$ of the annual salary and emoluments to any one serving 10 years and less than 11, and an additional sixtieth for each year’s service more than ten.

Civil Service in the United States

In the same article there is an historical treatment of civil service in the United States and of its gradual reform and extension since 1883. This may well be

supplemented by a study of the American party system of government and of the "spoils system" under which party loyalty and personal service to a party machine became the test of a candidate's fitness for office. For this the student should refer to the section (Vol. 27, p. 646) on *Constitution and Government*, of the article UNITED STATES, written by James Bryce, author of *The American Commonwealth* and formerly British ambassador to the United States; see p. 658–659, especially. There is also much information in the section *History* of the same article, especially paragraphs 168, 169 (p. 697) on the beginnings of the spoils system in Jackson's time, paragraph 333 (p. 722) on the beginnings of reform under Hayes, and paragraph 343 (p. 724) on Cleveland and civil service reform, etc.; and biographies of Andrew Jackson, W. L. Marcy and Martin Van Buren (for the spoils system) and of George William Curtis, E. L. Godkin, Carl Schurz, R. B. Hayes, Grover Cleveland, Benjamin Harrison, William McKinley and Theodore Roosevelt.

Information in regard to the civil service systems of states and cities may be found in separate state and city articles,—in addition to the material on state and city systems in the articles already mentioned.

"General Information" Papers

The wide-awake student who has read this far in this chapter and has referred to the articles mentioned in the Britannica, will now be saying to himself: "There is evidently much valuable information in the encyclopaedia about the history and status of civil service reform, and this seems as

full and complete for the United States as for Great Britain. If other topics are as fully treated in the Britannica, it will be invaluable to me in preparation for general information papers for civil service examinations." And he will be right. For instance, the government employe must know more about the government and its machinery and history than does the average "man in the street",—and he can learn this from the Britannica.

As has already been pointed out, the main treatment of the government of the United States in the Britannica is by James Bryce. This means that it is authoritative and that it is interesting and that in both these qualities it is far superior to the usual text book of "civics" or "civil government." It occupies pp. 646–661 of volume 27, and is equivalent to about 50 pages of this Guide—so that it is more than a bare outline. And it is followed by a valuable bibliography of the subject to guide the student to the best books on any special topic which he may wish to pursue further.

But this is far from being all the information in the Britannica on the subject. The contribution of Mr. Bryce is only a part of the article UNITED STATES. The entire article would take up nearly 400 pages if printed in the style of this Guide. It treats the physical geography, geology, climate, fauna and flora, population, industries and commerce, government, finance, army and history of the country—the equivalent of 225 pages of this Guide is devoted to *History* alone. All parts of this article contain valuable information about the country; and this article is supplemented by hundreds of others:—

(a) Articles on each of the states, arranged much as in the article UNITED STATES with sections on history and government serving as an authoritative summary

of the salient facts, and making up a complete course on state "civics," government and history;

(b) Articles on cities and towns with similar treatment of the distinctive elements in the government of each, and of the main points in their history;

(c) Separate articles on the important rivers, lakes, mountains and other topics in physical geography;

(d) Separate articles on topics in American history and government: such as NULLIFICATION, STATE RIGHTS, FUGITIVE SLAVE LAWS, ELECTORAL COMMISSION; and

(e) Biographies of great Americans, famous in war, politics, administration, business, science, art, religion,—in short all fields of activity.

In brief, whether for an examination on general information, on civics, on history, or on the special branch of the civil service to which the student wishes to be appointed, no book will give as valuable and complete information as the Britannica.

CHAPTER XXIX
FOR ARMY OFFICERS

A New Departure

It is often said of an article in the Britannica that it is "*the last word* on the subject," so thoroughly has the authority of the book been recognized. This is quite as true of military articles as of those in any other

field; but of the military articles it may also be said that they are the *first word*. Of course, there have been, in previous editions of the Britannica and, to a less degree in minor works of general reference, articles on military history and biography. But in the new Britannica, for the first time, all branches of military knowledge are included, and the spirit of the entire treatment is comparative and critical. The military student will find a discussion not merely of Napoleon's influence on army organization or Frederick's influence on cavalry (in the articles on these two leaders), but also of the influence of army organization on Napoleon (in the articles on the French Revolutionary Wars and the Napoleonic Campaigns), and of cavalry drill on the peculiar generalship of Frederick (in such articles as Seven Years' War, on Hohenfriedberg, and on Rossbach). Put more concretely, the novelty consists in the inclusion of articles on wars, campaigns and battles, chosen because of their importance in military as well as in political history, and treated from the point of view of the military critic and with particular attention to the lessons they contain for the modern army officer. The care with which the battles and campaigns of the American Civil War are analyzed and criticized will be of singularly great interest to the American soldier, who will immediately notice among the contributors to the military department of the Britannica such names as those of Capt. C. F. Atkinson, author of *The Wilderness and Cold Harbour*, Major G. W. Redway, author of *Fredericksburg: A Study in War*, Col. G. F. R. Henderson, author of *Stonewall Jackson and the American Civil War*, and Col. F. N. Maude, lecturer in military history, University of Manchester.

Army

The best starting point for a study of military affairs in the Britannica is the article ARMY (Vol. 2, p. 592; equivalent to more than 100 pages of this Guide). This "key" article may be outlined as follows:

General History

Early Armies—*Egypt* (chariots, infantry, archers). *Babylon* and *Assyria* (horsemen, charioteers, etc.). *Persian*, largely cavalry; the first "organized" army. *Greece*,—compulsory service; citizen militia; heavy infantry the strong arm; phalanx, the Greek formation. *Sparta*,—a nation in arms. *Greek* mercenaries. *Epaminondas* and *Thebes*—new phalanx tactics, "oblique order"; development of cavalry. *Alexander* and *Macedon*—a modified Theban system. *Carthage*—mercenary troops led by great generals, with modification of phalanx for greater elasticity. *Rome*—army under the Republic; its characteristics; under the Empire; see also separate article ROMAN ARMY (Vol. 23, p. 471), by Professor F. J. Haverfield of Oxford. *The Dark Ages*, the Byzantines, and the development of Feudalism. Medieval Mercenaries. Infantry in Feudal Times. *The Crusades*. *The Period of Transition* (1290–1490), development of English archers and of professional soldiery,—*condottieri*, *Swiss*, *Landsknechts*. *The Spanish army*: "at the disposal of its sovereign, trained to the due professional standard and organized in the best way found by experience." *The Sixteenth Century*—rise of the heavy cavalry armed with pistols, and fall of the pikemen. *Dutch System*—attention to minute detail; William the Silent and Maurice of Nassau. *Thirty Years' War*—the *Werbe-system*, small standing army to be increased by levy at time of need. *The Swedish Army*—conscription and feudal *indelta*; Gustavus. *The English Civil War*—real national armies; Cromwell and the "New Model" only an incident without influence on army organization. *Standing Armies*. French pre-eminence after Rocroi. Small field armies, well-fed and sheltered for economy's sake. *18th Century organization*: "linear" formation and its negative results. *Frederick the Great*: the art of war a formal science. *The*

French Revolution: a "nation in arms," a war-machine more powerful than Frederick's. The conscription in France. *Napoleon*—his attempt to make a dynastic army out of the "nation in arms." *The Grande Armée* of 1805–1806; development of artillery; the army corps. The Wars of Liberation: new Prussian army; excellent Austrian organization. *Armies of 1815–1870*. *American Civil War*,—its slow decision. Contrast between French and Prussian staff systems in 1870. *Modern Developments*: German model followed slavishly except in Great Britain and the United States.

Present Day Armies: The general accounts of existing armies, and of the past organizations of each country, are supplemented by detailed information in the articles on different countries. Especial attention should be given to the military information in the article on Japan. Army Systems: *Compulsory Service*; *Conscription*; *Voluntary Service*; *Militia*.

Army Organization

The three chief arms—their relative importance: proportion on peace footing—5 or 6 guns per 1000 men, 16 cavalry soldiers to 1000 men of other arms; proportion in war—Russian (1905) 3½ guns per 1000 men of other arms, 60 cavalry to 1000 infantry; Japanese (1905), 2½ field guns per 1000 men, 37 cavalry to 1000 infantry. *Command*: *Brigade*; *Division*; *Army Corps*, its constitution; *Army*; *Chief Command* of group of armies; chief of general staff and his relations to commander-in-chief—for example, von Moltke and King William. *Branches of Administration*—war office and general staff.

Table: Comparative strength of Various Armies.

British Army, *Indian Army*, *Canadian Forces*.

Austrian Army.

French Army.

German Army.

Italian Army.

Russian Army.

Spanish Army.

Turkish Army.

United States Army.

Armies of minor countries.

Bibliography (2000 words)

Theory and Practice

Next in order the student should turn to the article WAR (Vol. 28, p. 305; equivalent to 40 pages of this Guide), by Col. G. F. R. Henderson, well known for his books on the American Civil War (*Fredericksburg*, *Stonewall Jackson*, etc.), with a section on *Laws of War*, by Sir Thomas Barclay. Col. Henderson's article lays down important general principles. An analysis of modern conditions shows that improved methods of communication have made war a much speedier process, in which the victorious general cannot make mistakes at the outset. That intellect and education count for more than stamina and courage was the lesson of the Franco-Prussian War—a lesson learned by the Prussians before that war. Modern war is a science and the amateur has little chance; in this respect things have changed. "It is impossible to doubt that had the Boers of 1899 possessed a staff of trained strategists, they would have shaken the British Empire to its foundations." There must be a concert between diplomacy and strategy. Civilian war ministers cannot solve strategic problems. The greater deadliness of modern warfare, and the greater moral effect of being under fire call for better foresight, strategy and *morale*. The relation of army and navy is discussed and the new doctrine of "sea-power" explained. (See the chapter *For Naval Officers* in this Guide). The remaining topics in the article

are: weakness of allied armies; railways and sea as lines of operation; amphibious power; value of unprofessional troops and the need of professional leaders.

Arms of Service

In the articles INFANTRY (Vol. 14, p. 517; 2 plates; equivalent to 35 pages of this Guide) and ARTILLERY (Vol. 2, p. 685; 2 plates; equivalent to 30 pages of this Guide), both by Capt. Atkinson, and in the article CAVALRY (Vol. 5, p. 563; illustrated with 2 plates and 1 cut; in length equivalent to 30 pages of this Guide), by Col. F. N. Maude, the student will find an elaborate treatment of the history, organization and tactics (especially since 1870) of each of these arms. For details of their organization and equipment he should read the articles ENGINEERS, STAFF, MOUNTED INFANTRY, SUPPLY AND TRANSPORT (MILITARY), OFFICERS, AMBULANCE, FORTIFICATION, MACHINE GUNS, COAST DEFENCE, ORDNANCE, BALLISTICS, SIGHTS, RIFLE, GUN, PISTOL, EXPLOSIVE, GUNPOWDER, GUNCOTTON, CORDITE and NITRO-GLYCERINE. In many geographical articles there are descriptions of the world's great fortifications, e. g., *Paris*, *Antwerp*, and *Verdun*. Other topics of a more miscellaneous character are covered by the articles ARMY SIGNALLING, PIGEON POST, SIGNALS, WAR GAME, MANOEUVRES, KITE, etc.

The military use of aeroplanes and balloons is very fully shown in the articles FLIGHT and AERONAUTICS.

Strategy and Tactics

Before taking up a systematic course in military history, there are two general articles that the military student should read: TACTICS (Vol. 26, p.

347; equivalent in length to 20 pages of this Guide), by Maj. Neill Malcolm, editor of the *Science of War*; and STRATEGY (Vol. 25, p. 986; equivalent to 35 pages of this Guide), by Col. F. N. Maude. The former article should be compared with the sections on tactics in the articles INFANTRY, CAVALRY and ARTILLERY. Major Malcolm makes much of the continuity of military history, comparing Metaurus and Ramillies with the fighting in Manchuria, and Wellington at Maya with Oyama in his contest with Kuropatkin. The mistakes that have been made once should not be made again; at least the careful student of tactical history may see to it that if they are repeated, it is done by his opponent and not by himself. Modern tactics are different from ancient because of greater fire-power and improved methods of transportation. Cavalry tactics are in an uncertain condition; there is no recent practice to serve as a guide, since neither in South Africa in the Boer war nor in Manchuria during the Russo-Japanese conflict was cavalry much used. Infantry must co-operate to make artillery bombardment effective. An interesting discussion of offensive and defensive fighting is summed up in the words "To the true general the purely defensive battle is unknown" and as evidence are adduced Wellington at Salamanca and Oyama at Sha-ho. Oyama's victory in the latter battle, it is pointed out, shows the increased ease of the process of envelopment, which has resulted in discarding corps artillery in favour of divisional artillery. The importance—and the possibility—of the counter stroke; the danger of using for the relief of one's own troops forces which might better be launched at the enemy's weakest spot; and the similar unwisdom of any negative tactics, adopted to avoid loss, as in "holding attacks"—are the other principal points

made in the article.

The article STRATEGY should be read in conjunction with the articles ARMY and WAR. It is impossible to summarize or outline it here, but it is worth noting that the article closes with a definition and discussion of the following terms: *Base*; *Line of Communication*; *Line of Operations*; *Exterior Lines*; *Obstacles*.

Military History and Criticism

For a reasoned history of warfare in more detail than has been given in the general articles already alluded to, the reader will find some outline like the following valuable, the arrangement being roughly chronological and all words in *Italics* being titles of articles in the Britannica.

Marathon; *Darius*; *Miltiades*; *Herodotus*.

Thermopylae; *Leonidas*; *Salamis*.

Peloponnesian War; *Pericles*; *Cleon*; *Pylos*; *Brasidas*; *Alcibiades*; *Critias*; *Thucydides*; *Xenophon*.

Epaminondas; *Mantineia*.

Philip II of Macedon; *Olynthus*; *Chaeroneia*; *Alexander the Great*; *Arrian*.

Pyrrhus.

Roman Army; *Caudine Forks*; *Punic Wars*; *Carthage*; *Hanno*; *Hannibal*; *Hasdrubal*; *Mago*; *Trasimene*; *Fabius* (Cunctator); *Cannae*; *Scipio Africanus*; *Scipio Aemilianus*; *Aemilius Paulus*; *Perseus*; *Marius*; *Jugurtha*; *Sulla*; *Sertorius*; *Pompey*; *Caesar*; *Antonius* (Mark Antony).

Charles Martel.

Charlemagne.

William I (of England); *Hastings*; *Standard, Battle of*.

Crusades (equivalent to 90 pages of this Guide); *Godfrey of Bouillon*; *Raymund of Toulouse*; *Richard I* (of England); *Philip II* (of France); *Saladin*; *Henry VI* (Roman

Emperor); *Baldwin I*; *Frederick II*; *Louis IX* (of France).

Bouvines.

Bannockburn; *Robert Bruce*.

Hundred Years' War; *Philip VI*; *Edward III*; *Crécy*; *John of Bohemia*; *Edward* (the Black Prince); *Calais*; *Poitiers*; *John II* (of France); *Lancaster, House of* (for John of Gaunt); *Bertrand Du Guesclin*; *Henry V* (of England); *Agincourt*; *Joan of Arc*; *1st Duke of Bedford* (John Plantagenet); Count of *Dunois*.

Wars of the Roses; *St. Albans*; *Towton*; *Earl of Warwick* (Richard Neville); *Edward IV*.

Ravenna, battle of; *Bayard* (the chevalier); *Gaston de Foix*; *Pescara*; *Navarro*; *Marignan*; *Francis* I (of France).

Flodden; *James IV* (of Scotland); *Norfolk, 3rd Duke*.

St. Quentin (1557); *Coligny*; *Montmorency* (constable); *Emmanuel Philibert*.

Alva; *William the Silent* (Vol. 28, p. 672); *Maurice of Nassau*; *Farnese* (duke of Parma).

Thirty Years' War; *Maximilian I* (of Bavaria); *Frederick V* (elector palatinate; Vol. 11, p. 59); *Mansfeld*; *Tilly*; *Wallenstein*; *Gustavus Adolphus*; *Breitenfeld*; *Lützen*; *Bernhard of Saxe-Weimar*; duc de *Rohan*; *Frederick Henry*; *Gallas*; *Banér*; *Piccolomini*; *Turenne*; *Torstensson*; *Condé*; *Freiburg*; *Mercy*; *Nördlingen*; *Wrangel* (1613–1676); *Fronde*.

Great Rebellion (English Civil Wars of 1642–52); *Charles I* (of England); *Prince Rupert*; *Essex* (2nd Earl, Vol. 9, p. 782); *Edgehill*; *John Hotham*; *Baron Hopton*; *Sir William Waller*; *Duke of Newcastle* (1592–1676); *Fairfax of Cameron* (2nd and 3rd Barons); *Sir Bevil Grenville*; *Oliver Cromwell*; *Manchester*, 2nd Earl of (Vol. 17, p. 543); *Marston Moor*; *Leven*; *Skippon*; *Argyll, 8th Earl*; *Montrose*; *Lord Newark*; *Goring*; *Naseby*; *John Lambert*; *Charles Fleetwood*; *Dunbar*; *Thomas Harrison*.

Dutch Wars; *Louis XIV*; *Condé*; *Frederick William of Brandenburg*; *Turenne*; *Montecucculi*; *William III* (of England); *Duke of Luxembourg*; *Charles of Lorraine* (Vol. 17, p. 11).

Vauban.

Grand Alliance, War of; *Catinat*; *Luxembourg*; *Vauban*; *Fleurus*; *Louvois*; *Duc de Boufflers*; *Coehoorn*; *William III of England*; *Steenkirk*; *Neerwinden*; *Villeroi*.

Spanish Succession; *Marlborough*; *Eugene of Savoy*; *Villars*; *Peterborough*; *Ruvigny*; *Catinat*; *Vendôme*; *Blenheim*; *Ramillies*; *Oudenarde*; *Malplaquet*; *Berwick*.

Polish Succession War.

Austrian Succession; *Frederick the Great*; *Count von Schwerin*; *L. A. Khevenhüller*; *Duc de Broglie*; *Traun*; *Charles* (of Lorraine; Vol. 5, p. 936); *Seckendorf*; *George II* (of England); *Noailles*; *Conti* (Vol. 7, p. 28); *Hohenfriedberg*; *Fontenoy*; comte de *Saxe* (marshal); Duke of *Cumberland*; *Ligonier*; *Belle-Isle*.

Seven Years' War (with 5 diagrams): *Frederick the Great*; *Clive*; *Amherst*; *Wolfe*; comte de *Lally*; *Montcalm*; Count von *Browne*; *Ferdinand* (of Brunswick); *Daun*; *Zieten*; *F. E. J. Keith*; *Seydlitz*; *Rossbach*; *Soubise* (1715–1787); *Leuthen*; *Loudon*; *Kunersdorf*; *Finck*; *Minden*; *Sackville*, 1st Viscount; *Granby*.

American War of Independence; *Lexington*; *Concord*; *Bunker Hill*; *Joseph Warren*; *Israel Putnam*; *Thomas Gage*; *William Howe*; *Ethan Allen*; *Ticonderoga*; *George Washington*; *Benedict Arnold*; *Richard Montgomery*; *Long Island*; *Rufus Putnam*; *William Alexander*; *Trenton and Princeton*; *Henry Knox*; *Brandywine*; *Germantown*; *Burgoyne*; *Bennington*; *John Stark*; *Saratoga*; *George Rogers Clark*; *Sir Henry Clinton*; *Monmouth*; *John Sullivan*; *Anthony Wayne*; *William Moultrie*; *Charleston* (S. C.); *Francis Marion*; *Thomas Sumter*; *Andrew Pickens*; *Horatio Gates*; *Nathanael Greene*; *Cornwallis*; *Kalb*; *Camden*; *King's Mountain*; *Daniel Morgan*; *Henry Lee*; *Tarleton*; *Eutawville*; *Lafayette*; *Yorktown*.

French Revolutionary Wars (with 6 diagrams); *Dumouriez*; *Kellerman* (1735–1820); *Custine*; *Jemappes*; *Gribeauval*; *Neerwinden* (1793); *Clerfayt*; *Vendée*; *L. N. M. Carnot*; *Jourdan*; *Wattignies*; *Joubert*; *Frederick Augustus, Duke of York*; *Souham*; *Moreau*; *Kray von Krajova*; *Vandamme*; *Pichegru*; *Marceau*; *Charles*, archduke of Austria (Vol. 5, p. 935); *Masséna*; *Napoleon*; *Augereau*;

Serurier; *Joubert*; *Sir W. Sidney Smith*; *Kléber*; *Alexandria*; *Oudinot*; *Suvarov*; *Borodino*; *Macdonald*; *Marengo*; *Murat*; *Lannes*; *Berthier*; *Bautzen*.

Napoleonic Campaigns (9 diagrams; and see, on p. 233 of Vol. 19, "The Military Character of Napoleon"); *Napoleon*; *Wrede*; *Murat*; *Charles XIV* (Bernadotte); *Marmont*; *Davout*; *Ney*; *Lannes*; *Soult*; *Berthier*; *Angereau*; *Dupont de l'Etang*; *Austerlitz*; *Kutusov*; *Hohenlohe* (Vol. 13, p. 572); *Blücher*; *Lasalle*; *Massenbach*; *Kalckreuth*; *Scharnhorst*; *Lefebvre-Desnoëttes*; *Count von Bennigsen*; *Eylau*; *Friedland*; *Grouchy*; *Mortier*; *Senarmont*; *Oudinot*; *Massena*; *Aspern-Essling*; *Charles*, archduke of Austria; *Bellegarde*; *Wagram*; *Beauharnais*; *Macdonald*; Jerome *Bonaparte* (Vol. 4, p. 195); *Barclay de Tolly*; *Bagration*; *Victor-Perrin*; *Yorck von Wartenburg*; *Lauriston*; *Wittgenstein*; *Bautzen*; *Schwarzenberg*; *Gouvion St. Cyr*; *Dresden* (battle).

Peninsular War; *Junot*; *Murat*; *Dupont de l'Etang*; *Moncey*; *Palafox y Melzi*; *Wellington*; *Sir John Moore*; Sir David *Baird*; *Talavera*; *Suchet*; *Sebastiani*; *Foy*; *Lord Hill*; *Lord Lynedoch*; W. C. *Beresford*; *Salamanca*; *Clausel*; *O'Donnell*; *Vitoria*; *Sir William Napier*.

American War of 1812; Isaac *Brock*; *Dearborn*; *Baltimore*; *Washington*; *New Orleans*; Andrew *Jackson*; Jacob *Brown*; James *Wilkinson*; and for sea-fighting the titles in the chapter of this Guide: *For Naval Officers*.

Waterloo Campaign (with 3 maps); *Napoleon*; *Murat*; *Schwarzenberg*; *Barclay de Tolly*; *Wellington*; *Blücher*; *Lord Hill*; *Anglesey*; *D'Erlon*; *Gneisenau*; *Gérard*; *Grouchy*; *Vandamme*; *Thielmann*; *Bülow* (1755–1816); *Ney*; *Exelmans*; *Pajol*; *Picton*.

Greek Independence; *Ypsilanti*; *Mavrocordato*; *Coraës*; *Dundonald*; *Sir Richard Church*.

Russo-Turkish Wars (1828–29); *Paskevich*; *Diebitsch* (1877–78); *Osman*; *Skobelev*; *Plevna* (with diagram); *Todleben*; *Shipka Pass*.

Crimean War (with 2 diagrams): *Gorchakov*; *Hess*; *Raglan*; *Saint Arnaud*; *Canrobert*; *Pelissier*; *Menshikov* (1787–1869); *Bosquet*; *Todleben*; *Alma*; *Balaklava*; *Scarlett*;

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Italian Wars (1848–1870); *Radetzky*; *Charles Albert* of Sardinia (Vol. 5, p. 938); *Durando*; *Pepe*; *Victor Emmanuel*; *Pelissier*; *Canrobert*; *La Marmora*; *Napoleon III*; *Forey*; *MacMahon*; *Bazaine*; *Wimpffen*; *Benedek*; *Niel*; *Custozza*; *Cialdini*.

American Civil War; *Bull Run*; *McDowell*; *Beauregard*; *J. E. Johnston*; *R. E. Lee*; *Rosecrans*; *Lexington, Mo.*; *Fremont*; *Nathaniel Lyon*; *F. P. Blair, Jr.*; *Pope*; *Burnside*; *B. F. Butler*; *McClellan*; *A. S. Johnston*; *G. H. Thomas*; *U. S. Grant*; *C. F. Smith*; *Lew Wallace*; *McClernand*; *Halleck*; *O. M. Mitchel*; *Shiloh*; *N. P. Banks*; *T. J. (Stonewall) Jackson*; *Shenandoah*; *Fair Oaks*; *Seven Days*; *A. P. Hill*; *D. H. Hill*; *J. E. B. Stuart*; *Braxton Bragg*; *Longstreet*; *Bull Run (second battle)*; *Ewell*; *Sigel*; *Hooker*; *Kearny*; *Fitz-John Porter*; *Antietam*; *E. V. Sumner*; *Hood*; *Burnside*; *Van Dorn*; *Fredericksburg*; *W. B. Franklin*; *John F. Reynolds*; *D. N. Couch*; *Stone River*; *Hardee*; *A. McD. McCook*; *T. L. Crittenden*; *G. H. Thomas*; *J. C. Breckinridge*; *McPherson*; *Chancellorsville*; *T. F. Meagher*; *Meade*; *Gettysburg*; *O. O. Howard*; *Doubleday*; *Early*; *Hancock*; *Sickles*; *Vicksburg*; *J. H. Morgan*; *Chickamauga*; *N. B. Forrest*; *Chattanooga*; *Sheridan*; *Wilderness* (4 diagrams); *Fitz-Hugh Lee*; *J. H. Wilson*; *G. K. Warren*; *John Sedgwick*; *Merritt*; *R. H. Anderson*; *Spottsylvania*; *Cold Harbor*; *Petersburg*; *Shenandoah Valley*; *Cedar Creek*; *W. T. Sherman*; *Marietta*; *Atlanta*; *Slocum*; *Schofield*; *Joseph Wheeler*; *J. A. Logan*; *Nashville*; *Richmond*; *Appomatox Court-House*; *Durham, N. C.*

Seven Weeks' War (with 2 diagrams): *William I* (of Germany); *Moltke*; *Benedek*; *Frederick III* (of Germany); *Frederick Charles* (of Prussia; Vol. 11, p. 61); *Steinmetz*; *Blumenthal*; *Hohenlohe-Ingelfingen* (Vol. 13, p. 573b); *Goeben*; and see *Italian Wars* above.

Franco-German War; *Napoleon III*; *Niel*; *Moltke*; *William I* (of Germany); *Steinmetz*; *Frossard*; *MacMahon*; *Wörth* (with plan); *Bazaine*; *Metz* (2 plans); *Alvensleben*; *Canrobert*; *Bourbaki*; *Leboeuf*; *Manteuffel*; *Caprivi*; *Prince Frederick Charles*; *Sedan* (with plan); *Vinoy*; *Wimpffen*;

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Servo-Bulgarian War; *Alexander of Bulgaria* (Vol. 1, p. 544); *Milan of Servia*.

Greco-Turkish War; *Edhem Pasha*.

Spanish-American War; *Joseph Wheeler*; *F. V. Greene*; *Roosevelt*; *Miles*.

Transvaal (Vol. 27, pp. 203 sqq. for Boer War of 1899–1902); *Kruger*; *Cronje*; *P. J. Joubert*; *Sir George White*; *Buller*; *Lord Roberts*; *Lord Kitchener*; *J. H. De la Rey*; *Christian DeWet*; *Louis Botha*.

Russo-Japanese War (with 4 diagrams); *Kuroki*; *Kuropatkin*; *Inouye*; *Oku*; *Nozu*; *Oyama*.

A Military Encyclopaedia

The military student will see from what has already been said that the Britannica is not merely a general work of reference but a valuable aid in the study of military history, biography, theory, practice and phraseology. The following alphabetical list names only the chief of the articles in the Britannica which make it a military cyclopaedia. As has been noticed above, many articles are special treatises in themselves dealing with many related topics, and—for instance—articles on wars or campaigns contain elaborate descriptions of separate battles. Many topics are treated in the Britannica, even if they are not in the following list, and their whereabouts may be readily learned by turning to the Index volume.

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CHAPTER XXX
FOR NAVAL OFFICERS

The scope of a naval officer's professional interests is so broad that the present chapter of this Guide could not, without duplicating other chapters, indicate all the aspects of the Britannica with which he is directly concerned. And he will find that his use of the Britannica is simplified by the subdivisions about

to be specified, which virtually present his subjects under four different heads. Of course he may be called upon, in the exercise of his duties, simultaneously to think and to act in all his capacities, to concentrate upon the swift solution of one problem his knowledge of warfare, of shipbuilding, of navigation and of mechanical engineering; but his reading upon these topics naturally divides itself into these four parts.

Three Other Relevant Chapters

Inasmuch as army officers, even when they are at sea, are passengers, and, save in relation to the discipline of their troops, have nothing to do with the ship's management, it could not be assumed that the present chapter would appeal to them. But naval officers, when co-operating in a land expedition, need to employ every kind of knowledge that is of use to army officers, and as the chapter *For Army Officers* in this Guide would therefore in any case be read by them, it has seemed convenient to include in it the description of those articles in the Britannica which deal with war in general.

The chapter *For Marine Transportation Men* in this Guide is also one to which the naval officer should refer, as it deals with ships and navigation in general. The articles SHIP and SHIPBUILDING mentioned in that chapter are (except for the historical section of the former) by Sir Philip Watts, designer of the British "Dreadnoughts" and "Super-Dreadnoughts;" and the article SHIPPING is by Douglas Owen, of the Royal Naval War College at Portsmouth. Obviously these and many other articles described in that chapter are of the greatest importance to naval officers.

The chapter *For Engineers* in this Guide describes the articles dealing with steam engines, internal combustion engines, electrical machinery and fuels of all kinds; and it would be a waste of space to repeat in this chapter a summary of the Britannica treatment of these subjects.

All three of the chapters mentioned should therefore be treated as forming constituent parts of

the general plan of this present chapter, in which the naval officer will find no repetition of their contents.

The Key Article

The article to which he will naturally first turn is NAVY AND NAVIES (Vol. 19, p. 299), by David Hannay, author of *A Short History of the Royal Navy*. This article is equivalent to 60 pages of this Guide in length. It contains:

Naval Personnel.

Sketches of the *Administrative History of navies*: *Athenian*; *Roman*; *Byzantine*; *Medieval*; *British*, with special attention to the period since the Restoration, and the reforms under James II when Samuel Pepys was secretary;

French—modern navy dating from the time of Richelieu;

Spanish—a great navy without an organization before the 18th century;

Dutch—good seamen and well-fed, led by able admirals, but unorganized, and unimportant after the 17th century;

United States—the first great extra-European power on the sea;

Russian—dating from the reign of Peter the Great, when it was organized and led by foreigners.

The Balance of Navies in History: influence of sea-power —"when Napoleon fell, the navy of Great Britain was not merely the first in the world; it was the only powerful navy in existence." *Modern Rivalry* between Italy and Germany (1871), United States (1890), Japan; England and the Dual Alliance—"naval scares" since 1874; British Naval Defence Act of 1889; Russia's navy crushed (1904); new navies rivalling Great Britain and France,—Italy, Germany, United States, Japan.

Latest developments: "Dreadnoughts"; Building Programmes.

Bibliography (about 1800 words).

Naval Strategy and Tactics.

Historical evolution: inter-relation of the ship's capacity and armament.

Early history: ramming demanded oars for propulsion; small warships, large fighting crews,—no blockade, short cruises;

Greek and Roman methods: boarding introduced by Romans; "bearding," that is, fortifying with iron bands across the bows, an early form of armor plate.

Sailing ships: ramming discarded; "line ahead" formation displaces "line abreast"; principles of fighting tactics—order at beginning to be kept throughout, thus no advantage taken of enemy's disorder; Clerk's theories (1790–97)—not maximum safety but immediate mêlée the *desideratum*; Suffren, Rodney and Howe and their disregard of accepted tactics.

Improved shipbuilding and modern times: New problems —steam propulsion, its gain in speed, but its dependence on fuel; fleet in being; risk of transporting troops while enemy is unbeaten; ramming and pell-mell battles forbidden by torpedoes; searchlight as check to torpedoes; failure of attempts to "bottle up" harbours; gun-fire still the great factor; position; speed; submarines still an unknown factor.

Bibliography.

Naval Administration

The first part of this article NAVY AND NAVIES should be supplemented by the article ADMIRALTY ADMINISTRATION (Vol. 1, p. 195), by Admiral Sir R. Vesey Hamilton, and, for the United States, the late Admiral W. T. Sampson. The American part of this article describes the divisions and the working of the Navy Department, its bureaus, judge advocate-general, office of naval intelligence, boards etc.; and there is additional information on the subject in such

articles as DOCKYARDS, and UNITED STATES NAVAL ACADEMY.

For the legal side of naval administration the reader should study the article ADMIRALTY JURISDICTION (Vol. 1, p. 205), by Sir Walter Phillimore, former president of the International Law Association (and author of the Britannica article ADMIRALTY, HIGH COURT OF), and, for the United States, by J. Arthur Barrett; and also the general articles INTERNATIONAL LAW (Vol. 14, p. 694), by Sir Thomas Barclay, author of *Problems of International Practice and Diplomacy*, and INTERNATIONAL LAW, PRIVATE (Vol. 14, p. 701), by Dr. John Westlake, formerly professor of international law, Cambridge University, and member for the United Kingdom of the International (Hague) Court of Arbitration; as well as such special articles as SEARCH (Vol. 24, p. 560), by Sir Thomas Barclay, and SEA LAWS (Vol. 24, p. 535), by Sir Travers Twiss.

Policy, Strategy, Tactics

It has already been noticed that the closing part of the article NAVY AND NAVIES dealt with strategy and tactics in a general way. This subject is treated in fuller detail by Admiral Sir Cyprian Bridge, G.C.B. (former Director of Naval Intelligence, British Navy, author of *Sea-Power and other Studies*) in two articles SEA-POWER (Vol. 24, p. 548) and SEA, COMMAND OF THE (Vol. 24, p. 529). Each of these articles will be of great value and interest to the naval officer as a summary and criticism of the theories of Captain A. T. Mahan and Vice-Admiral P. H. Colomb; and this will be made evident by the brief outline of the two articles which follows.

Article, SEA-POWER—Use of the term to mean (1) a state pre-eminently strong at sea; and (2)—as in this article—the various factors in a state's naval strength. Thucydides as a forerunner of Mahan; he makes Pericles in comparing Athenian resources with those of her enemies comment on the importance of "sea-power."

The meaning of sea-power can only be learned historically. Although there have been more land-wars, "the course of history has been profoundly changed more often by contests on the water." Salamis saved Greece and held back Oriental invasion. The loss of the Peloponnesian War by Athens was due to her weakening sea-power. The First Punic War, Roman rather than Carthaginian control of the Mediterranean, was won by Roman naval predominance. Mahommedan conquest spread west in Africa only with the creation of a navy. The crusades could not have continued had not Mahommedan naval power sunk as the Venetian, Pisan, and Genoese grew. The defeat of Genoa by Venice gave the latter a right to perform the ceremony of "wedding the sea" with a ring as token of "perpetual sway." Lepanto (1571) the end of Turkish sea-power.

Spanish and Portuguese sea-power crushed by English growth and the loss of the Armada. Early English naval history: the importance of the battle of Dover in 1217. Appearance of standing navies. The New World and its influence on sea-power. The sea-power of the Dutch; its sudden rise; its basis in foreign trade; the Dutch wars with England resulted in England's becoming the first great naval power, but did not crush the United Provinces because of their sea-power. Torrington and the "Fleet in Being" in 1690. Change in naval operations in 17th century—the scene thereafter in the enemy's waters, not near the coast of England.

The 18th century. Rise of Russia's sea-power—an artificial creation. Seven Years' War and its gains to Great Britain. War of American Independence: British mistakes —the enemy's coast *not* considered the frontier. Wars of the French Revolution and Empire: Great Britain's advantage not in organization, discipline or "science,"

but in sea-experience.

The War of 1812. "The British had now to meet the *élite* of one of the finest communities of seamen ever known.... In any future war British sea-power, great as it may be, should not receive shocks like those that it unquestionably did suffer in 1812."

Later Manifestations of Sea-Power. American Civil War —"By dominating the rivers the Federals cut the Confederacy asunder; and, by the power they possessed of moving troops by sea at will, perplexed and harassed the defence, and facilitated the occupation of important points." Russo-Turkish War of 1877–78—Turkish control of Black Sea forced Russians to invade by land through the difficult Balkans. Chilean Civil War of 1891—an army defeated by a navy. Chino-Japanese War of 1894–95—Japanese navy in transport work and in crushing last resistance. Spanish-American War: "Spaniards were defeated by the superiority of the American sea-power."

Article, SEA, COMMAND OF THE—Sketch of Sovereignty of the Sea; Command different from Sovereignty or Dominion.

Attempts to gain Command: Dutch Wars.

Strategic Command or Control—largely the power of carrying out considerable over-sea expeditions at will. Seeking the enemy's fleet. Temporary command in smaller operations.

Special Historical Articles

As for the army officer, so the Britannica has for the naval officer many separate articles on wars, campaigns, battles, generals, commanders. The following list of articles will serve as a guide to a course of reading constituting a history of naval warfare, furnishing the concrete separate facts on which are based the articles already described.

Ancient History.

Greece: articles *Salamis*, *Themistocles*, *Xerxes I*,

Peloponnesian War, *Pericles*.

Rome: articles *Punic Wars*, *Carthage*, *Pompey*, *Actium*.

Medieval History.

Crusades; *Swold*; *Dover, Battle of*; *Sluys, Battle of*; *Espagnols sur Mer* (and article *Edward III*), *Chioggia* (and articles *Venice* and *Genoa*).

16th Century.

Lepanto (and article *Don John of Austria*).

Armada (and articles on *Howard*, *Hawkins*, *Drake*, *Frobisher*, *Raleigh*, *Richard Grenville*, and the other heroes of this first bright glow of England's naval glory).

The Era of Sailing Vessels.

Dutch Wars (and articles *Tromp*, *Robert Blake*, *Ayscue*, *De Ruyter*, *Cornelius De Witt*, *William Penn*, *George Monk*, *Sir John Lawson*, *James II*, *Prince Rupert*, *First Earl of Sandwich*, *Abraham Duquesne*).

Grand Alliance, Naval Operations (and articles *Earl of Torrington*, and *Beachy Head, Battle of*; *La Hogue*, *Earl of Oxford* [Edward Russell] and *Tourville*).

Spanish Succession, Naval Operations (and *Château-Renault*, *Benbow*, *Rooke*, *Cloudesley Shovel*, *Duguay-Trouin*, *Forbin*).

Austrian Succession, Naval Operations (and the articles *Edward Vernon*, *Lord Anson*, *Toulon, Battle of*, and *Thomas Mathews*, marking the official sanction in England of an absurd formal system of tactics).

Seven Years' War, Naval Operations (and *Boscawen*, *Byng*, *Hawke*, *Pocock*, *Quiberon*).

American War of Independence, Naval Operations (and *Esek Hopkins*, *John Paul Jones*, *Comte d'Estaing*, *Suffren St. Tropez*, *Thomas Truxtun*, *Lord Howe*, *John Byron*, *Hotham*, *Hyde Parker*, *Rodney*, *Guichen*, *Comte de Grasse*).

French Revolutionary Wars, Naval Operations (and *First of June, Battle of*, *Howe*, *Villaret de Joyeuse*, *Lord Bridport*, *Lord Hood*, *Earl of St. Vincent* [John Jervis], *St. Vincent, Battle of*, *Lord Keith*, *Lord Duncan*, *Nile*, *Nelson*, *Sir Thomas Troubridge*).

Napoleonic Campaigns, Naval Operations (and *Baron de Saumarez*, *Copenhagen, Battle of*, *Sir Hyde Parker*, *Sir Robert Calder*, *Villeneuve*, *Trafalgar*, *Lord Collingwood*).

American War of 1812 (and *John Rodgers*, *Isaac Hull*, *William Bainbridge*, *Stephen Decatur*, *David Porter*, *Oliver Hazard Perry*, *Sir Philip Broke*, *Thomas Macdonough*).

And *Lissa* (1811), closely resembling Trafalgar, and *Navarino*, decisive for Greek Independence.

The Era of Steam.

American Civil War (and *Hampton Roads*, *Andrew Hull Foote*, *New Madrid*, *D. G. Farragut*, *D. D. Porter*, *W. B. Cushing*).

Chile-Peruvian War.

Chilean Civil War.

Chino-Japanese War (and see *Ito*).

Spanish-American War (and see the articles *W. T. Sampson*, *W. S. Schley*, *George Dewey*, *Pascual Cervera y Topete Cervera*).

Russo-Japanese War (and *Togo*, *Dogger Bank*, *Tsushima*).

Armaments

The subject of *armaments* is treated in the articles SHIP and SHIPBUILDING (see chapter *For Marine Transportation Men*), ARMOUR PLATES, with illustrations, by Major William Egerton Edwards, late lecturer at the Royal Naval War College, Greenwich, ORDNANCE, AMMUNITION, TORPEDO, etc.

The following is an alphabetical list of articles in the Britannica of especial interest to naval officers or other students of naval warfare.

Actium

Admiral

Admiralty Administration

Admiralty Jurisdiction

American Civil War
American War of Independence
American War of 1812
Ammunition
Anson, Lord
Armada
Armour Plates
Arms and Armour
Ayscue
Bainbridge, William
Beachy Head
Benbow
Beresford
Blake, Robert
Boscawen
Bridport, Lord
Broke, Sir Philip
Byng
Byron, John
Calder, Sir Robert
Camperdown
Carthage
Casemate
Case-shot
Cervera
Château-Renault

Chile-Peruvian War
Chilean Civil War
Chino-Japanese War
Chioggia
Coaling Stations
Coast Defence
Coast Guard
Codrington
Coligny
Collingwood, Lord
Colomb
Commodore
Copenhagen, Battle of
Crusades
Cushing, W. B.
Decatur, Stephen
d'Estaing
De Ruyter
De Saumarez, Baron
Dewey, George
De Witt, Cornelius
Dockyards
Dogger Bank
Dover, Battle of (1217)
Drake
Duguay-Trouin

Duilius
Duncan, Lord
Duquesne, Abraham
Dutch Wars
Edward III
Espagnols sur Mer
Farragut, D. G.
Fireship
First of June
Flagship
Fleet
Flying Column
Foote, Andrew Hull
Forbin
French Revolutionary Wars
Frigate
Frobisher
Genoa
Grand Alliance
Grasse, Comte de
Grenville, Richard
Greek Independence
Guardship Perry,
Guichen
Hampton Roads
Hawke

Hawkins
Hood, Lord
Hopkins, Esek
Hotham
Howard
Howe, Lord
Hull, Isaac
International Law
James II
Jones, John Paul
Keith, Lord
La Hogue
Lawson, Sir John
Lepanto
Liner
Lissa (1811, 1866)
Macdonough, Thomas
Madrid, New
Mahan
Marines
Mathews, Thomas
Meloria
Miaoulis
Midshipman
Monk, George
Napoleonic Campaigns

Nauarchia
Naucrary
Naval Operations
Navarino
Navy and Navies
Nelson
Nile, Battle of the
Ordnance
Oxford, Earl of
Parker, Hyde
Parker, Sir Hyde
Peloponnesian War
Penn, William
Pepys
Pericles
Perry, Oliver Hazard
Piracy
Pocock
Pompey
Porter, David
Porter, D. D.
Privateer
Punic Wars
Quiberon, Battle of
Raleigh
Range-finder

Rodgers, John
Rodney
Rooke
Rupert, Prince
Russo-Japanese War
Saint-Bon
Saint Vincent
Saints, Battle of the
Salamis
Sampson, W. T.
Sandwich, 1st Earl of
Schley, W. S.
Sea, Command of the
Sea Laws
Seamanship
Sea-Power
Search
Seven Years' War
Ship, Shipbuilding
Shovel, Cloudesley
Sluys
Spanish-American War
Spanish Succession
Squadron
Submarine Mines
Suffren, St. Tropez

Swold
Themistocles
Togo
Torpedo
Torrington
Toulon, Battle of
Tourville
Trafalgar
Tromp
Troubridge, Sir Thomas
Truxtun, Thomas
Tsushima
U. S. Naval Academy
Venice
Vernon, Edward
Villaret de Joyeuse
Villeneuve
Xerxes I

Part II
Courses of Educational Reading to Supplement Or Take the Place of School or University Studies

CHAPTER XXXI
MUSIC

The general articles on music in the Encyclopaedia Britannica provide an illuminative discussion of broad artistic principles which cannot fail to stimulate the musical sense and perception of the professional or the amateur. The technical and critical treatment of the subject was directed by Donald F. Tovey, composer, pianist, and author of *Essays in Musical Analysis*; and no one could be better fitted for the work of organizing this department of the Britannica. He was assisted by W. H. Hadow, the well-known musical writer and composer, J. A. Fuller Maitland, musical critic of *The Times* (London), E. J. Dent, author of *Alessandro Scarlatti and His Works*, R. H. Legge, principal musical critic on the *Daily Telegraph* (London), and others; and the section

treating of musical instruments was organized and contributed by Miss Kathleen Schlesinger, the greatest living authority on the subject.

In mapping out courses of reading the subject is divided into sections as follows: (1) Evolution, (2) Theory, (3) Musical Forms, (4) Musical Instruments.

The article MUSIC (Vol. 19, p. 72), by Donald Tovey, which contains a masterly account of the development of the art from the earliest time down to the present day, provides the reader with just that general survey which enables him to see the whole picture in perspective. This he will naturally turn to first, but to fill out the picture there are a number of other articles which he will wish to read. In the following scheme the evolution of the art has been sketched in skeleton, so that the student may have before him a guide to the study of any period in which he is specially interested. This outline serves to show how very thoroughly the ground is covered in the new Encyclopaedia Britannica.

(1) EVOLUTION OF MUSIC

Subject for Reading	*Article*
PRE-HARMONIC STAGE	
Primitive Music.	MUSIC (Vol. 19, p. 72).
	SONG (Vol. 25, p. 406).
Musical sense first awakened by the rhythm of the dance.	DANCE (Vol. 7, p. 795); see also RHYTHM (Vol. 23, p. 278).
Legendary account of the invention of music by a Judean.	DAVID (Vol. 7, p. 859).

Hebrew music: setting of the Psalms.	PSALMS, BOOK OF (Vol. 22, p. 539 and p. 536).
Suggested Jewish origin of some Gregorian Tunes.	PLAIN SONG (Vol. 21, p. 706).
Dawn of modern music in Greece. Connection of music with lyric poetry. Terpander of Lesbos (660 B.C.) adds 3 strings to the 4–stringed lyre, giving compass of octave.	GREEK LITERATURE (Vol. 12, p. 509).
Characteristics of Greek music. Pythagoras (6th century, B.C.) fixes the intervals of the harmonic series and of the diatonic scale.	MUSIC (Vol. 19, p. 73); see also PYTHAGORAS (Vol. 22, p. 699).
The Greek scale shows a latent harmonic sense, though octaves only allowed.	LYRE (Vol. 17, p. 178); see also ORCHESTRA (Vol. 20, p. 168); AULOS (Vol. 2, p. 917); CITHARA (Vol. 6, p. 395).
	HARMONY (Vol. 13, p. 1).
Pitch in Greek music.	PITCH, MUSICAL (Vol. 21, p. 661).
Other primitive systems without influence on modern music.	CHINA, *Literature* (Vol. 6, p. 228 and p. 215).
Chinese adopted Pythagorean system; a lost art recovered in 3rd century, A.D.	
Indian music—Scale of 22 intervals.	SANSKRIT (Vol. 24, p. 181).

Siamese music: 7 tone scale; orchestras perform in unison.	SIAM (Vol. 25, p. 5).
The music of the North American Indian.	INDIANS, NORTH AMERICAN (Vol. 14, p. 470).

Biographies of musicians of the primitive, non-harmonic, period in the Britannica are: TERPANDER, 7th century B.C.; PYTHAGORAS, 6th century B.C.; ARISTOXENUS, 4th century; ALYPIUS, 3rd century B.C.; ARISTIDES, QUINTILIANUS, 3rd century.

HARMONIC ORIGINS

The Greeks found that by doubling the melody at the octave a greater sonority resulted. It was a great step from this to the discovery that two separate tunes could be combined which should be satisfying to the ear. With this discovery modern harmony may be said to have begun.

Subject	*Article*
Awakening of the harmonic sense.	MUSIC (Vol. 19, p. 74); HARMONY (Vol. 13, p. 1).
The Grecian modes modified into the ecclesiastical by Ambrose in the 4th century.	PLAIN SONG (Vol. 21, p. 705); see also AMBROSE (Vol. 1, p. 798), and GREGORY (Vol. 12, p. 567).

Following Hucbald, "beatus Guido inventor musicae" in the 11th century, invents names for the notes and improves system of notation.	GUIDO OF AREZZO (Vol. 12, p. 687); see also HUCBALD (Vol. 13, p. 847).
The Troubadour becomes a learned musician in the 13th century.	ADAM DE LA HALE, 13th century (Vol. 1, p. 171); MACHAUT (Vol. 17, p. 233).
After Dunstable of England and Dufay of the Netherlands had invented counterpoint comes the first great composer, heralding the advent of the "Golden Age."	DES PRÉS, JOSQUIN (Vol. 8, p. 103); see also BINCHOIS, EGIDIUS (Vol. 3, p. 948).

THE GOLDEN AGE

The First Great Climax

Composers were not long content with the simple combination of two tunes. They soon found that three tunes so treated afforded a yet richer texture, and the extension to the elaborate polyphony of 16th century choral music was an inevitable step. An elaborate system of prohibitions, based on the limitations of the human voice, and the difficulty of attacking certain intervals, shackled the composer at every turn and formed the basis of theories of counterpoint which endured almost to our time.

Despite the restrictions imposed by their rules, the structure raised by the great composers of the first half of the 16th century was of amazing richness and complexity.

Subject of Reading	*Article*
The Riot of Choral Polyphony in the 16th century.	MUSIC, *The Golden Age* (Vol. 19, p. 75); see also HARMONY (Vol. 13, p. 2); INSTRUMENTATION, *Vocal Styles of 16th Century* (Vol. 14, p. 651).
Musical forms brought to great perfection in this period those in which texture holds first place.	CONTRAPUNTAL FORMS, *Canonic Forms and Devices, Counterpoint on a Canto Fermo* (Vol. 7, p. 42); see also MASS, *Polyphonic Masses* (Vol. 17, p. 849); MADRIGAL (Vol. 17, p. 295); MOTET (Vol. 18, p. 905).
Leaders of musical thought in the "Golden Age."	LASSO, Orlando (Vol. 16, p. 237); TALLIS, T. (Vol. 26, p. 377); PALESTRINA (Vol. 20, p. 627).

Composer of the Golden Age

Composers of the "Golden Age," following the polyphonic tradition of the early 16th century, biographies of whom appear in the Britannica, are: *Netherlandish*: ARCADELT, JACOB, 1514–1556; LASSO, ORLANDO, c. 1530–1594; *German*: FINCK, HERMANN, 1527–1558; ECCARD, JOHANN, 1553–1611; AICHINGER,

GREGOR, leader of Reformation church music, c. 1565–1628; *French*: GOUDIMEL, C., c. 1510–1572; *English*: WILBYE, JOHN, 16th century, famous for his madrigals; MERBECK, JOHN, d. 1585; BENNETT, JOHN, d.c. 1614; BATESON, T., d. 1630, a composer of madrigals; TALLIS, T., c. 1515–1585, "father of English cathedral music"; FARRANT, R., c. 1530–1581; BYRD, WM., 1543–1623; MORLEY, T., 1557–1603; GIBBONS, ORLANDO, 1583–1625; *Italian*: ANIMUCCIA, GIOVANNI, c. 1490–1571; ZARLINO, GIOSEFFO, 1517–1590, fixed the diatonic scale as now accepted; PALESTRINA, GIOVANNI PIERLUIGI DA, 1526–1594; BANCHIERE, ADRIANO, c. 1557–1634, fought against monodist revolt—see below; ANERIO (brothers), c. 1560–1620; ARTUSI, G. M., 16th century, opposed Monteverdi's innovations—see below; *Spanish*: VICTORIA, TOMMASSO L. DA, c. 1540–1613.

THE FIRST ROMANTIC MOVEMENT

The last word in polyphony seemed to have been said by such masters as Orlando Lasso, and Palestrina, and a change into new paths was inevitable. Moreover, men's minds were craving something more directly stimulating than the passionless web of ecclesiastical polyphony, which was the glory of the 16th century. Freedom was sought from the conventions of modal counterpoint. The monodist revolt was the result.

Subject	*Article*
Revolt against the overelaboration of texture.	MUSIC, *The Monodic Revolution* (Vol. 19, p. 76); HARMONY, *Modern Harmony* (Vol. 13, p. 4).

Prominence given to solo part rather than to choral effect leads to development of the aria.	SONG (Vol. 25, p. 406); ARIA (Vol. 2, p. 489).
The leader in the new paths, the pioneer of modern harmony.	MONTEVERDE, CLAUDIO (Vol. 18, p. 778).
The first oratorio (1600).	ORATORIO (Vol. 20, p. 161); see also CAVALIERE, EMILIO DEL (Vol. 5, p. 563).
The first opera (1600).	OPERA (Vol. 20, p. 121); see also PERI, JACOPO (Vol. 21, p. 144).
The monodic impulse synchronizes with the startling development of the violin family by the Cremona makers.	VIOLIN (Vol. 28, p. 103); see also AMATI (Vol. 1, p. 783); GUARNIERI (Vol. 12, p. 660); STRADIVARI (Vol. 25, p. 977).

Famous Monodists

Among distinguished composers of this period and school are: *English*: BULL, JOHN, c. 1562–1628; FORD, THOMAS, b. 1580; LAWES, HENRY, 1595–1662; *Italian*: CAVALIERE, E. DEL, c. 1550–1602; PERI, JACOPO, b. 1561; GABRIELE, GIOVANNI, 1557–c. 1612, early experimenter in chromatic harmony; CACCINI, GIULIO, 1558–1615; MONTEVERDE, CLAUDIO, 1567–1643; ALLEGRI, GREGORIO, c. 1570–1652; FRESCOBALDI, GIROLAMO, 1583–1644, famous also as a teacher; AGOSTINO, P., 1593–1639; CAVALLI, F., 1596–1676, popularized opera; CARISSIMI, G., c. 1604–1674, popularized oratorio; ROSSI, LUIGI DE. All the above have separate articles assigned to them in the Britannica.

THE 17th CENTURY AND AFTER

The Second Great Climax

Those who revolted from the traditions of the polyphonic school went, as was inevitable, too far. A reaction was equally inevitable, for the language of the new music was unformed and was in danger of being stereotyped into the emptiest of formulas. The welding of the old and new ideas was all that was needed to prepare the way for the colossal achievement of a Bach or a Beethoven. It was a busy period when the rules of counterpoint were reviewed and revised, when theories of harmony as a distinct science took shape. But, save for the work of such men as Purcell, the Englishman (Vol. 22, p. 658), born 100 years before his time, the 17th century was mainly one of preparation. The next great climax came in the first half of the 18th century.

Subject	*Article*
The renascence of texture, the welding of polyphony and monody.	MUSIC (Vol. 19, p. 77); HARMONY (Vol. 13, p. 4).
Publication in 1715 of the famous *Gradus ad Parnassum*, the first complete theory of counterpoint.	FUX, JOHANN JOSEPH (Vol. 11, p. 375).
The first systematic theory of harmony published in 1722.	RAMEAU, J. P. (Vol. 22, p. 874).
The second great climax in music.	MUSIC, *Bach and Handel* (Vol. 19, p. 78).

The achievement of Johann Sebastian Bach.

BACH, J. S. (Vol. 3, p. 124); see also CONTRAPUNTAL FORMS (Vol. 7, p. 41); CONCERTO (Vol. 6, p. 825); OVERTURE (Vol. 20, p. 384); SUITE (Vol. 26, p. 51); ORATORIO (Vol. 20, p. 161); CANTATA (Vol. 5, p. 209); MASS, *Lutheran Masses* (Vol. 17, p. 850); VARIATIONS (Vol. 27, p. 912); INSTRUMENTATION, *Decoration* and *Orchestral Schemes* (Vol. 14, p. 651 and p. 655).

17th and 18th Century Composers

Composers of the period who have separate notices in the Britannica are: *Italian*: CESTI, M. A., c. 1620–1669; COLONNA, GIOVANNI P., c. 1637–1695; PASQUINI, B., 1637–1710; STRADELLA, ALESSANDRO, 1645–1682; CORELLI, ARCANGELO, 1653–1713, first classic of the violin; STEFFANI, A., 1653–1728; SCARLATTI, ALESSANDRO, 1659–1725, largely created language of modern music; PITONI, G. O., 1657–1743; LOTTI, ANTONIO, c. 1667–1740; CLARI, G. C. M., c. 1669–1745; BONONCINI, G. B., c. 1672–1750; ALBINONI, T., c. 1674–1745; ASTORGA, EMANUELE D', 1681–1736; DURANTE, FRANCESCO, 1684–1755; MARCELLO, B., 1686–1739; VINCI, LEONARDO, 1690–1730; LEO, LEONARDO, 1694–1744; LOGROSCINO, NICOLA, c. 1700–1763; PERGOLESI, GIOVANNI BATTISTA, 1710–1736; ALBERTI, DOMENICO, c. 1710–1740; *French*: CAMBERT, R., 1628–1677; LULLY, JEAN-BAPTISTE, c. 1623–1687, inventor of the classical

French opera style; *English*: LOCKE, MATTHEW, c. 1630–1677; BLOW, JOHN, 1648–1708; PURCELL, HENRY, 1658–1695; CROFT, WILLIAM, 1678–1727; HANDEL, GEORGE FREDERICK, 1685–1759; GREENE, MAURICE, 1695–1755; *German*: BACH, JOHANN SEBASTIAN, 1685–1750; HASSE, JOHANN A., 1699–1783; EBERLIN, J. E., 1702–1762.

THE RISE OF THE SONATA

The Third Great Climax

Bach, like Palestrina, seemed to have closed a period; and for nearly a hundred years after his death his influence on the course of musical development was astonishingly small. Again men sought new channels of expression and found them in instrumental music. But a structure less loosely knit than the suite form was needed if the new ideas were to be adequately stated, and the sonata grew into being, a form which has sufficed to this day as a medium for the noblest thoughts of the great composers. The 18th century saw, too, the reform of the opera by Gluck, a great development of orchestral resources, and the rise of the string quartette in chamber music.

Subject	*Article*
The new language: evolution of the sonata from the suite.	MUSIC (Vol. 19, p. 79); SONATA, *Sonata Style* (Vol. 25, p. 394); see also SCARLETTI, DOMINICO (Vol. 24, p. 302); and BACH, K. P. E. (Vol. 3, p. 130).

Reform of the opera.	OPERA (Vol. 20, p. 123); see also GLUCK (Vol. 12, p. 138); PICCINNI (Vol. 21, p. 579); MOZART (Vol. 18, p. 951).
The rise of the symphony and the string quartette, development of the sonata.	MUSIC, *The Symphonic Classes* (Vol. 19, p. 78); SONATA FORMS (Vol. 25, p. 395); SYMPHONY (Vol. 26, p. 290); see also HAYDN (Vol. 13, p. 110).
The growth of the orchestra.	INSTRUMENTATION, *Symphonic* (Vol. 14, p. 652); see also HAYDN (Vol. 13, p. 110).
The third great climax. The perfection of the sonata form.	BEETHOVEN, L. VON (Vol. 3, p. 644); see also SONATA FORMS (Vol. 25, p. 397); INSTRUMENTATION (Vol. 14, p. 653); VARIATIONS (Vol. 27, p. 913); MASS (Vol. 17, p. 850).

Biographies of the following composers of the period appear in the Britannica: *German and Austrian*: BACH, KARL PHILIPP EMANUEL, 1714–1788; GLUCK, C. W., 1714–1787; HILLER, J. A., 1728–1804; HAYDN, FRANZ JOSEPH, 1732–1809; DITTERSDORF, KARL DITTERS VON, 1739–1799; WINTER, P., c. 1755–1825; MOZART, WOLFGANG AMADEUS, 1756–1791; HIMMEL, F. H., 1765–1814; BEETHOVEN, LUDWIG VAN, 1770–1827; *French*: GOSSEC, F. J., 1734–1829; GRETRY, A. E. M., 1741–1813; MEHUL, ETIENNE H., 1763–1817; LESUEUR, JEAN FRANÇOIS, c. 1763–1837; BOIELDIEU, F. A., 1775–1834; *English*: ARNE, T. A., 1710–1778, preserved English

tradition in face of Handelian obsession; BOYCE, WILLIAM, 1710–1779; JACKSON, W., 1730–1803; BATTISHILL, J., 1738–1801; ARNOLD, S., 1740–1802; DIBDIN, C., 1745–1814; SHIELD, W., 1748–1829; STORACE, S., 1763–1796; ATTWOOD, T., 1765–1838; WESLEY, SAMUEL, 1766–1837, father of modern organ playing; *Italian*: SCARLATTI, DOMENICO, 1685–1757; MARTINI, G. B., 1706–1784; GALUPPI, BALDASSARE, 1706–1785; JOMMELLI, N., 1714–1774; GUGLIELMI, P., 1727–1804; PICCINNI, N., 1728–1800; SARTI, GIUSEPPE, 1729–1802; SACCHINI, A. M. G., 1734–1786; PAISIELLO, G., 1741–1816; BOCCHERINI, LUIGI, 1743–1805, last real master of suite form; CIMAROSA, D., 1749–1801; SALIERI, A., 1750–1825; CHERUBINI, 1760–1842; PAER, F., 1771–1839.

NEW PATHS

Early in the 19th century the wave of romanticism broke over Europe. The effect on music was not nearly so violent as was the monodic revolt of the 16th–17th centuries, since the resources and technique of the art had now been developed; but it was nevertheless striking and showed itself in several directions, but mainly in two: lyrical and dramatic. The short compositions of Field, Schumann, and Chopin, and the development of the art song are instances of the former; the whole range of programme music, of which the symphonic poem is the prototype, is evidence of the latter; while in opera the reforms started by Gluck were carried to their logical conclusion by Wagner. Two other movements are also significant; the return to Bach and a recognition of his amazing modernity, and the pronounced revival of national characteristics in music, as shown particularly in the new English, Russian, and Bohemian Schools.

Subject	*Article*
The Romantic Period.	MUSIC, *From Beethoven to Wagner* (Vol. 19, p. 79).
The Romantic in opera.	WEBER, CARL MARIA F. E. VON (Vol. 28, p. 455); SONG (Vol. 25, p. 409).
The first great lyrical song writer.	SCHUBERT, FRANZ PETER (Vol. 24, p. 379); SONG (Vol. 25, p. 409).
The Romantic in the symphony.	PROGRAMME MUSIC (Vol. 22, p. 424); see also BERLIOZ, HECTOR (Vol. 3, p. 791).
The rediscovery of Bach.	BACH, J. S. (Vol. 2, p. 124); MENDELSSOHN (Vol. 18, pp. 121–124).
Development of song forms.	SONG (Vol. 25, p. 410); see also SCHUMANN, ROBERT (Vol. 24, p. 384); WOLF, HUGO (Vol. 28, p. 771); BRAHMS, J. (Vol. 4, p. 390).
Discontent with the sonata form.	SYMPHONIC POEM (Vol. 26, p. 289); LISZT, F. (Vol. 16, p. 780).
Gluck's idea realised; union of music	MUSIC (Vol. 19, p. 80); OPERAS, *Leit-Motif* with drama. (Vol. 20, p. 125); WAGNER, W. RICHARD (Vol. 28, p. 236).
The last of the royal line of German composers shows vitality of the sonata form.	BRAHMS, JOHANNES (Vol. 4, p. 389); SONATA FORMS, *Sonata since Beethoven* (Vol. 25, p. 398).

Modern Tendencies.	MUSIC (Vol. 19, p. 82); see also STRAUSS, RICHARD (Vol. 25, p. 1003); DEBUSSY, ACHILLE (Vol. 7, p. 906).

Composers of this period, who have had separate articles assigned to them in the Britannica, follow: the growth of national schools will be noted.

19th Century Composers

German and Austrian: GANSBACHER, J. B., 1778–1844; KREUTZER, K., 1780–1849; SPOHR, LUDWIG, 1784–1859; WEBER, CARL MARIA F. E. VON, 1786–1886; MEYERBEER, G., 1791–1863; HAUPTMANN, M., 1792–1868; LÖWE, J. K. G., 1796–1869; SCHUBERT, FRANZ PETER, 1797–1828; LORTZING, G. A., 1801–1851; STRAUSS, JOHANN, 1804–1849, king of valse composers; MENDELSSOHN-BARTHOLDY, J. L. F., 1809–1847; NICOLAI, OTTO, 1810–1849; SCHUMANN, ROBERT ALEXANDER, 1810–1856; HILLER, F., 1811–1885; WAGNER, RICHARD, 1813–1883; HELLER, STEPHEN, 1815–1888; FRANZ, ROBERT, 1815–1892, song composer; ABT, FRANZ, 1819–1885, art folk-song; SUPPE, F. VON, 1820–1895; RAff, J. J., 1822–1882; CORNELIUS, CARL AUGUST PETER, 1824–1874, song writer; BRUCKNER, ANTON, 1824–1896, Wagnerian symphonist; REINECKE, C. H. C., 1824–1910; LASSEN, EDUARD, 1830–1904; JOACHIM, JOSEPH, 1831–1907; BRAHMS, JOHANNES, 1833–1897; BRUCH, MAX, b. 1838; RHEINBERGER, J. G., 1839–1901; GOETZ, HERMANN, 1840–1876; NESZLER, V., 1841–1890: HUMPERDINCK, E., b. 1854; WOLF, HUGO, 1860–1903; STRAUSS, RICHARD, b. 1864.

French: AUBER, D. F. E., 1782–1871; HEROLD, L. J. F., 1791–1833; HALEVY, J. F. F. E., 1799–1862; BERLIOZ, HECTOR, 1803–1869; DAVID, F., 1810–1876; THOMAS, C. L. AMBROISE, 1811–1896; GOUNOD, C. F., 1818–1893; OffENBACH, J., 1819–1880; FRANCK, CESAR, 1822–1890,

founder of Modern French School; LALO, E., 1823–1892; REYER, E., b. 1823; LECOCQ, A. C., b. 1832; BENOIT, P. L. L., 1834–1901; SAINT-SAËNS, CHARLES CAMILLE, b. 1835; DUBOIS, F. C. T., b. 1837; BIZET, GEORGES, 1838–1875; JONCIERES, V., 1839–1903; CHABRIER, A. E., 1841–1894; AUDRAN, E., 1842–1901; MASSENET, J. E. F., 1842–1912; FAURE, GABRIEL, b., 1845; WIDOR, CHARLES MARIE, b. 1845; GODARD, BENJAMIN L. P., 1849–1895; PLANQUETTE, R., b. 1850; D'INDY,. P. M. T. V., b. 1851; MESSAGER, A. C. P., b. 1853; BRUNEAU, ALFRED, b. 1857; CHAMINADE, CÉCILE, b. 1861; BEMBERG, HERMAN, b. 1861; DEBUSSY, CLAUDE ACHILLES, b. 1862.

Belgian: The violinist YSAYE, b. 1858.

Italian: SPONTANI, G. L. P., 1774–1851; ROSSINI, G. A., 1792–1868; DONIZETTI, G., 1798–1848; BELLINI, V., 1801–1835; VERDI, GIUSEPPE, 1813–1901; PONCHIELLI, AMILCARE, 1834–1886, on whom have modelled themselves, Mascagni, Leoncavallo, etc.; BOITO, ARRIGO, b. 1842; SGAMBATI, G., b. 1843; LEONCAVALLO, R., b. 1858; PUCCINI, G., b. 1858; MASCAGNI, P., b. 1863.

British: HORSLEY, WM., 1774–1858; SMART, SIR GEORGE T., 1776–1867; BISHOP, SIR H. R., 1786–1855; PEARSALL, R. L. DE, 1795–1856; FIELD, JOHN, 1782–1837, inventor of the nocturne; GOSS, SIR JOHN, 1800–1880; HATTON, J. L., 1800–1886; BARNETT, J., 1802–1890; BENEDICT, SIR JULIUS, 1804–1885; BALFE, M. W., 1808–1870; WESLEY, S. S., 1810–1876; HULLAH, JOHN P., 1812–1884; MACFARREN, SIR G. A., 1813–1887; WALLACE, WM. V., 1814–1865; PIERSON, H. H., 1815–1873; BENNETT, SIR WM. STERNDALE, 1816–1875; OUSELEY, SIR F. A. G., 1825–1889; BACHE, F. E., 1833–1858; CLAY, F., 1838–1889; BARNBY, SIR J., 1838–1896; STAINER, SIR JOHN, 1840–1901; SULLIVAN, SIR ARTHUR S., 1842–1900; CELLIER, ALFRED, 1844–1891; MACKENZIE, SIR A. C., b. 1847; PARRY, SIR C. HUBERT H., b. 1848, on whom fell the mantle of Purcell; THOMAS, ARTHUR GORING, 1850–1892; COWEN, F. J., b. 1852; STANFORD, SIR CHARLES VILLIERS, b. 1852; ELGAR, SIR EDWARD, b. 1857; MACCUNN, HAMISH, b. 1868.

Bohemian: SMETANA, F., 1824–1884, founder of modern Bohemian School; DVOŘÁK, ANTON, 1841–1904.

Hungarian: GUNG'L, JOSEF, 1810–1889; LISZT, FRANZ, 1811–1886; GOLDMARK, KARL, b. 1832; PADEREWSKI, I. J., b. 1860.

Polish: CHOPIN, FREDERIC FRANÇOIS, 1810–1849; MOSZKOWSKI, MORITZ, b. 1854.

Russian: GLINKA, M. IVANOVICH, 1803–1857, founder of national school; DARGOMIJSKY, A. SERGEIVICH, 1813–1869; RUBINSTEIN, ANTON, 1829–1894; BORODIN, A. PORFYRIEVICH, 1834–1887; MOUSSORGSKY, M. PETROVICH, 1835–1881; BALAKIREV, M. ALEXEIVICH, b. 1836; TSCHAIKOVSKY, PETER ILICH, 1840–1893; RIMSKY-KORSAKOV, N. ANDREIEVICH, 1844–1908; GLAZUNOV, A. CONSTANTINOVICH, b. 1865.

Norwegian: The violinist BULL, OLE, 1810–1880; KJERULF, HALFDAN, 1815–1868; SVENDSEN, J. S., b. 1840; GRIEG, EDVARD HAGERUP, 1843–1907.

Danish: GADE, NIELS W., 1817–1890.

Sweden: WENNERBERT, G., 1817–1901, song writer.

American: EMMETT, D. D., started "negro minstrels," 1815–1904; FOSTER, STEPHEN C., 1826–1864, song writer; EICHBERG, JULIUS, 1824–1893, founded Boston Conservatory of Music; BUCK, DUDLEY, 1839–1909; MACDOWELL, EDWARD ALEXANDER, 1861–1908. For notices of other modern composers and their tendencies —see MUSIC, *Recent Music* (Vol. 19, p. 82).

Musical Historians

Famous musical historians and writers on music, whose biographies are in the Encyclopaedia Britannica, are: ARISTOXENUS, 4th century B.C.; PRAETORIUS, M., 1571–1621; PERUSCH, J. C., 1667–1752; BARNARD, JOHN, 17th century; HAWKINS, SIR JOHN, 1710–1789; GERBERT, M., 1720–1793; BURNEY, CH., 1726–1814; GERBER, 1746–1819; FORKEL, J. N., 1749–1818; BAINI, G., 1775–1844; NOVELLO, V., 1781–1861; CALLCOTT, J. W., 1766–1821; FETIS, F. J., 1784–1871; CHORLEY, H. F., 1808–1872; CHAPPELL, WM., 1809–1888; DWIGHT, JOHN S., 1813–

1893; AMBROS, A. W., 1816–1876; GROVE, SIR GEORGE, 1820–1900.

(2) THEORETICAL ARTICLES

"In the beginning," said Hans von Bülow, "was rhythm," and as RHYTHM (Vol. 23, p. 277) is the skeleton of every musical phrase and formula, the interesting article by Donald Tovey on rhythm in music may well serve as an introduction to the other subjects in this section. Passing to the elements, the articles SOUND, *Diatonic Scale* (Vol. 25, p. 448) and PLAIN SONG (Vol. 21, p. 705) should be read. In the former article the physical basis of the modern scale is determined, while in the latter an account is given of the modes which for centuries were the vehicles of musical expression. In the article MUSICAL NOTATION (Vol. 19, p. 86) the steps by which the present system of recording music was reached are noted, and in PITCH, MUSICAL (Vol. 21, p. 660), the whole of this interesting and vexed subject is reviewed by Alfred J. Hipkins, a high authority, formerly hon. curator of the Royal College of Music. The article MELODY (Vol. 18, p. 96) contains in addition to a discussion of the terms a series of useful definitions (e.g., conjunct and disjunct motion) and several musical examples. This brings us to the main articles of this section—COUNTERPOINT (Vol. 7, p. 315), HARMONY (Vol. 13, p. 1) and INSTRUMENTATION (Vol. 14, p. 651). All are by Donald Tovey and all are brilliant. In particular the article HARMONY deserves the most careful study, especially interesting being the sections *Tonality* and *Key-relationship*. The article on counterpoint is mainly a definition of the principles involved and is

introductory both to Harmony and to Contrapuntal Forms. In INSTRUMENTATION the question of colour is discussed from the historical and aesthetic aspects, accompanied by valuable analysis of the colour schemes of various composers from the choral writers of the "Golden Age" down to Wagner and Richard Strauss.

Theorists

Famous theorists who have helped to establish the grammar of music are the following: TERPANDER, 7th century B.C., founder of Greek music (Vol. 26, p. 647); PYTHAGORAS, 6th century, B.C., said to have discovered numerical relation governing the harmonic series (Vol. 22, p. 699); ALYPIUS, 3rd century B.C. (Vol. 1, p. 776); ARISTIDES, QUINTILIANUS, 3rd century A.D.; HUCBALD, c. 840–930, inventor of new notation (Vol. 13, p. 847); GUIDO OF AREZZO, c. 995–1050, "Beatus Guido, inventor musicae," (Vol. 12, p. 687); AGRICOLA, MARTIN, c. 1500–1556; ZARLINO, G., 1517–1590, fixed the diatonic scale; ARTUSI, G. M., 16th century, opposed monodist revolt; FUX, J. J., wrote the famous *Gradus ad Parnassum*, RAMEAU, J. P., 1683–1764, to whom the first systematic theory of harmony is due; ALBRECHTSBERGER, J. G., 1736–1809, the teacher of Beethoven; REICHA, A. J., 1770–1836; RICHTER, E. F. E., 1808–1879; CURWEN, J., 1817–1880, inventor of tonic sol-fa system; BERLIOZ HECTOR, whose text book on instrumentation is classic. On all these separate articles will be found in the Britannica.

(3) MUSICAL FORMS

Contrapuntal Forms

In making a detailed study of any particular form,

reference should be made to the critical sections of the biographies of those masters who have done most towards its development. As has been seen in the historical section of this chapter, the CONTRAPUNTAL FORMS (Vol. 7, p. 41) were the first to attain to a high standard of organization in the hands of such masters as ORLANDO LASSO (Vol. 16, p. 237) and PALESTRINA (Vol. 20, p. 627). The articles MASS (Vol. 17, p. 849), MOTET (Vol. 18, p. 905), MADRIGAL (Vol. 17, p. 295), CANON (Vol. 5, p. 190), CHORALE (Vol. 6, p. 269), cover the ground of early choral music. In tracing their development reference should be made to the articles on BACH, J. S. (Vol. 3, p. 127), BEETHOVEN (Vol. 3, p. 649), BRAHMS (Vol. 4, p. 390). ORATORIO (Vol. 20, p. 161) and CANTATA (Vol. 5, p. 209) had their beginning in the work of the followers of Monteverde in the early 17th century, and their development may be traced in the work of CAVALIERE (Vol. 5, p. 563), CARISSIMI (Vol. 5, p. 338), PURCELL (Vol. 22, p. 658), BACH (Vol. 3, p. 127), HANDEL (Vol. 2, p. 912), BRAHMS (Vol. 4 p. 390), CÉSAR FRANCK (Vol. 11, p. 3), and SIR C. HUBERT PARRY (Vol. 20, p. 865).

Suite and Sonata

In instrumental music, the SUITE (Vol. 26, p. 51), of which BOCCHERINI (Vol. 4, p. 105) was the last master, most nearly foreshadowed the Sonata (SONATA FORMS, Vol. 25, p. 394), and together they tell the tale of the development of absolute music up to modern experiments in the more elastic SYMPHONIC POEM (Vol. 26, p. 289) of which LISZT (Vol. 16, p. 780) was the first to see the possibilities. In addition to the articles SONATA and SONATA FORMS the reader should carefully study that part of

the article BEETHOVEN beginning on page 647 of Vol. 3; also the article HARMONY, *Key Relationships* (Vol. 13, p. 5) which contains analyses of several striking key systems, and further reference should also be made to the articles VARIATIONS (Vol. 27, p. 912), SYMPHONY (Vol. 26, p. 290).

Programme Music

To the Romantic movement of the early part of the 19th century may be traced the attempt to escape from the apparent restrictions of the Sonata Form, and SCHUMANN'S (Vol. 24, p. 384) many *Fantasie-Stücke* and CHOPIN'S lyrical compositions (Vol. 6, p. 268) are prototypes in little of the tendencies of the time. On a larger canvas are the Ton-dramen of Liszt and the symphonic poems and the elaborate programme music of modern composers such as RICHARD STRAUSS (Vol. 25, p. 1003); and though BRAHMS (Vol. 4, p. 389) showed clearly enough that the classical sonata form was a framework sufficiently elastic to hold the most elaborate and modern ideas, the direction in which music has tended is towards the Symphonic Poem in which, by such devices as the transformation of themes and the *Leitmotif* (OPERA, Vol. 20, p. 125) a still greater elasticity is sought in form with a greater continuity of idea in substance. See PROGRAMME MUSIC (Vol. 22, p. 424).

Opera

Supplementing the article OPERA (Vol. 20, p. 121) are several which should be consulted. ARIA (Vol. 2, p. 489), OVERTURE (Vol. 20, p. 384), and especially GLUCK (Vol. 12, p. 139), MOZART (Vol. 18, p. 951), WEBER (Vol. 28, p. 457), and WAGNER (Vol. 28, p. 237). These, with the biographical notices of operatic composers, which include almost every Italian

composer from the days of PERI (Vol. 21, p. 144), and French composers from LULLY (Vol. 17, p. 121), give a mass of information bearing on the development of this popular form.

Song

SONG (Vol. 25, p. 400), the oldest of art forms, and almost the last to be rescued from the too narrow formalism of which the classical ARIA (Vol. 2, p. 489) is the beautiful example, is so much the most generally popular that the article on it in the Britannica will probably be more widely read than any other on musical subjects. Written by W. A. J. Ford, a scholarly musician and teacher of singing at the Royal College of Music (London), it provides a brilliant survey of the evolution of the song from its earliest beginnings. In connection with it the reader will find much to interest him in the biographical notices of two famous troubadours of the 13th and 14th centuries, ADAM DE LA HALE (Vol. 1, p. 171) and MACHAUT, G. DE (Vol. 17, p. 233); of MONTEVERDE (Vol. 18, p. 778), the pioneer of the monodist revolt at the end of the 16th century, of SCARLATTI, ALESSANDRO (Vol. 24, p. 302), 17th century, who perfected the aria form, of PURCELL, HENRY (Vol. 22, p. 658), the great English composer of the 17th century, of JOHANN SEBASTIAN BACH (Vol. 3, p. 126) 18th century, of SCHUBERT (Vol. 24, p. 380), the creator of the modern song, of SCHUMANN (Vol. 24, p. 384) who brought a yet greater intimacy into the form, of HUGO WOLF (Vol. 28, p. 771), the most clairvoyant of song writers, of SIR HUBERT PARRY (Vol. 20, p. 865), and SIR CHARLES VILLIERS STANFORD (Vol. 25, p. 773), who have respectively done the best modern work in the English and Irish tradition, and of the American

MACDOWELL (Vol. 17, p. 214). Reference should also be made to the articles MELODY (Vol. 18, p. 96), ACCOMPANIMENT (Vol. 1, p. 122), RHYTHM (Vol. 23, p. 277). Suggestive also are the articles BALLADS (Vol. 3, p. 264), POETRY (Vol. 21, p. 889). On the technique of singing the article VOICE (Vol. 28, p. 172) by Dr. J. G. McKendrick, will be found very helpful, especially the section on the *Physiology of Voice Production*.

(4) MUSICAL INSTRUMENTS

One branch of the subject yet remains, that of musical instruments. Here the editor of the Britannica had the advantage of the assistance of Miss Kathleen Schlesinger (author of *The Instruments of the Orchestra*, and the greatest authority on the subject), who contributed practically all of the articles in the book on musical instruments. A list of them is given below, classified under their most convenient groupings. From these articles in the Encyclopaedia Britannica the reader will get a full account of every known musical instrument whether modern or ancient, with its compass, and scale, and of its connection with other instruments of the same class; so that the evolution of every type is clearly brought out. As a preliminary to a general study of the subject, the articles ORCHESTRA (Vol. 20, p. 168), and INSTRUMENTATION (Vol. 14, p. 651) may conveniently be read. In the former Miss Schlesinger gives a summary of the development of the various classes of instruments and of their concerted use. In the article INSTRUMENTATION, on the other hand, Donald Tovey illustrates the *principles* which govern their use. This article closes with an interesting

survey of the orchestral schemes at different periods in the history of the art. The following classified list of separate articles on musical instruments in the Britannica, shows how very completely this work covers the field:

Stringed Instruments (Vol. 25, p. 1038).

Strings Plucked by Fingers or Plectrum: ASOR; BALALAIKA; BANJO; BARBITON; CHELYS; CITHARA; CITOLE; CITTERN; EPIGONION; GUITAR; HARP; HARP-LUTE; KINNOR; KISSAR; LUTE; LYRE; MANDOLINE; NANGA; PANDURA; PSALTERY; REBAB; ROTTA; SAMBUCA; THEORBO; TRIGONON; ZITHER. *Strings Set in Vibration by Friction of the Bow*: CROWD; DOUBLE BASS; FIDDLE; GEIGE; GUITAR-FIDDLE; GUSLA; NAIL VIOLIN; PHILOMEL; RAVANASTRON; REBAB; REBEC; TROMBA MARINA; VIELLE; VIOL; VIOLA; VIOLIN; VIOLONCELLO. *Strings Struck by Hammers or Tangents*: CLAVECIN; CLAVICEMBALO; CLAVICHORD; CLAVICYTHERIUM; DULCIMER; HARMONICHORD; HARPSICHORD; PIANOFORTE; SPINET; VIRGINAL. *Strings Set in Vibration by Friction of a Wheel*: HURDY-GURDY; ORGANISTRUM. *Strings Set in Vibration by the Wind*: AEOLIAN HARP. *Appliances*: BOW; MONOCHORD; MUTE; MOUTHPIECE; KEYBOARD; SORDINO.

Wind Instruments (mouth blown) (Vol. 28, p. 709.)

Wood Wind.

The Pipe Class: EUNUCH FLUTE; FIFE; FLAGEOLET; FLUTE; NAY; PICCOLO; PIPE AND TABOR; RECORDER; SYRINX. *Single Reed Class* (cylindrical bore): REED INSTRUMENTS; ARGHOUL; AULOS; BASS CLARINET; BASSET HORN; BATYPHONE; CLARINET; PEDAL CLARINET. *Double Reed Class* (conical bore): REED INSTRUMENTS; AULOS; BASSOON; BOMBARD; CONTRAFAGOTTO; COR ANGLAIS; OBOE; POMMER; SHAWM; CLARINA; HOLZTROMPETE; CROMORNE; RACKETT; SAXOPHONE; SORDINO; TIBIA. To reed instruments also belong the

Bagpipe Class: ASKAULES; BAGPIPE; BINIOU; CHORUS; DRONE; PLATERSPIEL; SYMPHONIA.

Brass Wind.

BOMBARDON; BUCCINA; BUGLE; CORNET; EUPHONIUM; HELICON; HORN; LITUUS; OPHICLEIDE; SACKBUT; SAXHORN; SERPENT; TROMBONE; TRUMPET; TUBA; to which may be added, though not of brass or metal: ALPENHORN; OLIPHANT; SHOFAR; see also MOUTHPIECE; MUTE; VALVES.

Wind Instruments (mechanically blown).

ACCORDION; BARREL-ORGAN; CONCERTINA; HARMONIUM; ORCHESTRION; ORGAN; PHYSHARMONICA; PORTATIVE ORGAN; POSITIVE ORGAN; REGAL; to which, though mouth blown, may be added CHENG. See also FREE REED VIBRATION; KEYBOARD.

Instruments of Percussion.

Sounding a Sensible Note: BELL; BUMBULUM; CARILLON; GLOCKENSPIEL; GONG; HARMONICA; JEWS' HARP; MUSICAL BOX; PARSIFAL BELL-INSTRUMENT; XYLOPHONE. *Not Sounding a Sensible Note*: CASTANETS; CYMBALS; CHINESE PAVILLON; DRUM; KETTLE DRUM; NACAIRE; SISTRUM; TAMBOURINE; TIMBREL; TOM-TOM; TRIANGLE; TYMPANON.

CHAPTER XXXII
THE FINE ARTS: GENERAL AND INTRODUCTORY

The art-student and every other reader interested in the fine arts will find in the Britannica the material for courses of reading of very great range and of the

utmost interest and value—whether he wishes to study theory, practice or history.

Theory of Art

Of course no adequate treatment of the arts, or of any one of them, could logically, much less advantageously, separate theory, practice and history. But the theory of art, though it may be inferred or deduced from many other articles in the book, including those the most devoted to the practical or historical, may best and most directly be studied in three articles, AESTHETICS, ART, and FINE ARTS. Of these, the first, AESTHETICS (Vol. 1, p. 277), equivalent to nearly 40 pages of this Guide, is written by Professor James Sully, late of University College, London, and author of *The Human Mind* and other psychological studies. It discusses the meaning of beauty and the problem of the nature of pleasure, especially "higher" pleasure, its relation to play, etc. And the article closes with a history of Aesthetic Theories, including those of the following philosophers, on all of whom the student will find separate and elaborate critical biographies in the Britannica: PLATO, who set beauty high, but thought art a mere trick of imitation and wished it be censored rather than encouraged in his model republic; ARISTOTLE, who sets beauty above the useful and necessary, but whose aesthetic seems to be applied to poetry rather than to any other art; the German philosophers, KANT, SCHELLING, HEGEL, SCHOPENHAUER, who so deeply impressed their theories on the literature of their times, etc. The articles ART (Vol. 2, p. 657) and FINE ARTS are both by Sir Sidney Colvin, formerly keeper of prints and drawings, British Museum. The former begins with a contrast between art and nature—the contrast made

famous by Pope, by Chaucer, repeatedly by Shakespeare and by Dr. Johnson in his definition of Art as "the power of doing something which is not taught by Nature or by instinct." This definition is in itself an excellent text for a discourse on the importance in the study of the fine arts of the best literature on the subject. But Sir Sidney Colvin points out that the definition is incomplete, since Art

> is a name not only for the power of doing something, but for the exercise of the power; and not only for the exercise of the power, but for the rules according to which it is exercised; and not only for the rules, but for the result. Painting, for instance, is an art, and the word connotes not only the power to paint, but the act of painting; and not only the act, but the laws for performing the act rightly; and not only all these, but the material consequences of the act or the thing painted.

Art is then "*Every regulated* operation or dexterity by which organized beings pursue ends which they know beforehand, together with the rules and the result of every such operation or dexterity."

And a consideration of the etymology of the words "Art" and "Kunst" is the basis of a discussion of the relation of Science and Art, which is summed up in these words:

> Science consists in knowing, Art consists in doing. What I must do in order to know, is Art subservient to Science: what I must know in order to do, is Science subservient to Art.

After speaking of dancing, music, drawing, painting, sculpture, architecture, poetry, the author says:

> Of all these arts, the end is not use, but pleasure, or pleasure before use, or at least pleasure and use conjointly. In modern language, there has grown up a usage which has put them into a class by themselves under the name of the Fine Arts, as distinguished from

> the Useful or Mechanical Arts. (See AESTHETICS and FINE ARTS.) Nay, more, to them alone is often appropriated the use of the generic word Art.... And further yet, custom has reduced the number which the class-word is meant to include. When Art and the works of Art are now currently spoken of in this sense, not even music or poetry is frequently denoted, but only architecture, sculpture and painting by themselves, or with their subordinate and decorative branches.

Fine Arts

The article FINE ARTS (Vol. 10, p. 355; equivalent to 70 pages of this Guide) is divided into the following parts: *General Definition*, with particular attention to the theory that makes the arts a form of play and to the definitions of Plato and Schiller; *Classification*—architecture, sculpture, painting, music and poetry classified as "shaping" and "speaking" or as imitative and "non-imitative," with definitions from the aesthetic or philosophic point of view of sculpture and of painting; and *Historical Development*, with a criticism of Spencer's theory of the evolution and gradual separation of the arts and of Taine's natural history, as well as a critical and illuminating outline history of the arts.

Whether we include under the fine arts music and poetry, or with the more popular usage make the fine arts not five but three, architecture, painting and sculpture, the arts may be studied in the Britannica and there is the basis for this study in this Guide.

Music is the subject of a separate chapter.

Poetry is treated in the chapters on Literature, but it will be well to remind the student of the philosophy of art of the remarkable article POETRY (Vol. 21, p. 877; equivalent to 45 pages in this Guide) by Theodore Watts-Dunton, and of the articles on the different poetic forms, mostly by

Edmund Gosse.

Architecture in the Britannica is outlined in this Guide in the chapter *For Architects*.

The two chapters immediately following this are devoted respectively to Painting, Engraving and Drawing and to Sculpture and the Subsidiary Arts. Of practical value to the art student as an introduction to these two chapters are the articles ART SOCIETIES, by A. C. Robinson Carter, editor of *The Year's Art*, and ART TEACHING, by Walter Crane, the English illustrator, who also contributed the article ARTS AND CRAFTS.

For an alphabetical list of articles on the fine arts see the end of the chapter on *Sculpture*.

CHAPTER XXXIII
PAINTING, DRAWING, ETC.

The article PAINTING (Vol. 20, p. 459; equivalent to 190 pages of this Guide) is an elaborate "key" article which may well be the starting point for more definite study. The art student who actually wishes to paint or draw—as distinct from the student of the history of art—will do well to read first in this great article its third section, *The Technique of Painting* (pp. 482–497), by Gerard Baldwin Brown, professor of fine art, Edinburgh, and author of *The Fine Arts*. The main topics in this part of the article are:

The Materials of Painting; The Surfaces Covered by the Painter; Binding Materials or Media; The Processes of Painting, and their Historical Uses; Painting with

Coloured Vitreous Pastes (with bibliography)—on this method and on similar processes see the separate articles CERAMICS, with remarkably valuable and beautiful coloured illustrations; MOSAIC; ENAMEL; GLASS, STAINED. The following sections are Fresco Painting (with bibliography)—see Fig. 34, Plate X (facing p. 477); Fresco-Secco (with bibliography); Stereochromy or Water-Glass Painting (with bibliography); Spirit Fresco or the "Gambier Parry" Process, as improved by Professor Church (with bibliography); Oil Processes of Wall Painting; Tempera Painting on Walls; Encaustic Painting on Walls (with bibliography); Encaustic Painting in General (with bibliography); Tempera Painting (with bibliography); Water Colour Painting (with bibliography).

Drawing and Engraving

In connection with this part of the article—theoretically before it, perhaps,—the student should read the articles DRAWING and ENGRAVING.

DRAWING (Vol. 8, p. 552), by John R. Fothergill, editor of *The Slade*, is a peculiarly interesting article in its denial of the possibility of conveying colour by drawing or monochrome, in its tracing the development of drawing from the "papery" and flat first attempts on early Greek vases to the depth, length and breadth of the later Greeks or of a Michelangelo, for its criticism of the definition of artistic drawing as a process of selection and elimination from the forms of nature, and for its discussion of style or personality in drawing. See also the articles CARICATURE, CARTOON, ILLUSTRATION, POSTER, PLUMBAGO DRAWINGS.

ENGRAVING (Vol. 9, p. 645) is a short outline article to be supplemented by: LINE-ENGRAVING (Vol. 16, p. 721), by Philip Gilbert Hamerton, author of *Drawing and Engraving*, and more popularly known

as the author of *The Intellectual Life*, *Human Intercourse* and other essays, and by M. H. Spielmann, formerly editor of the *Magazine of Art*; WOOD ENGRAVING, by the same authors; MEZZOTINT, by Gerald Philip Robinson, president of the Society of Mezzotint Engravers; and Etching.

Supplementing the section in the article PAINTING on *The Technique of Painting* are the separate articles: CRAYON, PASTEL, PALETTE; AQUATINT, AQUARELLE, ENCAUSTIC PAINTING, FRESCO, GOUACHE, ILLUMINATED MANUSCRIPTS (with 5 plates), by Sir E. Maunde Thompson, late director British Museum and author of *English Illuminated Manuscripts*; MINIATURE (with 19 illustrations in halftone), by the same author, and by G. C. Williamson, author of *History of Portrait Miniatures*, whose articles on the miniature painters the CLOUETS, COSWAY, the HILLIARDS, GEORGE MORLAND, PETER OLIVER, the PETITOTS, PIERRE PRIEUR, JOHN SMART, etc., should also be read; PANORAMA, PASTEL, by M. H. Spielmann, PORTRAITURE, by Sir George Reid, the Scotch artist and late president of the Royal Scottish Academy, PREDELLA, TEMPERA and TRIPTYCH.

History of Painting

Although the articles enumerated in the last paragraph have primarily to do with technique, there is in them—especially in such articles as MINIATURE and PORTRAITURE—much historical and critical information. And from them the student may well turn back to the article PAINTING to pursue there those topics which he has not yet covered. These are: *Part I.—A Sketch of the Development of the Art* (pp. 460–478); *Part II.—Schools of Painting*, a tabular scheme (pp. 479–481), and *Recent Schools of Painting*

(pp. 497–518), by M. H. Spielmann, for British; Léonce Bénédite, keeper of the Luxembourg Museum, for French; Fernand Khnopff, painter and etcher, for Belgian; Prof. J. C. Van Dyck, Rutgers College, author of *History of American Art*, for the United States; and Prof. Richard Muther, Breslau University, author of *The History of Modern Painting*, on Dutch, German, Austrian, Italian, Spanish, Danish, Swedish, Norwegian, Russian and Balkan States.

These parts of the article are illustrated with ten plates containing 36 figures, including four prehistoric incised drawings of animals found in French caves and remarkable for their technical accuracy and life; two paintings, a boar and a bison, reproduced in colours, from the palaeolithic cave of Altamira—see also Plates II and III in the article ARCHAEOLOGY (between pp. 348 and 349, Vol. 2), Figs. 6, 7 and 8 in Plate accompanying ANTHROPOLOGY (opposite p. 118, Vol. 2), and the plates of American antiques in the article AMERICA (Vol. 1, pp. 808–816); an excellent Egyptian drawing of birds; the François vase (Greek); a Pompeian wall painting—see also the reproduction in colours of a wall-painting from a Roman villa in the article MURAL DECORATION (Vol. 20, p. 22); a wall painting from Brunswick cathedral; and typical examples of the work of Hubert van Eyck, Giotto, Lorenzetti, Masaccio, Uccello, Pollaiuolo, Piero della Francesca, Ghirlandajo, Mantegna, Bellini, Giorgione, Michelangelo, Botticelli, Titian, Holbein, Watteau, Gainsborough, Rembrandt, Quintin Matsys, Brouwer, Ruysdael, Turner, Chardin.

“A rough division of the whole history of art into four main periods” gives “first ... the efforts of the older Oriental peoples, best represented by the painting of the Egyptians; the second includes the

classical and medieval epochs up to the beginning of the 15th century; the third the 15th and 16th centuries, and the fourth the time from the beginning of the 17th century onward. In the first period the endeavour is after truth of contour, in the second and third after truth of form, in the fourth after truth of space."

The Egyptian artist was satisfied if he could render with accuracy, and with proper emphasis on what is characteristic, the silhouettes of things in nature regarded as little more than flat objects cut out against a light background. The Greek and the medieval artist realized that objects had three dimensions, and that it was possible on a flat surface to give an indication of the thickness of anything, that is, of its depth away from the spectator, as well as its length and breadth, but they cannot be said to have fully succeeded in the difficult task they set themselves. For this there was needful an efficient knowledge of perspective, and this the 15th century brought with it. During the 15th century the painter fully succeeds in mastering the representation of the third dimension, and during the next he exercises the power thus acquired in perfect freedom, producing some of the most convincing and masterly presentments of solid forms upon a flat surface that the art has to show. During this period, however, and to a more partial extent even in the earlier classical epoch, efforts were being made to widen the horizon of the art and to embrace within the scope of its representations not only solid objects in themselves, but such objects as a whole in space, in due relation to each other and to the universe at large. It was reserved, however, for the masters of the 17th century perfectly to realize this ideal of the art, and in their hands painting as an art of representation is widened out to its fullest possible limits, and the whole of nature in all its aspects becomes for the first time the subject of the picture.

Early Painting

Following this classification, the article PAINTING, after commenting on primitive art among bushmen, Eskimo and Australians and on the remarkable cave drawings and paintings of Altamira, Gourdan and Lortet,—even the paintings are thought to be 50,000 years old,—discusses the painting of contour in Egypt and Babylonia, in prehistoric Greece, in ancient Greece and Italy, and in the early Christian and early medieval periods. Of particular interest is the criticism of Greek drawing.

> It may be admitted that in many artistic qualities it was beyond praise. In beauty, in grace of line, in composition, we can imagine works of Apelles, of Zeuxis, of Protogenes, excelling even the efforts of the Italian painters, or only matched by the finest designs of a Raphael or a Leonardo.... The facts, however, remain, first, that the Greek pictures about which we chiefly read were of single figures, or subjects of a very limited and compact order, with little variety of planes; and second, that the existing remains of ancient painting are so full of mistakes in perspective that the representation of distance cannot have been a matter to which the artists had really set themselves.... The problem of representing correctly the third dimension of space ... had certainly not been solved.... It is an additional confirmation of this view to find early Christian and early medieval painting confined to the representation of the few near objects which the older Oriental artists had all along envisaged.

For more detailed treatment of this period see the articles: EGYPT, *Art and Archaeology* (Vol. 9, pp. 65–77), with many illustrations both of painting and sculpture, by Dr. W. M. Flinders Petrie, the eminent Egyptologist; BABYLONIA AND ASSYRIA, particularly the two plates of illustrations (opposite pp. 104 and 105, Vol. 3); AEGEAN CIVILIZATION, especially the illustrations (Vol. 1, pp. 246–251); GREEK ART (Vol. 12, pp. 470–492), by Percy Gardner, author of *Grammar of Greek Art*,—and, mostly by the same

author, the articles AGATHARCHUS, PANAENUS, MICON, POLYGNOTUS, PROTOGENES, APELLES, ARISTIDES OF THEBES, PAUSIAS, THEON, ZEUXIS; ROMAN ART (Vol. 23, pp. 474–486), especially Plates V (p. 481) and VI (p. 484); and for the early Christian and early medieval periods such articles as ILLUMINATED MANUSCRIPTS, with illustrations, by Sir E. Maunde Thompson, late director British Museum, and MINIATURE. The reader should also consult the articles CHINA and JAPAN for the section on the art of each of these countries (Vol. 6, pp. 213–216, with two plates, 17 figures; and Vol. 15, pp. 172–190, with eight plates, 30 figures—especially Plates I-IV, pp. 172–177), as Oriental art in general may be said to belong to this phase of effort after truth of contour and of form. See also the separate articles on Japanese artists, mostly by E. F. Strange, author of *Japanese Illustration*, *Hokusai*, etc.,—particularly KORIN, UTAMARO, HOKUSAI, HIROSHIGE, and YOSAI.

The first important individual names after those of the Greek painters mentioned above are those of the Proto-Renaissance of the 13th and 14th century.

For Italy see PIETRO CAVALLINI; in Florence, CIMABUE, by W. M. Rossetti, author of *Fine Art, Chiefly Contemporary*; GIOTTO, by Sir Sidney Colvin, late keeper prints and drawings, British Museum; GADDI, by W. M. Rossetti; ORCAGNA, by the late John Henry Middleton, Slade professor of fine arts, Cambridge, art director South Kensington Museum; SPINELLO ARETINO (Vol. 25, p. 685), and ANGELICO, by W. M. Rossetti; in Siena, SIMONE MARTINI; and for Flanders, the VAN EYCKS (Vol. 10, p. 90), by Sir Joseph Archer Crowe, author with G. B. Cavalcaselle, of *Early Flemish Painters*, etc.



15th Century: Florence

With the 15th century, and particularly at Florence, begins the third of the four periods in the evolution of painting. “The father of modern painting is the Florentine Masaccio”: see the article on him (Vol. 17, p. 833), by W. M. Rossetti, who says “he led the way in representing the objects of nature correctly, with action, liveliness and relief.... All the greatest artists of Italy, through studying the Brancacci chapel, became his champions and disciples.” For the other great Florentine names of the century see the articles: MASOLINO DA PANICALE, by Rossetti; BRUNELLESCHI, architect, student of perspective, and, with Masolino, master of Masaccio; the two earlier LIPPI, by Rossetti; BOTTICELLI, by Sir Sidney Colvin; GOZZOLI, by Rossetti; ROSSELLI; PIERO DI COSIMO (Vol. 21, p. 950); CASTAGNO; BALDOVINETTI, by Sir Sidney Colvin; POLLAIUOLO; GHIRLANDAJO, father and son, by W. M. Rossetti; and, marking the perfection of art on the formal side, BARTOLOMMEO, and Rossetti’s article, ANDREA DEL SARTO (Vol. 1, p. 969).

15th Century: Other Parts of Italy

As for the remainder of Italy, Sienese art declines in this century, but there is an advance in Northern Italy and in Umbria. See the articles: FRANCESCHI, by Rossetti, MELOZZO, “the first who practised foreshortening with much success,” and SIGNORELLI; Raphael’s master, PERUGINO, by Rossetti; MANTEGNA, by the same author; LORENZO COSTA; FRANCIA, by Rossetti; and at Venice, GENTILE, the VIVARINI, ANTONELLO DA MESSINA, CARPACCIO, the

BELLINI (Vol. 3, p. 700), by Sir Sidney Colvin.

15th and 16th Centuries: Northern Europe

In Germany and the Low Countries the art of the 15th and 16th centuries may be traced in the articles: for Germany—SCHONGAUER; DÜRER, by Sir Sidney Colvin; GRÜN; the HOLBEINS and CRANACH, by Sir Joseph Archer Crowe; BURGKMAIR; GRÜNEWALD; and for the Low Countries—ROGER VAN DER WEYDEN; his greater pupil MEMLINC, by Sir J. A. Crowe and P. G. Konody, art critic of the *Observer* and *Daily Mail*; GOES; GERARD DAVID, by P. G. Konody; LUCAS VAN LEYDEN (Vol. 17, p. 93); HEEMSKERK; MATSYS; BREUGHEL; MABUSE, by Sir J. A. Crowe; FLORIS; MORO; and BRIL.

16th Century: Italian Masters

Roughly contemporary with Dürer and Holbein the younger were the even greater masters of Italian painting. See the articles: for Florence—LEONARDO DA VINCI (Vol. 16, p. 444, equivalent to 35 pages of this Guide), and MICHELANGELO (Vol. 18, p. 362), both by Sir Sidney Colvin, and VASARI, painter and biographer of painters; for Rome—RAPHAEL SANZIO (Vol. 22, p. 900, with 7 cuts), by the late Prof. John Henry Middleton, and GIULIO ROMANO, by W. M. Rossetti; for North Italy—LUINI, CORREGGIO, PARMIGIANO, and MORONI, all by Rossetti, and MORETTO; and for Venice—GIORGIONE, by Sir Sidney Colvin; LOTTO and PALMA, TITIAN, TINTORETTO, and PAUL VERONESE (Vol. 20, p. 965), all by W. M. Rossetti.

We have now come to modern times so far as painting is concerned. The article PAINTING says:

The Fourth Period: 17th Century and After

By the 17th century the development of painting had passed through all its stages, and the picture was no longer a mere silhouette or a transcript of objects against a flat background, but rather an enchanted mirror of the world, in which might be reflected space beyond space in infinite recession. With this transformation of the picture there was connected a complete change in the relation of the artist to nature. Throughout all the earlier epochs of the art the painter had concerned himself not with nature as a whole, but with certain selected aspects of nature that furnished him with his recognized subjects. These subjects were selected on account of their intrinsic beauty or importance, and as representing intrinsic worth they claimed to be delineated in the clearest and most substantial fashion. In the 17th century, not only was the world as a whole brought within the artist's view, but it presented itself as worthy in every part of his most reverent attention. In other words, the art of the 17th century, and of the modern epoch in general, is democratic, and refuses to acknowledge that difference in artistic value among the aspects of nature which was at the basis of the essentially aristocratic art of the Greeks and Italians.... The artist who was the first to demonstrate convincingly this principle of modern painting was Rembrandt.... Rembrandt in his later work attended to the pictorial effect alone, and practically annulled the objects by reducing them to pure tone and color. Things are not there at all, but only the semblance or effect, or "impression" of things. Breadth is in this way combined with the most delicate variety, and a new form of painting, now called "impressionism," has come into being.

See: RUBENS, by Henri Hymans, author of *Rubens: sa vie et son œuvre*, and P. G. Konody; REMBRANDT, by John Forbes White and P. G. Konody; and FRANS HALS, by P. G. Konody. These were the leaders of the

great 17th century school—the Dutch. For the more immediate followers of Rembrandt see the articles: DOUW, EECKHOUT, FLINCK, MAES, HOOCH, MEER. For Rubens' great pupil and rival and his successors, the articles VAN DYCK and TENIERS, both by Henri Hymans and P. G. Konody, SNYDERS and the great animal painter FYT. See BROUWER for Hals' pupil and assistant. For the genre painters, the articles: TER BORCH, METSU, STEEN, WOUWERMANN, and the OSTADE family, by Sir J. A. Crowe and P. G. Konody. On the landscapists see the articles: KONINCK, GOYEN, NEER, by Sir J. A. Crowe and P. G. Konody; RUYSDAEL, HOBBEMA, by Sir J. A. Crowe, and BERCHEM; and, for animal and landscape, A. VANDEVELDE, CUYP, by Sir J. A. Crowe, and POTTER, by P. G. Konody. The other important articles for the Dutch school of the 17th century are: HEEM, HEDA, HONDECOETER, WEENIX and HUYSUM, painters of still life, etc.; W. VANDEVELDE and BACKHUYSEN, marine painters; and at the close of the period, or marking its decline, MIERIS and NETSCHER.

In the article on PAINTING this summary follows the outline of the general development of painting through the 17th century:

Kinds of Painting

The fact that the Dutch painters have left us masterpieces in so many different walks of painting, makes it convenient that we should add here some brief notes on characteristic modern phases of the art on which they stamped the impress of their genius. The normal subject for the artist, as we have seen, up to the 17th century, was the figure-subject, generally in some connexion with religion. The Egyptian portrayed the men and women of his time, but the pictures, through their connexion with the sepulchre, had a quasi-religious significance.

Portraiture is differentiated from this kind of subject-picture through stages which it would be interesting to trace, but the portrait, though secular, is always treated in such a way as to exalt or dignify the sitter. Another kind of figure-piece, also differentiated by degrees from the subject-picture of the loftier kind, is the so-called *Genre Painting*, in which the human actors and their goings-on are in themselves indifferent, trivial, or mean, and even repellent; and in which, accordingly, intrinsic interest of subject has disappeared to be replaced by an artistic interest of a different kind. *Landscape*, in modern times so important a branch of painting, is also an outcome of the traditional figure-piece, for at first it is nothing but a background to a scene in which human figures are prominent. *Marine Painting* is a branch of landscape art differentiated from this, but supplied at first in the same way with figure-interest. The origin of *Animal Painting* is to be sought partly in figure-pieces, where, as in Egypt and Assyria, animals play a part in scenes of human life, and partly in landscapes, in which cattle, &c., are introduced to enliven the foreground. The *Hunting Picture*, combining a treatment of figures and animals in action with landscape of a picturesque character, gives an artist like Rubens a welcome opportunity, and the picture of *Dead Game* may be regarded as its offshoot. This brings us to the important class of *Still-life Painting*, the relation of which to the figure-piece can be traced through the genre picture and the portrait.

The article then proceeds to sketch the history and development of different kinds of painting:

Portraiture:

It is Gentile and Giovanni Bellini ... who may be regarded as the fathers of modern portrait painting. Venetian art was always more secular in spirit than that of the rest of Italy, and Venetian portraits were abundant.... Some of the finest portraits in the world are the work of the great Venetians of the 16th century, for they combine pictorial quality with an air of easy

greatness which later painters find it hard to impart to their creations. Though greatly damaged, Titian's equestrian portrait of Charles V. at Madrid (fig. 26, Plate VIII.) is one of the very finest of existing works of the kind. It is somewhat remarkable that of the other Italian painters who executed portraits the most successful was the idealist Raphael, whose papal portraits of Julius II. and Leo X. are masterpieces of firm and accurate delineation. Leonardo's "Monna Lisa" is a study rather than a portrait proper.

The realistic vein, which, as we have seen, runs through northern painting, explains to some extent the extraordinary merit in portraiture of Holbein, who represents the culmination of the efforts in this direction of masters like Jan van Eyck and Dürer.... Frans Hals of Haarlem, one of the most brilliant painters of the impressionist school that he did much to found, achieved remarkable success in the artistic grouping of a number of portraits.... As portraitists the other great 17th-century masters fall into two sets, Rembrandt and Velazquez contrasting with Rubens and his pupil Van Dyck.... In the 18th century, though France produced some good limners and Spain Goya, yet on the whole England was the home of the best portraiture. Van Dyck had been in the service of Charles I., and foreign representatives of his style carried on afterwards the tradition of his essentially courtly art, but there existed at the same time a line of native British portraitists of whom the latest and best was Hogarth. One special form of portraiture, the *miniature* (*q.v.*), has been characteristically English throughout....

Genre:

Probably the most excellent painters of genre are Ter Borch, Metsu and Brouwer, the two first painters of the life of the upper classes, the last of peasant existence in some of its most unlovely aspects. The pictures of Brouwer are among the most instructive documents of modern painting.... He is best represented in the Munich Pinacotek, from which has been selected fig. 30, Plate IX. Hardly less admirable are Teniers in Flanders; De Hooch,

Ver Meer of Delft, Jan Steen, A. van Ostade, in Holland, while in more modern times Hogarth, Chardin, Sir David Wilkie, Meissonier, and a host of others carry the tradition of the work down to our own day (see Table VIII.)....

Landscape and Marine Painting:

Several of the Dutch masters, even before the time of Rembrandt, excelled in the truthful rendering of the scenes and objects of their own simple but eminently paintable country; but it was Rembrandt, with his pupil, de Koningk, and his rival in this department Jacob Ruysdael, who were the first to show how a perfectly natural and unconventional rendering of a stretch of country under a broad expanse of sky might be raised by poetry and ideal feeling to the rank of one of the world's masterpieces of painting. Great as was Rembrandt in what Bode has called "the landscape of feeling," the "Haarlem from the Dunes" of Ruysdael (fig. 31, Plate IX.) with some others of this artist's acknowledged successes, surpass even his achievement.... Among Turner's chief titles to honour is the fact that he portrayed the sea in all its moods with a knowledge and sympathy that give him a place alone among painters of marine....

Animal Painting:

In Holland, in the 17th century, the animal nature presented itself under the more contemplative aspect of the ruminants in the lush water-meadows. True to their principle of doing everything they attempt in the best possible way, the Dutch paint horses (Cuyp, Wouwerman) and cattle (Cuyp, Adrian Vandevelde, Paul Potter) with canonical perfection, while Hondekoeter delineates live cocks and hens, and Weenix dead hares and moor-fowl, in a way that makes us feel that the last word on such themes has been spoken. There is a large white turkey by Hondekoeter in which the truth of mass and of texture in the full soft plumage is combined with a delicacy in the detail of the airy filaments, that is the despair of the most accomplished modern executant.

But animals have been treated more nobly than when

shown in Flemish agitation or in Dutch phlegmatic calm. Leonardo da Vinci was specially famed for his horses, which he may have treated with something of the majesty of Pheidias....

Still-Life Painting:

There is no finer Rembrandt for pictorial quality than the picture in the Louvre representing the carcase of a flayed ox in a flesher's booth. As illustrating the principle of modern painting this form of the graphic art has a value and importance which in itself it could hardly claim.... The way was prepared for it as has been noticed, by the minute and forcible rendering of accessory objects in the figure-pieces and portraits of the early Flemish masters, of Dürer, and above all of Holbein. The painting of flower and fruit pieces without figure interest by Jan Breughel the younger, who was born in 1601, represents a stage onward, and contemporary with him were several other Dutch and Flemish specialists in this department, among whom Jan David de Heem, born 1603, and the rather older Willem Klaasz Heda may be mentioned. Their subjects sometimes took the form of a luncheon table with vessels, plate, fruit and other eatables; at other times of groups of costly vessels of gold, silver and glass, or of articles used in art or science, such as musical instruments and the like; and it is especially to be noted that the handling stops always short of any illusive reproduction of the actual textures of the objects, while at the same time the differing surfaces of stuffs and metal and glass, of smooth-rinded apples and gnarled lemons, are all most justly rendered.... In this form of painting the French 18th-century artist Chardin, whose impasto was fuller, whose colouring more juicy than those of the Dutch, has achieved imperishable fame (see fig. 33, Plate X.); and the modern French, who understand better than others the technical business of painting, have carried on the fine tradition which has culminated in the work of Vollon. The Germans have also painted still-life to good result, but the comparative weakness in technique of British painters has kept them in this department rather in the background.



National Schools of Painting

The history of painting since the 17th century may best be studied in the Britannica in the order in which "recent schools" are treated (Vol. 20, pp. 497–518), and this plan will be followed here in a brief outline, giving only a few out of many articles for each country.

British

British art in the 17th and 18th centuries is dependent largely on foreign and particularly Flemish influences—Van Dyck in especial. See Rossetti's articles on LELY and KNELLER, who, like Holbein and Van Dyck, were importations, but, unlike them, were pretty thoroughly Anglicized. For the first purely English painter see Austin Dobson's article HOGARTH (Vol. 13, p. 566). For "the most prominent figure in the English school of painting" whose *Discourses* largely affected English notions of aesthetics, see SIR JOSHUA REYNOLDS; also the article on his rival GEORGE ROMNEY. And read Rossetti's article GAINSBOROUGH; and those on the portrait painters RAEBURN and SIR THOMAS LAWRENCE. On the Norwich school of landscapists see the articles CROME, COTMAN and GEORGE VINCENT. For foreign influences on landscape painting see RICHARD WILSON (Vol. 28, p. 695) for French influence, and JOHN CONSTABLE (Vol. 6, p. 982), by C. J. Holmes, author of *Constable and His Influence on Landscape Painting*, for German. With the article on the greatest of English landscapists J. M. W. TURNER (Vol. 27, p. 474), by Sir George Reid, the student should read Frederic Harrison's article on JOHN RUSKIN, himself an exquisite draughtsman, although unable to compose a picture, whose

championship of Turner and general theories of art so strongly influenced British painting. See also the articles on the subject painter THOMAS STOTHARD and the landscapist GIRTIN; and on the genre painters, SIR DAVID WILKIE, by J. Miller Gray, late curator of the Scottish National Portrait Gallery, MULREADY, WILLIAM COLLINS, and FRITH. See the article WILLIAM BLAKE, by J. W. Comyns-Carr, author of *Essays on Art*, for an appreciation of that remarkable genius, who in his combination of painting and poetry may be reckoned a forerunner of the Pre-Raphaelites. On the P. R. Brotherhood see the articles: D. G. ROSSETTI, by F. G. Stephens, former art-critic to the *Athenaeum* and, for Rossetti's literary work, Theodore Watts-Dunton; SIR J. E. MILLAIS and W. HOLMAN HUNT, by Cosmo Monkhouse, the poet and critic; and FORD MADOX BROWN, by W. M. Rossetti, himself a member of the Brotherhood—see the article on ROSSETTI. Of much the same school were several later men. See, for instance, the articles: LORD LEIGHTON, by Cosmo Monkhouse; WILLIAM MORRIS, by Arthur Waugh; BURNE-JONES, by Lawrence Binyon, poet and author of monographs on Blake, Crome, etc.; GEORGE FREDERICK WATTS, by Malcolm Bell, biographer of Burne-Jones; WALTER CRANE. On the "Newlyn" school, see the article NEWLYN; on the etchers, WHISTLER, by Frederick Wedmore, author of *Whistler's Etchings*, and WILLIAM STRANG and SIR F. S. HADEN, by Sir Charles Holroyd, artist and critic; on figure painters, SIR JOHN GILBERT, ALBERT MOORE, JOHN PETTIE, G. H. BOUGHTON, ALMA-TADEMA, SIR E. J. POYNTER and SIR W. B. RICHMOND; for painters of sentiment, MARCUS STONE, SIR LUKE FILDES and SIR HUBERT VON HERKOMER; among portrait painters, J. J. SHANNON, and C. W. FURSE; the decorator FRANK

BRANGWYN; the realistic landscapists, H. W. B. DAVIS, DAVID MURRAY, SIR E. A. WATERLOW, VICAT COLE; the more imaginative and romantic painters of landscape, ALFRED W. HUNT, CECIL GORDON LAWSON, JOHN LINNELL, G. H. MASON, FREDERICK WALKER, SIR ALFRED EAST, J. BUXTON KNIGHT, GEORGE CLAUSEN; the "subjective landscapist" B. W. LEADER; the marine painters HENRY MOORE, C. NAPIER HEMY, JAMES CLARKE HOOK; the animal-painters BRETON, RIVIERE, J. M. SWAN, and, for the earlier period, LANDSEER; the Scottish artists ORCHARDSON, by Sir Walter Armstrong, director of National Gallery of Ireland; JOHN PETTIE, THOMAS FAED, DAVID MURRAY, ARTHUR MELVILLE, JOHN LAVERY, ROBERT BROUGH, SIR JAMES GUTHRIE, and SIR GEORGE REID, of whom we have already spoken as a contributor to the Britannica; and the water colorists SIR JOHN GILBERT, by F. G. Stephens, former art critic of the *Athenaeum*, HENRY MOORE, ALBERT MOORE, GEORGE CLAUSEN, E. J. GREGORY, BIRKET FOSTER, HAAG, KATE GREENAWAY, by M. H. Spielmann, biographer of Kate Greenaway. On English illustrators, besides those already named, Hogarth and Blake notably, see the articles THOMAS BEWICK, BARTOLOZZI, FLAXMAN, by Sir Sidney Colvin, CATTERMOLE, SAMUEL PROUT, JAMES WARD, GILLRAY, BUNBURY, ROWLANDSON, CRUIKSHANK, JOHN LEECH, RICHARD DOYLE, TENNIEL, SIR JOHN GILBERT, AUBREY BEARDSLEY, by E. F. Strange, THOMAS CRESWICK, DU MAURIER, C. S. KEENE, FREDERICK WALKER, G. J. PINWELL, R. CALDECOTT, HARRY FURNISS, SIR F. C. GOULD, E. LINLEY SAMBOURNE, PHIL MAY, LEONARD RAVEN-HILL.

French

On French painting of the 17th century read: on landscape, POUSSIN, and CLAUDE OF LORRAINE (Vol. 6, p. 463), by W. M. Rossetti; the historical and religious painters LE BRUN and LE SUEUR; and the portraitist PHILIPPE DE CHAMPAIGNE. For the 18th century: the articles WATTEAU and FRAGONARD, by P. G. Konody; FRANÇOIS BOUCHER, LANCRET, VERNET the eldest, RIGAUD, CHARDIN, and GREUZE, by Lady Dilke, author of *French Painters of the 18th Century*.

In the 19th century came a classical reaction: see the article on its leader JACQUES LOUIS DAVID and his pupils and imitators J. B. REGNAULT, GIRODET, BARON GUÉRIN, PRUD'HON; then a mediate movement, on which see INGRES, by Lady Dilke, and GROS; and then a Romantic revolt—see DELACROIX, GÉRICAULT, ISABEY. Other important names are ZIEM, MEISSONIER and ROSE BONHEUR, both by Henri Frantz of the *Gazette des Beaux Arts*, CABANEL, BAUDRY, GÉRÔME, BOUGUEREAU, BENJAMIN CONSTANT, CORMON, BONNAT and HENNER. On the Barbizon school, see the articles BARBIZON, THEODORE ROUSSEAU, DAUBIGNY, COROT, and DIAZ, by D. Croal Thomson, author of *The Barbizon School*, J. F. MILLET, by Lady Dilke; DUPRÉ, FRANÇAIS and HARPIGNIES. Ranking with Corot and Millet in influence is COURBET; see the article on Courbet, by Henri Frantz of the Paris *Gazette des Beaux Arts*, and on Courbet's followers, LEGROS, FANTIN-LATOUR, RIBOT, by Frederick Wedmore, CAROLUS-DURAN. Contrasted with these nature-lovers are the more mystic MOREAU, RICARD, DELAUNAY, FROMENTIN and CAZIN.

The later names we may classify: the decorative painter—PUVIS DE CHAVANNES, by Henri Frantz; the impressionists—see the article IMPRESSIONISM (Vol.

14, pp. 343–346), by D. S. MacColl, keeper of the Tate Gallery, and author of *Nineteenth Century Art*, and in the article PAINTING the discussion on pp. 473–474 of Vol. 20—MANET, by Henri Frantz, MONET, DEGAS, RENOIR; the plein-airists JULES BRETON, BASTIEN-LEPAGE, by Henri Frantz; ROLL, GERVEX; the symbolist GUSTAVE MOREAU; the military painters ALPHONSE DE NEUVILLE and DETAILLE; and the "neo-evangelist" CAZIN.

Belgium and Holland

The art of Belgium and Holland in the 19th century is to be studied in Prof. Muther's sections on these two countries (pp. 506–509) in the article PAINTING, and in such separate articles as LEYS, ALFRED STEVENS (to be distinguished from the English sculptor), BRAEKELEER, WILLEMS, CLAYS, PORTAELS, WAUTERS, CONSTANTIN MEUNIER, VERLAT, the DE VRIENDTS, KHNOPff, already mentioned as a critic and a contributor to the Britannica,—all these are Belgians; and, in Holland, ISRAËLS, MARIS, MAUVE.

Germany

Going back to the close of the 18th century for German painters influenced by Winckelmann, the important articles are MENGS and CARSTENS. See OVERBECK, by J. Beavington Atkinson for the German "pre-Raphaelite" movement—and the articles, PETER VON CORNELIUS, by W. Cave Thomas, author of *Mural or Monumental Education*; the SCHADOWS, by J. B. Atkinson; VEIT, and SCHNORR. The other more important names before 1870 are: BETHEL, SCHWIND, ACHENBACH and PRELLER. The glorification of the Empire and of Prussia is the theme of the new historical school: see particularly

MENZEL. The study of the old masters is to be seen in KAULBACH and LENBACH. Among the members of a more modern school are: LIEBERMANN, KALCKREUTH, KELLER, UHDE; of another reaction, FEUERBACH, THOMA, and BÖCKLIN, by Henri Frantz; and of a sculptural order *Klinger* and *Stuck*.

Austria-Hungary

As for Austria-Hungary, we may here mention only three articles: MAKART, PETTEKOFEN, and MUNKACSY, by E. F. Strange.

Italy

In Italy since the great days of the 17th century, we may mention TIEPOLO, CANALE and GUARDI before the 19th century, and in that era SEGANTINI, GIOVANNI COSTA, and MUZZIOLI.

Spain

The art of Spain has not been touched heretofore in this summary. For the 16th century see the articles COELLO, BECERRA, VINCENTE JOANES, NAVARRETE, EL GRECO; and for the 17th, *the* Spanish century, HERRERA, his great pupil VELAZQUEZ, by J. Forbes White and P. G. Konody; CANO, and ZURBARAN and MURILLO, both by W. M. Rossetti. In the 18th century the only great Spanish artist was GOYA Y LUCIENTES, painter and etcher. On the 19th century see: FORTUNY, by Alfred Lys Baldry, art critic of the London *Globe*; PRADILLA; BENLLIURE Y GIL; SOROLLA Y BASTIDA; MADRAZO Y KUNT; ZULOAGA.

Other European Countries

To the other countries of Europe, fully as their painting is treated in the Britannica, we can devote little space here. It may suffice to mention the

Norwegian HANS DAHL and the Russians REPIN and VERESCHAGIN.

The United States

On painting in the United States, see the section in the article PAINTING, by Prof. J. C. Van Dyke of Rutgers College (Vol. 20, pp. 518–519); and the articles J. S. COPLEY, BENJAMIN WEST, JOHN TRUMBULL, GILBERT STUART, JOHN VANDERLYN, WASHINGTON ALLSTON, REMBRANDT PEALE, J. W. JARVIS, THOMAS SULLY, THOMAS COLE, ASHER B. DURAND, J. F. KENSETT, F. E. CHURCH, CHESTER HARDING, HENRY INMAN, WILLIAM PAGE, G. P. A. HEALY, DANIEL HUNTINGTON, W. S. MOUNT, W. M. HUNT, JOHN LA FARGE, GEORGE FULLER, EASTMAN JOHNSON, ELIHU VEDDER, LEONARD OCHTMAN, WINSLOW HOMER, A. H. WYANT, GEORGE INNESS, HOMER D. MARTIN, SWAIN GIFFORD, the MORANS, JERVIS MCENTEE, D. W. TRYON, ALBERT BIERSTADT, W. H. BEARD, BLASHFIELD, J. W. ALEXANDER, W. M. CHASE, DUVENECK, CECILIA BEAUX, W. H. LOW, H. S. MOWBRAY, H. O. TANNER, E. C. TARBELL, R. W. VONNOH,—and the Americans who have made their home and their fame in Europe, like WHISTLER, SARGENT, E. A. ABBEY and J. J. SHANNON, and those whose work is Continental, or even purely Parisian in tone, like W. T. DANNAT, GEORGE HITCHCOCK, GARI MELCHERS, C. S. PEARCE, E. L. WEEKS and WALTER GAY. On illustrators, see the articles: HOWARD PYLE, FREDERICK REMINGTON, C. S. REINHART, W. T. SMEDLEY, ROBERT BLUM, CHARLES DANA GIBSON, W. HAMILTON GIBSON, the wood-engraver TIMOTHY COLE, the etcher JOSEPH PENNELL; and for caricature the article THOMAS NAST and the section on the United States in M. H. Spielmann's article CARICATURE (Vol. 5, pp. 334–

335).

For a fuller list of articles on painting, drawing, engraving, etc., with articles on sculpture, see the end of the next chapter *Sculpture*.

CHAPTER XXXIV
SCULPTURE

The Main Article

The Britannica article SCULPTURE (Vol. 24, p. 488; equivalent to 90 pages of this Guide) is a complete treatise on the technique and history of this branch of art by J. H. Middleton, late professor of Fine Art, Cambridge, M. H. Spielmann, former editor of the *Magazine of Art*, P. G. Konody, art critic of the *Observer* and *Daily Mail*, and, for French sculpture, Léonce Bénédite, keeper of the Luxembourg Museum and author of *Histoire des Beaux Arts*. It is illustrated with 10 full page plates as follows: I and II. *Medieval*, etc., with examples of the work of Jacopo della Quercia, Donatello (2), Andrea Pisano, Michelangelo, Verrocchio and Leopardo, Luca della Robbia, Benvenuto Cellini, Peter Vischer, Bernini, Goujon, Canova, Houdon, Coysevox; III. IV. V. *Modern British* —Alfred Stevens, Sir George Frampton, Lord Leighton, Harry Bates, H. H. Armstead, G. F. Watts (2), A. Gilbert, F. W. Pomeroy, E. Onslow Ford, W. Hamo Thornycroft (2), Alfred Drury, F. Derwent Wood, Bertram Mackennal, Albert Toft, Havard Thomas, W. Goscombe John, W. R. Colton (2), Sir

Charles Lawes-Wittewronge, Sir J. Edgar Boehm, Thomas Brock; VI. *American*—J. Q. A. Ward, D. C. French and E. C. Potter, Augustus St. Gaudens, Frederick MacMonnies; VII. VIII. and IX. *Modern French*—Falguière, Barrias, Delaplanche, Idrac, Becquer, L. Gérôme, Marqueste, Longepied, Frémiet, Guillaume, Puech, Saint-Marceaux, Mercié, Rodin, Michel, Dalou, Aubé, Chapu, Bloche, Gardet, Bartholomé; and X. *Other Foreign Countries*—Sinding, Begas, Ximenes, Querol, Antokolski, Lambeaux, Meunier.

Other General Articles

This article opens with an account of technical methods of sculpture which should be supplemented by other articles, which deal also with history and criticism: WOOD-CARVING (Vols. 28, p. 791), by Franklyn Arden Crallan, author of *Gothic Wood-carving*, with four plates and with descriptions not merely of Gothic and Renaissance work in Europe, but of Coptic, Mahommedan, Persian, Indian and Burmese, Chinese and Japanese, and the carving done by savage races; IVORY (Vol. 15, especially pp. 95–98, with 5 illustrations), by A. Maskell, author of *Ivories*; CHRYSELEPHANTINE; METAL-WORK (Vol. 18, p. 205), (with 9 text cuts and 2 full page plates), by Prof. J. H. Middleton, Cambridge, and John Starkie Gardner, author of *Armour in England* and *Iron Work*; GEM (Vol. 11, p. 560; with 2 full page plates containing 76 illustrations, mostly of antique gems, besides 10 cuts in the text) by Alexander Stuart Murray, author of *History of Greek Sculpture*, *Terra Cotta Sarcophagi*, etc., and Arthur Hamilton Smith, keeper of Greek and Roman Antiquities, British Museum; CAMEO; INTAGLIO; SEALS (Vol. 24, p. 539;

with 9 illustrations), by Sir E. Maunde Thompson, late director British Museum; NUMISMATICS (Vol. 19, p. 869; equivalent to 120 pages of this Guide; with 6 plates—20 Greek coins, 27 Greek and Roman coins, 23 Roman and Medieval coins, 22 Oriental coins, 8 modern coins and medals, and 4 Italian medals—and 11 cuts illustrating modern coins) by Reginald Stuart Poole, formerly keeper department coins and medals, British Museum, Herbert Appold Grueber, keeper of the same department in 1906–1912, and George Francis Hill, assistant keeper of this department; MEDAL (Vol. 18, especially pp. 1 and 2, with 2 plates, showing 32 medals), by M. H. Spielmann; TERRA COTTA (Vol. 26, p. 652, with 2 plates, 12 illustrations), by William Burton, author of *English Stoneware and Earthenware* and H. Beauchamp Walters, assistant keeper Greek and Roman antiquities, British Museum; PLATE (Vol. 21, p. 789; with 31 illustrations), by H. R. H. Hall, author of *The Oldest Civilization of Greece*, H. Stuart Jones, author of *The Roman Empire*, and E. Alfred Jones, author of *Old English Gold Plate*, etc.; ALTO-RELIEVO; BASSO-RELIEVO; RELIEF and REPOUSSÉ, by M. H. Spielmann; WAX FIGURES; EFFIGIES, MONUMENTAL, by the late Charles Boutell, author of *A Manual of British Archaeology*, and M. H. Spielmann.

History of Sculpture

Early sculpture is separately treated. For "Classical" sculpture see the articles GREEK ART by Percy Gardner and ROMAN ART by H. Stuart Jones, both elaborately illustrated and devoting particular attention to statuary, plate; etc. See also the illustrations in the articles mentioned in the last paragraph,—especially GEM, NUMISMATICS, TERRA

COTTA; and those in the article ARCHITECTURE and subsidiary articles mentioned in the chapter of this Guide *For the Architect*. And on Greek art see the article PERGAMUM and the sketches of the great sculptors of Greece:

AGASIAS

AGESANDER

AGORACRITUS

ALCAMENES

ANTENOR

APOLLONIUS OF TRALLES ARCHERMUS

BATHYCLES

BOETHUS

BRYAXIS

BUPALUS AND ATHENIS

BUTADES

CALAMIS

CALLIMACHUS

CANACHUS

CEPHISODOTUS

CHARES

CRESILAS

CRITIUS AND NESIOTES

DAMOPHON

DEMETRIUS

DIPOENUS AND SCYLLIS

ENDOEUS

EUTYCHIDES

LEOCHARES

LYSIPPUS

LYSISTRATUS

MYRON

ONATAS

PAEONIUS

PASITELES

PHEIDIAS

POLYCLITUS

PRAXIAS AND ANDROSTHENES

PRAXITELES

RHOECUS

SCOPAS

SILANION

STRONGYLION

THRASYMEDES

TIMOTHEUS

See also the article BYZANTINE ART; and for sculpture elsewhere the sections *Art* in the articles EGYPT, CHINA, JAPAN.

Medieval

For medieval sculpture, almost entirely an adjunct to architecture and particularly ecclesiastical architecture, see, besides the treatment in the historical part of the article SCULPTURE (pp. 490–496), the articles ARCHITECTURE and EFFIGIES, MONUMENTAL, comparing with the latter the article

BRASSES, MONUMENTAL (with 13 illustrations).

Renaissance

The close of the medieval period and the beginning of the more individualistic Renaissance are marked by the occurrence of the names of great individual artists, whose biographies are the best summary of the sculpture of the period.

See on Italy: the articles NICCOLA PISANO (Vol. 20, p. 648); VITTORE PISANO (Vol. 20, p. 649); ANDREA PISANO (Vol. 20, p. 647) and the article immediately following on his son, GIOVANNI PISANO; each of these four with an illustration; VITTORE PISANO or Pisanello; AGOSTINO and AGNOLO DA SIENA (Vol. 1, p. 381); ORCAGNA, "the last great master of the Gothic period," by J. H. Middleton; DELLA QUERCIA, who "heralds ... the boldest and most original achievements of two generations hence," by E. T. Strange, assistant keeper, South Kensington; GHIBERTI, "the first of the great sculptors of the Renaissance"; DONATELLO, by P. G Konody; MICHELOZZO; DELLA ROBBIA family (with 3 illustrations), by J. H. Middleton and William Burton, author of *English Stoneware and Earthenware*; LEONARDO, by Sir Sidney Colvin; VERROCCHIO, by J. H. Middleton; LEOPARDO; POLLAIUOLO; MICHELANGELO, by Sir Sidney Colvin; BANDINELLI; AMMANATI; and in the 16th century period of decline GIOVANNI DA BOLOGNA, LOMBARDO family, CELLINI, by W. M. Rossetti and E. Alfred Jones, author of *Old English Gold Plate*, etc.

On the Renaissance in France: JEAN GOUJON, SARRAZIN.

—In Germany: VEIT STOSS, ADAM KRAFFT, the VISCHERS.

—In England: the Italian TORRIGIANO.

—In Spain: ALONZO CANO, MONTAÑES, PEDRO DE MENA, ZARCILLO.

17th and 18th Century

Some of the names just mentioned are those of 17th century artists. But the rococo character of the period is best seen in Italy: see the articles BERNINI, ALGARDI, and, for France, GIRARDON and PUGET. With the 18th century came a classical revival for which the great names are CANOVA and THORWALDSEN: see the articles on these sculptors, that on Canova being by W. M. Rossetti. See also the articles on Thorwaldsen's followers, SERGEL, BYSTRÖM and FOGELBERG. The more important articles on French sculpture in this period are PIGALLE and HOUDON, the latter known to Americans by his portraits of our Revolutionary worthies. For English sculpture in the 17th and 18th centuries see: NICHOLAS STONE, ROUBILIAC, by M. H. Spielmann, SCHEEMAKERS, NOLLEKENS, JOHN BACON, and, possibly most important, JOHN FLAXMAN, by Sir Sidney Colvin. For Germany: ANDREAS SCHLÜTER.

19th Century and Modern Schools

On the 19th century in Germany see the articles: SCHADOW, RAUCH, RIETSCHEL, DANNECKER, SCHWANTHALER, and marking a sharp reaction, REINHOLD BEGAS, and the younger men, known also as painters, FRANZ STUCK and MAX KLINGER.

On modern British sculpture see the articles: JOHN GIBSON, E. H. BAILY, THOMAS BANKS, SIR RICHARD WESTMACOTT, and ALFRED STEVENS; and, for the last thirty years, JULES DALOU, LORD LEIGHTON, better known as a painter, E. ONSLOW FORD and

ALFRED GILBERT, the most influential and important factors in the awakening, and THOMAS WOOLNER, MAROCHETTI, SIR EDWIN LANDSEER, SIR J. E. BOEHM, J. H. FOLEY, H. H. ARMSTEAD, THOMAS BROCK, W. HAMO THORNYCROFT, JOHN M. SWAN, HARRY BATES, G. F. WATTS. Scores of others are criticized and their work summarized on pp. 501–508 in the article SCULPTURE.

France

The 19th century in France opened with a pseudo-Roman school, and among the names of this period are PRADIER, RUDE, P. J. DAVID, ETEX, and CARPEAUX and BARYE, by Henri Frantz, who mark a transition. For the more modern period see GUILLAUME, DUBOIS, FALGUIÈRE, MERCIÉ, FRÉMIET, GUSTAVE CRAUCK, DALOU, RODIN.

Other European Countries

In addition to the discussion of modern Belgian sculptors in the section on Belgium of the article SCULPTURE there are separate articles on PAUL DE VIGNE, VAN DER STAPPEN, JEF LAMBEAUX, JULIEN DILLENS, and CONSTANTIN MEUNIER. For Italian sculpture in the 19th century see BARTOLINI, and the summary in the article SCULPTURE (Vol. 24, p. 513). Separate articles on Spanish sculptors are JOSE ALVAREZ and MANUEL ALVAREZ.

American Sculpture

In the United States there was little sculpture of native origin, and virtually none of the slightest merit, before the 19th century. The following list of articles in rough chronological order will supplement the outline in the article SCULPTURE (Vol. 24, p.

516): HORATIO GREENOUGH, HIRAM POWERS, THOMAS CRAWFORD, HENRY KIRKE BROWN, WILLIAM RIMMER, E. D. PALMER, THOMAS BALL, L. W. VOLK, HARRIET G. HOSMER, J. Q. A. WARD, LAUNT THOMPSON, LARKIN G. MEAD, G. E. BISSELL, OLIN L. WARNER, W. R. O'DONOVAN, JONATHAN S. HARTLEY, AUGUSTUS SAINT-GAUDENS, D. C. FRENCH, J. J. BOYLE, C. H. NIEHAUS, LORADO TAFT, W. O. PARTRIDGE, CYRUS E. DALLIN, A. P. PROCTOR, CHARLES GRAFLY, F. W. MACMONNIES, GEORGE GRAY BARNARD, P. W. BARTLETT, HERMON A. MACNEIL, KARL BITTER, BORGLUM.

Summary

This chapter, and the one before, outline courses on these arts in the Britannica, but there are many articles on these topics to which no reference has been made in these pages. It may, therefore, be interesting to the student of these forms of art to have before him a list, fairly complete, of articles in the Britannica dealing with painting and sculpture. The following is such a list in alphabetical arrangement. The student should remember that the absence from the list—or from any similar list in the Guide—of a topic on which he wishes information does not mean that there is no information on the subject in the Britannica, but merely that there may be no separate article on the subject. In such cases let him turn to the general index (Vol. 29).

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Rude, François
Runciman, Alexander
Russell, John
Ruysdael, Jacob van
Ryder, A. P.

Ryland, W. W.
Sacchi, Andrea
Saint-Gaudens, Augustus
Sambourne, E. Linley
Sandby, Paul
Sandrart, Joachim von
Sandys, Frederick
Sansovino, Andrea C. del Monte
Sansovino, Jacopo
Santerre, J. B.
Sargent, J. S.
Sarrazin, Jacques
Sartain, John
Satterlee, Walter
Sayer, James
Schadow
Schadow, J. G. and R.
Schalcken, Godfried
Scharf, Sir George
Scheemakers, Peter
Scheffer, Ary
Schetky, J. C.
Schiavonetti, Luigi
Schirmer, Friedrich W.
Schirmer, Johann W.
Schlüter, Andreas

Schnorr von Karolsfeld
Schongauer, Martin
Schreyer, Adolf
Schwanthaler, L. M.
Schwartze, Teresa
Schwind, Moritz von
Scopas
Scott, David
Scott, William Bell
Sculpture
Sebastiano del Piombo
Seddon, Thomas
Segantini, Giovanni
Sequeira, D. A. de
Sergel, Johan Tobias
Severn, Joseph
Shannon, C. H.
Shannon, J. J.
Sharp, William
Shee, Sir M. A.
Sherwin, J. K.
Short, F. J.
Sigalon, Xavier
Signorelli, Luca
Silanion
Simon, Abraham

Simon, Thomas
Simmons, E. E.
Simson, William
Sisley, Alfred
Slodtz, René Michel
Smart, John
Smedley, W. T.
Smillie, J. D.
Smirke, Robert
Smith, Colvin
Smith, John Raphael
Smybert, John
Snyders, Franz
Sodoma, Il
Solario, Antonio
Sorolla y Bastida, J.
Spagna, Lo
Spinello, Aretino
Stanfield, W. C.
Stannard, Joseph
Stark, James
Steen, Jan Havicksz
Steer, P. Wilson
Stevens, Alfred
Stevens, Alfred
Stewart, Julius L.

Stillman, W. J.
Stone, Frank
Stone, Marcus
Stone, Nicholas
Stoss, Veit
Stothard, C. A.
Stothard, Thomas
Strang, William
Strange, Sir Robert
Strongylion
Stuart, Gilbert
Stuck, Franz
Subleyras, Pierre
Sully, Thomas
Swan, J. M.
Taft, Lorado
Tait, A. F.
Tanner, H. O.
Tarbell, Edmund C.
Tempera
Teniers (family)
Tenniel, Sir John
Ter Borch, Gerard
Terra Cotta
Thayer, Abbott H.
Theon of Samos

Thoma, Hans
Thompson, Launt
Thomson, John
Thornhill, Sir James
Thornycroft, W. Hamo
Thorwaldsen, Bertel
Thrasymedes
Tiepolo, G. B.
Tiffany, L. C.
Timanthes
Timomachus
Timotheus
Tintoretto
Tisio, Benvenuto
Tissot, J. J. J.
Titian
Torrigiano, Pietre
Triptych
Troy, J. F. de
Troyon, Constant
Trumbull, John
Tryon, D. W.
Turner, Charles
Turner, J. M. W.
Uhde, F. K. H. Von
Utamaro

Vanderlyn, John
Van der Stappen, C.
Van der Weyden, R.
Vandevelde, Adrian
Vandevelde, William
Van Dyck, Sir Anthony
Vanloo, C. A.
Vanloo, J. B.
Varley, Cornelius
Varley, John
Vasari, Giorgio
Vedder, Elihu
Veit, Philipp
Velazquez, D. R. de Silva y
Verboeckhoven, E. J.
Vereshchagin, V. V.
Verlat, M. M. C.
Vernet (family)
Verrocchio, Andrea del
Vertue, George
Vien, J. M.
Vierge, Daniel
Vigée-Lebrun, M. A. E.
Vigne, Paul de
Vincent, George
Vinton, F. P.

Vischer (family)
Vischer, F. T.
Vivarini (family)
Volk, L. W.
Vonnoh, R. W.
Vouet, Simon
Vrancx, Sebastian
Vriendt, J. J. de and A. F. L. de
Waagen, G. F.
Waldo, S. L.
Walker, Frederick
Walker, H. O.
Walker, Horatio
Walker, Robert
Wappers, E. C. G.
Ward, James
Ward, E. M.
Ward, J. Q. A.
Ward, William
Warner, Olin Levi
Waterhouse, J. W.
Waterlow, Sir E. A.
Watteau, Antoine
Watts, G. F.
Wauters, Emile
Wax Figures

Webster, Thomas
Weeks, E. L.
Weenix, J. B.
Weir, R. W.
Werner, A. A. von
West, Benjamin
Westall, Richard
Westmacott, Sir R.
Wheatley, Francis
Whistler, J. A. McN.
White, Robert
Wiles, I. R.
Wilkie, Sir David
Willems, F. J. M.
Willette, L. A.
Willmore, J. T.
Wilson, Richard
Wohlgemuth, Michael
Wolf, Joseph
Woodbury, C. H.
Wood Carving
Wood Engraving
Woollett, William
Woolner, Thomas
Wouwerman, Philip
Wright, Joseph

Wyant, A. H.
Wylie, Robert
Yosai
Zarcillo y Alcaraz, F.
Zeuxis
Ziem, F. F. G. P.
Zoffany, Johann
Zuccarelli, Francesco
Zuccaro, Taddeo
Zuccaro, Federigo
Zuloaga, Ignacio
Zurbaran, Francisco

CHAPTER XXXV
LANGUAGE AND WRITING

Evolution

One of the most interesting subjects of scientific study developed during the last century is that of primitive culture and the gradual advancement of primitive man from a state of savagery to comparative civilization. For this study there are no historical documents in the ordinary use of the words "historical" and "document." The story must be arrived at by analysis, deduction, even by guess-work, supplementing the studies of travelers among tribes which now are in the lowest stages of development and farthest from civilization, and therefore most resemble our remotest human ancestors. Almost the very earliest of writers on evolution, the Roman poet LUCRETIUS (Vol. 17, p. 107), who died in 55 B.C., sketched general outlines of the development of this primitive civilization in much the same way as do modern ethnologists. But his description was imaginary and was fashioned to fit his and Epicurus's evolutionary theories.

The article CIVILIZATION (Vol. 6, p. 403) in the Britannica makes the development of speech the mark of the first period when mankind was in the lower stages of savagery. "Our ancestors of this epoch inhabited a necessarily restricted tropical

territory and subsisted upon raw nuts and fruit." The next higher period in the progress of civilization began with the knowledge of the use of fire (p. 404).

> This wonderful discovery enabled the developing race to extend its habitat almost indefinitely, and to include flesh, and in particular fish, in its regular dietary. Man could now leave the forests and wander along the shores and rivers, migrating to climates less enervating than those to which he had previously been confined. Doubtless he became an expert fisher, but he was as yet poorly equipped for hunting.... Primitive races of Australia and Polynesia had not advanced beyond this middle status of savagery when they were discovered a few generations ago.

The next great ethnical discovery was that of the bow and arrow, a truly wonderful instrument.

> The possessor of this device could bring down the fleetest animal and could defend himself against the most predatory. He could provide himself not only with food, but with materials for clothing and for tent-making, and thus could migrate at will back from the seas and large rivers.... The meat diet, now for the first time freely available, probably contributed, along with the stimulating climate, to increase the physical vigour and courage of this highest savage, thus urging him along the paths of progress. Nevertheless, many tribes came thus far, and no further, as witness the Athapascans of the Hudson's Bay Territory and the Indians of the valley of the Columbia.

After the use of fire and the discovery of the bow and arrow came the invention of pottery, the domestication of animals, and the smelting of iron, all successive stages in man's history which "in their relation to the sum of human progress, transcend in relative importance all his subsequent works,"—and this is even truer if there is included in this period the development of a system of writing, which may be reckoned either the end of the primitive period or

the beginning of the period of *civilization proper*. These two great steps in the story of civilization, language and writing, are closely connected in our minds, though so far separated in time of origin; and their story as told in the Britannica by the world's greatest authorities, English, American, German, French, Italian, Danish, etc., is an interesting one for the general reader, while the articles are invaluable to the specialist in linguistic study.

Philology

The starting point for a course of reading is the article PHILOLOGY (Vol. 21, p. 414; equivalent to 80 pages in this Guide), of which the first part, a general treatment, is by the greatest of American philologists, William Dwight Whitney, editor-in-chief of *The Century Dictionary*, and author of *Life and Growth of Language*, one of the most important scientific contributions to the subject. The second part, on the comparative philology of the Indo-European languages, is by Prof. Eduard Sievers of Leipzig and Prof. Peter Giles of Cambridge. Both these names are well known to students of the subject, the former as that of the author of numerous valuable works on Germanic phonetics and metric, and the latter as a writer on Greek language and as the author of *A Short Manual of Comparative Philology*.

The article begins with a definition of "philology," the science of language, and of "comparative philology," the comparison of one language with another, in order to bring out their relationships, their structures, and their histories. Prof. Whitney shows how much the recent development of linguistic science owes to the general scientific movement of the age. "No one," he says, "however

ingenious and entertaining his speculations, will cast any real light on the earliest history of speech." But he notes the obvious analogy between speech and writing, and he puts stress on the "sociality" of man as the prime factor in his development of speech. Other topics in this part of the article are:

Instrumentalities of expression—gesture, grimace, and voice; "language" means "tonguiness"—a mute would call it "handiness"; advantages of voice over gesture.

Imitation as a factor in development of language and of writing; onomatopoetic origin of words.

Development of sign-making: "Among the animals of highest intelligence that associate with man and learn something of his ways, a certain amount of sign-making expressly for communication is not to be denied; the dog that barks at a door because he knows that somebody will come and let him in is an instance of it; perhaps, in wild life, the throwing out of sentinel birds from a flock, whose warning cry shall advertise their fellows of the threat of danger, is as near an approach to it as is anywhere made."

Brute speech and human speech: "Those who put forward language as the distinction between man and the lower animals, and those who look upon our language as the same in kind with the means of communication of the lower animals, only much more complete and perfect, fail alike to comprehend the true nature of language, and are alike wrong in their arguments and conclusions. No addition to or multiplication of brute speech would make anything like human speech; the two are separated by a step which no animal below man has ever taken; and, on the other hand, language is only the most conspicuous among those institutions the development of which has constituted human progress."

Language and culture: "Differences of language, down to the possession of language at all, are differences only in respect to education and culture."

Development of language signs: the beginning slow,

acceleration cumulative.

The root-stage: first signs must have been "integral, significant in their entirety, not divisible into parts."

Earliest phonetic forms: the simplest syllabic combination a single consonant with a following vowel. See the article HAWAII (Vol. 13, p. 88) for a similar language even now in existence: "Every syllable is open, ending in a vowel sound, and short sentences may be constructed wholly of vocalic sounds."

Character of early speech: "first language-signs must have denoted those physical acts and qualities which are directly apprehensible by the senses.... We are still all the time drawing figurative comparisons between material and moral things and processes, and calling the latter by the names of the former."

Development of language as illustrated in Indo-European speech.

Laws of growth and change: internal growth by multiplication of meanings; phonetic change—the principle of economy (euphony); borrowing and mixing of vocabularies.

Classification of languages by structural types: isolating (Chinese); agglutinative (Turkish, etc.); inflective (Indo-European); or—a more elaborate classification:

Indo-European Languages

Indo-European: on which see part II of the article PHILOLOGY and the article INDO-EUROPEAN LANGUAGES (Vol. 14, p. 495; equivalent to 20 pages of this Guide), by Prof. Peter Giles,—especially interesting for the attempt on a linguistic basis to reconstruct the original civilization and to discover the home of the ancestors of this language-stock which now occupies nearly all of Europe and is so intimately connected with the civilization of the last 2500 years. See:

GREEK LANGUAGE (Vol. 12, p. 496), by Professor

Giles, and articles HOMER (Vol. 13, p. 626); DORIANS (Vol. 8, p. 423), etc.; but the main treatment of different Greek dialects is in the article GREEK LANGUAGE (Vol. 12, p. 496), to which the student should refer for Arcadian and Cyprian, Aeolic, Ionic-Attic, and Doric dialects.

LATIN LANGUAGE (Vol. 16, p. 244), by Dr. A. S. Wilkins, late professor of Latin, Owens College, Manchester, and Dr. Robert S. Conway, professor of Latin, University of Manchester, with a peculiarly valuable summary of *The Language as Recorded*, which is a linguistic critique of the style and vocabulary of the great Roman authors and a comparison (p. 253) of Latin and Greek prose. And see the articles on the dialects of ancient Italy: ITALY, *Ancient Languages and People*; ETRURIA, *Language*; LIGURIA, *Philology*; SICULI; POMPEII, *Oscan Inscriptions*; SABINI; FALISCI; VOLSCI; OSCA LINGUA; IGUVIUM; BRUTII; UMBRIA; PICENUM; SAMNITES, etc., by Prof. Conway, which will serve the student as a foundation for this subject, with more recent revision of all that is known than there is in Prof. Conway's books, in the works of C. D. Buck, or in other authorities.

Romance Languages

For the descendants of Latin, the article ROMANCE LANGUAGES (Vol. 23, p. 504), by Dr. Wilhelm Meyer-Lübke, Professor of romance philology in the University of Vienna; and the following separate articles:

ITALIAN LANGUAGE (Vol. 14, p. 888), by Graziadio I. Ascoli, professor of comparative grammar at the University of Milan, and Carlo Salvioni, professor of Romance languages in the same university, with a

valuable summary of the dialects of modern Italy.

FRENCH LANGUAGE (Vol. 11, p. 103), by Henry Nicol and Paul Meyer, professor at the Collège de France; particularly interesting because treated comparatively with constant reference to English and French influence on English.

PROVENÇAL LANGUAGES (Vol. 22, p. 491), by Prof. Paul Meyer.

SPAIN: *Language* (Vol. 25, p. 573), by Alfred Morel-Fatio, professor of Romance languages at the Collège de France, and James Fitzmaurice-Kelly, professor of Spanish, Liverpool University; describing the Catalan as well as the Castilian and the Portuguese.

RUMANIA: *Language* (Vol. 23, p. 843).

Teutonic Languages

The general articles SCANDINAVIAN LANGUAGES (Vol. 24, p. 291), by Dr. Adolf Noreen, professor in the University of Upsala, with sections on Icelandic, Norwegian or Norse, Swedish, and Danish, and the Scandinavian dialects; and TEUTONIC LANGUAGES (Vol. 26, p. 673), by Hector Munro Chadwick, Librarian of Clare College, Cambridge.

More in detail on the Teutonic languages are the articles:

ENGLISH LANGUAGE (Vol. 9, pp. 587–600; equivalent to 45 pages of this Guide), by Sir James A. H. Murray, editor-in-chief of the (Oxford) *New English Dictionary*, and Miss Hilda Mary R. Murray, lecturer on English at the Royal Holloway College.

DUTCH LANGUAGE (Vol. 8, p. 717), by Prof. Johann Hendrik Gallée of the University of Utrecht.

GERMAN LANGUAGE (Vol. 11, p. 777), Dr. Robert Priebsch, professor of German philology, University

of London, which deals with modern and ancient, new, middle, and old, high and low German.

For Indo-Iranian languages, see:

Persia and India

PERSIA: *Language and Literature* (Vol. 21, p. 246), by Dr. Hermann Ethé, professor of Oriental languages, University College, Wales, dealing with Zend, and Old, Middle and New Persian and modern dialects of Persian.

INDO-ARYAN LANGUAGES (Vol. 14, p. 487), by George Abraham Grierson, formerly in charge of the Linguistic survey of India, who treats in this article the relations of Pisaca, Prakrit and Sanskrit, and contributes the separate articles PISACA LANGUAGES, PRAKRIT, BENGALI, BIHARI, GUJARATI AND RAJASTHANI, HINDOSTANI, KASHMIRI, and MARATHI. More important than these minor dialects are SANSKRIT LANGUAGE (Vol. 24, p. 156), by Dr. Julius Eggeling, professor of Sanskrit, Edinburgh University,—an article equivalent in length to 90 pages of this Guide; and PALI (Vol. 20, p. 630), by Prof. T. W. Rhys Davids of Manchester University, president of the Pali Text Society.

ARMENIAN LANGUAGE AND LITERATURE (Vol. 2, p. 571), by Dr. F. C. Conybeare, author of *The Ancient Armenian Texts of Aristotle*, etc.

LITHUANIANS AND LETTS, *Language and Literature* (Vol. 16, p. 790); SLAVS: *Language* (Vol. 25, p. 233), by Ellis Hovell Minns, Lecturer in palaeography, Cambridge, with a table of alphabets; and supplementary information in the articles RUSSIA, BULGARIA, SERVIA, POLAND, BOHEMIA, CROATIA-SLAVONIA, SLOVAKS, SLOVENES, SORBS, KASHUBES, POLABS.

ALBANIA, LANGUAGE (Vol. 1, p. 485), by J. D. Bourchier, correspondent of *The Times* (London) in South-eastern Europe.

Semitic

The material on the Semitic group is principally in the article SEMITIC LANGUAGES (Vol. 24, p. 617), by Theodor Nöldeke, late professor of Oriental languages at Strassburg. This article deals with:

Assyrian—see also CUNEIFORM (Vol. 7, p. 629);

Hebrew—see also HEBREW LANGUAGE (Vol. 13, p. 167), by Arthur Ernest Cowley, sub-librarian of the Bodleian, Oxford;

Phoenician—see also PHOENICIA (Vol. 21, p. 449), by the Rev. Dr. George Albert Cook, author of *Text Book of North-Semitic Inscriptions*, etc.;

Aramaic—and see the separate article ARAMAIC LANGUAGES (Vol. 2, p. 317);

Arabic, Sabaean, Mahri and Socotri, Ethiopic, Tigre and Tigrina, Amharic, Harari and Gurague.

And see the article SYRIAC LANGUAGE (Vol. 26, p. 309), by Norman McLean, lecturer in Aramaic, Cambridge.

Hamitic

The article HAMITIC LANGUAGES (Vol. 12, p. 893) is by Dr. W. Max Müller, professor in the Reformed Episcopal Seminary, Philadelphia. See also the article EGYPT, *Language and Writing* (Vol. 9, p. 57), by Dr. Francis Llewelyn Griffith, reader in Egyptology, Oxford; and the articles: ETHIOPIA (Vol. 9, p. 845), by Dr. D. S. Margoliouth, professor of Arabic, Oxford; BERBER, *Language* (Vol. 3, p. 766) and KABYLES (Vol. 15, p. 625) for the Libyan group of the Hamitic languages.

Other Tongues

On the mono-syllabic languages see CHINA, *Language* (Vol. 6, p. 216), by Dr. H. A. Giles, professor of Chinese, Cambridge, and Lionel Giles, assistant Oriental Department, British Museum;

JAPAN, *Language* (Vol. 15, p. 167), by Captain Frank Brinkley, late editor of the Japan *Mail*; and

TIBETO-BURMAN LANGUAGES (Vol. 26, p. 928), by Dr. Sten Konow, professor in the University of Christiania.

The article URAL-ALTAIC (Vol. 27, p. 784), by Dr. Augustus Henry Keane, late professor of Hindustani, University College, London, gives a general account of the relationship of Turkish, Finno-Ugrian, Mongol and Manchu; and is supplemented by the articles TURKS, *Language* (Vol. 27, p. 472), by Sir Charles Eliot, vice-chancellor of Sheffield University; FINNO-UGRIAN (Vol. 10, p. 388), on language of Finns, Lapps and Samoyedes, HUNGARY *Language* (Vol. 13, p. 924), on Magyar, both by Sir Charles Eliot; and MONGOLS, *Language* (Vol. 18, p. 719), by Dr. Bernhard Jülg, late professor at Innsbruck.

On the non-Aryan languages of Southern Africa see the article TAMILS (Vol. 26, p. 388), by Dr. Reinhold Rost, late secretary of the Royal Asiatic Society.

For languages of Malay-Polynesia and other Oceanic peoples see MALAYS, *Language* (Vol. 17, p. 477), by Sir Hugh Charles Clifford, colonial secretary of Ceylon, and joint-author of *A Dictionary of the Malay Language*; and the articles POLYNESIA, SAMOA, JAVA, HAWAII, etc.

On the Caucasian language see GEORGIA (Vol. 11, p. 758) and CAUCASIA (Vol. 5, p. 546).

On other European languages see BASQUES (Vol. 3,

p. 485), by the late Rev. Wentworth Webster, author of *Basque Legends*, and Julien Vinson, author of LE BASQUE ET LES LANGUES MEXICAINES; and for the Etruscan language ETRURIA (Vol. 9, p. 854), by Professor R. S. Conway.

On African languages see BANTU LANGUAGES (Vol. 3, p. 356), by Sir H. H. Johnston; BUSHMEN (Vol. 41, p. 871) and HOTTENTOTS (Vol. 13, p. 805); and, for the intermediate group, the article HAUSA (Vol. 13, p. 69).

On the languages of the North American Indians see the article INDIANS, NORTH AMERICAN (especially p. 457 of Vol. 14), by Dr. A. F. Chamberlain, professor of anthropology, Clark University, Worcester, Massachusetts.

Alphabet

This list of articles will serve the student as a guide for the purely linguistic articles. Besides the general treatment in the article PHILOLOGY from which we started, he should read articles on such general subjects as PHONETICS (Vol. 21, p. 458), by Dr. Henry Sweet, author of *A Primer of Phonetics*, *A History of English Sounds since the Earliest Period*, etc. This leads to a study of the article ALPHABET (Vol. 1, p. 723), equivalent to 30 pages of this Guide, written by Professor Peter Giles of Cambridge and illustrated with a plate and various fac-similes of early alphabets. This article is supplemented by Professor Giles's articles on all the letters of the alphabet, which deal with the history and form of the symbol, the character of the sound it stands for and, particularly, the development and change of the sound in English and its dialects. For instance the article on the letter *N* describes four different sounds, of which there are two in English—usually

distinguished as *n* and *ng*; explains that in the early Indo-European language some *n's* and *m's* could sometimes be pronounced *as vowels*; describes the opposite process, the nasalization of vowels, especially in French; and closes by saying: "It is possible to nasalize some consonants as well as vowels; nasalized spirants play an important part in the so-called Yankee pronunciation of Americans."

Artificial Languages

From alphabets the student may well turn to ideal languages in the article UNIVERSAL LANGUAGES (Vol. 27, p. 746), by Professor Henry Sweet, which criticizes Volapük and Esperanto and the Idiom Neutral as being unscientific, not really international —even from a European point of view, and still less when one considers the growing importance of Japan and China in world-trade and world-history. Their being based on national languages Dr. Sweet thinks is a disadvantage. But in their comparative success he sees proof that a universal language is possible. See also Prof. Sweet's separate articles VOLAPÜK (Vol. 28, p. 178) and ESPERANTO (Vol. 9, p. 773).

Writing

The article WRITING (Vol. 28, p. 852) deals, chiefly from the anthropological standpoint, with primitive attempts to record ideas in an intelligible form, for example with "knot-signs," "message-sticks," picture-writing and the like. The needs, which led to the invention of these primitive forms of writing, were: mnemonic, recalling that something is to be done at a certain time—the primitive "tickler" was a knotted string or thong, like our knotted handkerchief as a reminder, and these knot-strings were finally used for elementary accountings,

commercial or chronological, like the use of the abacus in little shops, or of the similar system in scoring games of pool; to communicate with some one at a distance, for which marked or notched sticks, engraved or coloured pebbles, wampum belts, etc., were used; and, third, to distinguish one's own property or handicraft whence cattle-brands, trade-marks, etc. In Assyria, Egypt and China picture-writing developed into conventional signs: on these see EGYPT (Vol. 9, p. 60), and CHINA (Vol. 6, p. 218). All of these are of great interest to the general reader, but the article CUNEIFORM (Vol. 7, p. 629) by Dr. R. W. Rogers, professor of Hebrew and Old Testament exegesis, Drew Theological Seminary, Madison, New Jersey, has the sort of entertainment in it that there is in a good detective story, since it tells how the meaning of the mysterious wedge-shaped inscriptions on the rocks at Mount Rachmet in Persia was discovered.

The subject of writing is treated, also, in the articles:

INSCRIPTIONS (Vol. 14, p. 618); *Semitic*, aside from the Cuneiform, by Arthur Ernest Cowley, sub-librarian of the Bodleian, Oxford; *Indian inscriptions*, by John Faithfull Fleet, author of *Inscriptions of the Early Gupta Kings*, etc.; *Greek*, by Edward Lee Hicks, Bishop of Lincoln, author of *Manual of Greek Historical Inscriptions*, etc., and George Francis Hill, author of *Sources for Greek History*, etc.; and *Latin*, by Emil Hübner, late professor of classical philology at Berlin, author of *Romische Epigraphik*, etc., and Dr. W. M. Lindsay, of the University of St. Andrews, author of *The Latin Language*, etc.

PALAEOGRAPHY (Vol. 20, p. 556), equivalent to 75 pages of this Guide, by Sir Edward Maunde Thompson, late librarian of the British Museum and

author of *Handbook of Greek and Latin Palaeography*, etc. The article is illustrated with 50 fac-similes of typical handwritings.

MANUSCRIPT (Vol. 17, p. 618), equivalent to 20 pages of this Guide, by the same author, with a description of the various forms of manuscripts, of the mechanical arrangement of writing in MSS., and of writing implements and inks. See, also, ILLUMINATED MANUSCRIPTS, PAPYRUS, PAPER and other articles mentioned in the chapter in this Guide *For Printers*.

Text Criticism

The student of language and literature and of writing will also find much valuable information in the article TEXTUAL CRITICISM (Vol. 26, p. 708), equivalent to 25 pages of this Guide, by Professor J. P. Postgate of the University of Liverpool, well-known to Latinists as the brilliant editor of Tibullus and Propertius. The article gives examples of the classes of errors occurring in texts and the methods of restoring true readings—largely of course by conjecture—and illustrates such errors and their correction by the very poorly printed first editions of the English poet Shelley.

In the study of language and writing as in courses on other sciences and arts, the reader will find an additional interest in supplementing general and abstract articles by biographical sketches of the great men in the science.

The following is a partial list of the articles in the Britannica on great philologists:

Aasen, Ivar

Adelung, J. C.

Ahrens, F. H. L.
Ascoli, G. I.
Baehr, J. C. F.
Baiter, J. G.
Bake, Jan
Barth, Kaspar von
Benfey, Theodor
Bennett, Charles E.
Bentley, Richard
Bernhardy, Gottfried
Bhau Daji
Blass, Friedrich
Bleek, W. H. I.
Bloomfield, Maurice
Böhtlingk, Otto von
Bopp, Franz
Bosworth, Joseph
Bréal, M. J. A.
Brown, Francis
Bücheler, Franz
Buck, C. D.
Bugge, Sophus
Burmann
Burnell, A. C.
Burnouf, Eugène
Buttmann, Philipp Karl

Carey, William
Casaubon
Caspari, K. P.
Castell, Edmund
Castiglione, Count
Castrén, M. A.
Childers, R. C.
Cleynaerts, Nicolas
Cobet, C. G.
Conington, John
Cook, A. S.
Corssen, W. P.
Cotgrave, Randle
Creuzer, G. F.
Csoma de Körös, A.
Darmesteter, J.
Delius, N.
Diez, F. C.
Döbrowsky, J.
Döderlein, J. C. W. L.
Donaldson, J. W.
Drisler, Henry
Dunash
Ebel, H. W.
Egger, Emile
Elias, Levita

Ellis, A. J.
Ellis, Robinson
Erasmus
Erpenius, Thomas
Ettmüller, E. M. L.
Facciolati, J.
Fairuzabadi
Fleckeisen, C. F. W. A.
Fleischer, Heinrich L.
Flügel, G. L.
Flügel, J. G.
Forcellini, Egidio
Freund, Wilhelm
Freytag, G. W. F.
Furnivall, F. J.
Fürst, Julius
Gabelentz, H. C. von der
Gaisford, Thomas
Gayangos y Arce, P. de
Gildersleeve, B. L.
Goeje, M. J. de
Goldstücker, T.
Goldziher, Ignaz
Golius, Jacobus
Goodwin, W. W.
Greenough, J. B.

Grimm, J. L. C.
Grimm, W. C.
Gudeman, Alfred
Gutschmid, Baron von
Hadley, James
Hagen, F. H. von der
Haldeman, S. S.
Hale, W. G.
Halhed, N. B.
Hall, Fitzedward
Hall, Isaac Hollister
Hasden, B. P.
Haug, Martin
Haupt, Moritz
Henry, Victor
Herbelot de Molainville, B. d'
Hervás y Panduro, L.
Hoffmann, J. J.
Hopkins, E. W.
Hottinger, J. H.
Hübner, Emil
Humboldt, K. W. von
Ingram, James
Jauhari
Jawaliqi
Jirecek, Josef

Jonah, Rabbi
Jones, Sir William
Karajich, V. S.
Kern, J. H.
Khalil ibn Ahmad,
Kimbi (family)
Klaproth, H. J.
Kuhn, F. F. A.
Lachmann, Karl
Lanman, C. R.
Lassen, Christian
Legge, James
Leitner, G. W.
Liddell, H. G.
Littré, M. P. E.
Ludolf, Hiob
Madvig, J. N.
Malan, S. C.
March, F. A.
Max Müller, F.
Mayor, J. E. B.
Ménant, Joachim
Meyer, P. H.
Mezzofanti, Giuseppe C.
Miklosich, Franz von
Mohl, Julius von

Monier-Williams, Sir M.

Morris, Richard

Munro, D. B.

Murray, Sir James

Nettleship, Henry

Nöldeke, Theodor

Oppert, Julius

Paley, F. A.

Paris, B. P. G.

Peerlkamp, P. H.

Peile, John

Petrarch

Poggio

Politian

Porson, Richard

Pott, A. F.

Quatremère, E. M.

Rask, R. C.

Reiske, J. J.

Reland, Adrian

Rémusat, J. P. A.

Ribbeck, Otto

Rieu, C. P. H.

Ritsche, F. W.

Rutherford, W. G.

Sale, George

Salesbury, William
Sanders, Daniel
Sayce, A. H.
Schafarik, P. J.
Scheler, J. A. W.
Schiefner, F. A.
Schleicher, August
Schultens (family)
Scott, Robert
Sellar, W. Y.
Skeat, W. W.
Taylor, Isaac
Ten Brink, B. E. K.
Teuffel, W. S.
Thorpe, Benjamin
Wailly, N. F. de
Walker, John
Warren, Minton
Webster, Noah
Whitney, W. D.
Wilkins, Sir Charles
Wordsworth, Christopher
Zarncke, F. K. T.

CHAPTER XXXVI
LITERATURE, INTRODUCTORY AND GENERAL

Contributors

The student of literature, like the student of painting, finds it as necessary to examine the great examples of the art as to study the laws which guide the artist, for the history of their development, and he will find that the articles which discuss literature in the Britannica are *themselves literature*, models of the form of artistic expression which they describe. A list of these contributors who deal with literary topics might, indeed, easily be mistaken for a list of such articles on the great contemporary writers as the student would most desire to read. Among these contributors are, for example: Edmund Gosse, Theodore Watts-Dunton, Swinburne, A. C. Benson, John Morley, Austin Dobson, Arthur Symons, J. Addington Symonds, Frederic Harrison, Walter Besant, William Sharp (“Fiona Macleod”), Professor George Saintsbury, Sir Arthur T. Quiller-Couch (“Q”), William Archer, Israel Gollancz, Robert Louis Stevenson, Andrew Lang, Sir Leslie Stephen, E. V. Lucas, Arthur Waugh, Mrs. Craigie (“John Oliver Hobbes”), Alice Meynell, Mrs. Humphry Ward, and—among American names,—George E. Woodberry, Henry Van Dyke, Edward Everett Hale, T. W. Higginson, Brander Matthews, W. P. Trent, Charles Eliot Norton, Charles William Eliot, George W. Cable, Lyman Abbott, Edmund Clarence Stedman, John Burroughs, Thomas Davidson, Horace E. Scudder, and Charles F. Richardson.

Before discussing the articles in which these and many other distinguished contributors deal with various aspects of literature, attention may be directed to the treatment of religious literature in the Britannica. The Bible is the subject of a separate chapter in this Guide on *Bible Study*, to which the reader is also referred for the whole literature of Biblical criticism. Religious literature based upon the Bible is discussed in the articles LITURGY (Vol. 16, p. 795), by the Rev. F. E. Warren; SERMON (Vol. 24, p. 673), by Edmund Gosse, and HYMNS (Vol. 14, p. 181), by Lord Selborne, equivalent to 35 pages of this Guide. The medieval miracle plays and mysteries, presenting incidents from Scripture, are described in the section on the *Medieval Drama* (Vol. 8, p. 497) of the article DRAMA. On the literature of other religions, see the chapter *For Ministers*.

General Articles

The student of literature in general may begin his course of reading with the article LITERATURE (Vol. 16, p. 783), a concise critical summary by Dr. James Fitzmaurice-Kelly, professor of Spanish language and literature, Liverpool University, best known as the editor of Cervantes. Read, after the article LITERATURE, the same contributor's article TRANSLATION (Vol. 27, p. 183). The student who does not wish to approach literature from the philosophic side need not read the articles AESTHETICS and FINE ARTS; but even such a one should read the article STYLE (Vol. 25, p. 1055), by Edmund Gosse, essayist, poet, biographer and librarian of the House of Lords, and the article PROSE (Vol. 22, p. 450), by the same contributor.

There is a well-known and perfectly authentic anecdote of Edmund Gosse's predecessor as librarian

of the House of Lords, who was once asked in the course of a newspaper symposium on education, "What were the principal factors in your education?" He replied by putting second only to his university training "the articles in the Encyclopaedia Britannica and in the *Athenaeum* by Theodore Watts-Dunton." Certainly the student will be well repaid by repeated study and analysis of Watts-Dunton's article POETRY (Vol. 21, p. 877; equivalent to 45 pages of this Guide). The same author's articles SONNET (Vol. 25, p. 414), MATTHEW ARNOLD (Vol. 2, p. 635), and WYCHERLEY (Vol. 28, p. 863) should be studied with the article POETRY as supplementing his literary philosophy.

The greatest of literary forms is amply represented by the space and the authority given to it in the Britannica. The article DRAMA (Vol. 8, p. 475; equivalent to 225 pages of this Guide) is mainly the work of Prof. A. W. Ward, master of Peterhouse, Cambridge, editor of the *Cambridge History of English Literature* and of the *Cambridge Modern History*; but some parts of the article are by William Archer, the dramatic critic, and by Auguste Filon ("Pierre Sandrié"). This elaborate article should be supplemented by the short article COMEDY (Vol. 6, p. 759) and by the biographical and critical sketches of the great dramatists.

Among the many other articles in the Britannica on the forms of literature are: SATIRE (Vol. 24, p. 228), by Richard Garnett, late librarian British Museum, with which the student may well combine the articles HUMOUR and IRONY, the articles BALLADE, BALLADS (Lang), BUCOLICS, PASTORAL, CENTO, CHANT ROYAL (with Gosse's first English chant royal, "The Praise of Dionysus," transcribed in full), DESCRIPTIVE POETRY, ELEGY, EPIC POETRY,

EPITHALAMIUM, HEROIC VERSE, IDYL, LIMERICK, LYRICAL POETRY, MACARONICS, NATIONAL ANTHEMS, ODE, OTTAVA RIMA, PANTUN, RIME ROYAL, RONDEAU, RONDEL, SESTETT, SESTINA, SONG, TRIOLET, VERS DE SOCIÉTÉ, VILANELLE, VIRELAY, and—a few of the prose forms, BIOGRAPHY, CONTE, CRITICISM, EPISTLE, ESSAY, EUPHUISM, NOVEL, PAMPHLET, PICARESQUE NOVEL, ROMANCE, TALE, TRACT,—nearly all these being by Edmund Gosse. Two articles of the utmost importance are DICTIONARY and ENCYCLOPAEDIA. Read the general article RHETORIC.

Periodical Publications

Periodical publications, especially those in the English and French languages, have contained a great part of the best literary criticism of miscellaneous essays published since the first French review appeared in 1665 and since the first English review, consisting wholly of original matter, was established in London in 1710. The latter was indebted to France not only for its model, but for its editor, who was a French Protestant refugee. Benjamin Franklin founded the first American monthly, the Philadelphian *General Magazine* in 1741. The article PERIODICALS (Vol. 21, p. 151), by H. R. Tedder, librarian of the Athenaeum Club, London, contains separate sections on the reviews and magazines of *England*, the *United States*, *Canada*, *South Africa*, *West India and the British Crown Colonies*, *India and Ceylon*, *France*, *Germany*, *Austria*, *Switzerland*, *Italy*, *Belgium*, *Holland*, *Denmark*, *Norway*, *Sweden*, *Spain*, *Portugal*, *Greece*, *Russia*, *Bohemia*, *Hungary* and *Japan*.

NEWSPAPERS (Vol. 19, p. 544), equivalent to 140

pages of this Guide, is an article in which the student will find a full account of the most fertile, if not the most studied, form of modern literature in all parts of the world. See also the chapter in this Guide *For Journalists and Authors*.

The reader should note that of the many articles on literary forms and rhetorical figures, only a few are given above, but they are listed more fully in the Index Volume, p. 929, where there are more than 350 such titles. He must remember also that there are more than 3,000 biographical and critical articles on authors in different languages and different periods. The following are "key" articles on national literatures:

National Literatures

ENGLISH LITERATURE, by Henry Bradley, joint-editor of the *New English Dictionary*; Prof. J. M. Manly, University of Chicago; Prof. Oliver Elton, University of Liverpool; Thomas Seccombe, author of *The Age of Johnson*.

AMERICAN LITERATURE, by G. E. Woodberry, formerly professor in Columbia University.

GERMAN LITERATURE, by Prof. J. G. Robertson, University of London, author of *History of German Literature*.

DUTCH LITERATURE
FLEMISH LITERATURE
WALLOONS, *Literature*
BELGIUM, *Literature*
DENMARK, *Literature*
SWEDEN, *Literature*
NORWAY, *Literature*

by Edmund Gosse.

ICELAND, *Literature, Classic*, by Prof. Frederick York Powell of Oxford; *Recent*, by Sigfús Blöndal, librarian of Copenhagen University.

FRENCH LITERATURE, by George Saintsbury.

PROVENÇAL LITERATURE, by Paul Meyer, Director of the École des Chartes, Paris, and Prof. Hermann Oelsner, Oxford, author of a *History of Provençal Literature*.

ANGLO-NORMAN LITERATURE, by Prof. Louis Brandin of the University of London.

SPAIN, *Literature*, by Prof. J. Fitzmaurice-Kelly of the University of Liverpool, and A. Morel-Fatio, author of *L'Espagne au XVIe et au XVIIe siècles*.

PORTUGAL, *Literature*, by Edgar Prestage, editor of *Letters of a Portuguese Nun*, etc.

ITALIAN LITERATURE, by Prof. Hermann Oelsner, Oxford, and Prof. Adolfo Bartoli of the University of Florence, author of *Storia della letteratura Italiana*.

SWITZERLAND, *Literature*, by Prof. W. A. B. Coolidge.

HUNGARY, *Literature*, by Emil Reich, author of *Hungarian Literature*, and E. Dundas Butler, author of *Hungarian Poems and Fables for English Readers*, etc.

POLAND, *Literature*, by W. R. Morfill, late professor of Slavonic Languages, Oxford, author of *Slavonic Literature*, etc.

RUSSIA, *Literature*, also by Prof. Morfill.

ARABIA, *Literature*, by the late Prof. M. J. de Goeje, University of Leiden, and the Rev. G. W. Thatcher, warden of Camden College, Sydney, N. S. W.

PERSIA, *Literature*, by Prof. Karl Geldner, Marburg University, and Prof. Hermann Ethé, University College, Wales.

CHINA, *Literature*, by H. A. Giles, professor of

Chinese, Oxford.

JAPAN, *Literature*, by Capt. Brinkley.

HEBREW LITERATURE, by Arthur Cowley, sub-librarian of the Bodleian, Oxford.

ARMENIAN LITERATURE, by F. C. Conybeare, author of *The Ancient Armenian Texts of Aristotle*.

SYRIAC LITERATURE, by Norman McLean, lecturer in Aramaic, Cambridge.

HINDOSTANI LITERATURE, by Sir Charles James Lyall.

SANSKRIT, *Literature*, by Prof. Julius Eggeling, Edinburgh.

CLASSICS, by Dr. J. E. Sandys, Cambridge, author of *History of Classical Scholarship*.

GREEK LITERATURE: *Ancient*, by Sir R. C. Jebb, author of *Companion to Greek Studies*; *Byzantine*, by Prof. Karl Krumbacher, editor of *Byzantinische Zeitschrift* and *Byzantinisches Archiv*; and *Modern*, by J. D. Bourchier, correspondent of *The Times* (London) in South-Eastern Europe.

LATIN LITERATURE, by Prof. A. S. Wilkins, of Owens College, Manchester, and Prof. R. S. Conway, of the University of Manchester.

CELT, *Literature*, to which W. J. Gruffydd, lecturer in Celtic, University College, Cardiff, contributes the section on *Welsh* literature; and E. C. Quiggin, lecturer in Celtic, Cambridge, contributes the sections on *Irish*, *Manx*, *Breton* and *Cornish* literatures.

Bibliography

This list of the literatures of many tongues, from each of which translations have added to the common stock accessible even to those who can read

with ease only one language, indicates the existence of a bewildering mass of printed matter, and just as each language has its literature—using the word to signify output, so each subject upon which men write has its literature—using the word to signify material for any one branch of study. Bibliographies are the charts by which students are enabled to navigate these vast seas of knowledge. The articles BIBLIOGRAPHY (Vol. 3, p. 908), by A. W. Pollard, assistant librarian of the British Museum, and INDEX (Vol. 14, p. 373) describe the technicalities of cataloguing and classifying books and their contents.

The Britannica is itself the most complete index to the subjects treated by books and the most complete bibliographical manual for the student that could be imagined. The Index of 500,000 entries (Vol. 29) shows to what class any one of half a million facts belongs, by referring to the article in which that fact is treated. At the end of the article a list of the best books on the subject shows the student who desires to specialize just where to go for further details. No less than 203,000 books are included in these lists appended to Britannica articles and many of them are, in themselves, substantial contributions to literature. The Shakespeare bibliography would, for example, fill 30 pages of the size and type of this Guide; the bibliography of English history, by A. F. Pollard, of the University of London, 13 pages, and the bibliography of French history, by Prof. Bémont of the École des Hautes Études, Paris, 8 pages.

A group of articles of great interest to every student of literature deals with the methods and appliances by which writings are preserved and circulated. MANUSCRIPT (Vol. 17, p. 618) is by Sir E. Maunde Thompson, of the British Museum Library; BOOK (Vol. 4, p. 214); BOOK-COLLECTING (Vol. 4, p.

221) and INCUNABULA (Vol. 14, p. 369) are by A. W. Pollard, also of the British Museum Library. LIBRARIES (Vol. 16, p. 545), equivalent to 100 pages of this Guide, is by H. R. Tedder, librarian of the Athenaeum Club, London. The articles on printing, binding, publishing and similar subjects are described in the chapter of this Guide *For Printers*.

With this chapter to help him the student will have little difficulty in devising his own course of reading in any one literature—starting with the general treatment, going from this to the separate biographies of the great authors mentioned in the general article, and, when there is in the national literature that he is studying some special development of a literary *genre*, as of the sermon in the 17th or the satire in the 18th century, turning to the article in the Britannica dealing with this form of literature, SATIRE, SERMON, or whatever it may be. For example, what could be more illuminating to the student of 19th century literature than the following passages-disconnected here—from the article SATIRE?

> Goethe and Schiller, Scott and Wadsworth, are now at hand, and as imagination gains ground satire declines. Byron, who in the 18th century would have been the greatest of satirists, is hurried by the spirit of his age into passion and description, bequeathing, however, a splendid proof of the possibility of allying satire with sublimity in his *Vision of Judgment*.... Miss Edgeworth skirts the confines of satire, and Miss Austen seasons her novels with the most exquisite satiric traits. Washington Irving revives the manner of *The Spectator*, and Tieck brings irony and persiflage to the discussion of critical problems.... In all the characteristics of his genius Thackeray is thoroughly English, and the faults and follies he chastises are those especially characteristic of British society. Good sense and the perception of the

ridiculous are amalgamated in him; his satire is a thoroughly British article, a little over-solid, a little wanting in finish, but honest, weighty and durable. Posterity must go to him for the humours of the age of Victoria, as they go to Addison for those of Anne's.... In Heine the satiric spirit, long confined to established literary forms, seems to obtain unrestrained freedom to wander where it will, nor have the ancient models been followed since by any considerable satirist except the Italian Giusti. The machinery employed by Moore was indeed transplanted to America by James Russell Lowell, whose *Biglow Papers* represent perhaps the highest moral level yet attained by satire.

In no age was the spirit of satire so generally diffused as in the 19th century, but many of its eminent writers, while bordering on the domains of satire, escape the definition of satirist. The term cannot be properly applied to Dickens, the keen observer of the oddities of human life; or to George Eliot, the critic of its emptiness when not inspired by a worthy purpose; or to Balzac, the painter of French society; or to Trollope, the mirror of the middle classes of England. If *Sartor Resartus* could be regarded as a satire, Carlyle would rank among the first of satirists; but the satire, though very obvious, rather accompanies than inspires the composition.

CHAPTER XXXVII
AMERICAN LITERATURE

The list in the preceding chapter of the key articles dealing with national literatures shows that the Britannica separately treats the literary products of some 30 countries. To outline 30 courses of reading, mentioning the 3,000 critical and biographical

articles, would make this Guide unwieldy. On pp. 929–937 of Vol. 29 the reader will find classified lists of these articles, and only four groups are selected here for detailed treatment: those on American, English, German and Greek literature. The main article in the literature of each of the other countries indicates the characteristic forms, the typical works of the leading writers discussed in special articles, so that courses of reading as systematic as these four can easily be planned for other countries by the reader.

Topic of Study	*Article and Contributor*
General Summary of the subject, with critical appreciation of main tendencies and great authors.	AMERICAN LITERATURE (Vol. 1, p. 831), by George E. Woodberry, formerly professor in Columbia University, biographer of Poe and Hawthorne, author of *America in Literature*, etc.
Colonial Period.	
English writers, especially historical.	JOHN SMITH (Vol. 25, p. 264), by Prof. Edward Arber, editor of *English Garner*, etc.
Colonial writers, especially of Puritan New England.	MASSACHUSETTS, *History* (Vol. 17, p. 858); CONNECTICUT, *History* (Vol. 6, p. 954).
Massachusetts governors and historical writing.	WILLIAM BRADFORD (Vol. 4, p. 370); JOHN WINTHROP (Vol. 28, p. 736).

The Clergy as writers of History, and of Theology of the Puritan School.	JOHN COTTON (Vol. 7, p. 255), by Prof. Williston Walker, Yale, author of *History of the Congregational Churches in the United States*; THOMAS HOOKER (Vol. 13, p. 674).
The Mathers.	COTTON, INCREASE, and RICHARD MATHER (Vol. 17, p. 883).
Apostle to the Indians.	JOHN ELIOT (Vol. 9, p. 278), by Prof. Walker.
Revolt against Puritanism.	
Ethical.	THOMAS MORTON (Vol. 18, p. 882).
Theological.	ROGER WILLIAMS (Vol. 28, p. 682).
New England Verse.	MICHAEL WIGGLESWORTH (Vol. 28, p. 626).
The New England Diarist.	SAMUEL SEWALL (Vol. 24, p. 733).
The great New England Philosopher and Theologian; the first American author with a lasting and European reputation.	JONATHAN EDWARDS (Vol. 9, pp. 3–6), by Prof. Harry Norman Gardiner, editor of *Jonathan Edwards—a Retrospect*, and Riehard Webster.
Edwards's contemporaries.	CHARLES CHAUNCY (Vol. 6, p. 18).
	JONATHAN MAYHEW (Vol. 17, p. 935).
Edwards's followers,—the New England theology.	JOSEPH BELLAMY (Vol. 3, p. 694).

	SAMUEL HOPKINS (Vol. 13, p. 685).
The first newspaper in New York.	WILLIAM BRADFORD (Vol. 4, p. 370).
A Virginia educator.	JAMES BLAIR (Vol. 4, p. 34).
The American Quaker preacher.	JOHN WOOLMAN (Vol. 28, p. 817).
A royal governor and historian.	THOMAS HUTCHINSON (Vol. 14, p. 13).
A New York statesman and philosopher.	CADWALLADER COLDEN (Vol. 6, p. 663).
The first great American figure in secular literature,—essayist, pamphleteer, politician, autobiographer.	BENJAMIN FRANKLIN (Vol. 11, p. 24), by Richard Webster, late fellow Princeton University, editorial staff, Encyclopaedia Britannica.
Revolutionary Period.	
The patriotic orators and Pamphleteers.	JAMES OTIS (Vol. 20, p. 366).
	PATRICK HENRY (Vol. 13, p. 300).
	JOHN ADAMS (Vol. 1, p. 176).
	JOSIAH QUINCY (Vol. 22, p. 753).
	JAMES WILSON (Vol. 28, p. 693).
"Common Sense."	THOMAS PAINE (Vol. 20, p. 456).
James Otis's Sister.	MERCY WARREN (Vol. 28, p. 330).

The Declaration of Independence and its author.	INDEPENDENCE, DECLARATION OF (Vol. 14, p. 372), and THOMAS JEFFERSON (Vol. 15, p. 301), both by Dr. F. S. Philbrick.
Prominent Patriots in New Jersey.	WILLIAM LIVINGSTON (Vol. 16, p. 813).
	JOHN WITHERSPOON (Vol. 28, p. 759).
A Connecticut Educator and Patriot.	EZRA STILES (Vol. 25, p. 919).
Opponents of Independence.	JOSEPH GALLOWAY (Vol. 11, p. 421).
"A Westchester Farmer."	SAMUEL SEABURY (Vol. 24, p. 531).
In Massachusetts.	MATHER BYLES (Vol. 4, p. 896).
In Maryland.	JONATHAN BOUCHER (Vol. 4, p. 312).
Patriotic Poetry.	JOHN TRUMBULL (Vol. 27, p. 324).
The "Hartford Wits."	TIMOTHY DWIGHT (Vol. 8, p. 741).
Satire and Epic.	JOEL BARLOW (Vol. 3, p. 406).
"Battle of the Kegs."	FRANCIS HOPKINSON (Vol. 13, p. 685).
A Western Traveler.	JONATHAN CARVER (Vol. 5, p. 437).

The National Period.

The Constitution and its Pamphleteers—"The Federalist," the greatest application of elementary principles of government to practical administration.	JAMES MADISON (Vol. 17, p. 284).
	ALEXANDER HAMILTON (Vol. 12, p. 880), by Dr. F. S. Philbrick and Hugh Chisholm.
	JOHN JAY (Vol. 15, pp. 294–296).
Importance of the early national period on the development of American literature.	UNITED STATES, *History*, §106 (Vol. 27, p. 688), by the late Prof. Alexander Johnson, Princeton, and C. C. Whinery, assistant editor, Encyclopaedia Britannica.
The first professional "man of letters."	CHARLES BROCKDEN BROWN (Vol. 4, p. 657).
First foreign vogue.	
Essay and History: "The American Goldsmith."	WASHINGTON IRVING (Vol. 14, p. 856), by Richard Garnett, late librarian British Museum.
Fiction: "The American Scott."	JAMES FENIMORE COOPER (Vol. 7, p. 79), by W. E. Henley, poet, critic and essayist.
Poetry.	WILLIAM CULLEN BRYANT (Vol. 4, p. 698), by G. W. Cable.

The Knickerbocker School.	NEW YORK CITY, *Literature* (Vol. 19, p. 615).
New York as a literary centre.	JAMES KIRKE PAULDING (Vol. 20, p. 958).
	FITZ-GREENE HALLECK (Vol. 12, p. 854).
A Southern novelist and poet.	W. G. SIMMS (Vol. 25, p. 123).
Cooper's successor as novelist of the sea.	HERMAN MELVILLE (Vol. 18, p. 102).
Poetesses of the early 19th century.	LYDIA HUNTLEY SIGOURNEY (Vol. 25, p. 82).
	ALICE AND PHOEBE CARY (Vol. 5, p. 438).
The "Literati."	N. P. WILLIS (Vol. 28, p. 686).
	RUFUS WILMOT GRISWOLD (Vol. 12, p. 610).
The short story.	EDGAR ALLAN POE (Vol. 21, p. 875), by David Hannay.
Traveler, Translator, Poet.	BAYARD TAYLOR (Vol. 26, p. 467).
New England in the 19th century.	
Boston and Cambridge.	BOSTON (Vol. 4, p. 293).
	HARVARD UNIVERSITY (Vol. 13, p. 38).
	GEORGE TICKNOR (Vol. 26, p. 936).

History and Scholarship as affected by European contacts.	GEORGE BANCROFT (Vol. 3, p. 307), by Prof. W. M. Sloane, Columbia.
	EDWARD EVERETT (Vol. 10, p. 8), by Edward Everett Hale.
	JARED SPARKS (Vol. 25, p. 608), by Prof. W. L. Corbin, Wells College.
	J. G. PALFREY (Vol. 20, p. 629).
	W. H. PRESCOTT (Vol. 22, p. 294).
	J. L. MOTLEY (Vol. 18, p. 909).
Unitarianism and its Literary Leaders, Influencing and Influenced by Transcendentalism.	HOSEA BALLOU (Vol. 3, p. 282).
	WILLIAM ELLERY CHANNING (Vol. 5, p. 843), by Richard Webster.
	JAMES FREEMAN CLARKE (Vol. 6, p. 444), by E. E. Hale.
	THEODORE PARKER (Vol. 20, p. 829).
Transcendentalism and the Concord School—central figures.	AMOS BRONSON ALCOTT (Vol. 1, p. 528), by Prof. C. F. Richardson, Dartmouth College.

	RALPH WALDO EMERSON (Vol. 9, p. 332), by Prof. Henry Van Dyke, Princeton.
	HENRY DAVID THOREAU (Vol. 26, p. 877), by William Sharp ("Fiona Macleod").
The Dial.	MARGARET FULLER (Vol. 11, p. 295).
	GEORGE RIPLEY (Vol. 23, p. 363), by Edward Livermore Burlingame, editor of *Scribner's*.
Brook Farm.	BROOK FARM (Vol. 4, p. 645), by E. L. Burlingame.
The author of "Margaret."	SYLVESTER JUDD (Vol. 15, p. 536).
The great New England Novelist.	NATHANIEL HAWTHORNE (Vol. 13, p. 102), by Richard Henry Stoddard, poet and essayist.
The great New England Poet.	HENRY WADSWORTH LONGFELLOW (Vol. 16, p. 977), by Thomas Davidson, author of *The Philosophical System of Rosmini*.
Earlier Romanticism.	WASHINGTON ALLSTON (Vol. 1, p. 709).
	RICHARD HENRY DANA (Vol. 7, p. 792).

Oratory.

In the North.	DANIEL WEBSTER (Vol. 28, p. 459), by Everett P. Wheeler, author of *Daniel Webster*, etc.
	RUFUS CHOATE (Vol. 6, p. 258).
	WENDELL PHILLIPS (Vol. 21, p. 407), by Col. T. W. Higginson.
	CHARLES SUMNER (Vol. 26, p. 81).
	ROBERT CHARLES WINTHROP (Vol. 28, p. 736).
In the South.	HENRY CLAY (Vol. 6, p. 470), by Carl Schurz, biographer of Clay.
Other Southern Orators.	JOHN C. CALHOUN (Vol. 5, p. 1), by Judge H. A. M. Smith, South Carolina.
	ROBERT YOUNG HAYNE (Vol. 13, p. 114).
The Pulpit Orator of the North.	HENRY WARD BEECHER (Vol. 3, p. 639), by Dr. Lyman Abbott, editor *The Outlook*.
The Abolition Novelist, author of *Uncle Tom's Cabin*.	HARRIET ELIZABETH BEECHER STOWE (Vol. 25, p. 972), by Horace E. Scudder, late editor of the *Atlantic Monthly*.
Another anti-slavery authoress.	LYDIA MARIA CHILD (Vol. 6, p. 135).

The New England Poets prominent in the Anti-Slavery Movement.	JOHN GREENLEAF WHITTIER (Vol. 28, p. 613), by Edmund Clarence Stedman, poet and critic.
	JAMES RUSSELL LOWELL (Vol. 17, p. 74), by Horace E. Scudder, biographer of Lowell.
Their Contemporary, the "Autocrat."	OLIVER WENDELL HOLMES (Vol. 13, p. 616), by J. T. Morse, biographer of Holmes.
The American Poet—by the criterion of foreign standards.	Walt Whitman (Vol. 28, p. 610), by John Burroughs, author of *Whitman, A Study*.
Scholarship and criticism in this Period and the Next: the particularly Important Work done by Americans in Grammar, Language, Text Criticism, etc.	FRANCIS JAMES CHILD (Vol. 6, p. 135).
	CORNELIUS C. FELTON (Vol. 10, p. 246).
	GEORGE PERKINS MARSH (Vol. 17, p. 768).
	WILLIAM DWIGHT WHITNEY (Vol. 28, p. 611), by Benjamin E. Smith, editor *Century Dictionary*.
	RICHARD GRANT WHITE (Vol. 28, p. 601).

	HORACE HOWARD FURNESS (Vol. 11, p. 362).
	FRANCIS ANDREW MARCH (Vol. 17, p. 688).
	BASIL LANNEAU GILDERSLEEVE (Vol. 12, p. 12).
	CHARLES ELIOT NORTON (Vol. 19, p. 797).
The later Poets.	
New England.	THOMAS BAILEY ALDRICH (Vol. 1, p. 536).
	JULIA WARD HOWE (Vol. 13, p. 836).
	WILLIAM WETMORE STORY (Vol. 25, p. 970).
New York.	EDMUND CLARENCE STEDMAN (Vol. 25, p. 861).
	RICHARD HENRY STODDARD (Vol. 25, p. 939).
	RICHARD WATSON GILDER (Vol. 12, p. 12).
Pennsylvania.	CHARLES GODFREY LELAND (Vol. 16, p. 405).
	SILAS WEIR MITCHELL (Vol. 18, p. 618).
The South.	SIDNEY LANIER (Vol. 16, p. 181), by Prof. W. P. Trent, Columbia.

The Middle West (especially humorous, light and character verse).	JOHN HAY (Vol. 13, p. 105).
	EUGENE FIELD (Vol. 10, p. 321).
	JAMES WHITCOMB RILEY (Vol. 23, p. 343).
The Far West.	FRANCIS BRET HARTE (Vol. 13, p. 31).
	JOAQUIN MILLER (Vol. 18, p. 464).
	EDWARD ROWLAND SILL (Vol. 25, p. 107).
Later Fiction.	
The American Realist.	W. D. HOWELLS (Vol. 13, p. 839).
The American Cosmopolite.	HENRY JAMES (Vol. 15, p. 143).
Stories of Italy.	F. MARION CRAWFORD (Vol. 7, p. 386).
Historical Romance.	LEWIS WALLACE (Vol. 28, p. 276).
Humorous Short Story.	FRANCIS R. STOCKTON (Vol. 25, p. 938).
Pietistic Novel.	E. P. ROE (Vol. 23, p. 449).
	J. G. HOLLAND (Vol. 13, p. 587).
The Provincial Types—	
Maine.	SARAH ORNE JEWETT (Vol. 15, p. 371).
New England.	MARY E. WILKINS (Vol. 28, p. 646).

West.	EDWARD EGGLESTON (Vol. 9, p. 17).
	MARY HALLOCK FOOTE (Vol. 10, p. 625).
	FRANCIS BRET HARTE (Vol. 13, p. 31).
South: Tennessee.	"CHARLES EGBERT CRADDOCK" (Vol. 7, p. 360).
Kentucky.	JAMES LANE ALLEN (Vol. 1, p. 691).
Virginia.	THOMAS NELSON PAGE (Vol. 20, p. 450).
New Orleans.	GEORGE W. CABLE (Vol. 4, p. 920).
Essayists.	THOMAS WENTWORTH HIGGINSON (Vol. 13, p. 455).
	EDWARD EVERETT HALE (Vol. 12, p. 832).
	CHARLES DUDLEY WARNER (Vol. 28, p. 326).
	GEORGE WILLIAM CURTIS (Vol. 7, p. 652), by Charles Eliot Norton.
Humor.	
	HENRY WHEELER SHAW, "Josh Billings" (Vol. 24, p. 813).
The American "Hood."	JOHN GODFREY SAXE (Vol. 24, p. 258).
"Bill Nye."	EDGAR WILSON NYE (Vol. 19, p. 929).

America's Great Humorist.	MARK TWAIN (Vol. 27, p. 490), by Prof. Brander Matthews, Columbia.
"Uncle Remus."	JOEL CHANDLER HARRIS (Vol. 13, p. 20).
Puck.	H. C. BUNNER (Vol. 4, p. 799).
"Mr. Dooley."	FINLEY PETER DUNNE (Vol. 8, p. 682).
History.	FRANCIS PARKMAN (Vol. 20, p. 832), by John Fiske.
	HERMANN EDUARD VON HOLST (Vol. 28, p. 210).
	FRANCIS LIEBER (Vol. 16, p. 590).
	C. E. A. GAYARRÉ (Vol. 11, p. 542).
	HENRY CHARLES LEA (Vol. 16, p. 314).
Historians.	HENRY MARTYN BAIRD (Vol. 3, p. 224).
	JOHN FISKE (Vol. 10, p. 437), by Prof. C. F. Richardson, Dartmouth.
	JAMES FORD RHODES (Vol. 23, p. 257).
	HENRY CABOT LODGE (Vol. 16, p. 860).
	JAMES B. MCMASTER (Vol. 17, p. 264).
	JAMES SCHOULER (Vol. 24, p. 377).
	THEODORE A. DODGE (Vol. 8, p. 369).

	JOHN CODMAN ROPES (Vol. 23, p. 718).
	ALFRED T. MAHAN (Vol. 17, p. 394).
	ALBERT BUSHNELL HART (Vol. 13, p. 30).
	HUBERT H. BANCROFT (Vol. 3, p. 309).
	THEODORE ROOSEVELT (Vol. 23, p. 711), by Lawrence F. Abbott, New York *Outlook*.
Newspaper Men.	NEWSPAPERS, *American* (Vol. 19, pp. 566–572).
	PERIODICALS, *United States* (Vol. 21, pp. 154–155).
New York Tribune.	HORACE GREELEY (Vol. 12, p. 531), by Whitelaw Reid.
	WHITELAW REID (Vol. 23, p. 52).
New York Herald.	JAMES GORDON BENNETT (Vol. 3, p. 740).
Springfield Republican.	SAMUEL BOWLES (Vol. 4, p. 344).
New York Times.	H. J. RAYMOND (Vol. 22, p. 933).
New York Sun.	C. A. DANA (Vol. 7, p. 791).
New York Evening Post.	EDWIN LAWRENCE GODKIN (Vol. 12, p. 174).
Louisville Courier-Journal.	HENRY WATTERSON (Vol. 28, p. 418).

CHAPTER XXXVIII
ENGLISH LITERATURE

On English literature, with its vastly longer history and greater volume, there is much more matter in the Britannica than on American literature—or of course any other national literature. The key article is ENGLISH LITERATURE (Vol. 9, p. 607; equivalent to 120 pages of this Guide), and an excellent outline for the study of this subject may be based on this article which should be supplemented by the sections on *Literature* in the articles SCOTLAND, CANADA, etc. A combination of these with special articles may be arranged as follows:

Anglo-Saxon

On the period before Chaucer—the first part of the article ENGLISH LITERATURE (Vol. 9, p. 607), by Henry Bradley, joint-editor of *The New English Dictionary*, etc.; the same author's BEOWULF (Vol. 3, p. 758), CÆDMON (Vol. 4, p. 934) and CYNEWULF (Vol. 7, p. 690), ANGLO-SAXON CHRONICLE (Vol. 2, p. 34), and ALFRED THE GREAT (Vol. 1, p. 582), both by the Rev. Charles Plummer, author of *Life and Times of Alfred the Great*, etc.; DAN MICHEL OF NORTHGATE (Vol. 18, p. 371); ANGLO-NORMAN LITERATURE (Vol. 2, p. 31), by Prof. L. M. Brandin, University of London; ANCREN RIWLE (Vol. 1, p. 952); ORM (Vol. 20, p. 293), by Henry Bradley; LAYAMON (Vol. 16, p. 311), by the late Prof. W. W. Skeat of Cambridge; HAVELOK THE DANE (Vol. 13, p. 80); ROMANCE, ARTHURIAN ROMANCE, etc.

Chaucer

On the period from Chaucer to the Renaissance, see the second part of the article ENGLISH

LITERATURE (Vol. 9, p. 611), by Prof. J. M. Manly, University of Chicago, author of *The Language of Chaucer's Legend of Good Women*; THE PEARL (Vol. 21, p. 27), by Prof. Israel Gollancz, King's College, London, editor of the Temple *Shakespeare*, etc.; LANGLAND (Vol. 16, p. 174); JOHN GOWER (Vol. 12, p. 298), by G. C. Macaulay, editor of Gower's works; GEOFFREY CHAUCER (Vol. 6, p. 13), by A. W. Pollard, chief-editor of the "Globe" *Chaucer*; JOHN LYDGATE, (Vol. 17, p. 156), by Frederick J. Snell, author of *The Age of Chaucer*; THOMAS OCCLEVE (Vol. 19, p. 966), by W. S. McCormick, formerly professor of English, University College, Dundee; STEPHEN HAWES (Vol. 13, p. 93); JOHN SKELTON (Vol. 25, p. 184); JULIANA BERNERS (Vol. 3, p. 801); THOMAS OF ERCELDOUNE (Vol. 26, p. 865); JOHN BARBOUR (Vol. 3, p. 389), by Professor George Gregory Smith, Queen's University, Belfast; ANDREW OF WYNTOUN (Vol. 28, p. 873); HARRY THE MINSTREL (Vol. 13, p. 29); JOHN WYCLIFFE (Vol. 28, p. 866), by Reginald Lane Poole, author of *Wycliffe and Movements for Reform*, and W. Alison Phillips; REGINALD PECOCK (Vol. 21, p. 33); SIR JOHN FORTESCUE (Vol. 10, p. 678), by P. C. Yorke; WILLIAM CAXTON (Vol. 5, p. 587).

The English versions of the Bible are dealt with in the chapter of this Guide on *Bible Study*; but the article BIBLE, ENGLISH (Vol. 3, p. 894), by Canon Henson of Westminster Abbey and Anna C. Paues, lecturer in Germanic philology at Newnham College, should be read in connection with the study of this and earlier periods of English literature.

Elizabethan Literature

Spenser

On English literature in the Elizabethan age read

part 3 of the article ENGLISH LITERATURE (Vol. 9, p. 616), by Prof. Oliver Elton, University of Liverpool; also SIR THOMAS MORE (Vol. 18, p. 822), by Mark Pattison, the essayist and student of the Renaissance; WILLIAM TYNDALE (Vol. 27, p. 498); ROGER ASCHAM (Vol. 2, p. 720), by A. F. Leach, author of *English Schools at the Reformation*, etc.; WILLIAM DUNBAR (Vol. 8, p. 668), by Prof. G. Gregory Smith; SIR THOMAS HOBY (Vol. 13, p. 553); RAPHAEL HOLINSHED (Vol. 13, p. 584); JOHN FOXE (Vol. 10, p. 770); SIR THOMAS NORTH (Vol. 19, p. 759); SIR THOMAS WYAT (Vol. 28, p. 861); EARL OF SURREY (Vol. 26, p. 138); GEORGE GASCOIGNE (Vol. 11, p. 493); NICHOLAS UDAL (Vol. 27, p. 554), by A. F. Leach; EDMUND SPENSER (Vol. 25, p. 639,) by the late Professor William Minto of Aberdeen, and F. J. Snell, author of *The Age of Chaucer*, etc.; SIR PHILIP SIDNEY (Vol. 25, p. 43); JOHN LYLY (Vol. 17, p. 159), by Mrs. Humphry Ward; EUPHUISM (Vol. 9, p. 898); MICHAEL DRAYTON (Vol. 8, p. 557), and SAMUEL DANIEL (Vol. 7, p. 808), all by Edmund Gosse; WILLIAM WARNER (Vol. 28, p. 327); EDWARD FAIRFAX (Vol. 10, p. 130); SIR JOHN HARINGTON (Vol. 12, p. 952); GILES and PHINEAS FLETCHER (Vol. 10, p. 498); THOMAS WATSON (Vol. 28, p. 413), by E. Gosse; THOMAS LODGE (Vol. 16, p. 860), by Prof. A. W. Ward, Cambridge; THOMAS CAMPION (Vol. 5, p. 137), by P. Vivian, editor of Campion; NICHOLAS BRETON (Vol. 4, p. 501); ROBERT SOUTHWELL (Vol. 25, p. 517); the metaphysical poets, JOHN DONNE (Vol. 8, p. 417), GEORGE HERBERT (Vol. 13, p. 339), RICHARD CRASHAW (Vol. 7, p. 379), ABRAHAM COWLEY (Vol. 7, p. 347), THOMAS TRAHERNE (Vol. 27, p. 155), and HENRY VAUGHAN (Vol. 27, p. 955); WILLIAM BROWNE (Vol. 4, p. 667); GEORGE WITHER (Vol. 28, p. 758); WILLIAM DRUMMOND of

Hawthornden (Vol. 8, p. 600); ROBERT HERRICK (Vol. 13, p. 389), by E. Gosse; RICHARD LOVELACE (Vol. 17, p. 71); SIR JOHN SUCKLING (Vol. 26, p. 7); ANDREW MARVELL (Vol. 17, p. 805); EDMUND WALLER (Vol. 28, p. 282), by E. Gosse; and JOHN MILTON (Vol. 18, p. 480), in great part by David Masson, late professor at Edinburgh University.

The Drama

Shakespeare

Elizabethan drama—particularly Shakespeare—deserves a separate paragraph, especially as its treatment in the Britannica is so full. Read in the article ENGLISH LITERATURE, pp. 622–626; in the article DRAMA, by Prof. A. W. Ward, Cambridge, pp. 520–524 of Volume 8; and the articles: JOHN LYLY (Vol. 17, p. 159), by Mrs. Humphry Ward; THOMAS KYD (Vol. 15, p. 958), by E. Gosse; GEORGE PEELE (Vol. 21, p. 44); ROBERT GREENE (Vol. 12, p. 539), by A. W. Ward; CHRISTOPHER MARLOWE (Vol. 17, p. 741), by A. C. Swinburne and Thomas Seccombe, author of *The Age of Johnson*, etc.; and above all SHAKESPEARE (Vol. 24, p. 772; equivalent to 80 pages of this Guide), containing a biography and sketches of the different works by E. K. Chambers, editor of the "Red Letter Shakespeare" and author of *The Medieval Stage*, with a discussion of the portraits of Shakespeare (20 of which are reproduced), by M. H. Spielmann, formerly editor of the *Magazine of Art*, and of the Shakespeare-Bacon controversy by Hugh Chisholm, editor-in chief of the Encyclopaedia Britannica, and an elaborate, classified bibliography by H. R. Tedder, librarian of the Athenaeum Club, London. In his discussion of the Baconian theory of the authorship of the plays Mr. Chisholm says:

"No such idea seems to have occurred to anybody

till the middle of the 19th century.... The most competent special students of Shakespeare, however they may differ as to details, and also the most authoritative special students of Bacon, are unanimous in upholding the traditional view." And he adds that as regards the effort to account for the positive contemporary evidence in favour of the identification of the man Shakespeare with the author of Shakespeare's works, "it is highly significant that it was not attempted or thought of for centuries." See also: HAMLET (Vol. 12, p. 894) for earlier treatment of the legend, and MACBETH (Vol. 17, p. 197) for the historical basis of the play.

For the other dramatists of the time see the articles BEN JONSON (Vol. 15, p. 502), by A. W. Ward; GEORGE CHAPMAN (Vol. 5, p. 852), JOHN WEBSTER (Vol. 28, p. 462), CYRIL TOURNEUR (Vol. 27, p. 106), and BEAUMONT AND FLETCHER (Vol. 3, p. 592), all by A. C. Swinburne; THOMAS DEKKER (Vol. 7, p. 939), by William Minto and R. B. McKerrow; THOMAS HEYWOOD (Vol. 13, p. 439); THOMAS MIDDLETON (Vol. 18, p. 416); JOHN MARSTON (Vol. 17, p. 776); PHILIP MASSINGER (Vol. 17, p. 868); JOHN FORD (Vol. 10, p. 641), by A. W. Ward; JAMES SHIRLEY (Vol. 24, p. 990).

16th and 17th Century Prose

For Elizabethan prose writers not already mentioned, see: the translators, JOHN BOURCHIER, LORD BARON BERNERS (Vol. 3, p. 800), PHILEMON HOLLAND (Vol. 13, p. 587) and GIOVANNI FLORIO (Vol. 10, p. 546); and the philosophers and essayists, RICHARD HOOKER (Vol. 13, p. 672), by T. F. Henderson, FRANCIS BACON, (Vol. 3, p. 135; equivalent to 55 pages of this Guide), by Robert

Adamson and J. M. Mitchell, THOMAS HOBBES (Vol. 13, p. 545), by G. Croom Robertson, biographer of Hobbes, SIR THOMAS BROWNE (Vol. 4, p. 666), IZAAK WALTON (Vol. 28, p. 300), ROBERT BURTON (Vol. 4, p. 865), JEREMY TAYLOR (Vol. 26, p. 469), THOMAS FULLER (Vol. 11, p. 296), WILLIAM CHILLINGWORTH (Vol. 6, p. 162), JOHN HALES (Vol. 12, p. 834), RALPH CUDWORTH (Vol. 7, p. 612), by Henry Sturt, author of *Personal Idealism*, etc.; the historian CLARENDON (Vol. 6, p. 428), by P. C. Yorke; and the letter-writer JAMES HOWELL (Vol. 13, p. 838).

Dryden

Pepys

On the Restoration period—from 1660 to 1700—see Professor Elton's chapter (Vol. 9, pp. 628–631) in the article ENGLISH LITERATURE; and the articles: JOHN DRYDEN (Vol. 8, p. 609), by William Minto and Margaret Bryant; SAMUEL BUTLER (Vol. 4, p. 885), SIR ISAAC NEWTON (Vol. 19, p. 583), by H. M. Taylor, Fellow of Trinity College, Cambridge; ISAAC BARROW (Vol. 3, p. 440), JOHN RAY (Vol. 22, p. 931), by Prof. D. Wentworth Thompson, University College, Dundee; JOSEPH GLANVILL (Vol. 12, p. 77), THOMAS BURNET (Vol. 4, p. 853), JOHN TILLOTSON (Vol. 26, p. 976), SIR WILLIAM TEMPLE (Vol. 26, p. 602), by G. W. Prothero, editor *The Quarterly Review* and joint-editor *Cambridge Modern History*, MARQUESS HALIFAX (Vol. 12, p. 839), by P. C. Yorke; ROBERT SOUTH (Vol. 25, p. 463), WILLIAM SHERLOCK (Vol. 24, p. 850), RICHARD BAXTER (Vol. 3, p. 551), JOHN HOWE (Vol. 13, p. 835), GEORGE FOX (Vol. 10, p. 765), JOHN BUNYAN (Vol. 4, p. 803), by Lord Macaulay; 2ND EARL OF ROCHESTER (Vol. 23, p. 427), SIR WILLIAM DAVENANT (Vol. 7, p.

851), NAHUM TATE (Vol. 26, p. 449), THOMAS OTWAY (Vol. 20, p. 376), NATHANIEL LEE (Vol. 16, p. 361), Watts-Dunton's article WILLIAM WYCHERLEY (Vol. 28, p. 863), and the two great diarists JOHN EVELYN (Vol. 10, p. 5) and SAMUEL PEPYS (Vol. 21, p. 130), by D. Hannay.

Addison, Steele and Swift
Pope
Burns
The Novel

On the 18th century literature see the chapter in the article ENGLISH LITERATURE (Vol. 9, pp. 631–636), by Thomas Seccombe, author of *The Age of Johnson*, etc.; and the articles: JOHN LOCKE (Vol. 16, p. 844), by Prof. Alexander Campbell Fraser, Edinburgh; JOSEPH ADDISON (Vol. 1, p. 184), by William Spalding and Austin Dobson; SIR RICHARD STEELE (Vol. 25, p. 865), by William Minto and Austin Dobson; JONATHAN SWIFT (Vol. 26, p. 224), by Richard Garnett and Thomas Seccombe; JOHN ARBUTHNOT (Vol. 2, p. 339), BERNARD DE MANDEVILLE (Vol. 17, p. 559), by J. M. Mitchell; BOLINGBROKE (Vol. 4, p. 161), by P. C. Yorke; ALEXANDER POPE (Vol. 22, p. 82), by William Minto and Margaret Bryant; MATTHEW PRIOR (Vol. 22, p. 359), by Austin Dobson; JOHN GAY (Vol. 11, p. 540), THOMAS PARNELL (Vol. 20, p. 859), MARK AKENSIDE (Vol. 1, p. 454), JAMES THOMSON (Vol. 26, p. 871) and THOMAS GRAY (Vol. 12, p. 392), both by D. C. Tovey, editor of Gray's Letters; WILLIAM COLLINS (Vol. 6, p. 692), by Edmund Gosse; CHRISTOPHER SMART (Vol. 25, p. 249), WILLIAM COWPER (Vol. 7, p. 349) and GEORGE CRABBE (Vol. 7, p. 358), by Clement K. Shorter, editor of *The Sphere*, WILLIAM

BLAKE (Vol. 4, p. 36), by J. W. Comyns-Carr, author of *Essays on Art*; WILLIAM SHENSTONE (Vol. 24, p. 839), THOMAS CHATTERTON (Vol. 6, p. 10), THOMAS PERCY (Vol. 21, p. 136), THOMAS WARTON (Vol. 28, p. 337), ROBERT BURNS (Vol. 4, p. 856), by John Nichol, the biographer of Burns, Byron and Carlyle; among the prose writers, forerunners of the novel, DANIEL DEFOE (Vol. 7, p. 927), SAMUEL RICHARDSON (Vol. 23, p. 300) and HENRY FIELDING (Vol. 10, p. 324), both by Austin Dobson, TOBIAS SMOLLETT (Vol. 25, p. 278), by Thomas Seccombe, and LAURENCE STERNE (Vol. 25, p. 901), by William Minto and Austin Dobson; the other great prose writers of the age, **Johnson** SAMUEL JOHNSON (Vol. 15, p. 463), by Lord Macaulay and Thomas Seccombe, **Goldsmith** OLIVER GOLDSMITH (Vol. 12, p. 214), by Lord Macaulay and Austin Dobson, LORD CHESTERfiELD (Vol. 6, p. 109), by Austin Dobson, and HORATIO WALPOLE (Vol. 28, p. 288), by W. P. Courtney; in a lesser group, JAMES BOSWELL (Vol. 4, p. 297), by Thomas Seccombe, FRANCES D'ARBLAY, "Fanny Burney" (Vol. 7, p. 826), HESTER LYNCH PIOZZI (Vol. 21, p. 632), GILBERT WHITE (Vol. 28, p. 599); **History** the historians DAVID HUME (Vol. 13, p. 876), by Robert Adamson and J. M. Mitchell, WILLIAM ROBERTSON (Vol. 23, p. 406) and EDWARD GIBBON (Vol. 11, p. 927), by Prof. J. B. Bury, editor of *The Decline and Fall*; and the philosophers, JOSEPH BUTLER (Vol. 4, p. 882), by Robert Adamson and A. J. Grieve, Yorkshire United Independent College, **Philosophy** WILLIAM PALEY (Vol. 20, p. 628), BERKELEY (Vol. 3, p. 779), by Robert Adamson and J. M. Mitchell, THOMAS REID (Vol. 23, p. 51), by Prof. A. Seth Pringle-Pattison, Edinburgh, DAVID HARTLEY (Vol. 13, p. 35), ABRAHAM TUCKER (Vol. 27, p. 361), THOMAS PAINE

(Vol. 20, p. 456), JOSEPH PRIESTLY (Vol. 22, p. 322), RICHARD PRICE (Vol. 22, p. 314), by J. M. Mitchell; WILLIAM GODWIN (Vol. 12, p. 177), **Politics** SIR JAMES MACKINTOSH (Vol. 17, p. 259), EDMUND BURKE (Vol. 4, p. 824), by John Morley, and "JUNIUS" (Vol. 15, p. 557),—see also SIR PHILIP FRANCIS (Vol. 10, p. 941).

Lake Poets

Byron

Criticism

History

For the 19th century see the last section of the article ENGLISH LITERATURE (Vol. 9, pp. 636–645), by Thomas Seccombe; and the articles: WILLIAM WORDSWORTH (Vol. 28, p. 826), by William Minto and Hugh Chisholm; S. T. COLERIDGE (Vol. 6, p. 678), by J. Mackinnon Robertson, author of *Modern Humanists*, etc., Hugh Chisholm, and the Very Rev. George David Boyle; CHARLES LAMB (Vol. 16, p. 104), by E. V. Lucas, editor of Lamb; WILLIAM HAZLITT (Vol. 13, p. 119), LEIGH HUNT (Vol. 13, p. 934); DE QUINCEY (Vol. 8, p. 61), by J. Ritchie Findlay, author of *Personal Recollections of De Quincey*; KEATS (Vol. 15, p. 708), by A. C. Swinburne and Margaret Bryant; THOMAS LOVELL BEDDOES (Vol. 3, p. 614), THOMAS HOOD (Vol. 13, p. 666), LANDOR (Vol. 16, p. 161), by A. C. Swinburne; SHELLEY (Vol. 24, p. 827), by W. M. Rossetti; SOUTHEY (Vol. 25, p. 511), CAMPBELL (Vol. 5, p. 130), THOMAS MOORE (Vol. 18, p. 810), LORD BYRON (Vol. 4, p. 897), by E. Hartley Coleridge, editor of *Byron's Poems*; FRANCIS JEFFREY (Vol. 15, p. 307), SYDNEY SMITH (Vol. 25, p. 268), J. G. LOCKHART (Vol. 16, p. 853), WILLIAM GIFFORD (Vol. 12, p. 5), BENTHAM (Vol. 3, p. 747), by Dr. T. E.

Holland, formerly professor of international law, Oxford, MALTHUS (Vol. 17, p. 515), HENRY HALLAM (Vol. 12, p. 851), by Lord Lochee of Gowrie; WILLIAM ROSCOE (Vol. 23, p. 726), by W. E. A. Axon, Manchester Libraries; LINGARD (Vol. 16, p. 728), HENRY HART MILMAN (Vol. 18, p. 476), MACAULAY (Vol. 17, p. 193), by Mark Pattison; THIRLWALL (Vol. 26, p. 851), WILLIAM MITFORD (Vol. 18, p. 620), GROTE (Vol. 12, p. 619), by J. M. Mitchell, edition of Grote's *Greece*, JAMES MILL (Vol. 18, p. 453), SIR WILLIAM NAPIER (Vol. 19, p. 175), WILLIAM COBBETT (Vol. 6, p. 606), SIR WALTER SCOTT (Vol. 24, p. 469), by William Minto; **Fiction** LEVER (Vol. 16, pp. 508–510), MARRYAT (Vol. 17, p. 759), BULWER LYTTON (Vol. 17, p. 185), by Arthur Waugh; BEACONSfiELD (Vol. 3, p. 563), by Frederick Greenwood; JANE AUSTEN (Vol. 2, p. 936), by E. V. Lucas; MARIA EDGEWORTH (Vol. 8, p. 934), HARRIET MARTINEAU (Vol. 17, p. 796), MARY RUSSELL MITFORD (Vol. 18, p. 619), ELIZABETH CLEGHORN GASKELL (Vol. 11, p. 501) and the BRONTËS (Vol. 4, p. 637), by C. K. Shorter; THOMAS LOVE PEACOCK (Vol. 21, p. 21), by Richard Garnett; GEORGE MEREDITH (Vol. 18, p. 160), by Hugh Chisholm; **Tennyson, Browning and Carlyle** TENNYSON (Vol. 26, p. 630), by E. Gosse; ELIZABETH BARRETT BROWNING (Vol. 4, p. 668), by Alice Meynell; ROBERT BROWNING (Vol. 4, p. 670) and CARLYLE (Vol. 5, p. 349), both by Sir Leslie Stephen; CHARLES READ (Vol. 22, p. 938), DICKENS (Vol. 8, p. 178), by Thomas Seccombe; **Victorian Novelists** THACKERAY (Vol. 26, p. 716), by W. H. Pollock; GEORGE ELIOT (Vol. 9, p. 275), by Mrs. Craigie ("John Oliver Hobbes"); ANTHONY TROLLOPE (Vol. 27, p. 301), WILKIE COLLINS (Vol. 6, p. 693), CHARLES and HENRY KINGSLEY (Vol. 15, p. 817);

HERBERT SPENCER (Vol. 25, p. 634), by F. C. S. Schiller, author of *Studies in Humanism*, etc.; **Natural Science** JOHN STUART MILL (Vol. 18, p. 454), by William Minto and J. M. Mitchell; CHARLES DARWIN (Vol. 7, p. 840), by Prof. E. B. Poulton, Oxford; HUXLEY (Vol. 14, p. 17), by Sir W. T. Thiselton-Dyer; J. R. GREEN (Vol. 12, p. 534), **History** WILLIAM STUBBS (Vol. 25, p. 1048), E. A. FREEMAN (Vol. 11, p. 79) and J. A. FROUDE (Vol. 11, p. 252), all by William Hunt, formerly president Royal Historical Society; LECKY (Vol. 16, p. 354), BUCKLE (Vol. 4, p. 732), MAINE (Vol. 17, p. 432), by Sir Frederick Pollock; GEORGE BORROW (Vol. 4, p. 275), by Theodore Watts-Dunton; **Arnold** EDWARD FITZGERALD (Vol. 10, p. 443), by E. Gosse; MATTHEW ARNOLD (Vol. 2, p. 635), by Theodore Watts-Dunton and Sir Joshua Girling Fitch; **Ruskin** JOHN RUSKIN (Vol. 23, p. 858), by Frederic Harrison; DANTE GABRIEL ROSSETTI (Vol. 23, p. 747), by Theodore Watts-Dunton and F. G. Stephens, formerly art-critic of the *Athenaeum*; SWINBURNE (Vol. 26, p. 234), by E. Gosse; WILLIAM MORRIS (Vol. 18, p. 871), JOHN ADDINGTON SYMONDS (Vol. 26, p. 286) and WALTER PATER (Vol. 20, p. 910) all by Arthur Waugh; **Oxford Movement** NEWMAN (Vol. 19, p. 517), by Arthur Wollaston Hutton, biographer of Manning; JOHN KEBLE (Vol. 15, p. 710), EDWARD BOUVERIE PUSEY (Vol. 22, p. 667), RICHARD JEFFERIES (Vol. 15, p. 300), by Sir Walter Besant, biographer of Jeffries; THOMAS HARDY (Vol. 12, p. 946), by Arthur Symons; ROBERT STEVENSON (Vol. 25, p. 907), by E. Gosse; and among later names—the historians LORD ACTON (Vol. 1, p. 159), by Hugh Chisholm, **History** MANDELL CREIGHTON (Vol. 7, p. 401), MORLEY (Vol. 18, p. 841), BRYCE (Vol. 4, p. 699) and BURY (Vol. 4, p. 867); the novelists

WILLIAM BLACK (Vol. 4, p. 19), BLACKMORE (Vol. 4, p. 24), M. E. BRADDON (Vol. 4, p. 369), MRS. HUMPHRY WARD (Vol. 28, p. 320), MARIE CORELLI (Vol. 7, p. 143), HALL CAINE (Vol. 4, p. 949), GEORGE GISSING (Vol. 12, p. 52), GEORGE MOORE (Vol. 18, p. 808), H. G. WELLS (Vol. 28, p. 514), WILLIAM DE MORGAN (Vol. 8, p. 10), **Fiction** RUDYARD KIPLING (Vol. 15, p. 825), by W. Price James, author of *Romantic Professions*, etc.; the critics and essayists WALTER BAGEHOT (Vol. 3, p. 198), by Richard Garnett, STOPFORD A. BROOK (Vol. 4, p. 645), MARK PATTISON (Vol. 20, p. 937), **Essays and Criticism** LESLIE STEPHEN (Vol. 25, p. 885), by Thomas Seccombe, H. D. TRAILL (Vol. 27, p. 155), GEORGE SAINTSBURY (Vol. 24, p. 45), SIDNEY COLVIN (Vol. 6, p. 748), WATTS-DUNTON (Vol. 28, p. 422), R. C. JEBB (Vol. 15, p. 299), F. W. H. MYERS (Vol. 19, p. 111), EDWARD DOWDEN (Vol. 8, p. 456), WILLIAM ARCHER (Vol. 2, p. 362), RICHARD GARNETT (Vol. 11, p. 471), EDMUND GOSSE (Vol. 12, p. 268), ANDREW LANG (Vol. 16, p. 171), G. K. CHESTERTON (Vol. 6, p. 111), ARTHUR SYMONS (Vol. 26, p. 287),—a list in which it is interesting to note how many are contributors to the Encyclopaedia Britannica; of poets, **Recent Poetry** ROBERT BRIDGES (Vol. 4, p. 532), so recently named poet-laureate, his predecessor ALFRED AUSTIN (Vol. 2, p. 938), WILLIAM WATSON (Vol. 28, p. 414), by W. Price James, W. B. YEATS (Vol. 28, p. 909), WILLIAM SHARP, "Fiona Macleod" (Vol. 24, p. 811), FRANCIS THOMPSON (Vol. 26, p. 869), JOHN DAVIDSON (Vol. 7, p. 863), SIR W. S. GILBERT (Vol. 12, p. 9), by Thomas Seccombe; OWEN SEAMAN (Vol. 24, p. 543), LAURENCE BINYON (Vol. 3, p. 952), H. J. NEWBOLT (Vol. 19, p. 463), STEPHEN PHILLIPS (Vol. 21, p. 407), ALICE MEYNELL (Vol. 18, p. 350); and of the

younger dramatists, **Modern Drama** OSCAR WILDE (Vol. 28, p. 632), by Hugh Chisholm, SIR A. W. PINERO (Vol. 21, p. 625), A. H. JONES (Vol. 15, p. 498), J. M. BARRIE (Vol. 3, p. 435), by W. Price James; G. BERNARD SHAW (Vol. 24, p. 812),—and see also under DRAMA (Vol. 8, especially pp. 534–538).

CHAPTER XXXIX
GERMAN LITERATURE

The article in the Britannica on German Literature (Vol. 11, p. 783; equivalent to 55 pages of this Guide) is by Professor John George Robertson, University of London, author of *History of German Literature*. This article is divided into six sections, and following this scheme the course of reading below is divided into six parts, in connection with each of which the reader should first peruse the correspondingly numbered section in the article GERMAN LITERATURE.

Old High German

I. *The Old High German Period, 750–1050*:—the articles ULFILAS (Vol. 27, p. 565), by Charles Anderson Scott, author of *Ulfilas, Apostle of the Goths*; HELIAND (Vol. 13, p. 221), by Henry Bradley, author of *The Story of the Goths*; EINHARD (Vol. 9, p. 134), by A. W. Holland; NOTKER (Vol. 19, p. 824) and HROSVITHA (Vol. 13, p. 842), by A. W. Ward—and see Prof. Ward on the medieval drama in the article DRAMA (Vol. 8, especially p. 497).

Middle Period

II. *The Middle High German Period, 1050–1350*:—the articles ROMANCE (Vol. 23, p. 500), by George Saintsbury; WALTHARIUS (Vol. 28, p. 298), NIBELUNGENLIED (Vol. 19, pp. 637–640), GUDRUN (Vol. 12, p. 668), DIETRICH OF BERN (Vol. 8, p. 221), ORTNIT (Vol. 20, p. 341), WOLFDIETRICH (Vol. 28, p. 772), HELDENBUCH (Vol. 13, p. 218), LAY OF HILDEBRAND (Vol. 13, p. 460), by J. G. Robertson; RUODLIEB (Vol. 23, p. 854), ARTHURIAN LEGEND (Vol. 2, p. 684), PERCEVAL (Vol. 21, p. 132), and TRISTAN (Vol. 27, pp. 292–294), by J. L. Weston, author of *Legends of the Wagner Drama*; HARTMANN VON AUE (Vol. 13, p. 37), GOTTFRIED VON STRASSBURG (Vol. 12, p. 277), WOLFRAM VON ESCHENBACH (Vol. 28, p. 775), by J. L. Weston; WALTHER VON DER VOGELWEIDE (Vol. 28, p. 299), MINNESINGERS (Vol. 18, p. 547), FREIDANK (Vol. 11, p. 94), CONRAD OF WÜRZBURG (Vol. 6, p. 968).

14th and 15th Centuries

III. *The Transition Period, 1350–1600*:—the articles FRAUENLOB (Vol. 11, p. 42), REYNARD THE FOX (Vol. 23, p. 226), SEBASTIAN BRANT (Vol. 4, p. 431), MAXIMILIAN I. (Vol. 17, p. 922), by A. W. Holland; MEISTERSINGER (Vol. 18, p. 86) and EULENSPIEGEL (Vol. 9, p. 887), by J. G. Robertson; HANS SACHS (Vol. 23, p. 972), TAULER (Vol. 26, p. 452), GEILER VON KAISERBERG (Vol. 11, p. 553), ERASMUS (Vol. 9, p. 727), by Mark Pattison and P. S. Allen, editor of the Oxford Erasmus; REUCHLIN (Vol. 23, p. 204), by W. Robertson Smith; ULRICH VON HUTTEN (Vol. 14, p. 14), by the Very Rev. G. W. Kitchin, Dean of Durham; MARTIN LUTHER (Vol. 17, p. 133), by Dr. T. M. Lindsay, author of *A History of the Reformation*;

ERASMUS ALBERUS (Vol. 1, p. 504), THOMAS MURNER (Vol. 19, p. 37), JOHANN FISCHART (Vol. 10, p. 425), PHILIPP NIKODEMUS FRISCHLIN (Vol. 11, p. 232), JÖRG WICKRAM (Vol. 28, p. 619), AYRER (Vol. 3, p. 74), FAUST (Vol. 10, p. 210).

Renaissance

IV. *The Renaissance, 1600–1740*:—the articles PAUL GERHARDT (Vol. 11, p. 768), JAKOB BOEHME (Vol. 4, p. 113), GEORG RUDOLF WECKHERLIN (Vol. 28, p. 464), MARTIN OPITZ (Vol. 20, p. 129), GEORG PHILIPP HARSDÖRffER (Vol. 13, p. 29), SIMON DACH (Vol. 7, p. 726), PAUL FLEMING (Vol. 10, p. 494), von LOGAU (Vol. 16, p. 877), ABRAHAM A SANCTA CLARA (Vol. 1, p. 72), JOHANN VON RIST (Vol. 23, p. 366), ANDREAS GRYPHIUS (Vol. 12, p. 642), MOSCHEROSCH (Vol. 18, p. 890), GRIMMELSHAUSEN (Vol. 12, p. 603), PUFENDORF (Vol. 22, p. 634), THOMASIUS (Vol. 26, p. 868), CHRISTIAN WOLff (Vol. 28, p. 774), by Andrew Seth Pringle-Pattison; LEIBNITZ (Vol. 16, p. 385), by Prof. W. R. Sorley, Cambridge; SPENER (Vol. 25, p. 638), von CANITZ (Vol. 5, p. 183), JOHANN CHRISTIAN GÜNTHER (Vol. 12, p. 730), B. H. BROCKES (Vol. 4, p. 624), and, the dictator of the pseudo-classic age, GOTTSCHED (Vol. 12, p. 279).

Classical Period

V. *The Classical Period of Modern German Literature, 1740–1832*:—the articles J. J. BODMER (Vol. 4, p. 111), GELLERT (Vol. 11, p. 558), RABENER (Vol. 22, p. 773), J. ELIAS SCHLEGEL (Vol. 24, p. 329), KLOPSTOCK (Vol. 15, p. 848), LAVATER (Vol. 16, p. 291), GERSTENBERG (Vol. 11, p. 907), GLEIM (Vol. 12, p. 118), GÖTZ (Vol. 12, p. 289), *Uz* (Vol. 27, p. 828), RAMLER (Vol. 22, p. 876), HAGEDORN (Vol. 12, p. 813), ALBRECHT VON HALLER (Vol. 12, p.

855), E. C. VON KLEIST (Vol. 15, p. 846), LESSING (Vol. 16, pp. 496–499), by James Sime, author of *A History of Germany*, and J. G. Robertson, and Lessing's associates—WINCKELMANN (Vol. 28, p. 707), by James Sime and J. M. Mitchell, MOSES MENDELSSOHN (Vol. 18, p. 120), by Israel Abrahams, author of *A Short History of Jewish Literature*, and C. F. NICOLAI (Vol. 19, p. 662)—; WIELAND (Vol. 28, p. 621), by J. G. Robertson; M. A. VON THÜMMEL (Vol. 26, p. 898), A. VON KNIGGE (Vol. 15, p. 850), MUSÄUS (Vol. 19, p. 43), BASEDOW (Vol. 3, p. 461), PESTALOZZI (Vol. 21, p. 284), HAMANN (Vol. 12, p. 869).

Sturm und Drang

On the *Sturm und Drang* period, the articles HERDER (Vol. 13, p. 347), the STOLBERGS (Vol. 25, p. 953), J. H. VOSS (Vol. 28, p. 215), HÖLTY (Vol. 13, p. 620), BÜRGER (Vol. 4, p. 812), M. CLAUDIUS (Vol. 6, p. 466),—all of the Göttingen school; GOETHE (Vol. 12, p. 182), by J. G. Robertson; his imitators and followers, J. M. R. LENZ (Vol. 16, p. 431), KLINGER (Vol. 15, p. 846), FRIEDRICH ("Maler") MÜLLER (Vol. 18, p. 961), HEINSE (Vol. 13, p. 216), K. P. MORITZ (Vol. 18, p. 838); the great dramatist of the late *Sturm und Drang*, SCHILLER (Vol. 24, p. 324), by J. G. Robertson; A. W. IFFLAND (Vol. 14, p. 291), F. JACOBI (Vol. 15, p. 115).

On the classical period proper, the latter part of the article on Goethe and Schiller, IMMANUEL KANT (Vol. 15, p. 662), and J. G. FICHTE (Vol. 10, p. 313), both by Robert Adamson; the historians SCHLOSSER (Vol. 24, p. 342), MÖSER (Vol. 18, p. 895), and JOHANNES VON MÜLLER (Vol. 18, p. 962), by W. A. B. Coolidge; the scientists J. G. A. FORSTER (Vol. 10, p. 674), ALEXANDER VON HUMBOLDT (Vol. 13, p.

873), by Agnes Mary Clerke, and KARL WILHELM VON HUMBOLDT (Vol. 13, p. 875), by Archibald Henry Sayce; the dramatist KOTZEBUE (Vol. 15, p. 919); the novelist RICHTER, "Jean Paul" (Vol. 23, p. 313); and the poet MATTHISSON (Vol. 17, p. 901).

Romanticism

On the romantic school: the articles on the founders, AUGUST WILHELM SCHLEGEL and FRIEDRICH SCHLEGEL (Vol. 24, p. 328 and 329), TIECK (Vol. 26, p. 962), HÖLDERLIN (Vol. 13, p. 583), and NOVALIS (Vol. 19, p. 829); in the second Romantic school, the more realistic Heidelbergers KLEMENS BRENTANO (Vol. 4, p. 496), L. A. VON ARNIM (Vol. 2, p. 630), J. J. VON GÖRRES (Vol. 12, p. 260), and, owing much to the interest in folk-literature of the Heidelbergers, the brothers GRIMM (Vol. 12, pp. 600–602), by Dr. Henry Sweet of the University of Oxford, CHAMISSO (Vol. 5, p. 825); the patriot poets KÖRNER (Vol. 15, p. 913) and ARNDT (Vol. 2, p. 627); the North Germans KLEIST (Vol. 15, p. 846), ZACHARIAS WERNER (Vol. 28, p. 523), FOUQUÉ (Vol. 10, p. 749), E. T. W. HOFFMAN (Vol. 13, p. 561), EICHENDORff (Vol. 9, p. 131), and RÜCKERT (Vol. 23, p. 813) and WILHELM MÜLLER (Vol. 18, p. 963), who, like Byron, found romance, one in the Orient and the other in Greek struggles for liberty; and, of the Swabian school, UHLAND (Vol. 27, p. 563), KERNER (Vol. 15, p. 757), HAUff (Vol. 13, p. 65), and MÖRIKE (Vol. 18, p. 837); and the philosopher SCHELLING (Vol. 24, p. 316).

1832–1870

VI. *Literature since Goethe, 1832 onwards*:—Read G. W. F. HEGEL (Vol. 13, p. 200, by the late Prof. William Wallace of Oxford and Prof. J. H. Muirhead, University of Birmingham), Schelling's successor as a

philosophic force in Germany; the articles on the "Young Germans" HEINE (Vol. 13, p. 213), by J. Walter Ferrier and J. G. Robertson; BÖRNE (Vol. 4, p. 255), GUTZKOW (Vol. 12, p. 744) and LAUBE (Vol. 16, p. 276); and the historians and philosophers D. F. STRAUSS (Vol. 25, p. 1002), GERVINUS (Vol. 11, p. 908), W. MENZEL (Vol. 18, p. 147) and FEUERBACH (Vol. 10, p. 303); the dramatists—some more closely connected with the preceding period,—GRABBE (Vol. 12, p. 306) and GRILLPARZER (Vol. 12, p. 596), IMMERMANN (Vol. 14, p. 335) and PLATEN-HALLERMUND (Vol. 21, p. 804), HOLTEI (Vol. 13, p. 619), RAUPACH (Vol. 22, p. 921) and MÜLLNER (Vol. 18, p. 965), and, in Austria, besides Grillparzer, COLLIN (Vol. 6, p. 690), MÜNCH-BELLINGHAUSEN, "Friedrich Halm" (Vol. 19, p. 2), BAUERNFELD (Vol. 3, p. 538) and RAIMUND (Vol. 22, p. 861); the novelists WILLIBALD ALEXIS (Vol. 1, p. 576), HAUff (Vol. 13, p. 65) and ZSCHOKKE (Vol. 28, p. 1046); and such poets of the '30 and the '48 as HERWEGH (Vol. 13, p. 405), FREILIGRATH (Vol. 11, p. 94), DINGELSTEDT (Vol. 8, p. 275), HOffMANN VON FALLERSLEBEN (Vol. 13, p. 561), and, in Austria, a little earlier, AUERSPERG, "Anastasius Grün" (Vol. 2, p. 900); and the possibly greater poets who were less interested in politics, GEIBEL (Vol. 11, p. 550), LENAU (Vol. 16, p. 417), STRACHWITZ (Vol. 25, p. 976), and DROSTE-HÜLSHOff (Vol. 8, p. 591).

On the mid-century period:—the articles on SCHOPENHAUER (Vol. 24, p. 372, by Prof. Wallace), —the philosopher of the new age; the natural scientists VOGT (Vol. 28, p. 172), and BÜCHNER (Vol. 4, p. 719); the fiction writers SPIELHAGEN (Vol. 25, p. 667), GUSTAV FREYTAG (Vol. 11, p. 212), EBERS (Vol. 8, p. 841), DAHN (Vol. 7, p. 734), "CHARLES SEALSfiELD" (Vol. 24, p. 543), GERSTÄCKER (Vol. 11,

p. 906), STORM (Vol. 25, p. 968), GOTTFRIED KELLER (Vol. 15, p. 718); and, among those who portrayed peasant and provincial life, BITZIUS, "Jeremias Gotthelf" (Vol. 4, p. 15), AUERBACH (Vol. 2, p. 899), STIFTER (Vol. 25, p. 915), FRITZ REUTER (Vol. 23, p. 210); the dramatists HEBBEL (Vol. 13, p. 165) and OTTO LUDWIG (Vol. 17, p. 114); in the Munich School, BODENSTEDT (Vol. 4, p. 109), SCHEFFEL (Vol. 24, p. 315), BAUMBACH (Vol. 3, p. 539), HAMERLING (Vol. 12, p. 876), HEYSE (Vol. 13, p. 438); and the Platt-Deutsch poet KLAUS GROTH (Vol. 12, p. 621).

Since 1870

On the period since 1870, see the articles LASSALLE (Vol. 16, p. 235, by Thomas Kirkup, author of *An Inquiry into Socialism*) and MARX (Vol. 17, p. 807, by Eduard Bernstein, Socialist deputy on the Reichstag) for new economic views; and LOTZE (Vol. 17, p. 23), by J. T. Merz, author of *European Thought in the XIXth Century*, and Henry Sturt, author of *Personal Idealism*, and EDUARD VON HARTMANN (Vol. 13, p. 36) for philosophical compromises between science and metaphysics and between pessimism and idealism; the dramatists ANZENGRUBER (Vol. 2, p. 158), PAUL LINDAU (Vol. 16, p. 717), and, composer and dramatist, RICHARD WAGNER (Vol. 28, p. 236), by W. S. Rockstro, author of *A Great History of Music*, and D. F. Tovey, author of *Essays in Musical Analysis*; the historians SYBEL (Vol. 26, p. 275), TREITSCHKE (Vol. 27, p. 238), RANKE (Vol. 22, p. 893), MOMMSEN (Vol. 18, p. 683) and BURCKHARDT (Vol. 4, p. 809); and Burckhardt's friend, the early friend of Wagner and the type of a new spirit in German letters, NIETZSCHE (Vol. 19, p. 672), by F. C. S. Schiller, Oxford, author of *Studies in Humanism*.

The most important names of the last few years are SUDERMANN (Vol. 26, p. 20) and HAUPTMANN (Vol. 13, p. 68). See, besides, the articles on WILHELM JENSEN (Vol. 15, p. 321), WILHELM RAABE (Vol. 22, p. 765), W. BUSCH (Vol. 4, p. 869), PETER ROSEGGER (Vol. 23, p. 734), FONTANE (Vol. 10, p. 608), EBNER-ESCHENBACH (Vol. 8, p. 843), FRANZOS (Vol. 11, p. 38), K. F. MEYER (Vol. 18, p. 349), RICHARD VOSS (Vol. 28, p. 215), ERNST VON WILDENBRUCH (Vol. 28, p. 633), and for modern German drama, in the article DRAMA (Vol. 8, especially pp. 535–536).

CHAPTER XL
GREEK LITERATURE

In the article LITERATURE in the Britannica, by Professor James Fitzmaurice-Kelly, himself a specialist in Spanish literature, are these sentences:

> The evolution of literature is completed in Greece, and there its subdivisions may best be studied. Epic poetry is represented by the Homeric cycle, lyric poetry by Tyrtaeus, dramatic poetry by Aeschylus, history by Herodotus, oratory by Pericles, philosophy by Plato, and criticism by Zoilus, the earliest of slashing reviewers; and in each department there is a long succession of illustrative names. Roughly speaking, all subsequent literature is imitative.

The Main Article

This testimony to the importance of Greek literature is all the more weighty as coming from one whose own field of criticism is in Romantic literature. The authority with which such an

important subject as Greek literature is treated in the Britannica will be apparent to any classical student who notes the names of the contributors of the articles mentioned in the following course of reading. The key article GREEK LITERATURE (Vol. 12, p. 507; equivalent to 65 pages of this Guide) is divided into three sections: Ancient (p. 507), Byzantine (p. 516) and Modern (p. 524). The second section, by Prof. Karl Krumbacher of Munich, author of *Geschichte der byzantinischen Literatur*, and the third, by J. D. Bourchier, correspondent of *The Times* (London) in South-Eastern Europe, need not be dwelt upon here. To the ordinary student, in spite of the increasing interest shown in Byzantine and modern Hellenic literature, "Greek literature" must mean the literature of ancient Greece, and for him the *first* part of the article will be the foundation of his study of the subject. This section of the article is by the late Sir Richard C. Jebb, professor of Greek at Glasgow and then at Cambridge, known as the biographer of Bentley, as the author of an excellent brief history of Greek literature, and as an authority on subdivisions of that subject so diverse as rhetoric and oratory on the one side and lyric and dramatic poetry on the other.

Jebb's article divides ancient Greek literature into three periods: *Early*, including epic, elegiac, iambic and lyric poetry and coming down to 475 B.C.; *Attic*, 475–300 B.C., including tragic and comic drama and historical, oratorical and philosophical prose; and *Decadence*—Alexandrian, 300–146 B.C., and Greco-Roman, 146 B.C.–529 A.D.

Epic

In the first of these periods the student should supplement Professor Jebb's treatment in the article GREEK LITERATURE by the following articles: EPIC POETRY (Vol. 9, p. 681), a general sketch of the form by Edmund Gosse; HOMER (Vol. 13, p. 626; equivalent to 40 pages of this Guide), by the late Prof. David Binning Monro of Oriel College, Oxford, editor of Homer and author of *Grammar of the Homeric Dialect*,—and on the "Homeric question" see also the articles ARISTARCHUS and F. A. WOLF; HESIOD (Vol. 13, p. 407), by James Davies, formerly head master Ludlow Grammar School, and John Henry Freese, formerly fellow St. John's, Cambridge; CYCLE (Vol. 7, p. 682; last part of the article); and the cyclic poets, STASINUS, ARCTINUS, LESCHES, and CREOPHYLUS.

Elegy

For the elegy see Edmund Gosse's article ELEGY; and on the Greek elegists, the articles CALLINUS and TYRTÆUS for martial poetry, MIMNERMUS for melancholy verse, SOLON for political and ethical poetry, THEOGNIS and PHOCYLIDES for the gnomic elegy, and XENOPHANES for the use of the measure in didactic philosophical verse. On iambic verse and its Greek writers before the time of the drama see: IAMBIC, ARCHILOCHUS, SIMONIDES OF AMORGOS, and HIPPONAX.

Lyric Poetry

The third poetic form of the period, one which unfortunately has come down to us only in tantalizingly brief fragments—comparable to the quotations illustrating word-usage in our dictionaries

—is the lyric. On this see the general article LYRICAL POETRY, by Edmund Gosse, on this form in different literatures, and the sketches of the Greek lyrists the Aeolians ALCAEUS (see also the article ALCAICS) and SAPPHO, by Prof. John Arthur Platt, University College, London; PRAXILLA and ERINNA, Sappho's rivals as lyric poetesses; the Ionian ANACREON (see also the article ANACREONTICS, by Edmund Gosse); the Dorian ALCMAN; STESICHORUS, ARION and IBYCUS; SIMONIDES, who may be called Panhellenic; PINDAR (Vol. 21, p. 617; equivalent to 10 pages of this Guide, by Sir R. C. Jebb), the only Greek lyrist whose work has come down to us in any considerable quantity, and whose poems are such remarkable examples of metrical structure; BACCHYLIDES (Vol. 3, p. 121; equivalent to 9 pages of this Guide; also by Sir R. C. Jebb, who was one of the first editors), Pindar's rival, whose poems until a few years ago were known to us only by brief quotations by grammarians, but who had the good luck to survive in papyrus lately found in Egypt; and TIMOTHEUS of Miletus, of whose "Persians" a valuable fragment was found in 1903 in what seems to be the oldest papyrus in existence.

Attic Literature

Comedy

The Attic period has two important developments —the drama, tragic and comic, and the beginnings of a Greek prose. For the drama read the part of Prof. A. W. Ward's article DRAMA dealing with the Greek period (Vol. 8, pp. 488–493), and the article COMEDY; and the articles on the great dramatists:— the tragedians THESPIS, CHOERILUS, PHRYNICHUS and PRATINAS in the earlier period; AESCHYLUS (Vol. 1, p. 272; equivalent to 12 pages of this Guide), by

Arthur Sidgwick, fellow of Corpus Christi, Oxford, and editor of the Oxford text of Aeschylus; SOPHOCLES (Vol. 25, p. 424; equivalent to 12 pages of this Guide), by Lewis Campbell, editor and translator of this poet; and EURIPIDES (Vol. 9, p. 901; equivalent to 15 pages of this Guide), in the main by Sir R. C. Jebb; and the comic poets,—the Sicilian EPICHARMUS; the representatives of the Attic Old Comedy, CRATINUS, CRATES, PHERECRATES, EUPOLIS, PHRYNICHUS (not to be confused with the tragic poet of that name), MAGNES, PLATO (to be distinguished from the philosopher),—all these known to us only by allusions and chance quotations —and ARISTOPHANES (Vol. 2, p. 499; equivalent to 7 pages of this Guide, by Sir R. C. Jebb), the only Greek poet of whom we have complete plays and probably the greatest of the writers of Greek comedy; the names—they are little more—of EUBULUS, ANTIPHANES, ALEXIS in the Middle Comedy; and in the New Comedy or third period, PHILEMON, MENANDER (by J. H. Freese), who was so highly esteemed and so constantly pilfered from by the Roman comic writers, and of whose plays large fragments have been found in the last few years; DIPHILUS, APOLLODORUS of Carystus, POSIDIPPUS, RHINTHON and SOTADES.

History

The prose of the Attic period we may divide roughly into history, oratory and philosophy. On the historians read LOGOGRAPHI, GREECE, *Ancient History*, "Authorities" (Vol. 12, p. 454), with criticism of the historical accuracy of Herodotus, Thucydides, Diodorus, Plutarch, Xenophon, etc., HECATAEUS of Miletus, HERODOTUS (Vol. 13, p. 381; equivalent to 10 pages of this Guide), by the historian George

Rawlinson and E. M. Walker, librarian of Queen's College, Oxford; THUCYDIDES (Vol. 26, p. 893; equivalent to 10 pages of the Guide), by Sir R. C. Jebb, and Malcolm Mitchell, editor of Grote's *Greece*; XENOPHON (Vol. 28, p. 885; equivalent to 7 pages in this Guide), by E. M. Walker and J. H. Freese; CTESIAS, PHILISTUS, THEOPOMPUS, and TIMAEUS.

Oratory

On Attic orators read ANDOCIDES, LYSIAS, ISOCRATES, ISAEUS, ANTIPHON, DEMOSTHENES, AESCHINES, HYPEREIDES,—most of these articles being by Sir R. C. Jebb, who was particularly versed in this branch of Greek literature. The special student of the orators should read also the articles GREEK LAW (Vol. 12, p. 501; equivalent to 15 pages in this Guide), by Prof. J. E. Sandys of Cambridge, author of *A History of Classical Scholarship*, etc.; SOPHISTS (Vol. 25, p. 418, equivalent to 20 pages of this Guide), by Prof. Henry Jackson of Cambridge, a well-known writer on Greek philosophy, and RHETORIC (Vol. 23, p. 233), by Sir R. C. Jebb.

On Greek philosophical writing see the articles PHERECYDES of Syros, ANAXIMENES of Miletus, ANAXIMANDER, and the names great not only in Greek thought and literature but in the world's—PLATO (Vol. 21, p. 808; equivalent to about 50 pages of this Guide), by Lewis Campbell, editor and critic of many of the Platonic dialogues, and ARISTOTLE (Vol. 2, p. 501; equivalent to 70 pages of this Guide), by Prof. Thomas Case, Oxford, author of *Physical Realism*, etc. For a fuller guide to Greek philosophy see the chapter in this Guide on *Philosophy*.

Decadence

The third period of classical Greek literature was one of Greek thought in unGreek surroundings—see

the article HELLENISM, by E. R. Bevan, author of *The House of Seleucus*, etc.,—and this came to its first and finest flower in Alexandria, in Egypt, under the Ptolemies—see the article ALEXANDRIAN SCHOOL, especially that part of it dealing with *Literature* (Vol. 1, p. 573). On the writers of the Alexandrian period see: for poetry, PHILETAS, HERMESIANAX, ASCLEPIADES of Samos, and the comic poets SOTADES and RHINTHON, already mentioned; HERODAS, by W. G. Headlam, editor of Herodas; the idyllist THEOCRITUS (Vol. 26, p. 760), by A. C. Clark, fellow of Queen's, Oxford; Theocritus's followers BION and MOSCHUS; the mythologist CALLIMACHUS, who influenced Catullus as much as Theocritus did the young Virgil; the didactic poet ARATUS, whom Cicero translated into Latin and whom Virgil imitated in his *Georgics*; the epic APOLLONIUS of Rhodes, and the late tragedian LYCOPHRON; and for prose the critic ARISTARCHUS.

In the Greco-Roman period, following the Alexandrian the principal articles for the student are: the historians POLYBIUS and DIODORUS SICULUS, the satirist LUCIAN, the later historians DIONYSIUS HALICARNASSENSIS, DIO CASSIUS, ARRIAN, APPIAN, HERODIAN, EUSEBIUS, ZOSIMUS, the biographers PLUTARCH, DIOGENES LAERTIUS, PHILOSTRATUS, the rhetoricians LONGINUS and DIO CHRYSOSTOM, and the emperor philosopher MARCUS AURELIUS and his forerunner the "slave philosopher" EPICTETUS.

Possibly the most typical output of the later Greek age is the matchless collection of short poems known to us as "the Greek Anthology"; on this see the articles EPIGRAM and ANTHOLOGY.

CHAPTER XLI
BIBLE STUDY

It is impossible for the student to consider the subject of Bible Study without being impressed by the immense labour and the profound scholarship which have been devoted to the interpretation and discussion of Scripture. Continued investigation has solved many difficulties, but has also vastly increased the mass of evidences and conjectures which must be weighed in connection with any doubtful passages. The Britannica tells us, for example, (Vol. 3, pp. 903, 904) that the translators of the King James's version spent only two years and nine months over their task, while the work on the Revised Version took eleven years for the New Testament and fourteen for the Old Testament.

The Bible as a Focus of Thought

It is equally true that all the time which learned men have given to translating and elucidating the text seems nothing when it is compared with the time that mankind at large have spent in reading it. But the Britannica mentions a report of the great English Bible Society, the "British and Foreign," in which the copies circulated by it are totalled at more than 198 million, and, for the American Bible Society and its federated associations, it gives a total of more than 84 million copies (Vol. 3, p. 907). It has often been said that the English Bible is the only example of a translation that became more famous than the original, and it is as true that no other translation has been the source of so many secondary translations, for versions in no less than 530 distinct

languages and dialects have been derived from the English text. It is interesting to note, although in this case the English version has certainly nothing to do with the matter, that "in Italy, by a departure from the traditional policy of the Roman Church, the newly formed, 'Pious Society of St. Jerome for the Dissemination of the Holy Gospels' issued in 1901, from the Vatican press, a new Italian version of the Four Gospels and *Acts*," and sold 400,000 copies at 4 cents each.

As a sort of threshold-study, it will be well to consider three topics: Hebrew Literature, Hebrew Religion and Biblical History.

Preliminaries

HEBREW LITERATURE (Vol. 13, p. 169), by Dr. Arthur Cowley, of the Bodleian Library, Oxford, points out that the term "Hebrew Literature" is loosely used of "all works written in Hebrew characters, whether the language be Aramaic, Arabic, or even some vernacular not related to Hebrew;" and that "this literature begins with, as it is almost entirely based upon, the Old Testament." This article on Hebrew Literature may be supplemented by the following articles:

TARGUM, by John Frederick Stenning, lecturer in Aramaic at Oxford.

HALAKHA QARAITES	by Israel Abrahams, reader in Talmudic and Rabbinic Literature, Cambridge.
TALMUD MIDRASH	by Stanley Arthur Cook, lecturer in Hebrew and Syriac, Cambridge.

SEADIAH, by Dr. Arthur Cowley.

MAIMONIDES, by Herbert Loewe, curator of Oriental Literature, Cambridge.

Hebrew Religion

Quite as important is the article HEBREW RELIGION (Vol. 13, p. 176), by the Rev. Dr. Owen Charles Whitehouse of Christ's and Cheshunt Colleges, Cambridge. His treatment of the subject is comparative and historical. There is an interesting summary of what is known and may be inferred about pre-Mosaic religion; and it is important to notice that the author does not consider that the plural Elohim used in certain Old Testament passages to mean "God" is to be understood as "a comprehensive expression for the multitude of gods embraced in the One God of Old Testament religion," but explains the plural as one "of majesty" like the "we" of royalty. Blood-offerings and magic charms against demons and jinns may be assumed as belonging to the early Hebrew religion as to the later Arabian period before Mahomet. Dr. Whitehouse thinks that there is little or no trace of totemism but possibly some of ancestor-worship in the Jews' religion.

Among the many articles supplementing this general treatment of Hebrew religion the following are possibly the most important:

CIRCUMCISION, by Israel Abrahams.

TERAPHIM, by W. Robertson Smith and G. H. Box, formerly lecturer in theology, Oxford.

BAAL, by W. Robertson Smith and Stanley Arthur Cook, editor for Palestine Exploration Fund.

CALF, THE GOLDEN, by S. A. Cook.

HIGH PLACES.

FEASTS AND FESTIVALS.

PASSOVER, by Dr. Joseph Jacobs of the Jewish Theological Seminary of New York City.

PENTECOST, by Dr. O. C. Whitehouse.

ARK, by Stanley Arthur Cook.

TABERNACLE and TEMPLE, by Dr. Archibald R. S. Kennedy, professor of Hebrew and Semitic languages, Edinburgh.

EPHOD, by S. A. Cook.

URIM AND THUMMIM, by G. H. Box.

PROPHET, by W. Robertson Smith, Owen Charles Whitehouse, Adolf Harnack of Berlin, and Professor A. C. McGiffert of Union Theological Seminary, New York.

JEHOVAH, by George Foot Moore, professor of history of religion, Harvard.

MESSIAH, by W. Robertson Smith and O. C. Whitehouse.

ESCHATOLOGY, by Dr. A. E. Garvie, principal of New College, Hampstead.

ANGEL, by William Henry Bennett, professor of Old Testament Exegesis in New and Hackney Colleges, London.

Biblical History

The third topic is history and for this the student should read the article JEWS (Vol. 15, p. 371), especially the part on *Old Testament History*, by S. A. Cook; the article PALESTINE, *Physical Features*, by R. A. S. Macalister, director of excavations for the Palestine Exploration Fund, *Old Testament History*, by S. A. Cook, especially the treatment of Biblical Religion (pp. 610–611 of Vol. 20); CANAAN, by Dr. Thomas Kelly Cheyne, formerly Oriel professor of interpretation of Scripture, Oxford; HITTITES, by D.

G. Hogarth, keeper of the Ashmolean Museum, Oxford.

The Article Bible

But of course the central article for the Bible student is the article BIBLE (Vol. 3, p. 849), which is divided into two main parts—*Old Testament* and *New Testament*, each of these being divided in turn into five parts: Canon, Texts and Versions, Textual Criticism, Higher Criticism, and Chronology. This logical arrangement greatly enhances the value of the article, which is in itself an excellent summary of the subject written by the following authorities: Dr. Samuel Rolles Driver, professor of Hebrew, Oxford, on Old Testament canon and chronology; John Frederick Stenning, dean of Wadham College, Oxford, and lecturer in Aramaic, on Old Testament texts and versions; Dr. George Buchanan Gray, professor of Hebrew and Old Testament exegesis, Mansfield College, Oxford, on Old Testament textual and higher criticism; Dr. William Sanday, professor of Divinity and canon of Christ Church, Oxford, on New Testament canon; the Rev. Kirsopp Lake, author of *The Text of the New Testament*, etc., and professor of New Testament exegesis at Leiden, on New Testament texts and versions and textual criticism; Dr. Francis Crawford Burkitt, professor of divinity, Cambridge, and author of *The Gospel History and its Transmission*, etc., on New Testament higher criticism; and Cuthbert Hamilton Turner, of Magdalen College, Oxford, on New Testament chronology.

The article BIBLE, ENGLISH (Vol. 3, p. 894), by Anna C. Paues, author of *A Fourteenth Century Biblical Version*, and Canon Henson of Westminster Abbey (on the Revised Version) is accompanied by a plate

with fac-similes of several early English Bibles and is besides of special value as giving quotations from different versions in Anglo-Saxon and later English. The article BIBLE SOCIETIES (Vol. 3, p. 905), by the Rev. Thomas Herbert Darlow, literary superintendent of the British and Foreign Bible Society, will also be of value to the student.

Inspiration

One other general article should be studied before the articles on different books of the Bible are taken up. This is—INSPIRATION (Vol. 14, p. 645), by Dr. Alfred Ernest Garvie, author of *Studies in the Inner Life of Jesus*; it outlines the principal theories of inspiration—

(1) Mechanical dictation or verbal inspiration;

(2) Dynamic influence or degrees of inspiration;

(3) Essential inspiration, distinguishing matters of doctrine and conduct from the remaining contents of Scripture;

(4) Vital inspiration, emphasizing religious and moral life.

The Hexateuch

A course of study in the books of the Bible may well start with the outline in the article BIBLE, especially pages 851–854 for the Old Testament. For the Hexateuch the student should read first the brief article HEXATEUCH; then what there is under BIBLE on pp. 851–852 of Vol. 3; then under JEWS for the early period; and then the articles:

GENESIS, by S. A. Cook; and the subsidiary articles: COSMOGONY, EDEN, PARADISE, ADAM, EVE, ABEL, CAIN, ENOCH, LAMECH, NOAH, DELUGE, ARARAT, ARK, BABEL, CANAAN, GENEALOGY, NIMROD, HAM, SHEM, JAPHETH, ABRAHAM, BEERSHEBA,

MELCHIZEDEK, ISAAC, MIDIAN, ABIMELECH, ISHMAEL, ESAU, JACOB, JACOB'S WELL, BETHEL, ISRAEL, SIMEON, SHECHEM, REUBEN, ISSACHAR, ZEBULUN, DAN, NAPHTALI, ASHER, GAD, MANASSEH, JOSEPH, BENJAMIN, LOT, MOAB, AMMONITES, GOSHEN, etc.

EXODUS, BOOK OF, by John Frederick Stenning, and EXODUS by S. A. Cook; and the articles MOSES, AARON, RAMESES, PITHOM, AMALEKITES, JETHRO, PASSOVER, SINAI, HOREB, DECALOGUE, SABBATH, CALF (GOLDEN), TABERNACLE, ARK, URIM AND THUMMIM.

LEVITICUS, by J. F. Stenning and LEVITES, by S. A. Cook; and SACRIFICE, ATONEMENT AND DAY OF ATONEMENT, MOLOCH, PENTECOST.

NUMBERS, by Dr. James Alexander Paterson, professor of Hebrew, New College, Edinburgh; and the articles BALAAM, HEBRON.

DEUTERONOMY, by Dr. Paterson, and the articles EZRA, NEHEMIAH, and JOSIAH.

JOSHUA, by S. A. Cook, and the articles AMALEKITES, GIBEONITES, HIVITES, PHILISTINES, GEZER, JUDAH, CALEB, SHECHEM.

JUDGES, BOOK OF, by S. A. Cook, and the articles, OTHNIEL, EHUD, DEBORAH, GIBEON, ABIMELECH, JEPHTHAH, SHIBBOLETH, SAMSON, EPHOD, TERAPHIM, MICAH (of Ephraim).

SAMUEL, BOOKS OF, and SAMUEL, by S. A. Cook; and the articles ELI, SHILOH, ARK, SAUL, JONATHAN, DAVID, GOLIATH, AHITHOPHEL, JASHAR, ABSALOM, JERAHMEEL, KENITES.

KINGS, BOOKS OF, by S. A. Cook; and the articles DAVID, ADONIJAH, SOLOMON, TEMPLE, JERUSALEM, ABIATHAR, JOAB, EPHRAIM, JEROBOAM, REHOBOAM, ASA, OMRI, AHAB, JEHOSHAPHAT, JEHORAM,

ATHALIAH, AHAZIAH, ELIJAH, CARMEL, JORDAN, ELISHA, JEHU, RECHABITES, JOASH, AZARIAH, HOSEA, UZZIAH, AHAZ, ISAIAH, HEZEKIAH, MANASSEH, JOSIAH, JEHOIACHIN, SAMARIA.

CHRONICLES, by W. Robertson Smith and S. A. Cook; and the articles ABSALOM, DAVID, UZZIAH, JUBILEES, MIDRASH, LEVITES and many mentioned above under SAMUEL and KINGS.

EZRA AND NEHEMIAH, BOOKS OF, by S. A. Cook; the article EZRA; and, as the books are to be grouped with CHRONICLES, that article and DEUTERONOMY, and the article SAMARITANS and those on the two "apocryphal" books, EZRA, THIRD BOOK OF, and EZRA, FOURTH BOOK OF, by Dr. Robert Henry Charles, lecturer in Biblical studies, Oxford. See also SYNAGOGUE.

The Prophets

For the prophetical books the article PROPHET as an introduction, and then:

ISAIAH, by T. K. Cheyne; and, for outline, under BIBLE, Vol. 3, p. 853; and EMMANUEL (on chap. 7) and MESSIAH and ATONEMENT (on chap. 53).

JEREMIAH, by T. K. Cheyne; and the articles BARUCH, ZEDEKIAH, NEBUCHADREZZAR, EDOM, AMMONITES, MOAB.

LAMENTATIONS, by the Rev. Charles James Ball, lecturer in ASSYRIOLOGY, Oxford, with peculiarly valuable information about poetical structure and acrostic verse, some suggested emendations of the text, and a summary of the arguments in regard to the authorship.

EZEKIEL, by Professor C. H. Toy of Harvard University; and the articles ZEDEKIAH, and, for certain literary forms, ALLEGORY and PARABLE.

Minor Prophets

The Minor Prophets: see Vol. 3, p. 853; Vol. 22, p. 443; Vol. 13, p. 183.

HOSEA, by W. Robertson Smith and the Rev. Henry Wheeler Robinson, professor of church history, Rawdon College, Leeds; articles BAAL, CALF (GOLDEN), etc.

JOEL, by W. Robertson Smith and T. K. Cheyne; and ESCHATOLOGY, etc.

AMOS, by T. K. Cheyne; JEROBOAM, etc.

OBADIAH, by W. Robertson Smith and H. W. Robinson; and EDOM, ESCHATOLOGY, etc.

JONAH, by T. K. Cheyne; and the article NINEVEH, and, for an explanation of the "great fish," COSMOGONY.

MICAH, by W. Robertson Smith and H. W. Robinson; and SAMARIA, HIGH PLACE, MESSIAH, ESCHATOLOGY.

NAHUM, by G. H. Box; NINEVEH, etc.

HABAKKUK, by H. W. Robinson; CHALDAEAN, etc.

ZEPHANIAH, by S. A. Cook; and BAAL, MOLOCH, COSTUME, *Oriental* (Vol. 7, p. 226 sq., for chap. 1, v. 8), etc.

HAGGAI, by W. Robertson Smith and Dr. A. J. Grieve, professor at the United Independent College, Bradford; and the article TEMPLE.

ZECHARIAH, by Julius Wellhausen, professor at Göttingen, and H. W. Robinson; and the articles ANGEL, TEMPLE, MESSIAH, ZION, JAPHETH and IONIANS (for "Javan" of chap. 9, v. 13).

MALACHI, by W. Robertson Smith and H. W. Robinson.

Psalms

PSALMS is by W. Robertson Smith and Dr. Robert Hatch Kennett, Canon of Ely and professor of Hebrew, Cambridge; read the articles HALLEL, DAVID, SOLOMON, TEMPLE, LEVITES (for Levitical Psalms), ASAPH, CHRONICLES, EZRA, PSALTERY, LITURGY, the section of Hebrew Hymnody in, and the whole article HYMNS; BIBLE, ENGLISH, for the version of the Psalms in the English Prayer Book from the Great Bible; and, for Psalms 9, 10, 25, 34, 37, 111, 112, 119 and 145, and the article ACROSTIC. See also R. H. Charles's article on the apocryphal book, SOLOMON, PSALMS OF.

Wisdom Literature

The student should read the article WISDOM LITERATURE, by Prof. C. H. Toy of Harvard as an introduction to PROVERBS, JOB and ECCLESIASTES (and to the apocryphal WISDOM, BOOK OF—see article by Professor Toy; ECCLESIASTICUS,—see article by William Emery Barnes, Hulsean professor of Divinity, Cambridge; TOBIT,—see article by St. George Stock, lecturer University of Birmingham; and 4th MACCABEES—see the article MACCABEES, by Dr. William Fairweather, editor of Maccabees in the "Cambridge Bible for Schools.")

PROVERBS, BOOK OF, by C. H. Toy; and the articles SOLOMON, PROVERB and, for other famous collections, PUBLILIUS, ERASMUS, etc.

JOB, by Dr. Andrew B. Davidson, late professor of Oriental languages, New College, Edinburgh, and author of a Commentary on Job, and Prof. C. H. Toy; and the articles DEVIL (for the meaning of "Satan" in chap. 1, v. 6); SABAEANS, UZ, BEHEMOTH, etc.

ECCLESIASTES, by Professor Toy; the articles PESSIMISM, ESCHATOLOGY, SADDUCEES.

CANTICLES, by W. Robertson Smith and H. W.

Robinson.

Other Old Testament Books

ESTHER, by T. K. Cheyne and, on the "additions," Dr. Robert Henry Charles, Grinfield lecturer, Oxford; and the articles AHASUERUS, SUSA, COSMOGONY, PURIM.

RUTH, by W. Robertson Smith and S. A. Cook; and the articles BETHLEHEM, CALEB, and, for the marriage custom underlying the story, the article on LEVIRATE.

DANIEL, by John Dyneley Prince, professor of Semitic languages, Columbia University, and, for the "additions," Susannah, Bel and the Dragon, and The Song of the Three Children, the Rev. Dr. Robert Henry Charles; the article SEMITIC LANGUAGES for the Aramaic of chapters 2 (from verse 4) to 7; ANGELS, GABRIEL, MICHAEL; CHALDAEAN and CHALDEE; BELSHAZZAR; APOCALYPTIC LITERATURE (for chapters 7–12).

Apocrypha

Before passing to the New Testament the student should read the article APOCRYPHAL LITERATURE, by Robert Henry Charles; and the articles on the separate books: EZRA, THIRD BOOK OF (1 Esdras) and EZRA, FOURTH BOOK (or APOCALYPSE), both by Robert Henry Charles; JUDITH, by the same scholar; ECCLESIASTICUS, by Dr. W. E. Barnes; BARUCH, by R. H. Charles; TOBIT, by St. George Stock; JEREMY, EPISTLE OF, by R. H. Charles; MACCABEES, BOOKS OF, and MACCABEES, by the Rev. Dr. William Fairweather; MANASSES, PRAYER OF, by R. H. Charles, and MANASSEH; and WISDOM, BOOK OF, by C. H. Toy.

New Testament

The general articles preliminary to a study of the New Testament are:—besides the part of the article BIBLE dealing with New Testament, Canon, Criticism, Text, Chronology, etc.—the following:

MESSIAH, by W. Robertson Smith and Dr. Owen Charles Whitehouse, lecturer in Hebrew, Cheshunt College, Cambridge.

JESUS CHRIST, by the Very Rev. Dr. Joseph Armitage Robinson, dean of Westminster, constituting a critical outline of the gospel story.

CHRISTIANITY, by Dr. George William Knox, late professor of philosophy and history of religion, Union Theological Seminary, New York City.

In outlining a course of study on the New Testament, the order of the books as printed in English Bibles will not be followed absolutely. Here, as in studying the Old Testament, a rearrangement may be worth while for topical study.

The Gospels

But first the student should read the article GOSPEL, by the Rev. Dr. Vincent Henry Stanton, professor of divinity, Cambridge, and author of *The Gospels as Historical Documents*, etc.; and the article by Dr. Kirsopp Lake on TATIAN the compiler of the Diatessaron or "Gospel of the Four Gospels."

For the gospel story the student should read the following separate articles:

JOHN THE BAPTIST, HEROD ANTIPAS, SALOME, JOSEPH (Vol. 15, p. 513, col. 2), MARY, IMMACULATE CONCEPTION, BETHLEHEM, NAZARETH, NAZARENES, EBIONITES, GALILEE, CAPERNAUM, CANA, JORDAN, PETER, ANDREW, JAMES, JOHN, PHILIP, BARTHOLOMEW, THOMAS,

MATTHEW, JUDAS, DEMONOLOGY, POSSESSION, EXORCISM, MIRACLE, MARY MAGDALENE, NATHANAEL, PHARISEES, SADDUCEES, SABBATH, PASSOVER, EUCHARIST, PARABLE, CAESAREA PHILIPPI, JUDAEA, JERUSALEM, BETHANY, OLIVES, MOUNT OF; GETHSEMANE, PILATE, CALVARY, JOSEPH OF ARIMATHAEA.

In studying the separate Gospels, let the reader follow the order suggested in the articles GOSPEL and JESUS CHRIST.

First he should study the article MARK, GOSPEL OF, by Dr. Stanton; the article on ST. MARK, by Dr. James Vernon Bartlett, professor of Church History, Mansfield College, Oxford, and, for a summary of the points in the Marcan or Galilean narrative as contrasted with the Jerusalem narrative in regard to the betrayal of Jesus and the period immediately following, the article on ST. PETER by Dr. Kirsopp Lake.

MATTHEW, GOSPEL OF ST., by Dr. Vincent H. Stanton, and MATTHEW, by Dr. J. V. Bartlett; with particular attention to the paragraph on additions to Mark's narrative in Vol. 15, p. 355, and to the stress on the Messianic character, the mention of the church and of St. Peter as the Rock in chapter 16.

LUKE, GOSPEL OF ST., by Dr. Stanton, and the biographical sketch of LUKE, by Dr. Bartlett; and the paragraph on Luke's additions to Mark's narrative in Vol. 15, p. 356. This is the universal gospel, just as Mark's was for extra-Palestinian use and Matthew's particularly for the Jew, as is shown by the incidents of Zaccheus and of the Samaritan leper; and Renan's characterization of the gospel of the one evangelist who was not a Jew, "the most beautiful book in the world," is quoted twice in the Britannica.

JOHN, GOSPEL OF ST., and JOHN (the Apostle), both by Baron Friedrich von Hügel, author of *The Mystical Element of Religion*: the paragraph on the distinctive elements of John's gospel (in Vol. 15, p. 357), such as the story of John the Baptist (see the article on this "forerunner," by G. H. Box, late lecturer in theology, Oxford); the philosophical prologue (see the article LOGOS, by the late Rev. Dr. Stewart Dingwall Fordyce Salmon, professor of systematic theology, United Free Church College, Aberdeen, and the Rev. A. J. Grieve, professor of New Testament and church history, Yorkshire United Independent College, Bradford); the Judean scene as contrasted with the predominance of Galilee and Samaria in the other three (synoptic) gospels, and the prominence given to great abstract ideas and symbols—the Light of the World, the Living Bread, the Only-Begotten, the Re-Birth, Eternal Life, the Way, the Truth, and the Life, Water and Wine, the Paraclete, and the refrain and variations on the theme of Love.

Before studying the articles dealing with the book of ACTS, let the reader consult Dr. Garvie's article MIRACLE, for a study of the supernatural and particularly for a development of the argument for miracles from "the congruity of the miracle with divine truth and grace"; the miracles of Jesus, and of the apostles, consist in "the relief of need, the removal of suffering, the recovery of health and strength."

Acts

The article ACTS OF THE APOSTLES, by Dr. J. Vernon Bartlett, should be supplemented by referring again to the article LUKE, and the student should call to mind that the probable author was not a Jew, was

a personal friend and traveling companion of both Paul and Peter, and was a physician, a trained scientific observer, as can be seen not only from his descriptions of disease, but from his accuracy in geographical, meteorological and other matters. The importance of the testimony of the physician to the miracles of the apostles is brought out (p. 164, top of column 2) in the article on the book. For the study of ACTS, besides the article on the book, read the following separate articles:

LUKE, PETER, JOHN, JUDAS, ACELDAMA, MATTHIAS, PENTECOST, TONGUES, GIFT OF; ANANIAS, GAMALIEL, STEPHEN, SIMON MAGUS, PHILIP, PAUL, JOPPA, ANTIOCH, HEROD, BARNABAS, ICONIUM, LYCAONIA, MARK, TIMOTHY, SILAS, PHILIPPI, THESSALONICA, ATHENS, AREOPAGUS, CORINTH, AQUILA, APOLLOS, EPHESUS, FELIX, ANANIAS, AGRIPPA.

St. Paul

For a study of the book of Acts, which was probably written before any one of the Gospels, one will need constantly to refer in the Britannica to the article on PAUL, THE APOSTLE (Vol. 20, p. 938), by Dr. J. Vernon Bartlett. This article, equivalent to 55 pages in this Guide, is so important that it will be well to outline it here. After an introduction, in which Paul's attitude toward Jewish legalism is made an explanation of the superficially obvious contrast between Jesus and Paul, there is a biographical sketch: Paul of Tarsus, a Roman citizen with Roman name, talking Latin and not a narrow, one-sided Jew; his Jewish training; in Jerusalem, under Gamaliel (see the article GAMALIEL); first impressions as to Jesus, and Saul as persecutor; the vision at Damascus and its spiritual content; his new theory of the law

and its universal value; Christology of Paul,—his deep insight into Jesus's character; Paul's theology rooted in experience; his early apostolate; his first missionary journey; the issue of Gentile Christianity raised; Paul's conciliatory spirit; Peter's visit to Antioch; Paul's protest; the second mission tour; Paul in Europe—Athens, Corinth, etc.; first missionary letters; as an ethical teacher; Paul, the Law, the Spirit; later travels; later letters; Paulinism—its Christocentric character; apparent contrasts and contradictions between Paul's gospel and Jesus's gospel—one seen through the eyes of a conscious sinner, the other the sinless consciousness of the Saviour; Paul's position between Judaeo-Christianity and Gnosticism—see also the article GNOSTICISM, by Wilhelm Bousset, professor of New Testament exegesis, Göttingen.

The Pauline Epistles

In general on the Pauline epistles the student should not only read this article PAUL, but should turn again to the treatment of New Testament canon in the article BIBLE (Vol. 3, pp. 872–873), and should look over the first part of the article JESUS CHRIST which finds in 1st Thessalonians the earliest extant document of Christianity. Then let him read the articles:

THESSALONIANS, EPISTLES TO THE, by the Rev. James Everett Frame, professor of Biblical theology, Union Theological Seminary, New York City. See also in the article PAUL (Vol. 20, pp. 945–946) for Paul at Thessalonica, and the articles ESCHATOLOGY and APOCALYPTIC LITERATURE for the doctrine of the "second coming" or "Parousia," especially in 2 Thess., chap. 2.

CORINTHIANS, EPISTLES TO THE, by the Rev. Dr. James Hardy Ropes, professor of New Testament criticism and interpretation, Harvard; and the articles CORINTH, APOLLOS, PETER, ASCETICISM, FASTING, EUCHARIST (1 Cor., chap. 11, vs. 23 sqq. is the oldest extant account of the Lord's Supper), TITUS.

GALATIANS, EPISTLE TO THE, by the Rev. Dr. James Moffatt, author of *The Historical New Testament*: and the articles GALATIA (for the "South Galatian" theory), ANTINOMIANISM (for Christianity *vs.* legalism).

ROMANS, EPISTLE TO THE, by Dr. Moffatt; and the article HEBREW RELIGION for the covenant which Paul here presents as one of faith and not of the law.

EPHESIANS, EPISTLE TO THE, by Prof. J. H. Ropes, pointing out that the theme is "the unity of mankind in Christ and hence the unity and divinity of the Church of Christ"; the article EPHESUS; the articles on COLOSSIANS and on 1st PETER for textual criticism; the article MARRIAGE for Paul's influence (Eph. ch. 5, v. 23–32) on the Church's attitude toward marriage; and the article GNOSTICISM for the tendency in the church which Paul attacked in this epistle and in Colossians.

COLOSSIANS, by Prof. J. E. Frame; the article COLOSSAE; ANGEL (on chap. 2, v. 18); ASCETICISM (on chap. 2, v. 16).

PHILEMON, EPISTLE TO, by Dr. Moffatt; the article SLAVERY, *Rome* (Vol. 25, p. 218) for the status of a runaway like Onesimus.

PHILIPPIANS, EPISTLE TO THE, by Dr. Moffatt; the article PHILIPPI; ANTINOMIANISM (on the beginning of chap. 3); and on the Kenosis or emptying of self of Christ in Phil. 2, 7, see the article on CHARLES GORE

(Vol. 2, p. 255), and in the article THEOLOGY the discussion in column 1 of p. 781 (Vol. 26).

TIMOTHY, FIRST EPISTLE TO; and TIMOTHY, SECOND EPISTLE TO, by Dr. Moffatt; the article TIMOTHY; the articles MARRIAGE and CELIBACY (on 1 Tim. 4, 3); FASTING, the article GNOSTICISM (for the "knowledge falsely so-called" of 1 Tim. 6, 20), and the article PASTORAL EPISTLES on these letters and on that to Titus. The article TITUS has much important criticism on Timothy.

TITUS, THE EPISTLE TO, by Dr. Moffatt; the articles BISHOP and PRESBYTER, etc.

HEBREWS, EPISTLE TO THE, by Dr. J. Vernon Bartlett; and, on authorship, the articles PAUL, BARNABAS, APOLLOS, LUKE, CLEMENT, STEPHEN; and the articles CLEMENTINE LITERATURE, HEBREW RELIGION, TEMPLE, ATONEMENT AND DAY OF ATONEMENT, ANGEL, MOSES, PRIEST, AARON, MELCHIZEDEK, SACRIFICE, MESSIAH.

The Other Epistles

Before turning to the articles on the other books of the New Testament, let the student read a part of the article THEOLOGY, by the Rev. Dr. Robert Mackintosh of the Lancashire Independent College, Manchester, with special attention to the paragraphs (end of p. 773 and p. 774, Vol. 26) on Jewish theology, St. Paul and contents of the New Testament. Here "Paulinism" is shown not merely in the Pauline writings but in the Acts, in 1st Peter ("good independent Paulinism"), and even in the Apocalypse, at least as regards the atonement and Christology. "The Johannine Gospel and Epistles are later than Paulinism, and presuppose its leading or less startling positions." And the same article (p. 783) after pointing out that Luther and the

evangelical revival "went back to St. Paul" asks "can Christianity not dig deeper by going back to Jesus?" The writer also suggests that the German school of Ritschl in "not idolizing Paulinism" have "idolized Luther."

The other principal topics to be studied are:

JAMES, EPISTLE OF, by the Rev. Dr. Benjamin Wisner Bacon, professor of New Testament criticism and exegesis, Yale; the article on JAMES by the Rev. Dr. George Milligan, Professor of divinity and Biblical criticism, Glasgow; and the articles REVELATION, CLEMENT, HERMAS, etc., for the question of date and relation with other writings; WISDOM LITERATURE, for earlier writings on the "Wisdom" and proverbial expressions of chapter 3; MATTHEW, for a similar view of the gospel and the Church; and on "Justification," vol. 20, p. 954, in article PAUL.

PETER, EPISTLES OF, by Dr. Kirsopp Lake; the article on ST. PETER, by the same scholar. For a date earlier than that of the Epistle of James, see the article on that book. See also ROMANS and POLYCARP to supplement what is here said of the relations of 1st Peter to these writings; and ESCHATOLOGY on the expected "second coming" of 2nd Peter, chapter 3, vs. 1–13, and JUDE, EPISTLE OF, on its relation to this book.

JUDE, EPISTLE OF, by Prof. B. W. Bacon of Yale; the article on HEGESIPPUS, the authority for the little we know of Jude; the articles ESCHATOLOGY (for "the last time" of verse 18), ANGEL (for vs. 6, 9), MICHAEL, and especially the articles APOCRYPHAL LITERATURE; MOSES, ASSUMPTION OF; and ENOCH, BOOK OF, for the allusions in verses 9 and 14.

Under the head of Johannine are grouped, besides

the fourth gospel, the three epistles of John and the Revelation. On these see:

Johannine Writings

JOHN, THE EPISTLES OF, by Dr. Moffatt, and the article on St. John in regard to authorship, which may more probably be assigned to John the presbyter; and the articles ANTICHRIST (on 1 John, 2, 22), GNOSTICISM (for chap. 3, vs. 4–7), etc.

REVELATION, BOOK OF, by the Rev. Dr. Robert Henry Charles, lecturer in Biblical studies, Oxford. This book, and this article, should be studied in connection with the article, also by Dr. Charles, on APOCALYPTIC LITERATURE, and the canonical apocalyptic passages in Mark 13, Mathew 24, Luke 21 and 2nd Thessalonians 2, as well as the extra-canonical apocalypses described in APOCALYPTIC LITERATURE and in the separate articles ISAIAH, ASCENSION OF, and HERMAS, SHEPHERD OF. Besides see the articles ESCHATOLOGY, MILLENIUM. The student should read the article NERO, even if "666" does not certainly refer to him, and the articles DOMITIAN and VESPASIAN on the possibility that one of them may have been "the beast that was and is not, ... himself also an eighth" (see footnote on p. 220, Vol. 23).

Apocryphal Literature

As an epilogue the student should read the articles APOCRYPHAL LITERATURE, both of the Old and New Testament periods, by Dr. Charles and at least the first part, by Dr. A. C. McGiffert of Union Theological Seminary, New York City, of the article CHURCH HISTORY.

A Biblical Encyclopaedia

The study outline sketched in this chapter will give the student some idea of the possibilities of the Britannica in helping him. The list of articles dealing with the Bible on pp. 944–945 of the Index (Vol. 29) will show that in the Britannica there is an adequate and excellent encyclopaedia of the Bible or text-book of Bible Study.

CHAPTER XLII
HISTORY, INTRODUCTORY AND GENERAL

When you turn to the new Britannica to study history, you naturally expect to learn a great deal that will be new to you. But you can anticipate something more and better than that. You will find a great deal that is new to *everyone*, even to those who have been reading history for years. For the contributors to the work, in making a completely fresh survey of the whole field of human knowledge, were helping one another to obtain new light upon the history of even the earliest periods. As all the articles were completed before a single volume was printed, there was such an opportunity for comparison and revision as has never before existed. When research upon one subject had disclosed new evidence that was of value in relation to another subject, the contributors and editors could co-operate as fully as if they had all been assembled in a great

international congress. And the result of this collaboration is that the publication of the new Britannica does more, at one stroke, to advance historical knowledge, to solve historical doubts, and to correct historical mistakes than is done by isolated historians in the course of a generation.

Authority

With this idea of *combined* effort clearly before you, consider for a moment the accumulated individual authority of such individual specialists as those who deal with history in the Britannica. There are, to name only a few, the Germans Eduard Meyer and Schiemann of Berlin, Hashagen of Bonn, von Pastor of Innsbruck, Pauli of Göttingen, Keutgen of Hamburg, and Count Lützow; Frenchmen like Mgr. Duchesne, Luchaire, Valois, Anchel, Halphen, Babelon and Bémont; the Italians Villari, Barnabei and Balzani; the Canadians Doughty, Grant, Dionne and Wrong; among Americans, J. H. Robinson, W. A. Dunning, H. L. Osgood, C. H. Hayes, G. W. Botsford, and J. T. Shotwell of Columbia; President Emeritus Charles W. Eliot, and Drs. Edward Channing, F. J. Turner and Charles Gross of Harvard; Drs. A. D. Morse, R. B. Richardson and Preserved Smith of Amherst; Dr. T. F. Collier of Williams; Professors William Graham Sumner, G. Burton Adams and J. C. Schwab of Yale; Prof. Grant Showerman of Wisconsin; Prof. William MacDonald of Brown; Profs. Fleming and Scroggs of Louisiana; Dr. McMaster of Pennsylvania; Prof. I. J. Cox of Cincinnati; the late Alexander Johnston of Princeton; Prof. W. Roy Smith of Bryn Mawr; Henry Cabot Lodge, Carl Schurz and James Ford Rhodes; and—to mention only a few English names—S. R. Gardiner, Edward Freeman, Thomas Hodgkin, James Bryce, James Gairdner, J. D.

Bury, C. W. C. Oman, A. F. Pollard, J. H. Round, H. W. C. Davis, Osmund Airy, G. W. Prothero, John Morley, Reginald Lane Poole, J. Holland Rose, F. J. Haverfield, W. Alison Phillips, Sir Donald Mackenzie Wallace, R. Nisbet Bain, W. Warde Fowler, J. L. Myres, J. S. Reid, W. J. Brodribb and H. F. Pelham.

So much for the quality of the historical matter in the Britannica. The quantity is equally remarkable.

If the history in the Britannica was printed in the usual volumes on heavy paper, containing 100,000 words to a volume, it would fill about 70 such volumes, or, say, four good-sized shelves in an ordinary "unit" bookcase.

Method of Treatment

Every country and every event from the earliest syllable of recorded time receives its proper treatment. Under such circumstances it is obvious that in the limits of this Guide it would not be possible to give outlines of courses of historical readings for all nations and periods. Such readings in history alone would more than fill this whole Guide. But the information is all in the Britannica, and what has been said above will give the reader some notion of the authority of the articles written by natives of nearly every civilized country in the world, and some idea of the scope of treatment. The character of the subject matter of history and the method of treatment in the Britannica combine to make minute outlines less necessary for historical study than for the pursuit of a course in almost any other subject. The Britannica, the student will quickly see, contains in each instance a "key" article on the history of each nation—either as a separate article, like ENGLISH HISTORY or ROMAN HISTORY or as a historical section of the article on the country—for instance, in

the article GREECE there is a "sub-article," so to say, on history (Vol. 12, pp. 440–470), and in the article UNITED STATES a sub-article on American history (Vol. 27, pp. 663–735). The student of any country's history should read *first* such an article or sub-article, so that he will get a big outline view of the subject, and then use it as a basis or starting point for further reading, looking up in the Index volume the important topics mentioned in the main article. These will be:

(1) Articles on the history of parts of the country he is studying—states, provinces, counties, kingdoms, duchies, cities and towns.

(2) Biographies of rulers, statesmen, soldiers, reformers, etc.

(3) Articles on wars and battles, each under its proper heading.

(4) Articles on movements and changes, sometimes of national, sometimes of international importance, the Renaissance, political parties, economic, political and religious revolutions, the Crusades, etc.

(5) Articles on churches, sects and denominations of historical importance in the country under consideration.

But although it is impossible to give in this Guide complete courses of reading for the history of all countries, it is possible and desirable to give it in cases where it would be most useful to the greatest number of readers.

The following chapter is an outline course of study in the *History of the United States*, which is given in some detail, because it has a peculiar interest to Americans.

Next is given an outline of a course of reading in Canadian and then in English History, then in French

History, and then in the History of the countries of the Far East, India, China and Japan. These will show the reader how fully and authoritatively the history of countries, whether near or distant, is given in the Britannica; and if he wishes to pursue his studies into the record of other countries, it is certain that with these for an example, and with the aid of the Index, he will have no trouble in so doing.

CHAPTER XLIII
AMERICAN HISTORY

The plan adopted in most of the chapters of this Guide is to give a separate account of each of the more important articles on the subject to which the chapter is devoted. But in the case of American history, the articles are so numerous, and are so accurately dovetailed to make a continuous story, that the reader's convenience has been better served by reversing this process, and grouping the articles under the periods with which they deal. The reader is thus enabled to turn at once to any one of the outstanding episodes of the story, and to find explicit references to those parts of the Britannica in which the narrative is continued from one article to another. The summary has been put in the form of a table, in order that its contents may more easily be surveyed. There is a much fuller summary, in narrative form, in the Britannica itself in the historical portion of the article UNITED STATES (Vol. 27, pp. 663–735). This is the most complete condensed history of the country that has ever been

written. It is not quite so long as this entire Guide; but from each of its 412 sections the reader can turn to articles describing in detail the events consecutively outlined.

It has been taken for granted that the reader will recognize the natural connection between this and other chapters of the Guide. For example, no attempt has been made in this chapter to indicate the articles, elsewhere described, which discuss the history of American industries and commerce, railroads and shipping, finance and economics, art and literature. Again, the particular history of a city, town, or river may be of the greatest interest in itself, although the events with which its name is associated were not so typical of any period as to give the article a place in the present chapter. Similarly, the numerous and elaborate American biographies are represented, in this chapter, only by the names of the foremost statesmen and soldiers of the periods included in the table. In short, the articles named are so few, in proportion to all those which directly relate to American history, that the general effect is to make the space which the Britannica devotes to the subject seem less than it really is. But it is not the purpose of this Guide to impress upon the reader the magnitude of the volumes he is using. In that respect the Britannica speaks for itself. The table instances a few of the main topics of American history, in order to show the reader how he may plan fuller courses of reading by combining other articles on the principle indicated by these illustrations.

The left hand columns present a brief outline of the main periods and aspects of American history. The right hand columns give the titles of the articles to be read, the page numbers as well as the volume numbers (so that when the reference is to only one

section of a long article the reader can find it at once) and the names of the contributors.

Topics for Reading	***Articles***
The Aborigines.	
Where did they come from, and when? Their food, tools, clothing and customs. How they carried on their wars. Their practical knowledge and religion. What the white man has learned from the Indians. Over 1000 languages and dialects in America.	AMERICA, *Ethnology and Archaeology* (Vol. 1, p. 810, fully illustrated), by Otis Tufton Mason, late curator, Department of Anthropology, National Museum, Washington; author of *Primitive Travel and Transportation*, etc.
	INDIANS, NORTH AMERICAN (Vol. 14, p. 452), by Dr. A. F. Chamberlain, professor of anthropology, Clark University.
Evidence of Asiatic origin. A state of culture in Mexico and Peru, "which in some respects must have put the Spaniards to shame."	ARCHAEOLOGY (Vol. 2, p. 349), by Dr. Charles H. Read, keeper of British and Medieval Antiquities and Ethnography, British Museum.

The fascinating story of the Aztecs. Did the Asiatic peoples make voyages to America long before Columbus?	MEXICO, *Ancient History and Civilization* (Vol. 18, p. 329), by Dr. E. B. Tylor, professor of anthropology at Oxford; author of *Methods and Results in Mexican Research*.
The splendid past of Central America. What was accomplished during the 500 years of Mayan culture. An interesting calendar.	CENTRAL AMERICA, *Archaeology of* (Vol. 5, p. 677), by Dr. Walter Lehmann, Royal Ethnographical Museum, Munich.
First Voyages of Discovery.	
The Northmen first Europeans to reach American continent, about 1000 A.D. The story of the Icelandic sagas. Was Vinland Nova Scotia?	VINLAND (Vol. 28, p. 98), by Julius E. Olson, professor of Scandinavian languages, University of Wisconsin, editor of *Voyages of the Northmen*, etc.
The accident of Leif's discovery of the American continent.	LEIF ERICSSON (Vol. 16, p. 396), by Dr. C. R. Beazley, professor of modern history in the University of Birmingham, author of *The Dawn of Modern Geography*.
The first colonizer (A.D. 1002). Fate of the colony. The hostile Skraelings.	THORFINN KARLSEFNI (Vol. 26, p. 878), by Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc.
Columbus and His Successors.	

Treaty of Tordesillas (1494).	AMERICA, *General Historical Sketch* (Vol. 1, p. 806), by David Hannay, author of *A Short History of the Royal Navy*.
Columbus thinks he discovers Asia. His voyages and colonies (1492–1504).	COLUMBUS, CHRISTOPHER (Vol. 6, p. 741), by Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc.
Discovery of the Mainland (1497).	CABOT, JOHN (Vol. 4, p. 921), by Henry P. Biggar, author of *The Voyage of the Cabots to Greenland*.
How the New World received its name. The beginning of free-lance expeditions. The mystery of the voyage of 1497.	VESPUCCI, AMERIGO (Vol. 27, p. 1053), by Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc.
The Discovery of the Pacific (1513).	BALBOA, VASCO NUÑEZ DE (Vol. 3, p. 241).
The existence of a new continent distinct from Asia revealed to the world. First circumnavigation of the globe. The Pacific Ocean named (1520).	MAGELLAN, FERDINAND (Vol. 17, p. 302), by Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc.
	PACIFIC OCEAN, *History* (Vol. 20, p. 438).

The Conquest of Mexico (1519–1521). "The Descendant of the Sun." Discovery of Lower California. Ingratitude of Charles V.	CORTES, HERNAN (Vol. 7, p. 205).
	CALIFORNIA, LOWER (Vol. 5, p. 21).
Exploration of Guatemala and Yucatan (1528), and the Mississippi (1541).	SOTO, FERDINANDO DE (Vol. 25, p. 435).
France attacks Spain in the New World.	LAS CASAS, BARTOLOMÉ DE (Vol. 16, p. 232).
Discovery of the St. Lawrence (1534). How Canada got its name. Early Canadian History.	CARTIER, JACQUES (Vol. 5, p. 433), by H. P. Biggar, author of *The Voyage of the Cabots to Greenland*.
	CANADA, *History* (Vol. 5, p. 156), by Dr. George McKinnon Wrong, University of Toronto.
Foundation of Quebec (1608). Discovery of Lake Champlain (1609). Champlain assists Algonquins and Hurons against the Iroquois. The beginning of the murderous conflicts between the French and the Iroquois.	CHAMPLAIN, SAMUEL DE (Vol. 5, p. 830), by Prof. Narcisse E. Dionne, Librarian of the Legislature of the Province of Quebec, author of *Life of Samuel de Champlain, Founder of Quebec*, etc.

The Fortunes of New France. Colonial Expansion. Horrors of Indian Warfare.	FRONTENAC (Vol. 11, p. 249), by Dr. Arthur G. Doughty, Dominion archivist of Canada, author of *The Cradle of New France,* etc.
Louisiana in possession of France (1682). Discovery of the Ohio River.	LA SALLE, RENÉ ROBERT, SIEUR DE (Vol. 16, p. 230), by Charles C. Whinery, assistant editor, Encyclopaedia Britannica.
The first English colony (1583) unsuccessful.	NEWFOUNDLAND, *History* (Vol. 19, p. 482), by Beckles Willson, author of *The Romance of Canada,* etc.
The persistent efforts of Raleigh (1584–1587). First English child born in America (Aug. 15, 1587).	NORTH CAROLINA, *History* (Vol. 19, p.
775).	NORTH CAROLINA, *History* (Vol. 19, p. 775).
	RALEIGH, SIR WALTER (Vol. 22, p. 869), by David Hannay, author of *Short History of the Royal Navy*.
The first permanent English settlement (1607).	VIRGINIA, *History* (Vol. 28, p. 122).
	JAMESTOWN (Vol. 15, p. 148).
Colonial Expansion and Development of Imperial Control.	

The Thirteen Original Colonies, their Founders and Leaders, and their early Struggles.	UNITED STATES, *History* (Vol. 27, p. 663), by Dr. Herbert L. Osgood, professor of history, Columbia University, author of *The American Colonies in the 17th Century*, etc.
Virginia.	VIRGINIA (Vol. 28, p. 122).
	JAMESTOWN (Vol. 15, p. 148).
	SMITH, JOHN (Vol. 25, p. 264).
	GOSNOLD, BARTHOLOMEW (Vol. 12, p. 265).
	BERKELEY, SIR WILLIAM (Vol. 3, p. 781).
	BLAIR, JAMES (Vol. 4, p. 34).
	SPOTSWOOD, ALEXANDER (Vol. 25, p. 735).
North Carolina.	NORTH CAROLINA (Vol. 19, p. 775).
South Carolina.	SOUTH CAROLINA (Vol. 25, p. 503).
New England.	NEW ENGLAND (Vol. 19, p. 476).
Massachusetts.	MASSACHUSETTS (Vol. 17, p. 858).
	PLYMOUTH, MASS. (Vol. 21, p. 863).
	BRADFORD, WILLIAM (Vol. 4, p. 370).

	STANDISH, MILES (Vol. 25, p. 772)
	ALDEN, JOHN (Vol. 1, p. 533).
	WINSLOW, EDWARD (Vol. 28, p. 733).
	ENDECOTT, JOHN (Vol. 9, p. 382).
	SALEM (Vol. 24, p. 62).
	WINTHROP, JOHN (Vol. 28, p. 736).
	BOSTON, MASS. (Vol. 4, p. 290).
	IPSWICH, MASS. (Vol. 14, p. 739).
	VANE, SIR HENRY (Vol. 27, p. 892).
	HUTCHINSON, ANNE (Vol. 14, p. 12).
Maine (a part of Massachusetts).	MAINE (Vol. 17, p. 439).
	POPHAM, SIR JOHN (Vol. 22, p. 88).
	GORGES, SIR FERDINANDO (Vol. 12, p. 256).
	PORTLAND, ME. (Vol. 22, p. 120).
Rhode Island.	RHODE ISLAND (Vol. 23, p. 251).
	WILLIAMS, ROGER (Vol. 28, p. 682).
	PROVIDENCE (Vol. 22, p. 512).

New Hampshire.	NEW HAMPSHIRE (Vol. 19, p. 496).
	PORTSMOUTH, N. H. (Vol. 22, p. 132).
Connecticut.	CONNECTICUT (Vol. 6, p. 954).
	HOOKER, THOMAS (Vol. 13, p. 674).
	NEW HAVEN (Vol. 19, p. 499).
	EATON, THEOPHILUS (Vol. 8, p. 838).
	HARTFORD (Vol. 13, p. 33).
Vermont.	VERMONT (Vol. 27, p. 1028).
Indian Wars in New England.	PEQUOT (Vol. 21, p. 132).
	PHILIP, KING (Vol. 21, p. 389).
New York.	NEW YORK (Vol. 19, p. 603).
	HUDSON, HENRY (Vol. 13, p. 849).
	IROQUOIS (Vol. 14, p. 839).
	NEW YORK (CITY) (Vol. 19, p. 620).
	ALBANY (Vol. 1, p. 490).
	STATEN ISLAND (Vol. 25, p. 802).
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Isthmian Canal.	PANAMA (Vol. 20, p. 666).
	PANAMA CANAL (Vol. 20, p. 666).
Panic of 1907.	BANKS AND BANKING (Vol. 3, p. 348), by Charles A. Conant, author of *A History of Modern Banks of Issue*.
Elkins Law.	RAILWAYS, *American Legislation* (Vol. 22, p. 829).
Eastern Policy.	HAY, JOHN (Vol. 13, p. 105).
	ROOT, ELIHU (Vol. 23, p. 711).

This sketch of American History closes with the inauguration of President Roosevelt, for the questions that have arisen since that date are questions into which current politics enter, and these are treated in the chapter of this Guide on *Questions of the Day*. Here we need only say that throughout

his study of American history the reader will constantly—and easily—find many more articles bearing on the subject than are mentioned in the outline given above. In particular let him note:

—that there are many biographies of figures prominent in nation and state not mentioned above;

—that in each article devoted to a state there is a section on history, which has a double value, as giving the outline of the state's history and as showing its part in the history of the nation;

—and that there is in articles on cities and towns a great deal of important information of historical value, sometimes merely local, but oftener bearing on the history of state or nation, or both.

CHAPTER XLIV
CANADIAN HISTORY

"Young" Rivers and Lakes

All the world thinks of Canada as the youngest of countries, for the extraordinary rapidity with which her western territory has been developed within recent years surpasses every other record of agricultural expansion. But in order to realize how young Canada is, in another sense, one must examine the less familiar facts of her geological history. "The innumerable lakes and waterfalls," says the Britannica (Vol. 5, p. 143), prove "that the rivers have not been long at work," and that the country

owes its contours to comparatively recent geological action. “In many cases the lakes of Canada simply spill over, at the lowest point, from one basin into the next below, since in so young a country there has not yet been time for the rivers to have carved wide valleys.... Thousands of these lakes have been mapped; and every new survey brings to light small lakes hitherto unknown to the white man.... For the great extent of lake-filled country there is no comparison” in any part of the world. And because the rivers have not yet worn their beds to an even slope, there are waterfalls enough to provide unlimited horse power; so that the natural advantages of Canada invite manufacturing just as the fertility of her soil invites agriculture.

The geographical and geological portions of the article CANADA (Vol. 5, p. 142) must be carefully read in order that the significance of the historical account of the country may be fully grasped; and the same is true of those parts of the article which deal with agriculture and with the commerce of which the first developments were associated with early exploration. There is ample and authoritative information on all these subjects in the article, which is equivalent in length to 85 pages of this Guide. The sections and their contributors are: *Geography*, by Prof. A. P. Coleman, Toronto University; *Population*, *Commerce*, etc., by Prof. W. L. Grant, Queens University, Kingston; *Agriculture*, by E. H. Godfrey, editor of Census and Statistics Office, Department of Agriculture, Ottawa; *History*—to the Federation by G. M. Wrong, University of Toronto, and after the Federation by G. R. Parkin, author of *Imperial Federation* and *Life of Sir John Macdonald*, etc., and *Literature*—English-Canadian, by L. J. Burpee, author of *The Search for the Western Sea*, and French-

Canadian by William Wood, author of *The Fight for Canada*.

Exploration and Settlement

On the early history of Canada the student should compare what is given in this Guide on the early history of America in general and especially the following articles: LEIF ERICSSON (Vol. 16, p. 396); VINLAND (Vol. 28, p. 98), by Prof. Julius Emil Olson, University of Wisconsin; JOHN CABOT (Vol. 4, p. 921); and JACQUES CARTIER (Vol. 5, p. 433), both by H. P. Biggar, author of *The Voyages of the Cabots to Greenland*; SAMUEL DE CHAMPLAIN (Vol. 5, p. 830), by N. E. Dionne, librarian of the Legislature of the Province of Quebec and biographer of Champlain; JACQUES MARQUETTE (Vol. 17, p. 752); SIEUR DE LA SALLE (Vol. 16, p. 230), by Charles C. Whinery, assistant-editor Encyclopaedia Britannica; FRONTENAC (Vol. 11, p. 249), by A. G. Doughty, Dominion archivist of Canada; LOUISBURG; DETROIT; SAULT STE. MARIE; MACKINAC ISLAND; PITTSBURG; NOVA SCOTIA, *History*; SEVEN YEARS' WAR (Vol. 24, especially page 722); QUEBEC; MONTCALM and WOLFE.

The War Periods

The close of the Seven Years' War saw New France ceded to Great Britain. On English rule down to Canadian Federation, the student should consult the following articles: QUEBEC ACT; JAMES MURRAY; AMERICAN WAR OF INDEPENDENCE—and particularly the articles on MONTGOMERY and ARNOLD, leaders in the nearly successful attempt of the Americans to capture Canada, and that on the 1st Baron DORCHESTER, the British defender of Quebec; JOHN GRAVES SIMCOE; LOYALISTS—and the articles

NEW BRUNSWICK and ONTARIO, both regions largely influenced by the settlement there of these Loyalists; AMERICAN WAR OF 1812—and especially the articles ISAAC BROCK, by Prof. W. L. Grant, Queens University, Kingston; ERIE, OLIVER H. PERRY, SACKETT'S HARBOR, TECUMSEH, LAKE CHAMPLAIN (Vol. 5, p. 830); FORT NIAGARA (Vol. 19, p. 634); JOHN STRACHAN; PAPINEAU and W. L. MACKENZIE for the two revolts of 1837; LORD DURHAM; LORD SYDENHAM; ROBERT BALDWIN and SIR LOUIS LAFONTAINE, heads of the first Liberal administrations; EARL ELGIN (Vol. 9, p. 268); SIR A. A. DORION; JOHN SANDfIELD MACDONALD, "the Ishmael of Parliament"; SIR JOHN BEVERLEY ROBINSON, head of the Tory "Family Compact"; and, for Irish-American outrages on the Canadian border, the article FENIANS.

Federation and Since

On the period since federation (1867), see the article FEDERAL GOVERNMENT (Vol. 10, p. 233) for a general description of this form of administration; the articles NOVA SCOTIA, ALFRED GILPIN JONES and JOSEPH HOWE, for local opposition to federation; SIR CHARLES TUPPER, who alone in the delegation from Nova Scotia favoured federation; THOMAS D'ARCY MCGEE (by A. G. Doughty), a prominent opponent of Fenianism who was assassinated by a Fenian; the articles HUDSON'S BAY COMPANY and SIR G. E. CARTIER, by Prof. W. L. Grant, Queens University, Kingston, for the extinction of the Hudson's Bay Company claims and the transfer of its territories to the government; LOUIS RIEL for the Red River Rebellion; PRINCE EDWARD ISLAND for its entrance into the Dominion; GEORGE BROWN, a prominent

advocate of federation, by Prof. Grant; GEORGE MONRO GRANT, author of *Ocean to Ocean*; SIR JOHN MACDONALD, by G. R. Parkin, author of *Imperial Federation*, and biographer of Macdonald; SIR FRANCIS HINCKS and SIR ALEXANDER GALT, financiers; SIR HUGH ALLAN and SIR DAVID MACPHERSON, for the Canadian Pacific Railway question; *Lord Dufferin*; *Alexander Mackenzie*, head of a Liberal government from 1873 to 1878 when SIR JOHN MACDONALD returned to power on a platform calling for protection of Canadian industries; GEORGE TAYLOR DENISON, founder of the "Canada First" party; SIR SAMUEL LEONARD TILLEY, Macdonald's minister of finance, who was principally responsible for the tariff of 1879; *Sir Louis Henry Davies*, Liberal politician and jurist; *Lord Strathcona*, by Prof. W. L. Grant, BARON MOUNTSTEPHEN, SIR WILLIAM C. VAN HORNE and SIR SANDFORD FLEMING for the completion of the Canadian Pacific Railway; LOUIS RIEL for the Second Riel Rebellion; SIR JOHN THOMPSON; GEORGE EULAS FOSTER; SIR H. G. JOLY DE LOTBINIÈRE; HONORÉ MERCIER, the French leader of Quebec; S. N. PARENT; SIR MACKENZIE BOWELL, premier in 1894–1896; his successor, *Sir Charles Tupper*; EDWARD BLAKE, a Liberal leader who in 1892 left Canadian politics to take a seat in the British House of Commons; SIR OLIVER MOWAT, Blake's successor as premier of Ontario; GEORGE WILLIAM ROSS; SIR DANIEL WILSON, educational reformer, by Professor Grant; SIR WILFRID LAURIER (by J. S. Willison, author of *Sir W. Laurier and the Liberal Party: A Political History*), the great Liberal leader of the last decade, and Laurier's ministers of finance, *Sir Richard John Cartwright* and *W. S. Fielding*, and his minister of militia SIR FREDERICK WILLIAM BORDEN; SIR

WILLIAM MULOCK; and ROBERT L. BORDEN, long leader of the Conservative opposition and premier in 1911.

CHAPTER XLV
ENGLISH, SCOTCH AND IRISH HISTORY

The British Empire

The student of English history in the Britannica may well begin with the summary view in the article BRITISH EMPIRE (Vol. 4, p. 606), equivalent to 30 pages of this Guide, by Lady Lugard, wife of the British explorer and colonial administrator, Sir Frederick Lugard, herself an authority on colonial subjects and well-known as colonial editor of the *Times* of London. On pp. 608–610 there is a chronological list of the acquisitions of the Empire, and nothing will surprise the reader more than the comparative recentness of the movement by which two small islands have expanded into an empire covering nearly one-fourth of the earth's land surface. Except for the Channel Islands, the Isle of Man, and "the nominal possession of Newfoundland by Sir Humphrey Gilbert in 1583, all the territorial acquisitions of the Empire have been made in the 17th and subsequent centuries." On each of the localities mentioned in this imposing list the reader will find a separate article in its proper alphabetical place in the Encyclopaedia Britannica dealing with

geography, government and history. Here it will be possible only to call attention to articles on the more important branches of the subject.

Early Britain

On the early inhabitants of the islands and on British archaeology, read the elaborate article CELT (Vol. 5, p. 611; equivalent to 135 pages of this Guide), by Prof. William Ridgeway, Cambridge, author of *The Oldest Irish Epic*, and E. C. Quiggin, lecturer in Celtic, Cambridge,—with particularly full treatment of Celtic languages and literatures,—Gaulish, Irish, Scottish, Gaelic, Manx, Welsh, Breton and Cornish; and the article BRITAIN (Vol. 4, p. 583; equivalent to 40 pages of this Guide), which is illustrated by a map of Roman Britain and plans of Roman remains. The treatment of pre-Roman and Roman Britain is by Professor F. J. Haverfield of Oxford; and later Britain is described by Hector Munro Chadwick, librarian of Clare College, Cambridge, and author of *Studies on Anglo-Saxon Institutions*.

Then read:

WALES, *History* (Vol. 28, pp. 261–268), by Herbert Murray Vaughan, Keble College, Oxford.

Scottish History

SCOTLAND, *Political History* (Vol. 24, pp. 429–457), by Andrew Lang, author of *History of Scotland from the Roman Occupation*; and, among many other articles, SCOTLAND, CHURCH OF, (Vol. 24, 460), by the Rev. Dr. Allan Menzies, St. Mary's College, St. Andrews, and such biographies as: MALCOLM III. (Canmore); ALEXANDER I, II AND III (Vol. 1, p. 563); WILLIAM THE LION (Vol. 28, p. 665); WALLACE, SIR WILLIAM (Vol. 28, p. 277), by A. F. Hutchinson, late

rector of the High School, Stirling; ROBERT I, THE BRUCE (Vol. 23, p. 395); DAVID I AND II (Vol. 8, p. 859); JAMES I, II, III, IV AND V (Vol. 15, p. 139); MARY, QUEEN OF SCOTS (Vol. 17, p. 817), a striking biography by the poet and essayist Algernon Charles Swinburne, author of the tragedies *Chastelard*, *Bothwell* and *Mary Stuart*; BOTHWELL (Vol. 4, p. 303), by P. C. Yorke; RIZZIO (Vol. 23, p. 388); DARNLEY (Vol. 7, p. 836), and see also the article CASKET LETTERS (Vol. 5, p. 449), an examination of the evidence in this mystery by Andrew Lang; MAR (Vol. 17, p. 666); KNOX, JOHN (Vol. 15, p. 878), by Dr. Alexander Taylor Innes, author of JOHN KNOX and *Studies in Scottish History*; GOWRIE (Vol. 12, p. 301), by R. J. McNeill, late editor *St. James's Gazette*; and JAMES I of England—VI of Scotland (Vol. 15, p. 136); and for the later period see ENGLISH HISTORY to supplement Andrew Lang's account of the period since the Union under SCOTLAND, *History*.

Irish History

IRELAND, *History* (Vol. 14, p. 756), by Prof. E. C. Quiggin, of Cambridge, on the early period, and Richard Bagwell, commissioner of national education for Ireland and author of *Ireland under the Tudors*, *Ireland under the Stuarts*, etc.; and to supplement this general treatment such separate articles as ST. PATRICK (Vol. 20, p. 933) and ST. COLUMBA (Vol. 6, p. 737), both by Dr. E. C. Quiggin; ST. BRENDAN (Vol. 4, p. 495); BRIAN (Vol. 4, p. 515); BREHON LAWS (Vol. 4, p. 488), by Laurence Ginnell, M. P. for North Westmeath and author of *Land and Liberty*, etc.; O'NEILL family (Vol. 20, p. 107) and O'DONNELL family (Vol. 20, p. 6), by R. J. McNeill; FITZGERALD family (Vol. 10, p. 441), by J. H. Round, author of *Feudal England*, etc.; TYRONE, earls of (Vol.

27, p. 549); TYRCONNELL (Vol. 27, p. 548); ST. LEGER, SIR ANTHONY (Vol. 24, p. 23), by R. J. McNeill; DESMOND (Vol. 8, p. 98); BUTLER family (Vol. 4, p. 879), by Oswald Barron, editor of *The Ancestor*; DROGHEDA (Vol. 8, p. 587); PEEP-OF-DAY BOYS (Vol. 21, p. 45); ORANGEMEN (Vol. 20, p. 160); FLOOD, HENRY (Vol. 10, p. 525); GRATTAN, HENRY (Vol. 12, p. 379); TONE, T. WOLFE (Vol. 27, p. 2) and EMMET, ROBERT and THOMAS A. (Vol. 9, pp. 342–343), all by R. J. McNeill; O'CONNELL, DANIEL (Vol. 19, p. 990), by the late William O'Connor Morris, author of *Irish History*, etc.; FENIANS (Vol. 10, p. 254), by R. J. McNeill; BUTT, ISAAC (Vol. 4, p. 889); PARNELL, C. S. (Vol. 20, p. 854), by James R. Thursfield, author of *Peel*, etc.; DAVITT, MICHAEL (Vol. 7, p. 870); BOYCOTT (Vol. 4, p. 353); DILLON, JOHN (Vol. 8, p. 273); PLUNKETT, SIR HORACE CURZON (Vol. 21, p. 857); REDMOND, JOHN E. (Vol. 22, p. 968); and many articles on Irish towns and counties, and, on Home Rule and recent political questions, the biographies of English viceroys, premiers and chief secretaries, and the latter part of the article ENGLISH HISTORY.

ENGLISH HISTORY

On English history the student will find the Britannica particularly valuable. The article ENGLISH HISTORY (Vol. 9, pp. 466–587), is itself equivalent to about 380 pages of this Guide, and carries the story through 13 centuries. This great article—a text-book of the subject in scope and power—is written by: Prof. C. W. C. Oman, Oxford, author of *England before the Norman Conquest*, etc., dealing with the period down to the time of Elizabeth; Prof. A. F.

Pollard, University of London, assistant editor *Dictionary of National Biography*, for the Reformation and the reign of Elizabeth, 1528–1603; Samuel Rawson Gardiner, best known as the historian of the Puritan Revolution, who deals with the period from 1603 to 1793; W. Alison Phillips, author of MODERN EUROPE, on the years 1793 to 1837; and Hugh Chisholm, editor-in-chief of the Encyclopaedia Britannica, for the period since the accession of Queen Victoria. And the article closes with a critical estimate of *Sources and Writers of English History*, by Prof. Albert Frederick Pollard, University of London.

For the period from 600 to 1066 read: Part 1 of ENGLISH HISTORY (Vol. 8, pp. 466–474); and the separate articles:

Anglo-Saxon Period

For the introduction of Christianity and the "Kingdoms"—AUGUSTINE (Vol. 2, p. 910); AETHELBERHT (Vol. 1, p. 289); EDWIN (Vol. 9, p. 7), by F. G. M. Beck, of Clare College, Cambridge; ANGLO-SAXONS (Vol. 2, p. 38), by H. M. Chadwick; BRITAIN, *Anglo-Saxon* (Vol. 4, pp. 589–595) and ANGLI (Vol. 2, p. 18) and JUTES (Vol. 15, p. 609), by the same author; SAXONS (Vol. 24, p. 264); NORTHUMBRIA (Vol. 19, p. 793); BERNICIA (Vol. 3, p. 802); DEIRA (Vol. 7, p. 933); EAST ANGLIA (Vol. 8, p. 827); WESSEX (Vol. 28, p. 534); MERCIA (Vol. 18, p. 151); SUSSEX, KINGDOM of (Vol. 26, p. 168), and KENT (Vol. 15, p. 735), ECGBERT (Vol. 8, p. 869); AETHELWULF (Vol. 1, p. 292).

On the Danish invasions and the Anglo-Saxon period, VIKING (Vol. 28, pp. 62–66), by C. F. Keary, author of *The Vikings in Western Europe*; ÆTHELBALD (Vol. 1, p. 289), ÆTHELBERHT (Vol. 1, p. 289) and

ÆTHELRED I (Vol. 1, p. 290); ALFRED THE GREAT (Vol. 1, p. 582), by Charles Plummer, biographer of Alfred; DANELAGH (Vol. 7, p. 803), by Prof, Allen Mawer of Armstrong College, Newcastle-on-Tyne; EDWARD "THE ELDER" (Vol. 8, p. 989), ÆTHELSTAN (Vol. 1, p. 291), EDMUND I (Vol. 8, p. 948), EDGAR (Vol. 8, p. 933), all by Prof. Mawer; ST. DUNSTAN (Vol. 8, p. 684), ÆTHELRED II "the Unready" (Vol. 1, p. 290), by Rev. C. Stanley Phillips, King's College, Cambridge; SWEYN I (Vol. 26, p. 224), by R. Nisbet Bain of the British Museum; DANEGELD (Vol. 7, p. 803); CANUTE (Vol. 5, p. 221), by R. Nisbet Bain; EDMUND "Ironside" (Vol. 8, p. 948), by Rev. C. Stanley Phillips; HAROLD I (Vol. 13, p. 11); HARDICANUTE (Vol. 12, p. 942); EDWARD "the Confessor" (Vol. 8, p. 990), by Rev. C. Stanley Phillips; HAROLD II (Vol. 13, p. 11).

For the Norman Conquest and the Norman and Angevin kings the student should read the second section of the article ENGLISH HISTORY (Vol. 9, pp. 474–486) and, at least, the following important articles:

William the Conqueror
William Rufus
Henry I
Stephen and Matilda
Henry II

WILLIAM I, "The Conqueror" (Vol. 28, p. 659), by H. W. Carless Davis of Oxford, author of *England under the Normans and Angevins*; HEREWARD (Vol. 13, p. 363), by J. H. Round, author of *Feudal England*, etc.; FEUDALISM (Vol. 10, p. 297), by Prof. George Burton Adams, Yale University, author of *Political*

History of England, 1066–1216, etc.; DOMESDAY BOOK (Vol. 8, p. 398), by J. H. Round; WILLIAM II, "Rufus" (Vol. 28, p. 661) and LANFRANC (Vol. 16, p. 169), both by H. W. Carless Davis; ANSELM (Vol. 2, p. 81); HENRY I (Vol. 13, p. 279), STEPHEN (Vol. 25, p. 881), MATILDA (Vol. 17, p. 888), HENRY II (Vol. 13, p. 281), BECKET, THOMAS (Vol. 3, p. 608), RICHARD I, "Coeur de Lion" (Vol. 23, p. 294), all by H. W. Carless Davis.

John Henry III Edward I to III

In connection with the third section of the article ENGLISH HISTORY dealing with the struggle for constitutional liberty from 1199 to 1337 (Vol. 9, pp. 486–501) the following supplementary articles are among the many to which the student should turn: JOHN (Vol. 15, p. 439), and LANGTON, STEPHEN (Vol. 16, p. 178), both by H. W. Carless Davis; MAGNA CARTA (Vol. 16, p. 314), by A. W. Holland, late scholar of St. John's, Oxford; HENRY III (Vol. 13, p. 282), PEMBROKE (Vol. 21, p. 78), MONTFORT, SIMON DE (Vol. 18, p. 781), EVESHAM (Vol. 10, p. 10); EDWARD I (Vol. 8, p. 991–993), by Prof. T. F. Tout, University of Manchester, author of *Edward I*; MORTMAIN (Vol. 18, p. 880); WESTMINSTER, STATUTES OF (Vol. 28, p. 551); EDWARD II (Vol. 8, p. 993); LANCASTER, HENRY and THOMAS, EARLS OF (Vol. 16, pp. 144 and 148); DESPENSER, HUGH LE (Vol. 8, p. 101); MORTIMER family (Vol. 18, p. 879); and EDWARD III (Vol. 8, p. 994).

Richard II Henry IV to VI

On the Hundred Years' War (1337–1453) and contemporary history, see the section in ENGLISH HISTORY (Vol. 8, pp. 501–516); the article HUNDRED

YEARS' WAR (Vol. 13, p. 893), by Jules Viard, archivist of the National Archives, Paris; SLUYS, BATTLE OF (Vol. 25, p. 246), by D. Hannay, author of *Short History of the Royal Navy*; CRÉCY (Vol. 7, p. 389); POITIERS, BATTLE OF (Vol. 21, p. 898); EDWARD, THE BLACK PRINCE (Vol. 8, p. 999), by Prof. Tout; WYCLIFFE (Vol. 28, p. 866), by R. Lane Poole, author of *Wycliffe and Movements for Reform*, and W. Alison Phillips, author of *Modern Europe*, etc.; LANCASTER, JOHN OF GAUNT, DUKE OF (Vol. 16, p. 146), by C. Lethbridge Kingsford, biographer of Henry V; RICHARD II (Vol. 23, p. 295), also by C. L. Kingsford; TYLER, WAT (Vol. 27, p. 495); BALL, JOHN (Vol. 3, p. 263); LOLLARDS (Vol. 16, p. 929), by Dr. T. M. Lindsay, author of *History of the Reformation*; GLOUCESTER, THOMAS, DUKE OF (Vol. 12, p. 130); NORFOLK, THOMAS MOWBRAY, DUKE OF (Vol. 19, p. 742); HENRY IV (Vol. 13, p. 283), by C. L. Kingsford; GLENDOWER, OWEN (Vol. 12, p. 120); NORTHUMBERLAND (Vol. 19, p. 787); HENRY V (Vol. 13, p. 284) and OLDCASTLE, SIR JOHN (Vol. 20, p. 66), by C. L. Kingsford; AGINCOURT (Vol. 1, p. 375); HENRY VI (Vol. 13, p. 285) and GLOUCESTER, HUMPHREY, DUKE OF (Vol. 12, p. 129), both by C. L. Kingsford; BEDFORD JOHN, DUKE OF (Vol. 3, p. 616); JOAN OF ARC (Vol. 15, p. 520), by Prof. J. T. Shotwell of Columbia University and Hugh Chisholm, editor-in-chief of the Encyclopaedia Britannica; BEAUFORT family (Vol. 3, p. 585); CADE, JOHN (Vol. 4, p. 927).

Edward IV and V
Richard III
Henry VII

On the fifth period of English history, read section 5, *The Wars of the Roses (1453–1497)* in the article

ENGLISH HISTORY (Vol. 9, pp. 516–525); the separate article, ROSES, WARS OF THE (Vol. 23, p. 735); and the articles: YORK, HOUSE OF (Vol. 28, p. 924), and LANCASTER, HOUSE OF (Vol. 16, p. 143), both by James Gairdner, author of *The Houses of Lancaster and York*, etc.; YORK, RICHARD, DUKE OF (Vol. 28, p. 926), WARWICK, RICHARD NEVILLE, EARL OF (Vol. 28, p. 339), EDWARD IV (Vol. 8, p. 996), MARGARET OF ANJOU (Vol. 17, p. 702), CLARENCE, GEORGE, DUKE OF (Vol. 6, p. 428), EDWARD V (Vol. 8, p. 996), RICHARD III (Vol. 23, p. 296), and BUCKINGHAM, HENRY STAFFORD, 2ND DUKE OF (Vol. 4, p. 726), all by C. L. Kingsford; HENRY VII (Vol. 13, p. 286), by James Gairdner, author of *The Houses of Lancaster and York*, and biographer of Henry VII; WARBECK, PERKIN (Vol. 28, p. 316).

Henry VIII Edward VI Mary Elizabeth

The sixth section of the article ENGLISH HISTORY, dealing with the years 1497–1528 (Vol. 9, pp. 525–530), should be supplemented by the latter part of James Gairdner's article on HENRY VII and by the articles: REFORMATION (Vol. 23, p. 4), by Prof. James Harvey Robinson, Columbia University, author of *History of Western Europe*, etc.; HENRY VIII (Vol. 13, p. 287) and FOX, RICHARD (Vol. 10, p. 766), both by Prof. A. F Pollard; WOLSEY, THOMAS (Vol. 28, p 779); CATHERINE OF ARAGON (Vol. 5 p. 529) and BOLEYN, ANNE (Vol. 4, p. 159), by P. C. Yorke, Oxford; CROMWELL THOMAS (Vol. 7, p. 499); CRANMER THOMAS (Vol. 7, p. 375); FISHER, JOHN (Vol. 10, p. 427), by Rev. E. L. Taunton, author of *The English Black Monks of St. Benedict*, etc.; MORE, SIR THOMAS (Vol. 18, p. 822), by Mark Pattison, late

rector of Lincoln College, Oxford; HOWARD, CATHERINE (Vol. 13, p. 832); PARR, CATHERINE (Vol. 20, p. 861); NORFOLK, THOMAS HOWARD, 3RD DUKE OF (Vol. 19, p. 743); ASKEW, ANNE (Vol. 2, p. 762), by A. F. Pollard; EDWARD VI (Vol. 8, p. 996); SOMERSET, EDWARD SEYMOUR, DUKE OF (Vol. 25, p. 386); NORTHUMBERLAND, JOHN DUDLEY, EARL OF WARWICK, AND DUKE OF (Vol. 19, p. 788); GREY, LADY JANE (Vol. 12, p. 590); MARY I (Vol. 17, p. 814) and GARDINER, STEPHEN (Vol. 11, p. 460), both by James Gairdner; WYAT, SIR THOMAS (Vol. 28, p. 862); POLE, CARDINAL (Vol. 21, p. 974), by E. L. Taunton; RIDLEY, NICHOLAS (Vol. 23, p. 320); LATIMER, HUGH (Vol. 16, p. 242), by T. F. Henderson, author of *Mary Queen of Scots and the Casket Letters*; ELIZABETH (Vol. 9, p. 282); MARY QUEEN OF SCOTS (Vol. 17, p. 817), by A. C. Swinburne; NORFOLK, THOMAS HOWARD, 4TH DUKE OF (Vol. 19, p. 744); ARMADA (Vol. 2, p. 560); HAWKINS, SIR RICHARD (Vol. 13, p. 99); DRAKE, SIR FRANCIS (Vol. 8, p. 473); RALEIGH, SIR WALTER (Vol. 22, p. 869); LEICESTER, ROBERT DUDLEY, EARL OF (Vol. 16, p. 390); ESSEX, ROBERT DEVEREUX, EARL OF (Vol. 9, p. 782); BACON, FRANCIS (Vol. 3, p. 135), by Prof. Robert Adamson of Glasgow, and J. Malcolm Mitchell, University of London; BURGHLEY, WILLIAM CECIL, BARON (Vol. 4, p. 816); and—for this whole period the article ENGLAND, CHURCH OF (Vol. 9, especially pp. 447–448), by William Hunt, author of *History of the English Church*.

James I Charles I The Commonwealth Charles II James II

The seventh part of the article ENGLISH HISTORY

(Vol. 9, pp. 535–542) deals with the *Stuart Monarchy, the Great Rebellion and the Restoration (1603–1689)*. From the great wealth of supplementary material in the Britannica on this interesting period, at least the following articles should be selected: STEWART or STUART family (Vol. 12, p. 911); JAMES I (Vol. 15, p. 136); GUNPOWDER PLOT (Vol. 12, p. 727); BIBLE, ENGLISH (Vol. 3, p. 894); SALISBURY, ROBERT CECIL, 1ST EARL OF (Vol. 24, p. 76); BUCKINGHAM, GEORGE VILLIERS, 1ST DUKE OF (Vol. 4, p. 722); THIRTY YEARS' WAR (Vol. 26, p. 852); CHARLES I (Vol. 5, p. 906) and LAUD, WILLIAM (Vol. 16, p. 276), both by P. Chesney York; SHIP-MONEY (Vol. 24, p. 982); HAMPDEN, JOHN (Vol. 12, p. 900); PYM, JOHN (Vol. 22, p. 680) and STRAFFORD, THOMAS WENTWORTH, EARL OF (Vol. 25, p. 978), both by P. C. Yorke; GREAT REBELLION (Vol. 12, p. 403); CROMWELL, OLIVER (Vol. 7, p. 487), by P. C. Yorke, C. F. Atkinson and R. J. McNeill; Cromwell, Richard (Vol. 7, p. 498); for the military operations of the Great Rebellion, the articles listed under that heading in the chapter of this Guide entitled *For Army Officers*; MONK, GEORGE (Vol. 18, p. 723); CHARLES II, (Vol. 5, p. 912); CLARENDON, EDWARD HYDE, 1ST EARL OF (Vol. 6, p. 428); BUCKINGHAM, GEORGE VILLIERS, 2ND DUKE OF (Vol. 4, p. 724); CLEVELAND, DUCHESS OF (Vol. 6, p. 500); PORTSMOUTH, DUCHESS OF (Vol. 22, p. 131); GWYN, NELL (Vol. 12, p. 750); LAUDERDALE, DUKE OF (Vol. 16, p. 279); SHAFTESBURY, 1ST EARL (Vol. 24, p. 760) by Osmund Airy, biographer of Charles II; DUTCH WARS (Vol. 9, p. 729); TEST ACTS (Vol. 26, p. 665); JAMES II (Vol. 15, p. 138); ARGYLL, 9TH EARL OF (Vol. 2, p. 484); MONMOUTH, DUKE OF (Vol. 18, p. 725); TYRCONNELL (Vol. 27, p. 548).

William and Mary;

Anne

On the Revolution and the age of Anne (1689–1714) see the article ENGLISH HISTORY (Vol. 9, pp. 542–544), and WILLIAM III. (Vol. 28, p. 662); MARY II. (Vol. 17, p. 816); BURNET, GILBERT (Vol. 4, p. 851); GRAND ALLIANCE (Vol. 12, p. 342), and for additional military articles the chapter *For Army Officers* in this Guide; ANNE (Vol. 2, p. 65); MARLBOROUGH, 1ST DUKE OF (Vol. 17, p. 737), by W. Prideaux Courtney; MASHAM, LADY (Vol. 17, p. 836); GODOLPHIN (Vol. 12, p. 174); SOMERS (Vol. 25, p. 384); HALIFAX, 1ST MARQUESS OF (Vol. 12, p. 839); OXFORD, 1ST EARL (Vol. 20, p. 403); BOLINGBROKE, VISCOUNT (Vol. 4, p. 161); SHREWSBURY, DUKE OF (Vol. 24, p. 1016).

George I to IV William IV

The part of the article ENGLISH HISTORY dealing with the Hanoverian Kings, 1714–1793 (Vol. 9, pp. 544–551) and that on the Revolutionary epoch, the reaction and the triumph of reform, 1793–1837 (pp. 551–558) are respectively by S. R. Gardiner and W. Alison Phillips. They should be supplemented by S. R. Gardiner's articles on the four Georges (Vol. 11, pp. 737–745); SOUTH SEA BUBBLE (Vol. 25, p. 515); STANHOPE, 1ST EARL (Vol. 25, p. 773); WALPOLE, HORATIO (Vol. 28, p. 288); WHIG AND TORY (Vol. 28, p. 588); TOWNSHEND, CHARLES (Vol. 27, p. 111); CAROLINE (Vol. 5, p. 380); PELHAM, HENRY (Vol. 21, p. 67); CHARLES EDWARD, "the Young Pretender" (Vol. 5, p. 940), by H. M. Vaughan, author of *The Last of the Royal Stuarts*; METHODISM (Vol. 18, p. 293); WESLEY, JOHN (Vol. 28, p. 527); NEWCASTLE, THOMAS PELHAM HOLLES, DUKE OF (Vol. 19, p. 471); CHATHAM, WILLIAM PITT, 1ST

EARL OF (Vol. 6, p. 1); SEVEN YEARS' WAR (Vol. 24, p. 715) and, for engagements and commanders in the war, see the chapter in this Guide *For Army Officers*; INDIA, *History* (Vol. 14, especially pp. 407–409); CANADA, *History* (Vol. 5, especially p. 158); BUTE, 3RD EARL OF (Vol. 4, p. 877); GRENVILLE, GEORGE (Vol. 12, p. 580); ROCKINGHAM, MARQUESS OF (Vol. 23, p. 434); GUILFORD, 2ND EARL, Lord North (Vol. 12, p. 691); WILKES, JOHN (Vol. 28, p. 642); BURKE, EDMUND (Vol. 4, p. 824), by John Morley; FOX, CHARLES JAMES (Vol. 10, p. 761); GORDON, LORD GEORGE (Vol. 12, p. 253); LANSDOWNE, MARQUESS OF, Lord Shelburne (Vol. 16, p. 184); PORTLAND, 3RD DUKE (Vol. 22, p. 119); PITT, WILLIAM (Vol. 21, p. 667); FRENCH REVOLUTIONARY WARS (Vol. 11, p. 171), NAPOLEONIC CAMPAIGNS (Vol. 19, p. 216) and, for leaders and engagements in these wars, in the Peninsular War, and in the American War for Independence, see the chapter in this Guide *For Army Officers*; CAROLINE AMELIA AUGUSTA (Vol. 5, p. 380); WELLESLEY, MARQUESS (Vol. 28, p. 506); LONDONDERRY, MARQUESS OF, Castlereagh (Vol. 16, p. 969); CANNING, GEORGE (Vol. 5, p. 186); CORN LAWS (Vol. 7, p. 174); COBBETT, WILLIAM (Vol. 6, p. 606); WELLINGTON, DUKE OF (Vol. 28, p. 507); WILLIAM IV. (Vol. 28, p. 664); GREY, 2ND EARL (Vol. 12, p. 586); BROUGHAM, LORD (Vol. 4, p. 652); PARLIAMENT (Vol. 20, especially p. 843); MELBOURNE, 2ND VISCOUNT (Vol. 18, p. 90); PEEL, SIR ROBERT (Vol. 21, p. 40).

Victoria

On the reign of Victoria the section of the article ENGLISH HISTORY (Vol. 9, pp. 558–582) gives a very full treatment, which should be supplemented by the study of such articles as: VICTORIA (Vol. 28, p. 28),

by Hugh Chisholm, editor-in-chief of the Encyclopaedia Britannica; ALBERT (Vol. 1, p. 495), by the same author; PALMERSTON (Vol. 20, p. 645); RUSSELL, 1ST EARL (Vol. 23, p. 863); O'BRIEN, WILLIAM SMITH (Vol. 19, p. 953); CHARTISM (Vol. 5, p. 953); DERBY, 14TH EARL (Vol. 8, p. 66); CRIMEAN WAR (Vol. 7, p. 450); "ALABAMA" ARBITRATION (Vol. 1, p. 464); BRIGHT, JOHN (Vol. 4, p. 567); COBDEN, RICHARD (Vol. 6, p. 607); BEACONSfiELD (Vol. 3, p. 563); GLADSTONE, W. E. (Vol. 12, p. 66), by G. W. E. Russell, biographer of Gladstone; SALISBURY (Vol. 24, p. 72); TRANSVAAL, *History* (Vol. 27, p. 193); PARNELL, C. S. (Vol. 20, p. 854); GORDON, C. G. (Vol. 11, p. 249); ROSEBERY (Vol. 23, p. 731); RHODES, C. J. (Vol. 23, p. 254).

Edward VII George V

For the years since Victoria's death see the articles: EDWARD VII. (Vol. 8, p. 997) and GEORGE V. (Vol. 11, p. 745), and the articles on recent political leaders: BALFOUR (Vol. 3, p. 250); CHAMBERLAIN (Vol. 5, p. 813); CAMPBELL-BANNERMAN (Vol. 5, p. 131); ASQUITH (Vol. 2, p. 769); and LLOYD GEORGE (Vol. 16, p. 832); and on the reform of the House of Lords PARLIAMENT (Vol. 20, especially pp. 845–847) and REPRESENTATION (Vol. 23, especially pp. 111–113).

CHAPTER XLVI
FRENCH HISTORY

The article FRANCE in the Encyclopaedia Britannica includes a section on *History* (Vol. 10, pp. 801–906) equivalent to 320 pages of this Guide, of which the first part, down to 1870, is by Paul Wiriath, director of the École Supérieure Pratique de Commerce et d'Industrie, Paris, and the part since 1870 is by J. E. C. Bodley, author of *France*, etc. Opposite page 802 are four coloured historical maps showing France at the end of the 10th, 13th and 14th centuries, and the changes in the eastern frontier from 1598 to 1789. The historical part of the article closes with a historiographic section, or critical summary of French historical writing, by Charles Bémont of the University of Paris.

Supplementing this main treatment, see:

Early History of France

On prehistoric and Roman France, GAUL (Vol. 11, p. 533), by Prof. F. J. Haverfield, Oxford, the well-known authority on Roman occupation of Britain and Gaul; BIBRACTE, ALESIA, ITIUS PORTUS, DRUIDISM, and, on Caesar's campaigns, CAESAR, JULIUS; and, on Roman remains, ARLES, NÎMES, ORANGE, ARCHITECTURE, AQUEDUCT, and AMPHITHEATRE.

On the Franks, the articles FRANKS (Vol. 11, p. 35) and SALIC LAW (Vol. 24, p. 68), by Prof. Christian Pfister of the Sorbonne; and the articles, AUSTRASIA, MEROVINGIANS, CHILDERIC, CLOVIS, CHILDEBERT, CLOTAIRE, SIGEBERT, CHARIBERT, GUNTRAM, FREDEGOND, BRUNHILDA, CLOTAIRE II, DAGOBERT, PIPPIN I, II and III, EBROIN, CAROLINGIANS, CHARLES MARTEL (Vol. 5, p. 942), CARLOMAN, CHILDERIC; CHARLEMAGNE, ROLAND, EINHARD, ALCUIN; LOUIS I "the Pious," LOTHAIR (Vol. 17, p. 17); CHARLES II "the Bald" (Vol. 5, p. 897);

FEUDALISM; LOUIS II and III; CHARLES III "the Fat" (Vol. 5, p. 898); ODO; LOUIS IV (Vol. 17, p. 35), by Dr. René Poupardin, secretary of the École des Charles; LOTHAIR (Vol. 17, p. 18); BRUNO; LOUIS V.

Medieval France

For the Capetian period, the articles CAPET (Vol. 5, p. 251); ROBERT "the Strong" (Vol. 23, p. 402); HUGH "the Great" (Vol. 13, p. 857); HUGH CAPET (Vol. 13, p. 858); ROBERT "the Pious" (Vol. 23, p. 399); HENRY I (Vol. 13, p. 290); PHILIP I (Vol. 21, p. 378); LOUIS VI (Vol. 17, p. 35), by Prof. J. T. Shotwell, Columbia University; Prof. Shotwell's article on LOUIS VII; SUGER; ELEANOR OF AQUITAINE (Vol. 9, p. 168); PHILIP AUGUSTUS (Vol. 21, p. 378); INGEBORG; ALBIGENSES; and for French and English relations, RICHARD I and JOHN of England; LOUIS VIII; BLANCHE OF CASTILE (Vol. 4, p. 40); Prof. Shotwell's article on LOUIS IX "St. Louis"; and the article CRUSADES; PHILIP III "the Bold" (Vol. 21, p. 381); PHILIP IV; BONIFACE VIII; SAISSET; NOGARET; TEMPLARS; LOUIS X; PHILIP V and CHARLES IV.

For the Valois line and the history of the period (1328–1498), the article HUNDRED YEARS' WAR; SLUYS; CRÉCY; and for detail of the war the articles under that head in the chapter *For the Army Officer* in this Guide; and PHILIP VI (Vol. 21, p. 383); FLANDERS; ARTEVELDE (Jacob and Philip van); DAUPHINÉ; DAUPHIN; GABELLE; JOHN II (Vol. 15, p. 441); POITIERS; MARCEL; LE COQ; STATES GENERAL; CHARLES II of Navarre (Vol. 5, p. 924); CHARLES V (Vol. 5, p. 917); JACQUERIE; DU GUESCLIN; CHARLES VI; ARMAGNAC; ISABELLA of Bavaria (Vol. 14, p. 860); BENEDICT XIII (Vol. 3, p. 718); JOHN "the Fearless" (Vol. 15, p. 445); AGINCOURT; CHARLES VII; ARTHUR III of Brittany (Vol. 2, p. 682); JOAN OF

ARC; COEUR; AGNES SOREL (Vol. 25, p. 432); BRÉZÉ; PRAGUERIE; LOUIS XI; BALUE; LE DAIM; LIÈGE, *History*; CHARLES "the Bold" of Burgundy (Vol. 5, p. 932); CHARLES VIII; ANNE of France (Vol. 2, p. 70); ANNE of Brittany (Vol. 2, p. 69).

16th Century

For the years, 1498–1589, and the Orleans dynasty, LOUIS XII and AMBOISE, by Prof. Jules Isaac of the Lyons Lycée; MARY (Vol. 17, p. 824); FRANCIS I (Vol. 10, p. 934), by Prof. Isaac; LOUISE OF SAVOY; MARIGNANO; PAVIA; MARGUERITE D'ANGOULÊME (Vol. 17, p. 706); ÉTAMPES (Vol. 9, p. 803); DU PRAT, ANNE DE MONTMORENCY (Vol. 18, p. 787); HENRY II (Vol. 13, p. 291); DIANE DE POITIERS; CATHERINE DE' MEDICI; FRANCIS II; GUISE (Vol. 12, p. 699); L'HÔPITAL; CONDÉ; AMBOISE; ROMORANTIN; HUGUENOTS; CHARLES IX; COLIGNY; SAINT ANDRÉ; ST. BARTHOLOMEW; HENRY III.

The Bourbons

For the Bourbon kings, beginning 1589—BOURBON (with genealogical chart); HENRY IV; Duke of MAYENNE; EDICT OF NANTES (Vol. 19, p. 165); SULLY; LOUIS XIII; MARIE DE' MEDICI; RICHELIEU, by Prof. J. T. Shotwell, Columbia University; CONCINI; LUYNES; CINQUE-MARS; ROHAN; SOUBISE; JANSENISM; THIRTY YEARS' WAR; and for leaders and engagements in that conflict the titles listed in the chapter in this Guide entitled *For Army Officers*; LOUIS XIV, by Prof. A. J. Grant of Leeds University; MAZARIN, by Prof. H. Morse Stephens, University of California; MARIE THERÈSE; LA VALLIÈRE; MONTESPAN; MAINTENON; Duc de BEAUFORT; FRONDE; TURENNE; RETZ and LA ROCHEFOUCAULD, by Prof. George Saintsbury of Edinburgh University; FOUQUET; COLBERT, by Prof. J. T. Shotwell,

Columbia; CHAMPLAIN; LA SALLE; LOUVOIS; CAMISARDS, by M. Frank Puaux, president of the Socíeté de l'Histoire du Protestantisme Français; JANSENISM, by Viscount St. Cyres; PORT ROYAL; BOSSUET; FENELON; LE TELLIER; GRAND ALLIANCE; and for details of military operations and sketches of commanders the articles enumerated in the chapter in this Guide *For Army Officers*; LOUIS XV; Philip II, Duke of ORLEANS (Vol. 20, p. 286); FLEURY; AUSTRIAN SUCCESSION and SEVEN YEARS' WAR and articles under these heads in the chapter in this Guide *For Army Officers*; CHATEAUROUX; POMPADOUR; DU BARRY; COMTE D' ARGENSON (Vol. 2, p. 459), CHOISEUL; MAUPEOU; AIGUILLON.

The Revolution

On the Revolution and the period immediately before it, the articles LOUIS XVI, by Robert Anchel, archivist to the Department de l'Eure; MARIE ANTOINETTE; BEAUMARCHAIS; MAUREPAS; TURGOT; NECKER; VERGENNES; CALONNE; DIAMOND NECKLACE; LOMÉNIE DE BRIENNE; FRENCH REVOLUTION (Vol. 10, p. 154, equivalent to 58 pages of this Guide), by Prof. F. C. Montague, University College, London; DES MOULINS; MIRABEAU; SIEYÈS; DANTON; ROBESPIERRE; MOUNNIER; LA FAYETTE; MONTMORIN DE SAINT-HÉREM; MARAT; CORDAY; TALLEYRAND; ASSIGNATS; NARBONNE-LARA; JACOBINS; GIRONDISTS; ROLAND; BRISSOT; MOUNTAIN; DIRECTORY; BABEUF; FRENCH REVOLUTIONARY WARS; and for battles and leaders in these wars the articles mentioned under this head in the chapter in this Guide *For Army Officers*.

The First Empire

On the Napoleonic period, the articles by J. Holland Rose, author of *Napoleonic Studies*, etc., on

NAPOLEON (Vol. 19, p. 190)—equivalent to 65 pages of this Guide, and on the principal figures of the Napoleonic period,—for example, BONAPARTE family, FOUCHÉ, GARDANE, JUNOT; the articles NAPOLEONIC CAMPAIGNS, PENINSULAR WAR and WATERLOO and the articles listed under these two heads in the chapter in this Guide *For Army Officers*.

The Kingdom Again

On the Bourbon restoration, LOUIS XVIII; DECAZES; Duc de RICHELIEU (Vol. 23, p. 302); Duc de BERRY; VILLÈLE; CHARLES X (Vol. 5, p. 921); MARTIGNAC; POLIGNAC; MARMONT.

On the revolution of 1830 and the rule of Louis Philippe, the articles LOUIS PHILIPPE (Vol. 17, p. 51); CAVAIGNAC; THIERS; GUIZOT; CONSTANT; CASIMIR PÉRIER; LAFITTE; BARROT; DUPONT DE L'EURE; BERRYER; SAINT-SIMON; FOURIER; LAMENNAIS; LOUIS BLANC; MOLÉ.

The Second Empire

On the revolution of 1848 and the second Empire, besides most of the articles in the preceding paragraph, NAPOLEON III, by Albert Thomas, author of *The Second Empire*; CRÉMIEUX; LEDRU-ROLLIN; CARNOT; GARNIER-PAGÈS; MONTALEMBERT; OLLIVIER; ROUHER; FAVRE; PICARD; CRIMEAN WAR; ITALIAN WARS; FRANCO-PRUSSIAN WAR; and articles listed under those heads in the chapter in this Guide *For Army Officers*; EUGÈNIE; MAXIMILIAN of Mexico (Vol. 17, p. 924).

Modern Times

On the Third Republic, 1870 and the following years, the story in Vol. 10, pp. 873–904 (equivalent

to 100 pages of this Guide) is to be supplemented by the articles THIERS; RÉMUSAT; SIMON; BARTHÉLEMY; BROGLIE; MACMAHON; DUFAURE; GRÈVY; FERRY; GAMBETTA; FREYCINET; CHAMBORD; CLÉMENCEAU; BRISSON; BOULANGER; CARNOT; LOUBET; LESSEPS; CASIMIR-PÉRIER; FAURE; RIBOT; MÉLINE; WALDECK-ROUSSEAU; DREYFUS; DUPUY; RIBOT; GALLIFFET; JAURÈS; MILLERAND; COMBES; DELCASSÉ; ROUVIER; PELLETAN; BRIAND; LEMIRE; FALLIÈRES; POINCARÉ.

CHAPTER XLVII
THE FAR EAST

Asiatic Characteristics

An account, in this chapter, of the principal articles dealing with the history of India, China and Japan, will sufficiently indicate to the student the plan adopted in the Britannica's treatment of all the countries in the far East. But before turning to these three groups of articles, he should read ASIA (Vol. 2, p. 734), which defines the social and economic position of the Orient in general, and gives a survey of the field covered by articles on Eastern countries other than the three dealt with in this chapter. This article, equivalent in length to 65 pages of this Guide, is by Sir Richard Strachey, the famous Indian administrator; Sir Charles Eliot, of the British diplomatic service Sir T. H. Holdich, of the Indian Frontier Survey; and Philip Lake, the Oriental geologist. The general survey of Asiatic

characteristics, as revealed by history, with which the historical section (p. 749) of the article begins, is noteworthy in connection with current political questions:

> The words "Asiatic" and "oriental" are often used as if they denoted a definite and homogeneous type, but Russians resemble Asiatics in many ways, and Turks, Hindus, Chinese, etc., differ in so many important points that the common substratum is small. It amounts to this, that Asiatics have not the same sentiment of independence and freedom as Europeans. Individuals are thought of as members of a family, state or religion, rather than as entities with a destiny and rights of their own. This leads to autocracy in politics, fatalism in religion, and conservatism in both.

All three of these are certainly conspicuous in the history of the first Eastern country dealt with in this chapter.

INDIA

In the article INDIA (Vol. 14, p. 375), (equivalent to 140 pages of this Guide) there is much of value to the historical student besides the chapter on *History* (p. 395), which is written by Sir William Wilson Hunter, administrative head of the statistical survey of India and one of the editors of *The Imperial Gazetteer of India*, and by James Sutherland Cotton, editor of this same Gazetteer. Particularly important are the sections, *The People* (p. 382), *Administration* (p. 385), and *Indian Costume* (p. 417), illustrated from pen-and-ink drawings by J. Lockwood Kipling, known to many as the illustrator of his son's book *Kim*. And the student of Oriental history will find it possible to gain a little comprehension—at least—of Oriental ways of thought, Eastern setting and colour,

by reading in the Britannica such articles as CASTE (Vol. 5, p. 464), HINDUISM (Vol. 13, p. 501), BRAHMANISM, BRAHMAN and BRAHMANA (Vol. 4, p. 378), all by Prof. Julius Eggeling, Edinburgh; BUDDHA and BUDDHISM (Vol. 4, p. 737), both by Prof. T. W. Rhys Davids of Manchester, author of *Sacred Books of the Buddhas*, etc.; MAHOMET (Vol. 17, p. 399), by Prof. D. G. Margoliouth, Oxford; MAHOMMEDAN INSTITUTIONS and MAHOMMEDAN LAW (Vol. 17, p. 411), by Prof. D. S. Macdonald, Hartford Theological Seminary, and MAHOMMEDAN RELIGION (Vol. 17, p. 417), by Rev. G. W. Thatcher, Camden College, Sydney, N. S. W.; INDIAN LAW (Vol. 14, p. 434), by Sir William Markby, author of *Lectures on English Law*, etc.; and ZOROASTER (Vol. 28, p. 1039), by Prof. Karl Geldner, Marburg, and PARSEES (Vol. 20, p. 866). This list of articles subsidiary to the history of India could be prolonged almost indefinitely, but enough has been given to put the student on the track of valuable articles which might otherwise escape his notice.

Before we come to the authentic history of India there is a legendary period, the only historic test for which is the rock inscriptions,—see the article INSCRIPTIONS, *Indian* (Vol. 14, p. 621), by J. F. Fleet, author of *Inscriptions of the Early Gupta Kings*. On the earliest literary description of the Aryans in India and their contests with the Dravidians see the article SANSKRIT, *Vedic Period* (especially p. 161 of Vol. 24, on the *Rig Veda*)—and in general the articles ARYAN and DRAVIDIAN. An interesting reconstruction of the civilization of the primitive Aryans on the basis of languages will be found in the article INDO-EUROPEAN LANGUAGES (Vol. 14, especially pp. 498–500), by Dr. Peter Giles, Cambridge, author of *Manual of Comparative Philology*; and this picture of

Aryan life before the conquest of India will hold in the main for the earlier period of the Aryans in India.

Early Buddhism

With the 6th century we come to the beginning of the Buddhist period. See the article JAINS, the articles on Buddhism already mentioned, and the articles: ASOKA, the great Buddhist emperor and organizer of the faith, whose rock inscriptions throughout India are so valuable as historical records; KANISHKA, the Buddhist king of Kabul and Kashmir; FA-HIEN and HSÜAN TSANG, the Chinese pilgrims of India, who left important records of early Buddhism and of Brahmanism, which was steadily growing in power and strength.

The Hindu period, overlapping the Buddhist, is marked by the beginning of Western influences on India. For the Persians in India see the articles PERSIA (Vol. 21, especially pp. 209–210), DARIUS (Vol. 7, p. 832), and SCYLAX, the Greek who under Darius's orders explored the course of the Indus. Far more important was the conquest by Alexander the Great and the establishment of the Hellenistic empire of the Seleucids in Syria, Bactria and India: see ALEXANDER THE GREAT (Vol. 1, especially p. 548), NEARCHUS, Alexander's admiral and navigator, and SELEUCID DYNASTY. The first paramount ruler of India was CHANDRAGUPTA (Vol. 5, p. 839), whom the Greeks called Sandracottus and who crushed the Seleucid power and founded the Maurya dynasty. Of his grandson Asoka we have already spoken in outlining the growth and decline of Buddhism. In this period Greek thought and art influenced India greatly, and in the period immediately following—2nd century B.C.—northwestern India was invaded again by western troops: see DEMETRIUS,

EUCRATIDES, MENANDER. The records of the next four centuries are confused and vague; on the invasions from the North, see SAKA and YUE-CHI, by Sir Charles Norton Edgcumbe Eliot.

The Yue-Chi founded the Kushan dynasty, in which the greatest king was KANISHKA (Vol. 15, p. 653), already mentioned as a Buddhist ruler whose policy marked the beginning of the end of Buddhism in India. On the succeeding dynasty see the article GUPTA; and refer again to the article FA-HIEN for the Chinese account of the rule of the second Gupta king, Chandragupta,—on whom in legend see VIKRAMADITYA. On the White Huns and their invasion consult the articles EPHTHALITES and HUNS. On the only other great king of this period, who was paramount monarch of northern India in the first half of the 7th century and whose administration was described by Hsüan-Tsang, see HARSHA. On the principal Deccan dynasties of the Hindu period, see CHALUKYA and RASHTRAKUTA, and the article DECCAN.

Mahommedans and Moslems

For a general notion of the Mahommedan period in India the student should read the articles on Mahommedanism already mentioned, and for more definite information about India, the articles on the 11th century invader MAHMUD OF GHAZNI (Vol. 17, p. 397), and on SOMNATH, the temple city which he captured and sacked in 1025. See DECCAN and GUJARAT for the Moslem conquest of these states by Ala-ud-din. For the destruction of the Tughlak dynasty, which followed Ala-ud-din's successors, see AFGHANISTAN (Vol. 1, especially p. 315) and TIMUR (Vol. 26, p. 994), by Major-General Sir Frederick

John Goldsmid. The “last stand made by the national faith in India against conquering Islam” was in VIJAYANAGAR (Vol. 28, p. 62). With the 16th century and the Mogul dynasty, India is quite definitely Moslem: see BABER, HUMAYUN, AKBAR, ABUL FAZL the historian of Akbar’s reign, JAHANGIR, SHAH JAHAN, and AGRA and INDIAN ARCHITECTURE (especially Fig. 17, opposite p. 433, Vol. 14) for the Taj Mahal, the Mausoleum built by Shah Jahan for his wife Mumtäz Mal, and—for the culmination of the Mogul power, the beginning of its decay, and the first sign of Moslem bigotry and intolerance on the part of the Mogul emperors,—AURANGZEB. His attempt to conquer the Mahommedan kings of the Deccan gave the natives an opportunity to regain power: see the article MAHRATTAS, and for the earlier risings of the Mahrattas, SIVAJI. And for the rise of Afghan power under the Durani dynasty and the battle of Panipat in 1761, a crushing defeat for the Mahrattas, see AFGHANISTAN, *History* (Vol. 1, especially p. 316), and AHMAD SHAH.

On earlier European settlements in India see the article INDIA, *History* (Vol. 14, p. 404), and more particularly for Portuguese explorations and settlements the articles VASCO DA GAMA (Vol. 11, p. 433), ALBUQUERQUE (Vol. 1, p. 516), and GOA the capitol of Portuguese India, the last article being by K. G. Jayne, author of *Vasco da Gama and His Successors*: for Dutch rule the article DUTCH EAST INDIA COMPANY (Vol. 8, p. 716); and for the beginning of British influence in India the articles EAST INDIA COMPANY; SURAT; MADRAS, where the first English fort was built in 1640 and the first grant, except for factory use, was made by the English; BOMBAY, acquired from Portugal in 1661–65; SIR JOHN and SIR JOSIAH CHILD; JOB

CHARNOCK, founder of Calcutta, and the article on CALCUTTA.

The British Conquest

On British political history in India in the 18th century, see the articles on PONDICHERRY, DUPLEIX, French Governor-General in Pondicherry, his rival CLIVE the founder of the British Empire and of the power of the East India Company in India, EYRE COOTE who took Pondicherry from the French in 1761, SURAJ-UD-DOWLAH and CALCUTTA for the siege of the city and story of the Black Hole, PLASSEY, SHAH ALAM for the massacre of PATNA; and for the period after CLIVE the articles WARREN HASTINGS, MAHRATTAS for the first Mahratta war, HYDER ALI and MYSORE for the first Mysore war; TIPPOO SAHIB and CORNWALLIS for the second Mysore war; TEIGNMOUTH and BENGAL, for the permanent settlement of Bengal under Cornwallis; WELLESLEY and TIPPOO SAHIB and SERINGAPATAM, WELLINGTON and LAKE (Vol. 16, p. 85) for the campaigns against the French and natives during Wellesley's governor-generalship; LORD MINTO for the years from 1807 to 1813; MARQUESS OF HASTINGS, OCHTERLONY and NEPAL for the war in Nepal; for the wars of 1817 the articles PINDARIS, MAHRATTAS, ELPHINSTONE, SIR JOHN MALCOLM; for the administration (1823–28) of Lord Amherst, the articles AMHERST, BURMESE WARS, BHARATPUR and COMBERMERE; for Bentinck's rule, the articles BENTINCK, SUTTEE, THUGS by Reinhold Rost, late secretary of the Royal Asiatic Society, and MYSORE; METCALFE, for a view of his short tenure of office; for the stormy period of the '40's, AUCKLAND, ELLENBOROUGH, AFGHANISTAN, SIR W. H.

MACNAGHTEN, SIR R. H. SALE and SIND; and for the Sikh wars, HARDINGE, PUNJAB, SIKH WARS, RANJIT SINGH, SIR HUGH GOUGH, DALHOUSIE, SIR HENRY LAWRENCE, EDWARDES, BURMESE WARS for the second war of 1852, and OUDH for its annexation; and for the close of the Company's rule, the articles LORD CANNING, INDIAN MUTINY, DELHI, LORD LAWRENCE, RICHARD BAIRD SMITH, JOHN NICHOLSON, SIR NEVILLE CHAMBERLAIN, CAWNPORE, NANA SAHIB, LUCKNOW, SIR HENRY LAWRENCE, SIR J. E. W. INGLIS, HAVELOCK, J. G. S. NEILL, OUTRAM, Sir Colin Campbell.

On India under the Crown, since 1858, see particularly the articles on the viceroys, CANNING, ELGIN, LAWRENCE, MAYO, NORTHBROOK, LYTTON (see also SHERE ALI and YAKUB KHAN),—RIPON (see also AYUB KHAN, EARL ROBERTS, and ABDUR RAHMAN KHAN), DUFFERIN (see also PANJDEH for the Russian scare of 1885 and BURMA and BURMESE WARS for the dispute with Thebaw), CURZON and KITCHENER, and MINTO.

CHINA

As with India, so with China, the whole of the article in the Britannica is of value to the historical student. The article CHINA (Vol. 6, pp. 166–231) is equivalent to 200 pages of this Guide. The most important part for the student of history is section V. (pp. 188–212) on *History*: but such parts of the article as *Geography*, with a coloured map, the *People* (pp. 171–174), *Religion* (174–177), *Economics* (177–181), *Government and Administration* (181–188), *Art* (213–216) with illustrations, and *Language and Literature* (216–231) are all of importance to help get

the background that is so baffling to an occidental studying the Far East. As was the case with India, the study of religions is particularly important and besides the section *Religion* in the article CHINA, the student should turn to the articles LAO-TSZE, the founder of a philosophy debased into Taoism, MENCIUS, and CONFUCIUS, all by the Rev. James Legge, author of *The Religions of China*, and the editor of *The Chinese Classics*, and BUDDHISM and LAMAISM, the latter the form of Buddhism in vogue in China,—and he should remember that there are some Mahommedans in China. In connection with the latest developments in Chinese history he should read with great care in the article CHINA, Section IV, *Government and Administration*, especially p. 184 on the Civil Service, an elaborate merit system.

Section V. of the article CHINA opens with a treatment by Sir Henry Yule, the famous Orientalist, of the European knowledge of China before 1615, particularly "Cathay" and the early explorers of Mongolia, CARPINI (see Vol. 5, p. 397) and RUBRUQUIS (see Vol. 23, pp. 810–812), and of Cathay itself MARCO POLO (see Vol. 22, pp. 7–10). The internal history of China begins (Vol. 6, p. 191) with a discussion of Chinese origins: "anthropological arguments seem to contradict the idea of any connection with Babylonians, Egyptians, Assyrians, or Indians. The earliest hieroglyphics of the Chinese, ascribed by them to the Shang dynasty (second millenium B.C.) betray the Mongol character of the nation that invented them by the decided obliquity of the human eye whenever it appears in an ideograph.... Our standpoint as regards the origin of the Chinese race is, therefore, that of the agnostic.... Their civilization was already old at a time when Britain and Germany were peopled by

half-naked barbarians, and the philosophical and ethical principles on which it is based remain, to all appearances, as firmly rooted as ever." Chinese legendary history goes back to Fu-hi as the "first historical emperor; and they place his lifetime in the years 2852–2738 B.C." **The First Definite Date** There is much that is purely legendary and mythical in these early records, but with the year 776 B.C. we find a veritable record: in an ode referring to a wicked emperor there is mention of "certain signs showing that Heaven itself is indignant at Yu-wang's crimes. One of these signs was an eclipse of the sun ... the date and month being clearly stated. This date corresponds exactly with August 29, 776 B.C.; and astronomers have calculated that on that precise date an eclipse of the sun was visible in North China." It is an interesting coincidence that this earliest sure date in Chinese history is the date of the first Greek Olympiad, from which time was reckoned in the Greek calendar—though there are no certain dates in Greek history until much later. The first outstanding event in the history of China was nearly 20 centuries later—the Mongol invasion; see the articles MONGOLS (Vol. 18, pp. 712–719) and JENGHIZ KHAN (Vol. 15, p. 316), both by Sir Robert K. Douglas, author of *The Life of Jenghiz Khan*. On the period immediately following see KUBLAI KHAN, for the foundation of the Mongol dynasty, and the section *Medieval Cathay* (Vol. 6, p. 189) of the article CHINA for early exploration and missionary effort. Mongol rule was broken in the 14th century by the founder of the Ming dynasty. **Foreign Relations** The Portuguese arrival at Canton in 1517 marked the beginning of modern intercourse with Europe; and see the article MATTEO RICCI by Sir Henry Yule, for the first important work of a Christian missionary in

China early in the 17th century. Immediately thereafter came the Manchu invasion, on which see the article MANCHURIA, by Sir R. K. Douglas. Trade with Europe on a large scale began in the second half of the 18th century; see the article CANTON. British diplomatic missions for the improvement of the condition of traders in Canton were unsuccessful, but in 1840 the opium war made China feel the weight of Great Britain's power when Hong Kong was ceded to the English and other ports were opened to trade: see LORD NAPIER, SIR HUGH GOUGH, and HONG-KONG. On the T'ai-p'ing rebellion, the "Arrow" affair, and the second interference of Great Britain with China, see SIR H. S. PARKES, CHARLES GEORGE GORDON ("Chinese Gordon"), EARL OF ELGIN (Vol. 9, p. 268), TSENG KUO-FAN, LI HUNG CHANG. On the Russian boundary disputes of 1858 and 1860 see AMUR and VLADIVOSTOK.

The history of China since 1875 is told pretty completely in the article CHINA, in two sections, the first on 1875–1901 being by Sir Valentine Chirol, author of *The Far Eastern Question*. But in connection with the general treatment the student should read the articles on KOREA, ANNAM and TONGKING for the earlier efforts to detach from the Chinese empire these quasi-vassals; CHINO-JAPANESE WAR for the military details of the struggle by which Japan got command of the Korean coast-line; MEKONG for the dispute of 1895 with Great Britain; KIAOCHOW BAY, PORT ARTHUR and WEI-HAI-WEI for the seizures of 1897 and 1898 by Germany, Russia and Great Britain respectively; JOHN HAY for America's part in the Open Door policy; PEKING and TIENTSIN for details added to the general account in the article CHINA, of the "Boxer" rising; MANCHURIA for Russian encroachments before, and JAPAN for

Manchuria after the Russo-Japanese War.

JAPAN

Japanese in America

The article JAPAN (Vol. 15, p. 156) is equivalent to 370 pages of this Guide,—and is almost entirely the work of Captain Frank Brinkley, editor of the *Japan Mail*, author of *Japan*, *A History of Japan*, *An Unabridged Japanese-English Dictionary*, etc. The article is divided into 10 parts—*Geography*, *People*, *Language and Literature*, *Art*, *Economic Conditions*, *Government and Administration*, *Religion*, *Foreign Intercourse*, *Domestic History*, and *The Claim of Japan; A Japanese View*, by Baron Dairoku Kikuchi, in which the president of the Imperial University of Kyoto and of the Imperial Academy of Japan discusses "the ambition of the Japanese people ... to be recognized as an equal by the Great Powers," their resenting "any discrimination against them as an Asiatic people," the "misrepresentation, arising from want of proper knowledge of Japanese character and feelings," that the Japanese immediately after the war with Russia were "ready and eager to fight with the United States"—whereas the Japanese have always regarded the Americans with a special good will, due no doubt to the steady liberal attitude of the American government and people towards Japan and Japanese, and they look upon the idea of war between Japan and the United States as ridiculous.

Marks of the Race

Any justifiable discrimination against the Japanese

as Asiatics must of course be based upon such characteristics of custom and thought as render Japanese immigration undesirable, and not upon the colour of the Japanese skin or any other peculiarity of appearance. But it is none the less interesting to turn from Baron Dairoku Kikuchi's argument to Capt. Brinkley's careful study (p. 164) of the physical characteristics of the Japanese. "The best authorities are agreed that the Japanese do not differ, physically, from their Korean and Chinese neighbors as much as the inhabitants of Northern Europe differ from those of Southern Europe." Some of the bodily traits which distinguish the Japanese from races of European origin are to be observed "in the eyes, the eyelashes, the cheekbones and the beard." The eyeball does not differ from that of an occidental, but the eye is less deeply set. The conspicuous peculiarity is that the upper eyelids are much heavier at the inner corners than at the outer, making the eyes apparently oblique; and a fold of the upper lids hangs over the roots of the upper lashes. The lashes, too, are short and scanty, and converge, instead of diverging as they do in occidentals, so that the tips are nearer together than the roots. There is but little hair on the face (except among the Ainus), and it is nearly always straight. The cheekbones are prominent among the lower, rather than the upper classes. The article proceeds to discuss the moral characteristics of the Japanese; attributing to them a degree of frugality and endurance such as to make it virtually impossible for any occidental race, living in reasonable comfort, to compete with Japanese labour.

As in the study of India and China, it will be well for the student of Japanese history to make himself familiar with the Britannica's full material on native

religion: see Vol. 15, p. 222, noting especially that in the section on Shinto it is said: “The grandson of the sun goddess was the first sovereign of Japan, and his descendants have ruled the land in unbroken succession ever since.”

Foreign intercourse

In Japanese history two main topics of study present themselves—foreign intercourse and domestic or internal history—the former naturally the more attractive to the foreign student, and of additional interest both because of its picturesque and romantic early detail and by reason of its explaining the sudden emergence of Japan as a power in world politics. Portuguese shipwrecked in Japan in 1542 or 1543 opened the country to Portuguese trade and in 1549 landed the great Jesuit missionary, FRANCISCO DE XAVIER: see the article by K. G. Jayne, author of *Vasco da Gama and his Successors*. The contest between Spain and Portugal for Eastern trade and between Jesuits and Franciscans for Japanese converts to Christianity and the other factors that resulted in the suppression of Christianity in 1614 and the consequent persecutions of converts and missionaries are told in the article JAPAN—and so also is the story of the foothold that Dutch and English traders got before the Japanese practically excluded them also, as Christians rather than as foreigners or traders. From the middle of the 17th to the beginning of the 19th century Japan was practically untouched by Western civilization. The part of the United States navy in opening the country to trade in 1853 is described in the article JAPAN (pp. 237–238) and in the article MATTHEW CALBRAITH PERRY. The article JAPAN also devotes

much space (p. 238) to the work done by another American, Townsend Harris, who was less known than Perry, but who carried through the immensely important first commercial treaty.

Recent Wars

The remainder of the story of Japan's foreign relations is given in the main article JAPAN, but the student should read besides the articles CHINO-JAPANESE WAR, MANCHURIA, and RUSSO-JAPANESE WAR. The last of these would be equivalent to 40 pages of this Guide; it is accompanied by the following plans: *General Dispositions after Nanshan*, *Liao-Yang*, *Port Arthur*, and *Mukden*: and it is a remarkable critical summary of the military operations of the war. Read also the biographies of KATSURA, KODAMA, KUROKI, NOGI, NOZU, OKUMA, OYAMA, TOGO, YAMAGATA.

Domestic History

As for domestic history, it is important to note that early Japanese history is more purely mythical and legendary, and is chronologically untrustworthy for a longer period than is Chinese history. The conventionally accepted date of the establishment of the Empire is 660 B. C.; and from this year all dates are reckoned; but Japanese annals are self-contradictory and are proved faulty by Chinese and Korean records. Even the famed Japanese invasion of Korea in 200 is possibly apocryphal, and there are few trustworthy recorded facts before 400 A.D. or dates before 500 A.D. In the middle of the 6th century Chinese influence, through Korea, became strong, and in 552 Buddhism was introduced from Korea. A century later legislative government and administrative reform began.

On the Japanese feudal system beginning in the

12th century see: the article BUSHIDO; in the article JAPAN the account of the earlier army; and the articles SHOGUN and MIKADO. The more important separate articles for the later period are: TOKUGAWA and ARISUGAWA for the rival families of the 17th–19th centuries; MUTSU HITO; SANJO; OKUBO TOSHIMITSU; SAIGO; MUTSU; IWAKURA MATSUKATA, the financier; KATO; KOMURA; ITO; ENOMOTO; ITAGAKI, "the first to organize and lead a political party in Japan"; INOUYE; OKUMA; YAMAGATA; HAYASHI.

CHAPTER XLVIII
ECONOMICS AND SOCIAL SCIENCE

Many topics in the field of economics and social science are treated with some detail in other parts of this Guide. For public finance, for instance, see the chapter *For Bankers and Financiers*. Tariffs, trusts, labour questions and the problems of population (such as immigration, eugenics, aliens and race-conflict, the liquor traffic, penal and charitable institutions) are among the topics presented in the course on *Questions of the Day*. In this chapter is a brief outline of the entire subject, including these special topics.

The key article, equivalent to 35 pages in this Guide, is ECONOMICS, (Vol. 8, p. 899), by W. A. S. Hewins, formerly director of the London School of Economics, secretary of the tariff commission.

Great Economists

For the history of economic theory in biographies of great economists, see JEAN BODIN; THOMAS MUN; HOBBES; SIR WILLIAM PETTY; SIR WILLIAM TEMPLE; SIR JOSIAH CHILD; VAUBAN; SIR DUDLEY NORTH; FÉNELON; CHARLES DAVENANT; PIERRE BOISGUILBERT; MONTESQUIEU; FRANÇOIS QUESNAY; BENJAMIN FRANKLIN; ANTONIO GENOVESI; SIR JAMES STEUART; JOSIAH TUCKER; VICTOR MIRABEAU; COUNT OF CARLI-RUBBI; JUSTUS MÖSER; PEDRO RODRIGUEZ; ADAM SMITH; ANNE ROBERT JACQUES TURGOT; FERDINANDO GALIANI; BECCARIA-BONESANA; DU PONT DE NEMOURS; GASPAR MELCHOR DE JOVELLANOS; GAETANO FILANGIERI; ALEXANDER HAMILTON; HENRY THORNTON; THOMAS ROBERT MALTHUS; MELCHIORRE GIOJA; JEAN BAPTISTE SAY; DAVID RICARDO; JEAN C. L. DE SISMONDI; JAMES MILL; THOMAS TOOKE; RICHARD JONES; ROBERT TORRENS; FRIEDRICH LIST; J. R. M'CULLOCH; NASSAU W. SENIOR; KARL HEINRICH RAU; HENRY CHARLES CAREY; AUGUSTE COMTE; FREDERIC BASTIAT; HARRIET MARTINEAU; JOHN STUART MILL; BONAMY PRICE; W. T. THORNTON; EMILE DE LAVELEYE; J. E. CAIRNES; J. E. THOROLD ROGERS; J. K. INGRAM; WALTER BAGEHOT; T. E. CLIFFE LESLIE; DAVID AMES WELLS; W. STANLEY JEVONS; HENRY GEORGE; FRANCIS AMASA WALKER; W. G. SUMNER; L. J. BRENTANO; WILLIAM CUNNINGHAM; EUGEN BOEHM VON BAWERK; ARNOLD TOYNBEE; R. T. ELY; A. T. HADLEY; D. R. DEWEY; F. W. TAUSSIG; W. J. ASHLEY; E. W. BEMIS; and E. R. A. SELIGMAN.

For the chief branches of economic theory read:

Economic Theory

VALUE (Vol. 27, p. 867) by Dr. J. S. Nicholson, professor of political economy, Edinburgh University,

author of *Principles of Political Economy*, etc. This article, equivalent to 25 pages of this Guide, distinguishes between utility and value—to be valuable a "thing must have some utility; and there must be some difficulty in its attainment." There are three laws of value—supply and demand, in the discussion of which monopoly-values and competition-values are considered; that of cost of production, in which cost of raw material and wages are obvious factors; and that of increasing cost with increased quantity of production,—upon which depends the theory of rent.

WEALTH (Vol. 28, p. 437) is by the same author, who adopts the definition of wealth connected with the name of Adolf von Held, based on a study of *consumption*, *production* and *distribution* of wealth, —"consumable utilities which require labour for their production and can be appropriated and exchanged."

CONSUMPTION (Vol. 7, p. 23) is the "destruction of utilities."

PRODUCTION (Vol. 22, p. 423) is the creation of utilities.

CAPITAL (Vol. 5, p. 278) is accumulated wealth available for earning interest and producing fresh wealth. "It is not antithetical to labour, but ... the accumulated savings of labour and of the profits accruing from the savings of labour." The "importance of ability or brain-work, as against much of modern theorizing against capitalism," must not be overlooked.

WAGES (Vol. 28, p. 229), also by Dr. Nicholson, is equivalent to 17 pages in this Guide. It distinguishes between nominal and real wages, describes the economic wages fund theory, and deals with such

topics as state regulation of wages, factory legislation, trades unions and wages, effects of machinery on wages.

Further information, more particularly in the field of finance, will be found in:

BANKS AND BANKING (Vol. 3, p. 334), with a special treatment of American banking by Charles A. Conant, formerly treasurer of the Morton Trust Co., New York City, and author of *History of Modern Banks of Issue*, and with the general description by Sir Robert Palgrave, director of Barclay & Co., Ltd., and editor of the *Dictionary of Political Economy*.

TRUST COMPANY (Vol. 27, p. 329) is by C. A. Conant, late treasurer of the Morton Trust Co., New York.

MONEY (Vol. 18, p. 694) and FINANCE (Vol. 10, p. 347) are by Prof. Charles Francis Bastable, University of Dublin, author of *Public Finance*, etc.

See also the articles on GOLD, SILVER, BIMETALLISM, and MONETARY CONFERENCES.

On "Ideal" social systems, see these four groups of articles:

Anarchism, Socialism, etc.

ANARCHISM (Vol. 1, p. 914), by Prince Kropotkin, author of *Modern Science and Anarchism*, and a contributor to the Britannica on Russian geography; and NIHILISM (Vol. 19, p. 686), by Sir Donald Mackenzie Wallace, author of *Russia*, and *The Web of Empire*; and biographies of WILLIAM GODWIN, PROUDHON, BAKUNIN, CLÉMENCE LOUISE MICHEL, KROPOTKIN, MOST, RECLUS (like Kropotkin, well known as a geographer), TOLSTOY, and on "anarchist" outrages see CHICAGO (Vol. 6, p. 125),

McKinley, Alexander II of Russia, M. F. S. Carnot, Elizabeth of Austria (Vol. 9, p. 285), and Humbert.

Communism (Vol. 6, p. 791), and see also Robert Owen, New Harmony, Amana, Shakers, Fourier, Brook Farm, Considerant, Cabet, Saint-Simon and Oneida Community; and on Plato's "Republic," Plato (especially pp. 818–819, Vol. 21); on More's "Utopia," the article Sir Thomas More (especially p. 825, Vol. 18); on Bacon's "New Atlantis," the article Francis Bacon (especially p. 144, Vol. 3); on Hobbe's "Leviathan," the article Hobbes (especially p. 547, Vol. 13); on Campanella's "Civitas Solis" or "City of the Sun," the article Campanella (Vol. 5, p. 121); Samuel Butler (Vol. 4, p. 887) for "Erewhon" and "Erewhon Revisited"; and Edward Bellamy (Vol. 3, p. 694) for "Looking Backward," the latest of the well-known literary pictures of an ideal commonwealth.

Co-Operation (Vol. 7, p. 82), by Aneurin Williams, chairman of executive, International Co-Operative Alliance, and author of *Twenty-eight Years of Co-operation at Guise*; and Building Societies (Vol. 4, p. 766) and Friendly Societies (Vol. 11, p. 217), both collaborative articles by Sir Edward William Brabrook, late chief registrar of friendly societies, and Dr. Carroll D. Wright, late United States Commissioner of Labor; and for the different co-operative experiments, see, in addition to the articles mentioned under Communism above: Rochdale, Guise, Jean Baptiste, André Godin, E. V. Neale, Raiffeisen and Schulze-Delitzsch for German co-operative banks and rural credit, Ireland (especially p. 749, Vol. 14), France (especially p. 782, Vol. 10), Italy (especially p. 14, Vol. 15), Russia (especially p. 887, Vol. 23, on the

Artel); and for American approaches to co-operation the articles HOPEDALE, PULLMAN and MORMONS (especially p. 846, Vol. 18).

SOCIALISM (Vol. 25, p. 301), by James Bonar, author of *Philosophy and Political Economy*; and supplement this by the articles ROBERT OWEN; KARL MARX, by Edward Bernstein, author of *Theorie and Geschichte des Socialismus* and formerly a Socialist member of the Reichstag and a leader of the German Socialist movement away from Marx; RODBERTUS; LASSALLE; KETTLER; BEBEL; LIEBKNECHT; SCHMOLLER; JAURES; MILLERAND; HENRY GEORGE; WILLIAM MORRIS; H. G. WELLS; BERNARD SHAW; JOHN BURNS; and local articles, especially NEW ZEALAND and FINLAND.

Tariffs, Trusts, etc.

Among the more interesting general economic topics are tariffs and trusts, matters of constant and great importance both in politics and business. See the articles: TARIFF (Vol. 26, p. 422), by Dr. F. W. Taussig, professor at Harvard, and author of *The Tariff History of the United States*; FREE TRADE (Vol. 11, p. 88), by Dr. William Cunningham, archdeacon of Ely, author of *Growth of English Industry and Commerce*.

PROTECTION (Vol. 22, p. 464), by E. J. James, president of the University of Illinois, author of *History of American Tariff Legislation*, etc.

For the history of tariff legislation in the United States, the articles ALEXANDER HAMILTON, HENRY CLAY, FEDERALIST PARTY, ANTI-FEDERALIST PARTY, DEMOCRATIC PARTY, WHIG PARTY, REPUBLICAN PARTY, J. S. MORRILL, MCKINLEY, etc., and UNITED STATES HISTORY (Vol. 27) especially § 113 (p. 689), § 151 (p. 694), § 195 (p. 701), § 241 (p. 708), § 297

(p. 716), § 314 (p. 718), § 354 (p. 728), § 370 (p. 728), § 373 (p. 729), etc.

And for the English tariff legislation in the last hundred years, the articles CORN LAWS, JOHN BRIGHT, COBDEN, JOSEPH CHAMBERLAIN, etc.

The article TRUSTS (Vol. 27, p. 334), by Prof. J. W. Jenks of New York University should be supplemented by the article GILDS (Vol. 12, p. 14), contributed by the late Professor Charles Gross of Harvard University, and for American Trust Legislation, by the articles INTERSTATE COMMERCE (Vol. 14, p. 711) and UNITED STATES, *History* (Vol. 27), especially pages 725–726, 729, 734. See also under separate state headings.

Labour and Wages

The article on Gilds just referred to will serve as an introduction to the subject of labour and labour organizations. The most important articles on modern conditions are TRADE UNIONS (Vol. 27, p. 140); STRIKES AND LOCKOUTS (Vol. 25, p. 1024); and LABOUR LEGISLATION (Vol. 16, p. 7), all with American sections by Carroll D. Wright, late U. S. Commissioner of Labor. On labour legislation see the special article EMPLOYERS' LIABILITY (Vol. 9, p. 356) and the sections on legislation and miscellaneous laws in separate state articles.

Statistics, Population, etc.

One of the great branches of economics is the study of statistics. Advisedly we say "*study* of statistics" and in the Britannica the student will find comparatively few statistical tables, but much analysis both of statistics and of their meaning. For statistics of population see, for instance, the section

on population in the article UNITED STATES or in any one of the state or city articles. Under *Population and Social Conditions* in the article UNITED STATES (Vol. 27, pp. 634–638) are treated: growth of the nation geographically and in population, with special consideration of immigration; changes in localities; urban and rural population; interstate migration; sexes; vital statistics—death rate, marriage, families, birth-rate, illiteracy; religious statistics; occupations; national wealth. And the state articles give: total population at each census; foreign-born and of foreign parentage,—often with analysis and historical outlines of immigration and its variation and character and amount; religious statistics; negroes and whites, Indians, Asiatics, etc.; urban population, with list of larger cities and population of each. In articles on American cities and towns population figures are given from the last census; comparisons are made between native and foreign-born and the foreign-born are classified, and, where there is a predominant element, like the Germans in Cincinnati and St. Louis, an estimate of the influence of this element.

One of the problems of population peculiar to the United States, particularly the Southern states, is the negro. See the article NEGRO (Vol. 19, p. 344), especially the part dealing with the United States, which is by Walter F. Willcox, professor of social science and statistics in Cornell University and chief statistician of the U. S. Census Bureau. This article and that on DIVORCE (Vol. 8, p. 334)—another urgent American problem—are remarkable examples of the treatment of a social question from the point of view of a statistician in a most interesting and illuminating manner, although based on dry statistics, and in a manner all the more satisfying and

accurate because it has carefully analyzed figures at the back of it.

The status of the negro in different states is described in the separate state articles, and there, too, the reader will find a summary of local divorce laws.

Other articles coming under the head of population are INFANTICIDE, ILLEGITIMACY, LEGITIMACY and LEGITIMATION.

Social Legislation

In the chapter in this Guide on *Questions of the Day* attention is called to the increasing tendency of the state to control and regulate matters which a generation or so ago were considered outside the sphere of government. Two particular economic questions—"social evils" we sometimes call them—are foremost in this category and on these the student of economics should read in the Britannica:

The article PROSTITUTION (Vol. 22, p. 457), by Dr. Arthur Shadwell, member of the Council of the Epidemiological Society and author of *Industrial Efficiency and Drink*, *Temperance and Legislation*, and the articles LIQUOR LAWS (Vol. 16, p. 759) and TEMPERANCE (Vol. 26, p. 578), also by Dr. Shadwell. These should be supplemented by accounts of local legislation against liquor, as for example in the articles MAINE, KANSAS, SOUTH CAROLINA, etc. On the Gothenburg system of Sweden and Norway see Vol. 16, pp. 769 and 780, and Vol. 26, p. 587, where, we learn that the essence of this method of conducting the retail traffic is that the element of private gain is eliminated. See besides biographies of temperance reformers—e.g., THEOBALD MATHEW, NEAL DOW, JOHN B. GOUGH, etc.

Another great problem which the state and the

municipality are attempting to solve, or to help solve, by means of legislation is that of housing. See the article HOUSING (Vol. 13, p. 814), which comprises not only the topic of city housing and its faults due to overcrowding, excessive value of land in great cities, etc., but the subject of rural housing, and the experiments in garden cities, model towns, etc. See also the article OCTAVIA HILL (Vol. 13, p. 465), and for American model towns, HOPEDALE, PULLMAN, etc.

Social Welfare

Many movements for social welfare are of a very different character and are based on an entirely different principle from that of repressive or controlling legislation. Charities, education, care of insane, training of defectives, prison reform—such are a few of these topics, and the student will quickly learn that these burdens have been borne quite as much by the individual as by the State, and that in many instances individual initiative has by long and laborious effort succeeded in reforming in this field abuses which had flourished under government care.

Charity

Of prime importance to the student is the elaborate article on CHARITY AND CHARITIES (Vol. 5, p. 860), by Dr. Charles Stewart Loch, secretary to the council of the London Charity Organization Society and author of *Charity Organization*, *Methods of Social Advance*, etc. This article, equivalent in contents to 100 pages of this Guide, is made up of an introduction and six parts, as follows:

Introduction: “Charity,” as used in New Testament, means love and mercy—an ideal social state.

Part I.—Primitive Charity—highly developed idea of duty to guest or stranger, whether beggar or vagrant.

Part II.—Charity among the Greeks. “In Crete and Sparta the citizens were wholly supported out of the public resources.” In Athens, charity by: legal enactment for release of debts; assisted emigration; gifts of grain; poor relief for infirm and for orphans of soldiers; pay for public service; private charity; loan societies.

Part III.—Charity in Roman Times. “The system obliged the hard-working to maintain the idlers, while it continually increased their number.” “The effect on agriculture, and proportionally on commerce generally, was ruinous.”

Part IV.—Jewish and Christian Charity. In Christianity a fusion of Jewish and Greco-Roman practice. Summary of Hebrew Charity. “To mark the line of development, we compare: 1. The family among Jews and in the early Christian church. 2. The sources of relief and the tithe, the treatment of the poor and their aid, and the assistance of special classes of poor. 3. The care of strangers; and, lastly, we would consider the theory of alms giving, friendship or love, and charity.”

Part V.—Medieval Charity and its Development. St. Francis and his influence. St. Thomas Aquinas. Medieval endowed charities.

Part VI.—After the Reformation. “The religious life was to be democratic—not in religious bodies, but in the whole people; and in a new sense—in relation to family and social life—it was to be moral. That was the significance of the Reformation.” Organization of municipal relief. Poor relief acts and statutory serfdom. Progress of thought in 18th and 19th century: influence of Rousseau, of Law, of Howard, of Bentham, of Nonconformists, particularly Friends in England; Society for Bettering the Condition of the Poor (1796). The Poor Law. Movement for Old Age Pensions. Charity Organization. Hospitals.

American charities and their peculiar problems.

Other articles bearing on the subject are:

POOR LAW (Vol. 22, p. 74), for the British system, and Dr. T. A. Ingram’s articles UNEMPLOYMENT (Vol. 27, p. 578) and VAGRANCY (Vol. 27, p. 837).

Prisons

One of the earliest and most important definite charitable movements was prison reform. On this subject see in the Britannica the articles,—all by Major Arthur Griffiths, British inspector of prisons,—PRISON, CRIME, CRIMINOLOGY, CHILDREN'S COURTS, POLICE, JUVENILE OFFENDERS, DEPORTATION, FINGER PRINTS, IDENTIFICATION. This series of articles shows both the improvements in methods of treating criminals, in itself a means of protecting society, and the better methods of defense and of police.

Insane

On the treatment of the insane and feeble-minded, on the gradual assumption of responsibility for them by governments, and on the transition from the prison-like asylum to the modern hospital, see the article INSANITY, particularly part III (Vol. 14, p. 616), on Hospital Treatment, by Dr. Frederick Peterson, professor of psychiatry, Columbia University, author of *Mental Diseases*, etc.

Deaf and Blind

As great as the change in treatment of the insane has been that in the treatment of the deaf and blind. On this subject read the articles; BLINDNESS (Vol. 4, p. 59), by Sir Francis J. Campbell, principal of the Royal Normal College for the Blind; and DEAF AND DUMB (Vol. 7, p. 880), by the Rev. Arnold Hill Payne, chaplain of the Oxford Diocesan Mission to the Deaf and Dumb. Both these authors have had experience in teaching in the United States as well as in Great Britain,—one of the many striking instances of the wisdom displayed in the choice of contributors to the Britannica. And see the articles on GALLAUDET

(Vol. 11, p. 416), the great teacher of the deaf, and S. G. HOWE (Vol. 13, p. 837), the educator of the blind.

Biographies

The following list, arranged for the most part in chronological order, gives some of the names of reformers and philanthropists about whom there are separate articles. These biographical sketches will be of great value for the study of the history and development of charitable work for the public welfare.

John Kyrle

Thomas Guy

Thomas Coram

Adam Anderson

Gen. Booth

John Howard

Tuke (family)

Baron de Montyon

Granville Sharp

Johann Beckmann

Sir Thomas Bernard

Robert Owen

François Charles Marie Fourier

George Birkbeck

Elizabeth Fry

Sir M. H. Montefiore

Sir Thomas F. Buxton

Theobald Mathew

Lucretia Mott
Joseph Sturge
Sir Rowland Hill
B. N. M. Appert
Gerrit Smith
Framjee Nasarwanjee Patel
Victor P. Considerant
E. Vansittart Neale
Baroness Burdett-Coutts
Grace Horsley Darling
J. B. A. Godin
John B. Gough
George Jacob Holyoake
Madhowdas Vurjcevandas
Clara Barton
Louis Adolphe Bertillon
Henri Cernuschi
Mary Ashton Livermore
Sir Francis Galton
Geo. Thorndike Angell
Sir D. M. Petit
George Smith of Coalville
M. E. L. Walras
Emily Faithfull
Lyman Judson Gage
Octavia and Miranda Hill

A. Carnegie

Baron Rowton

J. D. Rockefeller

Benjamin Waugh

Frances E. Willard

F. A. Bebel

Charles Booth

Gabriel Tarde

Laurence Gronlund

Samuel Gompers

Sidney Webb

Jane Addams

Helen Gould

CHAPTER XLIX
HEALTH AND DISEASE

You may have happened to glance at one of the text-books written for the use of medical students and of doctors, and found that you could hardly understand a word of it. And yet you have found, when you consulted a specialist, and he wanted to explain to you just what was wrong with some part of your body, that he could make it all quite clear to you. The six hundred articles on health and disease in the Britannica are written by specialists, most of them,

indeed, by professors in the leading medical schools; and these contributors to the Britannica are also the authors of many of the best text-books that practising physicians and surgeons habitually use. But in the Britannica the specialists were writing for the general public; and for that reason they have taken care not to be too technical either in their point of view or in the language they use.

Right and Wrong Way to Read

In this present chapter of the Reader's Guide, the subject of health and disease is treated just as the Guide treats any other department of knowledge. You may want to learn something about it because it is one of the most wonderful branches of science, just as you would take up the course of reading on astronomy. Or you may feel that you ought to know more than you do about your own body, about the way you should live in order to preserve your health, and about the causes of the diseases to which you are exposed. Some people will tell you that it is unwise to read about the subject at all. That is absurd. There are no doubt exceptional people, with unsound nerves, who will imagine they must take every patent medicine they see advertised, and who long to try every newly discovered serum that the newspapers tell them about.

The Danger of "Doctoring" Yourself

Again, you may be told that if you try to learn something about health and disease, you will be tempted to think you know as much as the doctor; and so neglect to go to him when you need his advice. But this objection, again, applies only to

people who lack good sense. For example, if you read the article on DENTISTRY, by Dr. E. C. Kirk, dean of the Dental Faculty of the University of Pennsylvania, it will help you to understand whatever your dentist may be doing for you. But it will certainly not give you the idea that you could fill your own teeth.

When you find your watch has stopped, you wind it. Then, if it does not start, you take it to the watchmaker. If, instead of doing that, you tried to tinker with it yourself, you would soon be in trouble. On the other hand, it would be ridiculous to go to the watchmaker without first finding out whether the watch merely wanted winding, and a man ought to know enough about his watch to connect the fact that it has stopped with the probability that he has forgotten to wind it. The daily winding is his work, not the watchmaker's. The chemical and mechanical work that is going on within you is as complicated as anything in a watch or anything that you could see in a laboratory or factory. It is your business (*and your most important business, for if you neglect it, you will not be able to do anything properly, for yourself or for anybody else*) to keep this machinery running, and to do that is not so simple as to wind a watch. Your body needs food and warmth. It very probably gets too much of both. Furthermore, the food is often unwholesome, and the warmed air is often bad air. But unless you are a millionaire invalid, you do not have a private doctor with you at all hours to watch the food put on your plate and to ventilate your room.

The Kind of Knowledge You Need

The average watch is better treated than the

average human body, and when the average body goes wrong, through the average man's thoughtlessness, he proceeds, without in the least knowing what is wrong, to take violent medicines, or to experiment with some fad about diet or underclothing or gymnastics, and to make matters very much worse. The knowledge he can gain from the Britannica will tend to keep him from being careless, and also from trying to doctor himself when he needs professional care. Whether you undertake a complete course of medical reading or not, it is certainly worth your while to read the first group of articles mentioned in this chapter—those which have to do with the healthy routine of life.

Eating and Drinking

You will find the best introduction to the subject of diet in general in a section (Vol. 26, p. 799) of the article THERAPEUTICS, by Sir Lauder Brunton. He is one of the most famous consulting physicians in the world, and he gives you advice which your own doctor will certainly confirm when he tells you that the way to avoid indigestion is to masticate your food well and sip half a pint of hot water four times a day—when you go to bed, when you get up, and again about an hour before luncheon and dinner, instead of drinking anything with any meal except your breakfast. If you try that treatment for a week, you will be glad that you looked at this chapter of the Guide. NUTRITION (Vol. 19, p. 920), by Prof. Noel Paton and Dr. Cathcart, describes the process of nourishment and shows how important it is to chew the food thoroughly, not only in order to break it up, but also in order to combine with it a sufficient supply of the chemical juices which come from the

glands in the mouth. DIETETICS (Vol. 8, p. 214) shows what use your body makes of each kind of food that you eat. This article, by the late Dr. Atwater of the United States Department of Agriculture, who conducted the famous government investigation of diet, and R. D. Milner, also of the Department, contains tables showing the amount of nourishment required by persons who are doing light or heavy muscular work, as well as by those who lead a sedentary life. It will interest you to see (p. 218) how the food of an American business man compares with that of an American working in a lumber camp. The article DIETARY (Vol. 8, p. 212), describing the food given to prisoners, soldiers and sailors in various parts of the world, contains some striking information as to the possibilities of the simple life. In Sweden prisoners get only two meals a day, and those consisting chiefly of porridge or gruel; and the "punishment diet" in English prisons is one pound of bread a day, and nothing else but water. The article WATER SUPPLY (Vol. 28, p. 387), by G. F. Deacon, deals with the storage and distribution of water, and shows how it should be filtered for drinking. SEWERAGE (Vol. 24, p. 735) describes the sanitary systems which prevent the pollution of streams and wells. MINERAL WATERS (Vol. 18, p. 517) describes the great variety of springs from which the table-waters in general use are obtained. Their medicinal values are also indicated, and in the table which classifies thirty of the most important American springs it is curious to see that nearly all of them lie in the Appalachian Mountain chain.

Hurtful Foods

VEGETARIANISM (Vol. 27, p. 967), by Dr. Josiah Oldfield, describes the various systems of diet which

reject flesh, the most extreme of which exclude everything but nuts, fruit and cereals, all to be eaten raw. COOKERY (Vol. 7, p. 74) shows how the digestibility of food is influenced by methods of cooking, and unhesitatingly condemns the general practice of baking meat. ADULTERATION (Vol. 1, p. 218), by Dr. Otto Hehner, describes the dangers to health which arise from the use of preservatives as well as substitutes. For the use of boracic acid, which has been proved to be slightly unwholesome, but not really dangerous, there is at any rate the excuse that it keeps food from spoiling, but the article has nothing but blame for the "coppering" of vegetables. "Many years ago some artful, if stupid, cook found that green vegetables like peas or spinach, when cooked in a copper pan, by preference a dirty one, showed a far more brilliant colour than the same vegetable cooked in earthenware or iron. The manufacturer who puts up substances like peas in pots or tins for sale produces the same effect which the cook obtained by the wilful addition of a substance known to be injurious to health, namely, sulphate of copper." FOOD PRESERVATION (Vol. 10, p. 612) also shows the risks of using carelessly canned goods. TEMPERANCE (Vol. 26, p. 578), by Dr. Arthur Shadwell, tells the story of the reforms that have been effected since the 18th century days when London bars used to put up signs inviting customers to get "drunk for one penny" or "dead drunk for twopence;" and LIQUOR LAWS (Vol. 16, p. 759) describes temperance legislation in all parts of the world, with a most interesting section on prohibition in the United States. DRUNKENNESS (Vol. 8, p. 601) deals specifically with the effects of excess on the health.

ALIMENTARY CANAL (Vol. 1, p. 663), by Dr.

Chalmers Mitchell, describes all the organs of the body that deal with food. DIGESTIVE ORGANS (Vol. 8, p. 262), by Dr. Andrew Gillespie, shows how indigestion arises, and DYSPEPSIA (Vol. 8, p. 786) describes the symptoms caused by habitual indigestion. METABOLIC DISEASES (Vol. 18, p. 195), by Dr. Noel Paton, covers all the maladies arising from defective nutrition. CORPULENCE (Vol. 7, p. 192) tells about the reduction of superfluous fat, while FASTING (Vol. 10, p. 193) and HUNGER AND THIRST (Vol. 13, p. 931) discuss the intentional or accidental cutting down of the usual food supply. FAMINE (Vol. 10, p. 166) gives a most interesting account of the disasters with which crop failures still threaten Asiatic countries. The feeding of young children is, of course, a distinct subject, and is treated in great detail in the article INFANCY (Vol. 14, p. 513), by Dr. Harriet Hennessy.

Sleep and the Want of it

SLEEP (Vol. 25, p. 238), by Prof. McKendrick, is an elaborate study of the curious changes in the action of the brain and other organs which take place during slumber. INSOMNIA (Vol. 14, p. 644) is a practical article on the causes and treatment of sleeplessness. Between absolutely lying awake and obtaining a really good night's rest there are many intermediate stages, and the article DREAM (Vol. 8, p. 558) contains a great deal of curious information about disturbed sleep. SOMNAMBULISM (Vol. 25, p. 393) shows that when dreams are vivid enough to produce sleepwalking there must be nervous trouble calling for immediate treatment. NARCOTICS (Vol. 19, p. 239) describes the dangers of the drugs to produce sleep; and in HYPNOTISM (Vol. 14, p. 201)

and SUGGESTION (Vol. 26, p. 48) there is a full account of the treatment frequently used for sleeplessness and other nervous disorders.

The Right Kind of Air

The effect of climates upon health is the subject of a special section (Vol. 6, p. 526) of the article CLIMATE. VENTILATION (Vol. 27, p. 1008) shows how to secure fresh air in the house without draughts. DUST (Vol. 8, p. 713), by Dr. Aitken, the inventor of the ingenious machine for counting the particles of dust floating in the atmosphere, gives a very full account of the impurities in the air. HEATING (Vol. 13, p. 160) contains descriptions and diagrams of the best methods of warming houses, and there is at the end of the article an account of the system of steam heating employed at Lockport, N. Y., where buildings anywhere within three miles of the central plant are heated at a very moderate cost.

General Hygiene

BATHS (Vol. 3, p. 514), and HYDROPATHY (Vol. 14, p. 165), and BALNEOTHERAPEUTICS (Vol. 3, p. 284) describe all the bathing treatments in which water, steam and hot air are employed. Electric baths are described in ELECTROTHERAPEUTICS (Vol. 9, p. 249), and AEROTHERAPEUTICS deals with compressed air baths. MASSAGE (Vol. 17, p. 863), by Dr. Arthur Shadwell, describes all the systems of rubbing. GYMNASTICS (Vol. 12, p. 752) gives an account of the Swedish and other systems of hygienic exercise; and out-door exercises of every kind are described in the articles mentioned in the chapter of *Readings in Connection with Recreations and Vacations*. Two other articles which relate to general hygiene

are DISINFECTANTS (Vol. 8, p. 312) and ANTISEPTICS (Vol. 2, p. 146). The proper care of the hair is indicated in the article BALDNESS (Vol. 3, p. 243), where prescriptions for lotions are given.

Various Diseases

The articles already named cover very fully the application of medical science to the ordinary routine of life, and will help you to regulate wisely your habits in regard to eating, sleeping and to the general care of your body. It may be the case that you wish, for your own sake, or for the sake of some member of your family, to carry your reading further in respect to some one disease or some one part of the body. In the list of articles at the end of this chapter you will find more than two hundred, each of which deals with one disease, such as rheumatism, catarrh, malaria or neuralgia. In the case of a very simple trouble you will find directions for treatment, as for example in the article CORN, where you are advised to use a solution of salicylic acid in collodion, or, for a soft corn, to paint it with spirits of camphor. Where the trouble is anything more serious, you should of course consult a doctor, but you will understand what he tells you all the better, and worry less, if you have read an article, which describes the usual course of the disease.

Parts of the Body

Again, you may have a special reason for wishing to learn all you can about some one part of the body: the eye, the ear, or the heart. There are fifty articles, in the list below, each dealing with some one organ or part of the body. The illustrations in these articles will help you to understand the exact position of any trouble which you have read about in the article on a disease affecting that particular part. Another set of

articles divides the body into groups of organs, one dealing with the NERVOUS SYSTEM, another with the MUSCULAR SYSTEM, another with the RESPIRATORY SYSTEM, and so on. Then you have the five general articles: ANATOMY, PHYSIOLOGY, PATHOLOGY, THERAPEUTICS and SURGERY, which outline all medical science. The article MEDICINE gives a complete history of medical science, and its section on *Modern Progress* reviews all that has been accomplished within recent years.

More Advanced Study

Beginning with the six articles just mentioned, and then taking the more detailed articles in the groups into which their subjects divide them, it is quite possible to follow in the Britannica a complete course of reading on medicine and surgery, and you may desire to do that, just as someone else likes to read about geology or astronomy. But do not forget that no amount of reading can give you more than a theoretical knowledge. When your doctor discovers what is the nature of your illness (which is much the most difficult part of his work), and when he gives you the treatment you need, his eye is comparing what it sees in your case, and his hand is comparing what it touches in your case, with the thousands of observations that he has made in the wards and in the operating theatre of the hospital. Without going through the course that he has gone through in the dissecting room, and studying the living body as he has studied it, you can never know what he knows. But you will be a more understanding patient, and a better nurse, if occasion brings nursing for you to do, if you have learned something of medical science from the Britannica.

ALPHABETICAL LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA RELATING TO MEDICAL SCIENCE

Abattoir
Abdomen
Abortion
Abscess
Abscission
Acne
Aconite
Acromegaly
Actinomycosis (Streptotrichosis)
Acupressure
Acupuncture
Adam's Apple
Addison's Disease
Adenoids
Adulteration
Aerotherapeutics
Ague
Ala
Albuminuria
Alienist
Alimentary Canal
Amaurosis
Ambulance

Anaemia
Anaesthesia and Anaesthetics
Anatomy
Aneurysm, or Aneurism
Angina Pectoris
Animal Heat
Ankle
Ankylosis, or Anchylosis
Ankylostomiasis
Anodyne
Antiseptics
Aphasia
Aphemia
Apnoea
Aponeurosis
Apophysis
Apoplexy
Apothecary
Appendicitis
Apyrexia
Araroba Powder
Arm
Arnica
Arteries
Arthritis
Articulation

Arytenoid
Asafetida
Ascites
Asphyxia
Asthma
Athetosis
Atrophy
Auscultation
Autopsy
Bacteriology
Baldness
Balneotherapeutics
Balsam
Baths
Bedsore
Belladonna
Beriberi
Bhang
Bibirine
Bilharziosis
Blackwater Fever
Bladder
Bladder and Prostate Diseases
Blindness
Blister
Blood

Blood-letting
Boil
Bone
Bow-leg
Brain
Breast
Bright's Disease
Bronchiectasis
Bronchitis
Bronchotomy
Bunion
Burns and Scalds
Caesarean Section
Caisson Disease
Cajaput Oil
Calabar Bean
Cancer, or Carcinoma
Cantharides
Capsicum
Carbuncle
Cartilage
Castor Oil
Catalepsy
Catarrh
Caul
Chicken-pox

Chilblains
Chirurgeon
Cholera
Chamomile, or Camomile Flowers
Climacteric
Cleft Palate and Hare-Lip
Clinic
Club-foot
Cod-Liver Oil
Coelom and Serous Membranes
Colic
Colon
Coma
Connective Tissues
Constipation
Convulsions
Corn
Corpulence or Obesity
Cramp
Cremation
Cretinism
Croton Oil
Croup
Cubebs
Cupping
Delirium

Dengue
Dentistry
Diabetes
Diaphoretics
Diaphragm
Diarrhoea
Dietary
Dietetics
Digestive Organs
Digitalis
Dilatation
Dill
Diphtheria
Dipsomania
Disinfectants
Diuretics
Dropsy
Drowning and Life Saving
Drug
Drunkenness
Ductless Glands
Dysentery
Dyspepsia
Ear
Eczema
Elaterium

Elbow
Electrotherapeutics
Elephantiasis
Emetics
Emphysema
Enteritis
Epilepsy
Epistaxis
Epithelial, Endothelial and Glandular Tissues
Equilibrium
Ergot, or Spurred Rye
Erysipelas
Eucalyptus
Euphorbium
Excretion
Eye
Face
Fauces
Favus
Fever
Fibrin
Filariasis
Finger
Fistula
Food
Foot

Frostbite
Fumigation
Galangal
Galbanum
Gall
Gamboge
Gangrene
Gastric Ulcer
Gastritis
Gelsemium
Ginseng
Goitre
Gout
Guaco, Huaco, or Guao
Guaiacum
Guarana
Guinea-Worm
Gynaecology
Haematocele
Haemophilia
Haemorrhage
Haemorrhoids
Hammer-toe
Hand
Hashish
Hay Fever, or Summer Catarrh

Head
Heart
Heel
Hernia
Herpes
Hip
Homoeopathy
Hospital
Humane Society, Royal
Hunger and Thirst
Hydrocele
Hydrocephalus
Hydropathy
Hydrophobia, or Rabies
Hygiene
Hypertrophy
Hypnotism
Hypochondriasis
Hysteria
Icthyosis or Xeroderma
Imbecile
Infancy
Influenza
Insanity
Insomnia
Intestinal Obstruction

Intestine
Intoxication
Ipecacuanha
Jaborandi
Jalap
Jaundice
Jaw
Joints
Kámalá
Kala-Azar
Kidney Diseases
Kino
Knee
Kousso
Laryngitis
Laudanum
Lead Poisoning
Leg
Leontiasis Ossea
Leprosy
Lethargy
Lichen
Ligament
Lip
Liver
Lobe

Locomotor Ataxia
Lumbago
Lung
Lupus
Lymph
Lymphatic System
Malaria
Malta Fever
Mammary Gland
Massage
Matrix
Measles
Medicine
Medical Education
Medical Jurisprudence
Ménière's Disease
Meningitis
Metabolic Diseases
Midwife
Mineral Waters
Morphine
Mortification
Mouth and Salivary Glands
Mumps
Muscle and Nerve
Muscular System

Myelitis
Myxoedema
Naevus
Narcotics
Navel
Necrosis
Nepenthes
Nerve
Nervous System
Nettlerash, or Urticaria
Neuralgia
Neurasthenia
Neuritis
Neuropathology
Nose
Nosology
Nostalgia
Nursing
Nutrition
Nux Vomica
Obstetrics
Oesophagus
Officinal
Olfactory System
Ophthalmology
Opium

Ovariotomy
Pain
Palate
Pancreas
Paralysis or Palsy
Paranoia
Parasitic Diseases
Pathology
Pediculosis
Pellagra
Pelvis
Pemphigus
Pepsin
Peritonitis
Perspiration
Phagocytosis
Pharmacology
Pharmacopoeia
Pharmacy
Pharyngitis
Pharynx
Phlebitis
Phrenology
Phthisis
Physiology
Picrotoxin

Pinto
Pityriasis Versicolor
Placenta
Plague
Pleurisy or Pleuritis
Pneumonia
Podophyllin
Poison
Polypus
Poultice
Prognosis
Pruritus
Psoriasis
Psorospermiasis
Ptomaine Poisoning
Puberty
Public Health, Law of
Puerperal Fever
Purpura
Pulse
Quarantine
Quassia
Quinine
Quinsy
Raynaud’s Disease
Relapsing Fever

Reproductive System
Respiratory System
Rhamnus Purshiana
Rhatany, or Krameria Root
Rheumatism
Rheumatoid Arthritis
Rhubarb
Rickets
Ringworm
St. Vitus' Dance, or Chorea
Salep
Salicin, Salicinum
Sanatorium
Sandalwood
Sandarach
Santonin
Sarsaparilla
Scabies, or Itch
Scalp
Scarlet Fever
Sciatica
Scrofula, or Struma
Scurvy
Sea-Sickness
Seborrhoea
Senega

Senna
Sepsis
Sewerage
Shock or Collapse
Shoulder
Sinew
Skeleton
Skin and Exoskeleton
Skin Diseases
Skull
Slaughter-house
Sleep
Sleeping-sickness
Smallpox
Sneezing
Somnambulism
Spinal Cord
Spleen
Sprue
Squill
Stammering or Stuttering
Starvation
Stethoscope
Stomach
Stramonium
Strychnine

Sumbul, or Sumbal
Sunstroke
Supra-renal Extract
Surgery
Surgical Instruments
Sweating-sickness
Sweetbread
Sympathetic System
Syncope
Taraxacum
Teeth
Temperance
Tetanus
Therapeutics
Thorax
Throat
Thyroid
Tongue
Tonsillitis
Toxicology
Tracheotomy
Trachoma
Trichinosis
Tuberculosis
Tumour
Typhoid Fever

Typhus Fever
Ulcer
Upas
Urinary System
Vaccination
Valerian
Varicose Veins
Vascular System
Vegetarianism
Veins
Venereal Diseases
Viburnum
Vivisection
Voice
Wart
Water-supply
Whitlow
Whooping-Cough
Windpipe
Wound
Wrist
Wry-neck
X-Ray Treatment
Yaws
Yellow Fever
Zymotic Diseases

CHAPTER L
GEOGRAPHY AND EXPLORATION

A Library of Geography

The Britannica devotes nearly one fourth of all its space to geographical subjects. You may miss the full significance of this statement; therefore let us put it differently. The matter in the Britannica on geography is equivalent to more than 100 ordinary volumes each containing 100,000 words, which, put on shelves about 5 feet long, would fill a section in your library 5 shelves high. But by the use of new India paper, this same material on geography, combined with three times as much on other subjects of importance, occupies in the Britannica less than 3 feet of shelf space. The unity of plan and treatment and the high authority of the Britannica in these articles are far beyond comparison with that you could get in the most wisely and carefully selected hundred volumes on Geography that would give an equivalent number of words.

A Science as well as a Body of Facts

Geographical information is so useful that the student is likely to overlook the scientific importance of geography in itself. The articles in the Encyclopaedia Britannica described in this chapter, besides giving the fullest information on countries, cities, towns, rivers, mountains, etc., trace the development of the science from its beginning; and the gradual increase of geographical knowledge, as told in the Britannica, is a story of fine out-of-door

adventure, of just the kind of spirited action that has supplied the theme of the most popular works of fiction.

This chapter will suggest an outline course of reading in geography, systematically grouping the more important articles in the Britannica.

The starting point for this course of study is the article GEOGRAPHY (Vol. 11, p. 619), equivalent in length to 70 pages of this Guide, written by Hugh R. Mill, author of *Hints on the Choice of Geographical Books*, etc. The story that it tells us is a most interesting one.

What Early Writers Taught about the Earth

The early Greeks thought of the earth as a flat disk, circular or elliptical in outline; and even in Homeric times this supposition had "acquired a special definiteness by the introduction of the idea of the ocean river bounding the whole." Hecataeus recognized two continents on the circular disk. Herodotus, traveler and historian both (see the article HERODOTUS Vol. 13, p. 381, by George Rawlinson and Edward M. Walker), who knew only the lands around the roughly elliptical Mediterranean Sea, was certain that the earth was not a circle because it was longer from east to west than from north to south, and he distinguished *three* continents, adding Africa to Europe and Asia. "The effect of Herodotus's hypothesis that the Nile must flow from west to east before turning north in order to balance the Danube running from west to east before turning south lingered in the maps of Africa down to the time of Mungo Park." Aristotle (see also the article ARISTOTLE, Vol. 2, p. 501, by Thomas

Case, president of Corpus Christi College, Oxford, and author of *Physical Realism*, etc.,) was the real founder of scientific geography. "He demonstrated the sphericity of the earth by three arguments, two of which are important ... only a sphere could always throw a circular shadow on the moon during an eclipse; and that the shifting of the horizon and the appearance of new constellations ... as one travelled from north to south, could only be explained on the hypothesis that the earth was a sphere.... He formed a comprehensive theory of the variations of climate with latitude and season ... speculated on the differences in the character of races of mankind living in different climates, and correlated the political forms of communities with their situation on a seashore, or in the neighborhood of natural strongholds." The article PTOLEMY (Vol. 22, p. 618), equivalent to 27 pages of this Guide, by the late Sir Edward Herbert Bunbury, the historian of ancient geography, and Dr. C. R. Beazley, author of *The Dawn of Modern Geography*, etc., should be studied in conjunction with the summary, in the article *Geography*, of Ptolemy's achievements. "He concentrated in his writings the final outcome of all Greek geographical learning," but his great aim was to collect and compare all existing determinations of latitude and estimates of longitude, and to solve the problem of representing the curved surface of the earth on the flat surface of a map.

Geography in the Middle Ages

The science of geography was at a low ebb in Christendom during the Middle Ages, when verbal interpretation of the Scriptures led the Church to oppose the spherical theory and also the theory of

the motion of the earth. But among the Arabs, geography was kept alive—especially by Al-Mamun (see the article MAMUN) (Vol. 17, p. 533), who had Ptolemy translated into Arabic.

New World: New Geography

The story of the great discoveries of the 15th and 16th centuries is outlined later in the article GEOGRAPHY. The effect on geographical theory was enormous.

> The old arguments of Aristotle and the old measurements of Ptolemy were used by Toscanelli and Columbus in urging a westward voyage to India; and mainly on this account did the crossing of the Atlantic rank higher in the history of scientific geography than the laborious feeling out of the coast-line of Africa. But not until the voyage of Magellan shook the scales from the eyes of Europe did modern geography begin to advance. Discovery had outrun theory; the rush of new facts made Ptolemy practically obsolete in a generation, after having been the fount and origin of all geography for a millennium.

In the century and a half after the discovery of America important theoretical work was done by Peter Apian, Sebastian Münster, Philip Cluwer, Nathanael Carpenter and Bernhard Varenius, for which see the biographical articles. The next century (1650–1760) saw little worth mentioning in geographical theory or method. Then, with the sudden burst of activity that so often follows scientific hibernation, came the important work of Torbern Bergman, a Swedish chemist and a pupil of the great botanist Linnaeus, and the lectures delivered at Königsberg after 1765 by the German philosopher Kant. They both put new stress on physical geography—see the articles on BERGMAN

(Vol. 3, p. 774) and KANT (Vol. 15, p. 662). Alexander von Humboldt and Karl Ritter (see the articles on both) in the first half of the 19th century supported, the one the unity of nature, and the other the comparative method, thus preparing the way for Darwin's evolutionary theory, which "has become the unifying principle in geography." Since the adoption of this theory, some of the more important names in geographical theory—each the subject of an article in the Britannica which the student should read—are: Baron von Richthofen, Hermann Wagner, Elisée Reclus and A. de Lapparent.

Geographical Discovery

Early travel and exploration is a story of varied interest even when we approach it from the only side on which we have material—that is to say "geographical exploration from the Mediterranean centre."

Early conquest of outlying peoples by the warlike kings of Egypt and Assyria may have momentarily increased geographical knowledge, but it is unimportant in the large story. The first great explorers were the earliest traders, the Phoenicians and their African colonists, the Carthaginians, who traded throughout the Mediterranean, possibly on the east coast of Africa and in the northern seas, and almost certainly on the west coast of Africa. For details supplementing the outline in the article GEOGRAPHY (p. 623, Vol. 11), see the articles PHOENICIA (Vol. 21, pp. 454–455), SIDON, TYRE, OPHIR, CARTHAGE, and HANNO, the African explorer. On the only Greek explorer of eminence see the article on PYTHEAS of Marseilles (Vol. 22, p. 703), who, about 330 B.C., explored the British coast

and the Baltic, and may have gone as far north as Iceland. Alexander the Great (see the biographical article) and his successors explored the East, "thus opening direct intercourse between Grecian and Hindu civilization."

The Romans were poor seamen and accomplished little as explorers. It has often been pointed out that the Greeks spoke of the "watery ways" of the sea, considering it a highway, but that the Romans, centuries later too, called the sea "dissociable," that is "preventing and hindering intercourse."

The Arabs and Northmen

The Arabs were the leading geographers of the Middle Ages, and among their great travelers on whom there are separate articles in the Britannica are MASUDI, IBN HAUKAL, IDRISI, and in the 14th century IBN BATUTA. In the 9th and 10th centuries, the Norseman Ohthere rounded the North Cape and saw the midnight sun; Iceland was colonized from Norway; Eric the Red discovered Greenland; and his son Leif Ericsson sailed along a part of the North American coast: see the articles ICELAND, GREENLAND, VINLAND, LEIF ERICSSON and THORfiNN KARLSEFNI.

The crusades made Europe a little more familiar with the East and opened the way for travel and pilgrimage. In general see the summary *Results of the Crusades* (p. 546, Vol. 7) at the close of the article CRUSADES; and particularly see BENJAMIN OF TUDELA (Vol. 3, p. 739) for a Jewish traveler of the 12th century who went as far east as the frontiers of China.

13th Century

Before the new age of real exploration began, in the 15th century, there was an age of travel, especially in Asia during the 13th century, which did much to rouse popular curiosity about the ends of the earth. Though these travelers were not scientifically trained, modern research shows a remarkable proportion of fact in their stories. The great names of this era: Joannes de Plano Carpini, a friend of St. Francis of Assisi and head of a Catholic mission to Mongolia; William of Rubruquis, a Fleming who went to Tartary under orders from Louis IX of France; Hayton, King of Armenia, who traveled in Mongolia about the middle of the century; Odoric, a Catholic friar of the 14th century; and Marco Polo,

> the first to trace a route across the whole longitude of Asia, naming and describing kingdom after kingdom which he had seen; the first to speak of the new and brilliant court which had been established at Peking; the first to reveal China in all its wealth and vastness, and to tell of the nations on its borders; the first to tell more of Tibet than its name, to speak of Burma, of Laos, of Siam, of Cochin-China, of Japan, of Java, of Sumatra and of other islands of the archipelago, of the Nicobar and Andaman Islands, of Ceylon and its sacred peak, of India but as a country seen and partially explored; the first in medieval times to give any distinct account of the secluded Christian Empire of Abyssinia, and of the semi-Christian island of Sokotra, and to speak, however dimly, of Zanzibar, and of the vast and distant Madagascar; whilst he carries us also to the remotely opposite region of Siberia and the Arctic shores, to speak of dog-sledges, white bears and reindeer-riding Tunguses.

See the articles CARPINI, RUBRUQUIS, HAYTON, ODORIC, and POLO, by C. R. Beazley, author of *The Dawn of Modern Geography*, and Sir Henry Yule, author of *Cathay and the Way Thither* and *The Book of Ser Marco Polo*.

A little later were the Spaniard Ruy Gonzalez de Clavijo who traveled to Samarkand; the Italians Nicola de'Conti whose travels in India were written by Poggio Bracciolini, secretary to Pope Eugene IV, and Ludovico di Varthema, who made the pilgrimage to Mecca in 1503. See the articles CLAVIJO, CONTI, POGGIO, himself a traveler, and VARTHEMA.

Portuguese Explorers

The construction of the mariner's compass gave a new impulse to navigation and discovery. "Portugal took the lead along this new path, and foremost among her pioneers stands Prince Henry the Navigator (1394–1460).... The great westward projection of the coast of Africa and the islands to the north-west of that continent, were the principal scene of the work of mariners sent out at his expense; but his object was to push onward and reach India from the Atlantic." The account of Portuguese discoveries in the article GEOGRAPHY (p. 625) should be supplemented by the articles HENRY OF PORTUGAL (Vol. 13, p. 296), by C. R. Beazley, author of *Prince Henry the Navigator* and *The Dawn of Modern Geography*: DIOGO GOMEZ and BARTOLOMEU DIAZ DE NOVAES (Vol. 8, p. 172), also by C. R. Beazley, PERO DE COVILHAM, VASCO DA GAMA, PRESTER JOHN, by Sir Henry Yule, and FERNÃO MENDES PINTO, by Edgar Prestage, lecturer in Portuguese, University of Manchester.

Columbus and America

We have now come to a point in the story where it begins to be more familiar to us all. "The Portuguese, following the lead of Prince Henry, continued to look for the road to India by the Cape of Good Hope. The

same end was sought by Christopher Columbus, following the suggestion of Toscanelli, and underestimating the diameter of the globe, by sailing due west." The discovery and early exploration of America are told in the following articles, selected from a long list—see also the chapter in this Guide on *American History*:—

COLUMBUS and VESPUCCI, both by C. R. Beazley; PINZON, dealing with the three members of the family; CABOT, by H. P. Biggar, author of *The Voyages of the Cabots to Greenland*; PIZARRO; BALBOA; CORTEZ; SOTO; AVILES; CARTIER, by H. P. Biggar; RIBAULT; HAKLUYT, by C. R. Beazley and C. H. Coote, formerly of the map department, British Museum; and for exploration in the Pacific, MAGELLAN, by C. R. Beazley, DRAKE, THOMAS CAVENDISH, JOHN DAVIS, SIR RICHARD HAWKINS, etc.

Recent American Exploration

Exploration in the United States, particularly as connected with westward expansion may be studied to advantage in the Britannica. See especially the articles DANIEL BOONE, RUFUS PUTNAM, GEORGE ROGERS CLARK, WILLIAM CLARK, MERIWETHER LEWIS, ZEBULON M. PIKE, STEPHEN AUSTIN, MARCUS WHITMAN, JOHN C. FREMONT, F. V. HAYDEN, J. W. POWELL, and B. L. E. BONNEVILLE; and also the earlier part of the historical section in each article on a state of the Union.

The Far East

In the Orient the principal explorers mentioned in the article GEOGRAPHY and treated each in a separate article are: the Englishmen, SIR JAMES LANCASTER, THOMAS CORYATE, SIR ANTHONY

SHIRLEY, SIR THOMAS HERBERT and SIR THOMAS ROE; the German ENGELBRECHT KAEMPFER; and, among many great Dutch navigators, ABEL JANSZOON TASMAN. On this period see also INDIA (especially pp. 404–406, Vol. 14); JAPAN, *Foreign Intercourse* (p. 224, et seqq., Vol. 15); FRANCISCO DE XAVIER; MALAY ARCHIPELAGO (p. 469, Vol. 17); TASMANIA; NEW GUINEA, etc.

Missionaries

The geographical work of missionaries has been remarkable—perhaps none of it more so than the survey of China by Jesuit missionaries. "They first prepared a map of the country round Peking, which was submitted to the emperor Kang-hi, and, being satisfied with the accuracy of the European method of surveying, he resolved to have a survey made of the whole empire on the same principles. This great work was begun in July, 1708, and the completed maps were presented to the emperor in 1718. The records preserved in each city were examined, topographical information was diligently collected, and the Jesuit fathers checked their triangulation by meridian altitudes of the sun and pole star and by a system of remeasurements. *The result was a more accurate map of China than existed, at that time, of any country in Europe*."

There was some 18th century exploration of importance in Arabia: see the article KARSTEN NIEBUHR; in Africa: see the articles JAMES BRUCE; JOHN LEDYARD, an American; and MUNGO PARK; and in South America: see C. M. DE LA CONDAMINE, PIERRE BOUGUER, etc. But the Pacific was the great field of exploration in this century and "the three voyages of Captain James Cook form an era in the history of geographical discovery." See the articles

JAMES COOK, COMTE DE LA PEROUSE, JOSEPH-ANTOINE BRUNI D'ENTRECASTEUX, WILLIAM BLIGH, GEORGE VANCOUVER, and local articles like HAWAII, TAHITI, etc.

Arctic Exploration

The story of Polar exploration is told in brief in the article GEOGRAPHY (p. 629) but there are more detailed accounts in the article POLAR REGIONS, by H. R. Mill and Fridtjof Nansen, the polar explorer, which is illustrated with maps of the North Polar and South Polar regions. This should be further supplemented by the following biographical sketches: PYTHEAS, CABOT, CORTE-REAL, WILLOUGHBY, STEVEN BOROUGH, FROBISHER, JOHN DAVIS, BARENTS, HUDSON, BAFFIN, SCORESBY, BERING, JAMES COOK, JOHN FRANKLIN, SIR W. E. PARRY, SIR JOHN ROSS, JOHN RAE, SIR R. J. L. M. MCCLURE, SIR F. L. MCCLINTOCK, SIR E. A. INGLEFIELD, E. K. KANE, CHARLES HALL, NORDENSKIÖLD, NARES; SIR C. R. MARKHAM, DELONG, A. W. GREELY, NANSEN, PEARY, etc., and on antarctic exploration the articles DUMONT D'URVILLE, CHARLES WILKES, SIR JAMES C. ROSS, etc. The article POLAR REGIONS includes an elaborate account of the physiography of the Arctic region (p. 954, Vol. 21) and of the Antarctic (p. 969 of same Vol.), dealing with geology, climate, pressure, flora, fauna, people, ocean depths, temperature and salinity, and marine biological conditions, etc.

Maps

The student of geography should read with great care the article MAP (Vol. 17, p. 629), equivalent to 110 pages of this Guide, written by Lieut. Col. Charles Frederick Close, author of *Text-Book of*

Topographical Surveying, Alexander Ross Clark, lately in charge of the trigonometrical operations of the British Ordnance Survey, and Dr. Ernest George Ravenstein, author of *A Systematic Atlas*, etc. The article has 59 illustrations and it deals with: classification, scale, delineation of ground, contours, selection of names and orthography; measurement on maps; relief maps; globe; map printing; history of cartography (equivalent to 55 pages of this Guide), with reproductions of many early maps; topographical surveys, summarizing the work done in different parts of the world; and map projections.

The maps in the Britannica are of the utmost value. They include nearly 150 full-page maps, many of them in colours, all prepared especially for this edition, and in accordance with the principles laid down in the article MAP.

Physiographic Articles

Of articles on physiographic topics possibly the most important are those on the several continents, each accompanied by a map in colours from the great German cartographic establishment of Justus Perthes, Gotha. Of particular importance to the American reader are the contributions of Prof. W. M. Davis of Harvard on physiography in the articles AMERICA and NORTH AMERICA, and of J. C. Branner, now president of Leland Stanford University, on SOUTH AMERICA. Then read the article OCEAN AND OCEANOGRAPHY, by Dr. Otto Krümmel, professor of geography at Kiel and author of *Handbuch der Ozeanographie*, and H. R. Mill, editor of *The International Geography*. This single article is equivalent to 65 pages of this Guide. Then study the articles on the different seas—for instance, ATLANTIC

OCEAN, by H. N. Dickson, author of *Papers on Oceanography*, etc.; PACIFIC OCEAN, by the same author, with a section on its islands, and with a map in colours; Dr. Dickson's article on the MEDITERRANEAN SEA; the article GREAT LAKES, the separate article on each of these lakes, GREAT SALT LAKE, etc., and the article LAKE, by Sir John Murray, the famous British geographer, which contains statistical tables of the important lakes.

Two important general articles are: CLIMATE AND CLIMATOLOGY, with 2 plates, 13 figures and several tables, by R. DeCourcy Ward, professor of climatology, Harvard; and METEOROLOGY, by Dr. Cleveland Abbe, professor of meteorology, U. S. Weather Bureau. These articles, both by Americans, deal with these subjects with particular attention to American conditions. They should be supplemented by a study of the articles: SKY; ATMOSPHERIC ELECTRICITY; CLOUDS, illustrated with remarkably fine pictures of the different cloud-types; and the separate articles on meteorological instruments.

The Britannica Gazetteer

What has already been said, although it suggests rather than exhausts the subject of geography in the Britannica, will show that the student will find in it a text-book of geography which is unparalleled elsewhere in size, scope, authority and interest. Besides, the Britannica contains the equivalent of a great gazetteer and atlas. Place-names are so entered in the Index (Vol. 29) that their location on maps may be discovered immediately and the articles on towns, villages, cities, states, etc., are full and authoritative. The reader who turns to an article in the Britannica on some small town or city with a

population of 5,000 or less finds there within the limits of a few lines of print the results of elaborate research and laborious correspondence with local authorities. Such articles give not merely location, population, railway service, commercial and manufacturing information, description of buildings, etc., but a historical sketch of the place, in which every date and detail has been verified with no sparing of expense or pains.

The Britannica as a Guide Book

The Encyclopaedia Britannica is not merely a geographical text-book and gazetteer, however. It is an excellent guide book. The same care in details that makes it valuable as a gazetteer makes it a wonderful companion for the traveler, full of literary charm and readableness. Such articles as NEW YORK, PHILADELPHIA, BOSTON, SAN FRANCISCO and ST. LOUIS contain valuable sketches of the culture, literary and artistic, of these cities. The world's "show" and vacation spots have elaborate treatment —for instance the English LAKE DISTRICT, RIVIERA, CATSKILLS, LAKE GEORGE, YOSEMITE, GRAND CANYON, etc.

Besides the student can turn immediately in the Britannica, as he could in no book purely geographical, from the description of a locality, say Mount Vernon, Stockbridge, Cooperstown, Tarrytown or Salem, to the biographies that these articles make him need,—Washington, Jonathan Edwards, Cooper, Irving and Hawthorne. See the last chapter in this Guide for an illustration of this use of the Britannica.

The following list of *general* articles on geography will give the reader an idea of the great scope of the

Britannica in geographical literature. If this list included all the geographical articles in the Britannica it would be nearly 60 times as long. For a complete list classified by different continents and countries see the Index Volume, beginning on p. 895.

Afterglow

Aiguille

Alp

Anemometer

Antarctic

Anthelion

Anticyclone

Antilia

Antipodes

Antonini Itinerarium

Aquae

Archipelago

Arctic

Arete

Arroyo

Atlantis

Atmosphere

Atoll

Aurora Polaris

Avalanche

Bahr

Bar

Bayou
Beach
Beaufort Scale
Bench-mark
Bergschrund
Berm
Bight
Blizzard
Bog
Bora
Bore
Brazil
Breeze
Brickfielder
British Empire
Brocken, Spectre of
Butte
Buys Ballot’s Law
Canyon
“Challenger” Expedition
Chart
Chinook
Cirque
Climate and Climatology
Cloud
Cloudburst

Coast
Col
Combe
Continent
Continental Shelf
Contour, Contour-line
Coral-reefs
Cordillera
Corrie
Crag
Creek
Crevasse
Cuesta
Cyclone
Dalle
Dawn
Delta
Desert
Dew
Dip
Divide
Doldrums
Donga
Down
Dust
Eagre

Earth, Figure of the
Earth Pillar
El Dorado
Esker
Estuary
Etesian Wind
Euroclydon
Fell
Ferrel’s Law
Fjord
Floe
Flood Plain
Fog
Föhn
Frost
Geodesy
Geography
Geoid
Giant’s Kettle
Glacier
Great Circle
Gromatici
Ground Ice
Gulf Stream
Hachure
Hail

Halo
Harmattan
Helm Wind
Hill
Horse Latitudes
Horst
Hummock
Hurricane
Hydrography
Hygrometer
Iceberg
Isabnormal (or Isanomalous) Lines
Island
Isles of the Blest
Isobar
Isoclinic Lines
Isodynamic Lines
Isogonic Lines
Isotherm
Isthmus
Itinerarium
Jebel
Jungle
Kame
Khamsin
Kuro Siwo

Lagoon
Lake
Latitude
Leste
Levée
Leveche
Lightning
Lithosphere
Longitude
Lowland
Loxodrome
Maelstrom
Maestro
Maidan
Map
Marsh
Massif
Meridian
Mesa
Meteorology
Mirage
Mistral
Monadnock
Monsoon
Moor
Moraine

Moulin
Mountain
Névé
Norther
Nullah
Nunatak
Nyanza
Oasis
Ocean and Oceanography
Ophir
Orography
Pampero
Peninsula
Plain
Plateau
Playa
Polder
Pond
Prairie
Quagmire
Rain
Rainbow
Rand
Ras
Reef
River

Roaring Forties
Sahel
St. Elmo’s Fire
Sargasso Sea
Savanna
Sea
Seiche
Simoom
Sirocco
Sleet
Snow
Snow-Line
Sounding
Squall
Steppe
Storm
Sudd
Sunshine
Surge
Surveying
Swallow-hole
Tacheometry
Tarn
Thalweg
Theodolite
Thule

Thunder
Timber-line
Topography
Tornado
Trade Winds
Tundra
Twilight
Typhoon
V-shaped Depression
Volcano
Wadi
Waterfall
Watershed
Waterspout
Weather
Wedge
Wind
World
Zone

CHAPTER LI
ANTHROPOLOGY AND ETHNOLOGY

These two sciences are devoted to the study of

mankind before written history began; and they have an interest for every reader who has asked, when he was a child and had a story told him: "What happened *before* that?" In the chapter in this Guide on *Language and Writing*, we have told the story of those two great inventions which made civilization possible. The present chapter is devoted to the story of man before writing was commonly used—that is, before historical documents could exist.

Just as the study of children and their habits is something new and peculiarly characteristic of the last generation, so these sciences of anthropology and ethnology which deal with the childhood of the human race are of recent origin. But in comparison with child-psychology these two sciences are at a disadvantage in a very important respect: there are always children to be studied, but the childhood of the race is long past and remote from the student of it, save for the primitive tribes which can still be observed, and even these tribes are now scattered and few, and by contact with civilization they are rapidly losing the characteristics which invite scientific study. A hundred years ago, the opportunities for experiment and observation were far greater, but at that time savages were not seriously studied. There could, indeed, be no "science of man" before the evolutionary theory of Darwin, Wallace and Huxley had been generally accepted. Throughout this Guide we see how this theory has affected all our modern thought, modified our sciences, and even created new sciences. The Eleventh Edition of the Encyclopaedia Britannica may, indeed, be described as the authoritative and interesting story of the human activities, critically studied from the point of view of evolution. The trustworthy material is chiefly derived from

observations in Australia, in the South Seas, among the North American Indians and among the still savage tribes of Africa, and from studies of the tools and other remains of early peoples. All broad conclusions must be based upon the similarity of customs among races widely separated by time and place, and upon the fact that some traces of such customs are still found among more highly civilized peoples.

The first article in a course of reading on the "science of man" in the Britannica is ANTHROPOLOGY (Vol. 2, p. 108), equivalent to 40 pages in this Guide, illustrated, by Prof. Tylor, of Oxford University, one of the founders of the science, and author of *Researches into the Early History of Mankind*, *Primitive Culture*, etc.

Man's Origin

This great article deals first with "man's place in Nature," the most interesting branch of the theory of evolution. Prof. Tylor traces back the recognition of man's structural similarity to the higher apes to Linnaeus (1735) and to the less scientific Lord Monboddo (1774 and 1778), whose simple literary style as well as his theory of the descent of man aroused the amusement and scorn of Dr. Samuel Johnson, who said that Monboddo was "as jealous of his tail as a squirrel."

Dr. Tylor remarks that:

> There are few ideas more ingrained in ancient and low civilization than that of relationship by descent between the lower animals and man. Savage and barbaric religions recognize it, and the mythology of the world has hardly a more universal theme. But in educated Europe such ideas had long been superseded by the influence of theology and philosophy, with which they seemed too incompatible.

But in 1843 Dr. J. C. Prichard, to whom Tylor gives the title that many would give to Tylor himself, "founder of modern anthropology," insisted that

> man is but an animal ... composed of the same materials, and framed on the same principles, as the creatures which he has tamed to be the servile instruments of his will, or slays for his daily food.

Dr. Tylor shows how Wallace and Darwin established a theory of human descent, and sums up the similarities and dissimilarities in anatomical construction between man and the man-like apes. Even more interesting is what the article says (p. 110) about "assigning to man his place in nature on psychological grounds."

> Huxley acknowledged an immeasurable and practically infinite divergence, ending in the present enormous psychological gulf between ape and man. It is difficult to account for this intellectual chasm as due to some minor structural difference.... Beyond a doubt, man possesses, and in some way possesses by virtue of his superior brain, a power of co-ordinating the impressions of his senses, which enables him to understand the world he lives in, and by understanding to use, resist, and even in a measure rule it. No human art shows the nature of this human attribute more clearly than does language

—although other animals have a sort of language. The article quotes Dr. A. Russel Wallace's conclusion that man stands "apart, as not only the head and culminating point of the grand series of organic nature, but as in some degree a new and distinct order of being." And another great anatomist, Prof. St. George Mivart, says "Man's animal body must have had a different source from that of the spiritual soul which informs it, owing to the distinctness of the two orders to which these existences severally belong." Dr. Tylor, in citing these authorities, adds that "man embodies an immaterial and immortal,

spiritual principle which no lower creature possesses, and which makes the resemblance of the apes to him but a mocking simulance."

The answer to the question "How did man originate?" depends on the answer to the question "How did species originate?" The main points are summed up in the article ANTHROPOLOGY (on p. 112), which also deals with the fossil remains of man, especially skulls, and their bearing on the question. A more detailed discussion will be found in the articles EVOLUTION (Vol. 10, p. 22) and SPECIES (Vol. 25, p. 616).

Races of Man

The classification of man into different races is the topic next taken up by Dr. Tylor in the article ANTHROPOLOGY, and he deals particularly with classification by the "facial angle" (on which see also the article CRANIOMETRY, Vol. 7, p. 372). Different classifications are criticized and the article decides that "Huxley's division probably approaches more nearly than any other to such a tentative classification as may be accepted.... He distinguishes four principal types of mankind, the Australioid, Negroid, Mongoloid and Xanthochroic (fair whites), adding a fifth variety, the Melanchroic (dark whites)." That races are not species, zoologically, is made plain by the fact that the offspring of parents of different races are fertile—those of different species being infertile.

Antiquity of Man

One of the questions connected with the origin of man is his antiquity. The Biblical chronology, as commonly reckoned and interpreted, allowed a time since the appearance of the original stock which seemed far too short for the apparent variation from

the original species (see CHRONOLOGY, Vol. 6, p. 305). The natural sciences, notably geology, have "made it manifest that our earth must have been the seat of vegetable and animal life for an immense period of time; while the first appearance of man, though comparatively recent, is positively so remote, that an estimate between twenty and a hundred thousand years may fairly be taken as a minimum." This geological claim is supported by the evidence of prehistoric archaeology (see the article ARCHAEOLOGY, Vol. 2, p. 344). In the caves of France and Belgium human bones have been found with the remains of fossil species of elephant, rhinoceros, hyena, bear, etc., and "the co-existence of man with a fauna now extinct or confined to other districts was brought to yet clearer demonstration by the discovery in these caves of certain drawings and carvings of the animals done by the ancient inhabitants themselves, such as a group of reindeer on a piece of reindeer horn, and a sketch of a mammoth, showing the elephant's long hair, on a piece of a mammoth's tusk from La Madeleine." See Fig. 7, Plate facing p. 118, Vol. 2; the figures of the reindeer and mammoth, hairy and with upturned tusks, in Plate II, article ARCHAEOLOGY (following p. 348, Vol. 2); and of the reindeer in Plate I (Vol. 19, p. 462), and the old cave paintings of wild boars and bison from Altamira, reproduced in colour on Plate II, the next page. These paintings, marking by their technical excellence a high stage of art if not of civilization, are said by geologists to date back 50,000 years. The student will be repaid for turning a moment from the article ANTHROPOLOGY and the question of the antiquity of man to the article **Cave-Dwellers** CAVE (Vol. 5, p. 573), by the eminent archaeologist, W. Boyd Dawkins, and the author of

Cave-hunting and *Early Man in Britain*. He reconstructs the civilization of the inhabitants of the pleistocene caves of the European continent (p. 576), describes the carvings and drawings of which we have just spoken, and says of the cave-dwellers:

> If these remains be compared with those of existing races, it will be found that the cave-men were in the same hunter stage of civilization as the Eskimos, and that they are unlike any other races of hunters. If they were not allied to the Eskimos by blood, there can be no doubt that they handed down to the latter their art and their manner of life. The bone needles, and many of the harpoons, as well as the flint spearheads, arrowheads and scrapers, are of precisely the same form as those now in use amongst the Eskimos. The artistic designs from the caves of France, Belgium and Switzerland, are identical in plan and workmanship with those of the Eskimos.... The reindeer, which they both knew, is represented in the same way by both. The practice of accumulating large quantities of the bones of animals round their dwelling-places, and the habit of splitting the bones for the sake of the marrow, are the same in both. The hides were prepared with the same sort of instruments, and the needles with which they were sewn together are of the same pattern. The stone lamps were used by both. In both there was the same disregard for sepulture. All these facts can hardly be mere coincidences caused by both peoples leading a savage life under similar conditions. The conclusion, therefore, seems inevitable that, so far as we have any evidence of the race to which the cave-dwellers belong, that evidence points only in the direction of the Eskimos. It is to a considerable extent confirmed by a consideration of the animals found in the caves. The reindeer and musk sheep afford food to the Eskimos now in the Arctic Circle, just as they afforded it to the cave-men in Europe; and both these animals have been traced by their remains from the Pyrenees to the north-east through Europe and Asia as far as the very regions in which they now live. The mammoth and bison also have been tracked by their remains in the frozen

> river gravels and morasses through Siberia as far as the American side of Bering Strait. Palaeolithic man appeared in Europe with the arctic mammalia, lived in Europe with them, and in all human probability retreated to the north-east along with them.

The antiquity of man may be estimated also by the time it must have taken to deposit the soil that overlies traces of civilization,—for instance in Egypt where pottery is found 60 feet deep, while inundations from the Nile probably have not averaged more than a few inches in a century. "The most recent work of Egyptologists proves a systematic civilization to have existed in the valley of the Nile at least 6000 to 7000 years ago." Similar testimony is given by examining the lake-dwellings of Switzerland and the kitchen middens of Denmark. On these see the articles LAKE DWELLINGS (Vol. 16, p. 91), by Joseph Anderson, keeper of the National Museum of Antiquities, Edinburgh, and SHELL-HEAPS (Vol. 24, p. 832). The latter article, in a description of the middens of Denmark, says:

> Among the bones were those of the wild bull or aurochs, beaver, seal and great auk, all now extinct or rare in this region. Moreover, a striking proof of the antiquity of these shell-heaps is that they contain full-sized shells of the common oyster, which cannot live at present in the brackish waters of the Baltic except near its entrance, the inference being that the shores where the oyster at that time flourished were open to the salt sea.

The article on LAKE DWELLINGS brings out very clearly the fact that this, like other early stages of development, is to be found at widely different periods of time: in Switzerland, thousands of years ago; in Scotland and Ireland (see also the article CRANNOG, Vol. 7, p. 377) during the Christian era; and in New Guinea and Central Africa within the last

few years. This is in accordance with the fact that the human race has not “matured” with equal rapidity all over the earth—that even now one race is in infancy, another in childhood, another in a transition stage like adolescence, and another in the prime of civilization.

Language

Returning to the article ANTHROPOLOGY, the next topic treated is Language. The more important points on this subject are stated in another chapter of this part of the Guide, on *Language and Writing*. Dr. Tylor says:

> For all that known dialects prove to the contrary, on the one hand, there may have been one primitive language, from which the descendant languages have varied so widely, that neither their words nor their formation now indicate their unity in long past ages, while, on the other hand, the primitive tongues of mankind may have been numerous, and the extreme unlikeness of such languages as Basque, Chinese, Peruvian, Hottentot and Sanskrit may arise from absolute independence of origin. The language spoken by any tribe or nation is not of itself absolute evidence as to its race-affinities. This is clearly shown in extreme cases. Thus the Jews in Europe have almost lost the use of Hebrew, but speak as their vernacular the language of their adopted nation, whatever it may be.... In most or all nations of mankind, crossing or intermarriage of races has taken place between the conquering invader and the conquered native, so that the language spoken by the nation may represent the results of conquest as much or more than of ancestry.... On the other hand, the language of the warlike invader or peaceful immigrant may yield, in a few generations, to the tongue of the mass of the population, as the Northman’s was replaced by the French, and modern German gives way to English in the United States.

Development of Civilization

The last general topic in the article ANTHROPOLOGY is Development of Civilization. In connection with it the student should read the article CIVILIZATION (Vol. 6, p. 403), by Dr. H. S. Williams, editor-in-chief of *The Historian's History of the World*, and particularly the first part of it dealing with early times.

Ethnology

The comparatively brief article ETHNOLOGY AND ETHNOGRAPHY (Vol. 9, p. 849) takes up the story of man's progress at the point where ANTHROPOLOGY stops, and deals particularly with the division of mankind into separate races. Was pleistocene man specifically one? The evidence to supply an answer to this question is of three kinds: anatomical, physiological and cultural and psychical. Human bones from this early period "show differences so slight as to admit of pathological or other explanation," and do not prove that there were separate species. The physiological answer, that there was only one species, is given and explained in the article ANTHROPOLOGY: species cannot breed with species, and hybrids are infertile. The third answer is also in the negative. "The works of early man everywhere present the most startling resemblance." Dr. J. C. Prichard is quoted in the article as saying that

> the same inward and mental nature is to be recognized in all races of men. When we compare this fact with the observations, fully established, as to the specific instincts and separate psychical endowments of all the distinct tribes of sentient beings in the universe we are entitled to draw confidently the conclusion that all human races are of one species and one family.

If man was specifically one, where did he originate and how did he spread over the world? “As to man’s cradle-land there have been many theories, but the weight of evidence is in favour of Indo-Malaysia.” The problem of distribution “has been met by geology, which proves that the earth’s surface has undergone great changes since man’s appearance, and that continents, long since submerged, once existed, making a complete land communication from Indo-Malaysia.... Proofs no less cogent are available of the former existence of an Eurafrican continent, while the extension of Australia in the direction of New Guinea is more than probable.... The western hemisphere was probably connected with Europe and Asia, in Tertiary times.” The article ETHNOLOGY closes with a description of the four divisions of the human race proposed by Huxley, which have already been enumerated.

Separate articles supplementing these two main articles, ANTHROPOLOGY and ETHNOLOGY, especially in the field of comparative anatomy, are: ANTHROPOMETRY (Vol. 2, p. 119) for physical measurements, including the Bertillon system used to identify criminals; BRACHYCEPHALIC (Vol. 4, p. 366), or short-headed, a term applied to Indo-Chinese, Savoyards, Croatians, Lapps, etc.; DOLICHOCEPHALIC (Vol. 8, p. 388), or long-headed, like Eskimos, negroes, etc.; MESOCEPHALIC (Vol. 18, p. 179), for the type between the two; PROGNATHISM (Vol. 22, p. 424), for jaw protrusion; CRANIOMETRY (Vol. 7, p. 372) and CEPHALIC INDEX (Vol. 5, p. 684), for the measurement of skulls and heads; STEATOPYGIA (Vol. 25, p. 860), for a peculiar heaviness of hips found in some negro and other savage peoples; MONOGENISTS (Vol. 18, p. 730), on the theory that all men are descended from a common original stock;

and POLYGENISTS (Vol. 22, p. 24) on the opposite theory.

North American Indians

One of the most elaborate ethnological articles in the Britannica is of particular interest to Americans, that on INDIANS, NORTH AMERICAN (Vol. 14, p. 452), by Dr. A. F. Chamberlain, professor of anthropology, Clark University, Worcester, Mass. It is equivalent to more than 100 pages of this Guide, and there are also scores of brief articles on different North American Indian tribes. A few, only, of the many interesting topics treated in it may be mentioned:

The name "American Indians"—due to the mistaken early belief that the New World was a part of Asia. "Amerind" a suggested substitute. Various uses of "Indian." French "sauvage" the original of "Siwash."

Popular fallacies of the origin of the Indians—Welsh, "lost Ten Tribes," etc.

Linguistic stocks. Table of languages. General description; varied character; enormous compound words, like *deyeknonhsedehrihadasterasterahetakwa* for "stove-polish." Indian literature.

Migrations of Indian stocks. Tabular conspectus of 180 tribes—situation and population, degree of intermixture, condition and progress, and authorities on each.

Population, physical characteristics, race mixture.

Culture, arts, industries, religion, mythology and games.

Social organization, contact of Indians and whites, Indian wars, missions, Indian talent and capacity, syllabaries invented by Indians.

In addition to the articles on Indian tribes there are many on Indian notables—for example, PONTIAC, TECUMSEH, KING PHILIP, BLACK HAWK, BRANT, and

SITTING BULL.

Central America

Interest in the Indians of Central America, popularly called Aztecs, is rather archaeological than ethnological. See in the Britannica the article CENTRAL AMERICA (Vol. 5, p. 677), by Dr. Walter Lehmann, directorial assistant of the Royal Ethnological Museum, Munich; and the article AMERICA, *Ethnology and Archaeology* (Vol. 1, p. 810), by O. T. Mason, late curator, Department of Anthropology, National Museum, Washington, dealing with the Indians of North, Central and South America in general. The other principal articles on races or tribes of unusual ethnographic importance are:

NEGRO (Vol. 14, p. 344), by Thomas Athol Joyce, assistant in the Department of Ethnography, British Museum,—with a section on the negro in the United States, by Walter F. Willcox, late chief statistician, United States Census Bureau; supplemented by AFRICA, *Ethnology* (Vol. 1, p. 325), by Mr. T. A. Joyce, with a particularly valuable classified list (p. 329) of African tribal distribution, which may be made the basis for further study by reference to articles on the separate tribes, such as BERBERS, KABYLES, MZABITES, TUAREG, etc.

POLYNESIA (Vol. 22, p. 33) for the Polynesian race; and also SAMOA (Vol. 24, p. 115) and HAWAII (Vol. 13, p. 83)

AUSTRALIA, *Aborigines* (Vol. 2, p. 954) and *Maori*. The following is a list in alphabetical order of articles on races or tribes:

Ababda

Abipones

Abnaki
Aborigines
Acholi
Afars (Danakil)
Agaiambo
Ahom
Aht
Ahtena
Aimak, or Eimak
Ainu
Akka
Alfuros
Algonquin
Alur
Amarar
Anti, or Campa
Apache
Apalachee
Arabs
Arapaho
Araucanians
Arawak
Areoi
Arikara, or Aricara
Artega
Ashraf (Shurefa)

Assiniboin
Athapascan
Attacapa
Awadia and Fadnia
Aymara
Aztecs
Babu
Badagas
Baggára
Bakalai
Bakhtiári
Ba-Kwiri
Ba-Luba
Bambute
Banate
Bangash
Barabra
Bari
Bashkirs
Basques
Battakhin
Battanni
Battas
Batwa
Bazigars
Bechuana

Bedouins
Beja, or Bija
Bellabella
Bellacoola, or Bilqula
Beni-Amer
Beni-Israel
Beothuk
Berbers
Bertat
Bhattiana
Bhils, or Bheels
Bimana
Bisharin
Blackfoot
Boer
Bogos (Bilens)
Bois Brûlés
Bongo
Botocudos
Bozdar
Brahui
Bugis
Bugti
Buriats
Bushmen
Caddo

Cagots
Cahita
Cahokia
Cakchiquel
Calchaqui
Caribs
Cashibo, or Carapache
Catauxi
Catawbas
Celt
Chamkanni
Changos
Charrua
Chechenzes
Chellian
Cheremisses
Cherokee
Cheyenne
Chickasaws
Chimesyan
Chinook
Chiquitos
Choctaws
Cholones
Chude
Chukchi

Chuncho
Chuvashes
Circassia
Cocoma, or Cucamas
Coeur d’Alêne
Comanches
Conestoga
Conibos
Copts
Cree
Creek Indians
Crow Indians
Cunas
Curetus
Czech
Dawari; or Dauri
Delaware Indians
Dinka
Dogra
Dravidian
Dualla
Duk-Duk
Durani
Dyaks
Engis
Eskimo

Ewe
Falashas
Fang
Fanti
Fellah
Fiji
Fingo, or Fengu
Finno-Ugrian
Flatheads
Fox Indians
Fula
Funj
Furfooz
Galchas
Gallas
Gararish
Ghilzai
Gilyaks
Gipsies
Golds
Gonaguas
Gros Ventres
Guanches
Guaranis
Guatos
Guatusos

Guaycurus
Gumus
Hababs
Hadendoa
Haida
Hakkas
Hamitic Races
Harratin
Hassania
Hausa
Hawawir
Hazara
Heroro, or Ovaherero
Hindki
Hipurnias
Hiung-nu
Hopi
Hottentots
Hova
Huambisas
Huastecs
Huichol
Huron
Indians, North American
Iquitos
Iroquois

Irulas
Itza
Ja’alin
Jakuns
Jats
Jeveros
Jibitos
Jicarilla
Juangs
Jur (Diur)
Juris
Kabbabish
Kabyles
Kaffirs
Kakar
Kalapuya
Kalispel
Kalkas
Kanaka
Kanuri (Beriberi)
Kara-Kalpaks
Karen
Kashubes
Kavirondo
Kaw (Kansa)
Kayasth

Khamtis
Khattak
Khazars
Khevsurs
Khonds
Kickapoo
Kiowas
Kirghiz
Klamath
Koch
Kolis
Kols
Korkus
Koryaks
Kotas
Krumen
Kubus
Kumyks
Kunbis
Kurumbas
Kusan
Kutenai
Kwakiutl
Laos
Lascar
Latuka

Legas
Lepcha
Lipan
Lolos
Madi
Mahar
Mahrattas
Makalaka
Makaraka
Malays
Mandan
Mandingo
Maneteneris
Mangbettu
Manyema
Maori
Marianas
Mariposan
Maroons
Marri
Masai
Mashona
Metabele
Maya
Mayoruna
Menangkabos

Mensa and Marea
Meshcheryaks
Meyrifab
Miami
Miaotsze
Micmac
Mikirs
Mishmi (tribe)
Modoc
Mohave
Mohawk
Mohican
Mohmand
Monassir
Montagnais
Moors
Moplah
Mordvinians
Moxos
Mpongwe (Pongos)
Mundas
Mundrucus
Muras
Musa Khel
Muskhogean Stock
Mzabites, or Beni-Mzab

Nahuatlan Stock
Namasudra
Nandi
Navaho, or Navajo
Nayar, or Nair
Negritos
Negro
Nez Percés
Niam-Niam
Nuer
Oerlams
Ojibway
Omaguas
Omahas
Oneida
Onondaga
Opata
Orakzai
Oraons
Ostiaks
Ottawa
Papuans
Pariah (caste)
Parsees
Pathan (people)
Pawnee

Penobscot
Pequot
Petchenegs
Pima
Polabs
Ponca
Pondo
Potawatami
Povindah
Prabhu (caste)
Pueblo Indians
Puelche
Pygmy
Quiché, or Kichés
Quichua
Rajput
Riffians
Ruthenians
Sahos
Sakai
Salishan
Samoyedes
Santals
Semang
Seminole
Seneca

Serers
Shagia
Shangalla
Shans
Shawnee
Sherani, or Shirani
Shilluh
Shilluk
Shinwari
Shukria
Sienetjo
Sikh
Sioux
Slavs
Slovaks
Slovenes
Songhoi
Sorbs
Swahili
Syryenians
Tajik
Talaing
Tamils
Tarkani
Tatars
Tehuelche

Tembu
Tibbu, or Tebu
Todas
Toltecs
Troglodytes
Tshi
Tuareg
Tukulor (Tuculers)
Tunguses
Tupis
Turi
Turki
Turkoman
Turks
Tuscarora
Uighur
Unyamwezi
Ustarana
Ute (Utah)
Utman Khel
Vaalpens
Veddahs
Wa
Wichita
Wochua
Wolof (Woloff, Jolof)

Wyandot (Huron)

Yaos

Yusafzai

Zaimukht

Zaparos

Zenaga

Zenata

Terminology

The technical terms of nearly every science are words coined from Latin and Greek roots, so that the student of these languages is at an advantage in learning any science—its terms have some meaning to him no matter how strange the science itself. But in anthropology and ethnology we come across such terms as *taboo*, *totem*, *shaman* and *manitou*. For their comprehension Latin and Greek give no aid. Each of these terms comes into English from the language of a primitive people to convey an idea at once too primitive and too complex to be expressed by any English word or by a Greek or Latin compound. “Taboo” is a Malay word meaning both “unclean” (as that word is used in the Old Testament) and “sacred”; and the idea it conveys is characteristic of the religious and social system found among the Polynesians and nearly all other peoples in a comparatively low stage of civilization, which sets persons or things apart as sacred or accursed. “Totem” is a Chippewa (North American Indian) word denoting an animal, plant, or other object chosen as the name of a whole family or tribal division. The word “shaman” comes from the Ural-Altaic (Tungus), and means “medicine-man,” a

combination of priest, magician and exorcist. "Manitou" is another North American word meaning "spirit" or "genius."

Taboo and Totem

The practice of taboo and totemism, although one word comes to us from the South Seas and the other from the American Indians, is found all over the less civilized world, and—even more important—it explains many things in the social and religious life of more civilized communities. For instance, the account by modern students of Greek and Roman religion has had to be largely rewritten in the light of what we have learned in the last two generations about taboo and totemism.

The articles TABOO (Vol. 26, p. 337) and TOTEMISM (Vol. 27, p. 79) are both by Andrew Lang, author of *Custom and Myth* and other standard works on folk-lore. It is unnecessary to outline these two articles here, as the two words have been defined, and the importance of the subject suggested. The reader should refer to the article on ANDREW LANG (Vol. 16, p. 171), in which it is said that "he explained the irrational elements of mythology as survivals from earlier savagery...." idealized "savage animism ... maintained the existence of high spiritual ideas among savage races, and instituted comparisons between savage practices and the occult phenomena among civilized races." His appreciation of the culture of the savage and his remarkably interesting style should induce the student to read Lang's other and related articles in the Britannica, especially:

FAMILY (Vol. 10, p. 158), (equivalent to 27 pages of this Guide), dealing particularly with the question of marriage as related to totemism, and the practices

of marrying only *out* of the tribe or totem, and of marrying only *within* the totem (see the articles ENDOGAMY and EXOGAMY, MATRIARCHATE, POLYANDRY, POLYGAMY, LEVIRATE and COUVADE).

NAME (Vol. 19, p. 157), which discusses the relation of the name to the totem, the strange primitive custom of the individual's having many names and concealing his true name, etc.; and also the articles FAIRY (Vol. 10, p. 134) and MYTHOLOGY (Vol. 19, p. 128).

Religion

For special forms of superstition, read the articles MAGIC, SHAMANISM, WITCHCRAFT, DEMONOLOGY and LYCANTHROPY, and in the field of religion, RELIGION, *Primitive* (Vol. 23, p. 63), by R. R. Marett, of Oxford University, author of *The Threshold of Religion*, etc. This article puts particular stress on the importance of ritual in early religion. Compare also the matter, already mentioned, on religion in the article on North American Indians with the short articles MANITOU (Vol. 17, p. 568) and GHOST DANCE (Vol. 11, p. 925). Besides, the student should road ORDEAL (Vol. 20, p. 173), PRAYER (Vol. 22, p. 256), RITUAL (Vol. 23, p. 370), SACRIFICE (Vol. 23, p. 980), ANIMISM (Vol. 2, p. 53), on the attempt to explain religion as due to the fear and worship of ghosts—and FETISHISM (Vol. 10, p. 295), by N. W. Thomas, government anthropologist to Southern Nigeria; ANCESTOR-WORSHIP (Vol. 1, p. 945), FUNERAL RITES (Vol. 11, p. 329) and PURIFICATION (Vol. 22, p. 660), all by Dr. F. C. Conybeare, author of *Myth, Magic and Morals*, etc.; TREE-WORSHIP (Vol. 27, p. 235) and SERPENT-WORSHIP (Vol. 24, p. 676), both bearing on totemism, by S. A. Cook, author of *Religion of Ancient Palestine*, etc.

Biographical Study

A course of reading on anthropology may well close with the study in the Britannica of the lives of some leaders in this science. The student will thus be familiarized with the theories of each great anthropologist—and will notice the manifold appeal of the science by seeing from what point each approached it—one from his interest in geology, another from travel, a third because of his studies in surgery or biology, another as a psychologist.

Avebury, 1st Baron

Bandelier, Adolph F. A.

Bastian, Adolf

Brasseur de Bourbourg, C. E.

Brinton, D. G.

Broca, Paul

Catlin, George

Christy, Henry

Dawkins, William Boyd

Deniker, Joseph

Fletcher, Alice C.

Hale, Horatio

Hodgson, B. H.

Lartet, Edouard

M’Lennan, John F.

Mantegazza, Paolo

Morgan, Lewis Henry

Mortillet, L. L. G. de

Prichard, James Cowles

Schoolcraft, H. R.

Tylor, Edward B.

Wagner, Rudolf

Waltz, Theodor

CHAPTER LII
MATHEMATICS

There is no single book in the English language, save the Britannica, in which the whole body of mathematical knowledge is examined and classified with special reference to the inter-relation of its various parts and to the results obtained in the neighboring domains of physics, chemistry, and engineering. Text-books necessarily have a somewhat narrow purpose, namely to teach the student how to solve problems in a single given field; wide views over the surrounding country can, therefore, seldom be afforded. The Britannica, however, does for English readers, what the *Encyclopädie der Mathematischen Wissenchaften* does for German, and more, in that in the Britannica the shadowy borderlands are illuminated and the roads cleared which connect the mathematical and the experimental sciences. In fact if anyone possessed every mathematical text-book that had ever been published, he would still find the articles full of suggestion to him, for in them the whole subject has

been presented, in all its complex bearings, logically and as a whole.

History

It is nearly 4,000 years since a mathematician was last deified in the person of Amenophis, and as far as can be ascertained only one other of his calling ever received this honour, and he also was an Egyptian who had entered into his godship a full thousand years earlier (Vol. 9, p. 46). To the ancient Egyptians mathematics owes the first fragmentary ideas of arithmetic and mensuration, but little else, for despite their amazing mechanical achievements very little record of purely mathematical knowledge has come down from them. It was the Greeks, starting with Thales (600 B.C.), who really created the sciences of geometry and numbers. To them we owe the great abstract ideas which dominate the science. The Greek period lasted till the capture of Alexandria by the Mohammedans, A.D. 640, at which time the Arabian school took shape, and to it we owe the development of algebra (*al-jebr-wa'l-muqubala*, which means the transposition and removal [of terms of an equation]). With the Renaissance the centre of scientific research shifted to Western Europe and from then on the boundaries of mathematical knowledge were rapidly extended, till to-day the subject is the common ground on which all the physical sciences meet. The student is referred to the article MATHEMATICS (Vol. 17, p. 878), by A. N. Whitehead, fellow and senior lecturer in mathematics, Trinity College, Cambridge, for a brilliant exposition of the foundations of the subject.

The professed mathematician will, of course, not need any set guide to his reading, but it may be well to point out one or two articles which he will find

especially worthy of his attention.

Leading Articles

The article PROBABILITY, (Vol. 22, p. 376), by Professor Edgeworth, author of *Mathematical Psychics*, and numerous papers on the calculus of probabilities, gives, to the best of our belief, the only statement of the whole problem in the English language. That on ALGEBRAIC FORMS (Vol. 1, p. 620), by Major Macmahon, former president of the London Mathematical Society, includes a number of results not previously published. The article ELASTICITY (Vol. 9, p. 141), by A. E. H. Love, professor of natural philosophy in the University of Oxford, embodies the experience of a distinguished mathematician who has made this subject the object of his special study for years. Sir George Darwin (son of Charles Darwin) in the article TIDE (Vol. 26, p. 938) summed up the results of his life's work. The new electrical theory of the properties of MATTER (Vol. 17, p. 891) is discussed by Sir J. J. Thomson, professor of physics, Cambridge, who has done more than anyone else to develop it. There are many other valuable articles, e.g., GEOMETRY, *Axioms* (Vol. 11, p. 730), and GEOMETRY, *Non-Euclidean* (Vol. 11, p. 724), by A. N. Whitehead; UNITS, DIMENSIONS OF (Vol. 27, p. 736), by Professor J. A. Fleming; ENERGY and ENERGETICS (Vol. 9, p. 398 and p. 390), by Sir Joseph Larmor; GROUPS, by Prof. Burnside, author of *Theory of Groups of Finite Order*. Articles which will be found highly useful to the engineer are MENSURATION (Vol. 18, p. 134); EARTH, FIGURE OF (Vol. 8, p. 801); GEODESY (Vol. 11, p. 607); STRENGTH OF MATERIALS (Vol. 25, p. 1007).

Leading Contributors

The mathematician will at once recognize the peculiar fitness of the contributors to deal with the subjects allotted to them, and this fitness is the more noticeable in the following list, arranged in alphabetical order, which names and briefly describes the distinguished mathematicians who have collaborated in the Britannica, and indicates the principal articles written by each.

H. F. Baker, Fellow and Lecturer of St. John's College, Cambridge. Cayley Lecturer in Mathematics in the University. Author of *Abel's Theory and the Allied Theory*, etc.:

DIFFERENTIAL EQUATION; *Function*, *Functions of Complex Variables*.

Ludwig Boltzmann, formerly Professor of Theoretical Physics in the Universities of Munich, Vienna, and Leipzig. Author of *Lectures on the Theory of Gas*; *Lectures on Maxwell's Theory of Electricity and Light*:

MODEL.

W. Burnside, Professor of Mathematics, Royal Naval College, Greenwich. Hon. Fellow of Pembroke College, Cambridge. Author of the *Theory of Groups of Finite Order*, etc.:

GROUPS, THEORY OF

Arthur Cayley, formerly Professor of Pure Mathematics in the University of Cambridge. See the biographical article (Vol. 5, p. 589):

CURVE (in part); DETERMINANT; EQUATION; NUMBERS, PARTITION OF; SURFACE (in part); GAUSS, K. F.; MONGE, G.

George Chrystal, Professor of Mathematics and Dean of the Faculty of Arts, Edinburgh University, Hon. Fellow and formerly Fellow and Lecturer, Corpus Christi College, Cambridge:

PERPETUAL MOTION; PASCAL (in part); RIEMANN, GEORG.

Col. A. R. Clarke, Royal Medal of Royal Society 1887; in charge of trigonometrical operations of the Ordnance Survey 1854–1881:

EARTH, FIGURE OF THE (in part); GEODESY (in part); MAP, *Projections* (in part).

Agnes Mary Clerke, Author of *History of Astronomy in the 19th Century*; *The System of the Stars*; *Problems in Astrophysics*; and many other astronomical books. See the biographical article (Vol. 6, p. 497):

ASTRONOMY, *History*: ZODIAC; BRAHE, TYCHO; COPERNICUS; FLAMSTEED; HALLEY; HUYGENS; KEPLER, etc.

Lt. Col. C. F. Close, head of the Geographical Section, British General Staff, formerly British Representative on the Nyasa-Tanganyika Boundary Commission. Author of *Text-Book of Topographical Surveying*, etc.:

MAPS, *Projections* (in part).

W. E. Dalby, Professor of Civil and Mechanical Engineering at the City and Guilds of London Institute, Central Technical College, South Kensington. Author of *The Balancing of Engines*, etc.:

MECHANICS, *Applied* (in part); and several engineering subjects.

Sir George H. Darwin, late Fellow of Trinity College, Cambridge, and Plumian Professor of Astronomy and Experimental Philosophy in the University. President of the British Association, 1905. Author of *The Tides and Kindred Phenomena in the Solar System*, etc.:

TIDE.

F. Y. Edgeworth, Professor of Political Economy

in the University of Oxford, etc. Author of *Mathematical Psychics*, and numerous papers on the Calculus of Probabilities in the *Philosophical Magazine*, etc.:

PROBABILITY.

E. B. Elliott, Waynflete Professor of Pure Mathematics, and Fellow of Magdalen College, Oxford. Formerly Fellow of Queen's College, Oxford. President of the London Mathematical Society, 1896–1898. Author of *Algebra of Quantics*, etc.:

CURVE, (in part); GEOMETRY, IV *Analytical Geometry*.

C. Everitt, Magdalen College, Oxford:

ALGEBRA, *History*: DENSITY; LIGHT, *Introduction*, *History*, etc.

J. A. Ewing, Director of (British) Naval Education. Hon. Fellow of King's College, Cambridge. Formerly Professor of Mechanism and Applied Mechanics in the University of Cambridge. Author of the *Strength of Materials*, etc.:

STRENGTH OF MATERIALS, and several engineering subjects.

J. A. Fleming, Pender Professor of Electrical Engineering in the University of London. Fellow of University College, London. Formerly Fellow of St. John's College, Cambridge, and Lecturer on Applied Mechanics in the University. Author of *Magnets and Electric Currents*, etc.:

UNITS, PHYSICAL; and many articles on Electrical Science.

Rev. A. H. Frost:

MAGIC SQUARE.

W. Garnett, Educational Adviser to the London County Council; formerly Fellow and Lecturer of St. John's College, Cambridge. Principal and Professor

of Mathematics, Durham College of Science. Author of *Elementary Dynamics*, etc.:

ENERGY (in part); HYDROMETER; KELVIN, LORD.

J. W. L. Glaisher, Fellow of Trinity College, Cambridge. Formerly President of the Cambridge Philosophical Society and the Royal Astronomical Society, Editor of *Messenger of Mathematics* and the *Quarterly Journal of Pure and Applied Mathematics*:

LOGARITHM; TABLE, MATHEMATICAL; LEGENDRE, A. M.; NAPIER, JOHN.

J. H. Grace, Lecturer in Mathematics at Peterhouse and Pembroke College, Cambridge. Fellow of Peterhouse:

GEOMETRY, *Line Geometry*.

Sir A. G. Greenhill, formerly Professor of Mathematics in the Ordnance College, Woolwich. Author of *Differential and Integral Calculus with Applications*; *Hydrostatics*; *Notes on Dynamics*, etc.:

BALLISTICS; GYROSCOPE AND GYROSTAT; HYDROMECHANICS.

Sir Thomas Little Heath, Assistant-Secretary to the Treasury, London. Fellow of Trinity College, Cambridge. Author of *Apollonius of Perga*; *Treatise on Conic Sections*; *The Thirteen Books of Euclid's Elements*, etc.:

ANTHEMIUS; APOLLONIUS OF PERGA; ARCHIMEDES; HERO OF ALEXANDRIA; PAPPUS OF ALEXANDRIA; PORISM, etc.

F. R. Helmert, Professor of Geodesy in the University of Berlin:

EARTH, FIGURE OF THE (in part); GEODESY (in part).

O. M. F. Henrici, Professor of Mechanics and Mathematics in the Central Technical College of the City and Guilds of London Institute. Author of *Vectors and Rotors*; *Congruent Figures*, etc.:

CALCULATING MACHINES; GEOMETRY, I. *Euclidean*; II. *Projective*; III. *Descriptive*; PERSPECTIVE; PROJECTION.

E. W. Hobson, Fellow and Tutor in Mathematics, Christ's College, Cambridge. Stokes Lecturer in Mathematics in the University:

FOURIER'S SERIES; SPHERICAL HARMONICS; TRIGONOMETRY.

A. E. Jolliffe, Fellow, Tutor and Mathematical Lecturer, Corpus Christi College, Oxford. Senior Mathematical Scholar, 1892:

CONTINUED FRACTIONS; MAXIMA AND MINIMA; SERIES.

H. Lamb, Professor of Mathematics, University of Manchester, formerly Fellow and Assistant Tutor of Trinity College, Cambridge; Member of Council of Royal Society, 1894–1896. Royal Medallist, 1902. President of London Mathematical Society 1902–1904. Author of HYDRODYNAMICS, etc.:

DYNAMICS; HARMONIC ANALYSIS; MECHANICS, I. *Theoretical*; VECTOR ANALYSIS; WAVE.

A. E. H. Love, Sedleian Professor of Natural Philosophy in the University of Oxford. Hon. Fellow of Queen's College; formerly Fellow of St. John's College, Cambridge; Secretary to the London Mathematical Society:

ELASTICITY; VARIATIONS, CALCULUS OF; FUNCTION, *Functions of Real Variables*; INFINITESIMAL CALCULUS.

W. H. Macaulay, Fellow and Tutor of King's College, Cambridge:

MOTION, LAWS OF.

Major P. A. Macmahon, Deputy Warden of the Standards, Board of Trade. Joint General Secretary, British Association. Formerly Professor of Physics, Ordnance College. President of London Mathematical Society, 1894–1896:

ALGEBRAIC FORMS; COMBINATORIAL ANALYSIS; CAYLEY, ARTHUR.

G. B. Mathews, formerly Professor of Mathematics, University College of N. Wales, sometime Fellow of St. John's College, Cambridge:

ALGEBRA, *Special Kinds of Algebra*; NUMBER.

J. Clerk Maxwell, former Professor of Experimental Physics in the University of Cambridge. See biographical article (Vol. 17, p. 929):

CAPILLARY ACTION (in part); DIAGRAM.

Simon Newcomb, former Professor of Mathematics and Astronomy, Johns Hopkins University, etc. See the biographical article (Vol. 19, p. 474):

ASTRONOMY, *Descriptive*; and many other astronomical subjects.

J. H. Poynting, Professor of Physics and Dean of the Faculty of Science in the University of Birmingham. Formerly Fellow of Trinity College, Cambridge. Joint-author of *Text-Book of Physics*:

ACOUSTICS; GRAVITATION (in part); SOUND.

F. Purser, formerly Fellow of Trinity College, Dublin; Professor of Natural Philosophy in the University of Dublin; Member of the Royal Irish Academy:

SURFACE (in part).

J. Purser, formerly Professor of Mathematics in Queen's College, Belfast. Member of the Royal Irish Academy:

SURFACE (in part).

W. J. M. Rankine, former Professor of Civil Engineering at Glasgow University. See the biographical article (Vol. 22, p. 894):

MECHANICS, *Applied* (in part).

Hon. B. A. W. Russell, formerly Fellow of Trinity College, Cambridge. Author of *Foundations of Geometry*; *Principles of Mathematics*, etc.:

GEOMETRY, VI. *Non-Euclidean* (in part).

W. F. Sheppard, Senior Examiner in the Board of Education; formerly Fellow of Trinity College, Cambridge; Senior Wrangler, 1884:

ALGEBRA, *Principles of Ordinary Algebra*; ARITHMETIC; DIFFERENCES, CALCULUS OF; INTERPOLATION; MENSURATION.

P. G. Tait, late professor of Natural Philosophy, Edinburgh University. Author of *Elementary Treatise on Quaternions*. Joint author with Lord Kelvin of *Treatise on Natural Philosophy*:

KNOT; QUATERNIONS (in part); HAMILTON, SIR WILLIAM; MAXWELL, JAMES CLERK.

Rev. Charles Taylor, formerly Master of St. John's College, Cambridge. Vice-Chancellor, Cambridge University, 1887–1888. Author of *Geometrical Conics*, etc.:

GEOMETRICAL CONTINUITY.

H. M. Taylor, Fellow of Trinity College, Cambridge; formerly Tutor and Lecturer. Smith's Prizeman, 1865. Editor of the Pitt Press *Euclid*:

NEWTON, SIR ISAAC.

Sir J. J. Thomson, Cavendish Professor of Experimental Physics and Fellow of Trinity College, Cambridge. President of the British Association, 1909–1910. Author of *A Treatise on the Motion of Vortex Rings*; *Application of Dynamics to Physics and Chemistry*:

MATTER; and several articles on Electrical Science.

J. Walker, Christ Church, Oxford. Demonstrator in the Clarendon laboratory. Formerly Vice-

President of the Physical Society. Author of *The Analytical Theory of Light*, etc.:

POLARIZATION OF LIGHT; REFRACTION, *Double Refraction.*

A. N. Whitehead, Fellow and Lecturer in Mathematics, Trinity College, Cambridge. Author of *A Treatise on Universal Algebra*, etc.:

GEOMETRY VI. *Non-Euclidean Geometry* (in part); GEOMETRY VII. *Axioms on Geometry*; MATHEMATICS.

These are the men who are responsible for the mathematical sections of the Britannica. A fuller list of articles on mathematical subjects is given below.

Abel, Niels Henrik

Abscissa

Acceleration

Agnesi, Maria Gaetana

Aguillon, F. D.

Algebra

Algebraic Forms

Aliquot

Allen, or Alleyn T.

Amicable Numbers

Anderson, Alexander

Angle

Anthemius

Apollonius of Perga

Archimedes

Argument

Arithmetic
Autolycus of Pitane
Axis
Babbage, Charles
Baldi, Bernardino
Ballistics
Barlow, Peter
Barrow, Isaac
Bernoulli (family)
Bessel Function
Binomial
Biquadratic
Bisectrix
Boole, George
Borda, Jean Charles
Boscovich, Roger J.
Bouguer, Pierre
Bowditch, Nathaniel
Brachistochrone
Briggs, Henry
Buxton, Jedediah
Calculating Machines
Camus, Charles E. L.
Cardan, Girolamo
Cardioid
Castel, Louis Bertrand

Catenary
Cauchy, A. L., baron
Cayley, Arthur
Charles, J. A. C.
Chebichev, P. L.
Circle
Cissoid
Clairault, A. C.
Clifford, William K.
Cocker, Edward
Colburn, Z.
Combinatorial Analysis
Conchoid
Cone
Conic Section
Conoid
Continued Fractions
Cotes, Roger
Cremona, Luigi
Cube
Curve
Cycloid
Cylinder
Demoivre, Abraham
De Morgan, Augustus
Determinant

Diagonal
Diagram
Diameter
Differences, Calculus of
Differential Equation
Dimension
Diophantus of Alexandria
Ditton, Humphry
Dodecahedron
Dynamics
Earth, Figure of the
Elasticity
Ellipse
Ellipsoid
Emerson, William
Energetics
Energy
Epicycloid
Equation
Euclid
Euler, Leonhard
Fermat, Pierre de
Figurate Numbers
Focus
Folium
Fourier, J. B. J.

Fourier’s Series
Frisi, Paolo
Frustum
Function
Galloway, Thomas
Galois, Evariste
Gauss, Karl Friedrich
Geodesy
Geometrical Continuity
Geometry
Gnomon
Graphical Methods
Gravitation
Greaves, John
Gregory (family)
Gregory, Olinthus G.
Groups, Theory of
Gunter, Edmund
Gyroscope and Gyrostat
Hachette, J. N. P.
Hamilton, Sir W. R.
Harmonic
Harmonic Analysis
Harriot, T.
Hero of Alexandria
Hodograph

Hutton, Charles
Huygens, Christiaan
Hydrodynamics
Hydromechanics
Hydrostatics
Hyperbola
Icosahedron
Inaudi, Jacques
Infinite
Infinitesimal Calculus
Interpolation
Inversion
Involution
Ivory, Sir James
Jacobi, Karl G. J.
Kelvin, William Thomson, 1st baron
Kinematics
Kinetics
Kircher, Athanasius
Knot
Kovalevsky, Sophie
Lagrange, Joseph L.
Landen, John
Laplace, P. S., de
Lardner, Dionysius
Legendre, Adrien Marie

Lemniscate
Leonardo of Pisa
Leslie, Sir John
Lever
Lie, Marius Sophus
Limaçon
Line
Lobachevskiy, N. I.
Locus
Logarithm
Logocyclic Curve, Strophoid or Foliate
MacCullagh, James
Maclaurin, Colin
Magic Square
Map
Mascheroni, Lorenzo
Mathematics
Matter
Maupertuis, Pierre de
Maxima and Minima
Maxwell, J. Clerk
Mechanics
Mensuration
Mersenne, Marin
Monge, Gaspard
Montucia, Jean-Étienne

Motion, Laws of
Murphy, Robert
Napier, John
Newton, Sir Isaac
Nicomachus of Gerasa
Number
Numbers, Partition of
Numeral
Octahedron
Ordinate
Oughtred, William
Oval
Pantograph
Pappus of Alexandria
Parabola
Peacock, George
Peirce, Benjamin
Pell, John
Perpetual Motion
Perspective
Pfaff, J. F.
Playfair, John
Plücker, Julius
Poinsot, Louis
Poisson, Siméon Denis
Polygon

Polygonal Numbers
Polyhedral Numbers
Polyhedron
Poncelet, Jean Victor
Porism
Price, Bartholomew
Prism
Probability
Projection
Quadratrix
Quaternions
Recorde, Robert
Riccati, J. F., count
Riemann, G. F. B.
Roberval, G. P. de
Robins, Benjamin
Roulette
Routh, Edward John
Russell, John Scott
Salmon, George
Saunderson, N.
Serenus of Antissa
Series
Serpentine
Simpson, Thomas
Simson, Robert

Smith, H. J. S.
Smith, Robert
Snell, Willebrord
Sphere
Spherical Harmonics
Spheroid
Spiral
Spottiswoode, W.
Statics
Steiner, Jakob
Stevinus, Simon
Stirling, James
Stokes, Sir George G.
Strength of Materials
Sturm, J. C. F.
Surface
Sylvester, J. J.
Table, Mathematical
Tait, Peter G.
Tartaglia, Niccolo
Taylor, Brook
Tetrahedron
Theodosius of Tripolis
Thompson, T. P.
Tide
Todhunter, Isaac

Triangle

Trigonometry

Trisectrix

Units, Dimensions of

Units, Physical

Variations, Calculus of

Vector Analysis

Vernier, Pierre

Vieta (or Viète), F.

Wallace, William

Wallis, John

Wave

Witch of Agnesi

Zero

CHAPTER LIII
ASTRONOMY

No greater homage has ever been paid to the progress of American science than when the planning and supervision of the astronomical section of the new Encyclopaedia Britannica was entrusted to the late Prof. Simon Newcomb, who was also the only American save Benjamin Franklin ever elected an associate of the French Institute. His death occurred some time before the Britannica was completed, but he had already finished the articles which he had

undertaken personally to contribute, and read a great number of the other articles which had, at his suggestion, been assigned to eminent astronomers in various parts of the world. His famous hand-book, *Popular Astronomy*, has been translated into all the European languages, and into Japanese as well; but the unlimited resources in the way of collaboration which the editorial organization of the Britannica put at his disposal, enabled him to assemble in these volumes a complete body of astronomical knowledge which is the greatest of his educational achievements.

The making of a lens for a great telescope is the most difficult undertaking in all craftsmanship, and the mounting of the telescope itself a triumph of mechanical ingenuity. Yet the stars and planets have been guide-posts for the shepherd and the sailor throughout the ages, and have told the farmer when to sow and when to reap, and, even in our day, observations made by an amateur, through a common field-glass, have in more than one instance yielded results of serious value.

A Few Facts

Progress is from one point of view so slow that astronomers are now compiling data regarding fixed stars of which the motion cannot be deduced for centuries to come; yet some of the changes to be observed are so swift that solar prominences often rise at the rate of 350,000 miles an hour, and have been seen to rise to that height. The temperature of the sun's envelope, 6000° C., greatly exceeds any that we can artificially create, and would convert into gas any substance we know; and for every unit of heat it sends to the earth, a hundred million other units, poured into space, are absolutely lost for any purposes of mechanical effect.

Astronomy deals with objects so minute that even a shooting star evolving, as it passes through our atmosphere, so much light that we can trace its course with the naked eye, may be no larger than a grain of sand; deals, too, with objects of so shadowy a nature that the white clouds in our sky are, in comparison, solid blocks; and deals, again, with distances and surfaces so vast that numerical description fails to convey any impression but one of confusion.

It is not easy to conceive, when we see a balloon in the air, the remainder that would exist if the bag, the car, and the cordage were all subtracted. There would be, until the gas mixed with the atmosphere, a sphere of gas. The stars, our sun included, seem to be masses of incandescent gas, possessing fairly definite boundaries, and not far from spherical in shape; the nebulae seem also to be masses of incandescent gas, irregular in form and having no clearly marked limits; even the nucleus of a comet is apparently not

solid enough to be opaque; and as the four great planets also seem to be gaseous, it is probable that only the smaller bodies, like our earth, the moon, and Mars, are solid.

To the rule that we can handle none of the matter that originates beyond the limits of our atmosphere, the meteorites supply an exception. Seventy years ago, a mass of stone, cold and invisible, flying through the aether of space at the rate of some hundred thousand miles an hour, entered our atmosphere, became so hot, as the air's friction checked its speed, that bits of its surface, fused to crust, flicked off and floated in the air, leaving a shining trail; then as its speed was reduced to some three hundred miles an hour, cooled until it was no hotter than a laundress likes her iron to be. At Mhow, in India, as it made a dent in the earth, it killed a man—the only man known to history who has died so uncanny a death. But near Wold Cottage, in Yorkshire, England, thirty years before, another meteorite had fallen only ten yards from a labourer; and only thirty years ago another arrived on a Yorkshire railway line, forty yards from a gang of platelayers. The largest meteoric mass known weighs about fifty tons, but most of them seem to have split in the course of their journey; and at Hessle, a hundred thousand fragments spread, like grapeshot from a giant gun, over an area of some thirty square miles. See METEORITE (Vol. 18, p. 262).

Life on Mars

Although the closest scrutiny has not discovered in any meteorite a shred of life, even the lowest, we obtain, from another source, and by a different method of observation, evidence—as yet inconclusive,—that not only life, but intelligent life

exists beyond our planet. As in respect of other astronomical problems, the Britannica is singularly clear, impartial and authoritative in its treatment of this question. The article MARS (Vol. 17, p. 761) was written by Professor Newcomb, but Professor Percival Lowell contributes a summary of the recent investigations and deductions relating to Mars with which his name is associated. In 1877, Schiaparelli, adopting the old belief now abandoned by all astronomers, that oceans occupied the darker-coloured regions of Mars, observed dark streaks connecting these dark patches, and, believing them to be strips of water, described them by the Italian word "canale," by which he meant channels, or natural bodies of water. An absurd misconception of his meaning gave wide currency to the idea that these strips were artificial *canals*, a manifest impossibility, as they are many miles in width. No canal, properly so called, could be so wide, and no reservoir could conceivably be so extensive. There is, in the existence of such patches, even if they were bodies of water, as no one now believes them to be, not the slightest indication of excavation. In 1894, Professor Lowell, an American astronomer of great authority, established, for the special purpose of observing Mars, the Lowell Observatory at Flagstaff, in Arizona, 7,250 feet above sea level, in singularly clear, dry air, equipped with a twenty-four-inch telescope. This observatory unquestionably commands greater penetration than any other, and Professor Newcomb says that the work there upon Mars "has been continued with such care and assiduity that its results must take precedence of all others." Professor Lowell's first announcement that he had detected evidences of the existence of extensive artificial canals, which would of course

absolutely prove Mars to be inhabited by intelligent creatures, was received with derision by many critics who jumped to the conclusion that he meant artificial canals many miles in width. Fuller statements from Professor Lowell showed that he believed Schiaparelli's wide strips to be not water, *but areas of vegetation lying on each side of artificial irrigating canals of no extraordinary width*, by a network of which water is brought to, and distributed throughout, the temperate and equatorial zones of Mars from the extreme North and South, as the polar snow caps melt; and that this irrigation gives the rainless area a seasonal fertility, just as the melting of Abyssinian snows fecundates the distant valley of the lower Nile. These strips, according to Professor Lowell and other observers, are at one season of a bluish-green colour suggesting prosperous vegetation, then fade to a paler shade or in some places to a tawny brown. The strips are thousands of miles in length, perfectly straight. No one claims to have seen the artificial canals, but if there are areas of vegetation, they must be due to irrigation performed by waterways. If continued observations confirm the existence of these strips, it will become certain that they are not telescopic illusions, but the results of engineering operations on a scale unknown to our planet. The readings indicated in this chapter will yield a survey of this special field, as of all other fields of current research in astronomy, and give new interest to current investigations.

A brief account of some of the principal astronomical articles is printed here in tabular form, and a fuller list, alphabetically arranged, follows this topical outline.

Topics for Reading	*Article and Contributor*
Early Interest in the Sky.	
Astral theology—the "assumption of a close link between the movements going on in the heavens and occurrences on the earth." The history of astrology traced to ancient Babylonia (about 3000 B.C.).	ASTROLOGY (Vol. 2, p. 795), and BABYLONIAN AND ASSYRIAN RELIGION (Vol. 3, p. 114), by Dr. Morris Jastrow, author of *Religion of the Babylonians and Assyrians*.
Story of the Constellations. A Map of the Heavens.	CONSTELLATION—with star-maps and tables (Vol. 7, p. 11), by Charles Everitt, fellow Royal Astronomical Society. See also separate articles on the principal constellations and stars.
Development of Astronomy.	
Scientific knowledge of the ancient Chinese, Egyptians and Babylonians. Revolutionary cycle of the planets.	ASTRONOMY, *History* (Vol. 2, p. 808), by Agnes M. Clerke, author of *A Popular History of Astronomy*.
First conception of the earth as a globe. "The harmony of the spheres." Identification of morning and evening stars (about 520 B.C.).	PYTHAGORAS (Vol. 22, p. 699), by Dr. A. S. Pringle-Pattison, author of *Man's Place in the Cosmos*, etc.

The Greeks measure the earth by astronomical means (about 200 B.C.).	ERATOSTHENES OF ALEXANDRIA (Vol. 9, p. 733), by Sir Thomas Little Heath, author of *Treatise on Conic Sections*.
The first observatory.	OBSERVATORY (Vol. 19, p. 954), by J. L. E. Dreyer, Director of Armagh Observatory.
The first systematic astronomer, Ptolemy and his System (A.D. 150).	PTOLEMY, *Mathematics* (Vol. 22, p. 620), by Prof. George J. Allman, Queen's, Galway; COPERNICUS (Vol. 7, p. 100), by Agnes M. Clerke.
Revival of heliocentric theory (A.D. 1506–1512).	KEPLER, JOHANN (Vol. 15, p. 749), by Agnes M. Clerke.
Plan of Solar System realized. The founder of descriptive astronomy (1564–1642).	GALILEO GALILEI (Vol. 11, p. 406), by Agnes M. Clerke.
Newton's contributions to astronomy and astronomical physics (1585–1586).	NEWTON, SIR ISAAC (Vol. 19, p. 586), by Henry M. Taylor, Fellow of Trinity College, Cambridge.
Continuation of Newton's work.	EULER, LEONHARD (Vol. 9, p. 887).
Nebular hypothesis of Laplace (1796).	NEBULAR THEORY (Vol. 19, p. 333), by Sir Robert S. Ball, author of *The Story of the Heavens,* etc.
The New Astronomy.	

Work of Wollaston, Fraunhofer, Kirchoff, and Rowland in spectrum analysis.	ASTROPHYSICS (Vol. 2, p. 819), by Dr. Simon Newcomb, late director National Observatory, Washington.
Discoveries during recent eclipses. Photographing the Heavens, Star-charts, etc.	PHOTOGRAPHY, CELESTIAL (Vol. 21, p. 523), by Prof. H. H. Turner, Oxford, author of *Modern Astronomy*, etc.
Measuring light and heat from the stars,—radio-micrometer.	PHOTOMETRY, *Celestial, or Stellar Photometry* (Vol. 21, p. 530), by Dr. H. H. Turner, Oxford.
New method of photographing the sun and the results of this mode of study.	SPECTROHELIOGRAPH, illustrated (Vol. 25, p. 618), by Dr. George E. Hale, inventor of the spectroheliograph.
Principles of Astronomy.	
How the positions and motions of the heavenly bodies are defined. System of co-ordinates.	ASTRONOMY, *Spherical or Geometrical Astronomy* (Vol. 2, p. 801), by Dr. Simon Newcomb.
Distance of sun from earth the fundamental celestial measurement.	PARALLAX (Vol. 20, p. 760), by Dr. Simon Newcomb.
Methods of determining distances of stars.	STAR, *Distances and Parallaxes of the Stars* (Vol. 25, p. 789), by Arthur S. Eddington, Royal Observatory, Greenwich.

Apparent motion of the heavenly bodies.	ABERRATION, *Aberration of Light* (Vol. 1, p. 54), by Dr. S. Otto Eppenstein, Zeiss Optical Works, Jena, Germany.
Eclipses and their recurrence. List of solar eclipses. Methods of computing eclipses.	ECLIPSE (Vol. 8, p. 887), by Dr. Simon Newcomb.
Diameter of earth as an astronomical unit. Determination of diameter and figure of earth.	EARTH, FIGURE OF THE (Vol. 8, p. 801), by Alexander R. Clarke, Ordnance Survey, and Prof. F. R. Helmert, University of Berlin.
The Stars. The two Star-Streams. Milky Way. Distribution of stars.	STAR (Vol. 25, p. 785), by Arthur S. Eddington, Royal Observatory, Greenwich.
True nebulae. Constitution. How they differ from star-clusters.	NEBULA, illustrated (Vol. 19, p. 332), by Arthur S. Eddington.
Comets—origins and orbits. Physical constitution. List of periodic comets.	COMET, illustrated (Vol. 6, p. 759), by Dr. Simon Newcomb.
Shooting Stars. History of meteoric showers.	METEOR (Vol. 18, p. 260), by W. F. Denning, formerly president, Liverpool Astronomical Society.
Constitution of Shooting Stars.	METEORITE (Vol. 18, p. 262), by Lazarus Fletcher, author of *Introduction to the Study of Meteorites*.

General description of the Solar System.	SOLAR SYSTEM (Vol. 25, p. 357), by Dr. Simon Newcomb.
The photosphere, chromosphere and corona, dimensions, temperature, and age of the sun, sun-spots.	SUN, illustrated (Vol. 26, p. 85), by Dr. Ralph A. Sampson, Astronomer Royal for Scotland.
The vast envelope which surrounds the sun.	ZODIACAL LIGHT (Vol. 28, p. 998), by Dr. Simon Newcomb.
Are Northern Lights due to emanations from the sun?	AURORA POLARIS, illustrated (Vol. 2, p. 934), by Dr. Charles Chree, president Physical Society of London.
Opaque Bodies, members of the Solar System. Their relation to each other. Their spectra, atmosphere, temperatures. First planetoid discovered (Jan. 1, 1801). Groupings of the planetoids.	PLANET, illustrated (Vol. 21, p. 714), and PLANETS, MINOR (Vol. 21, p. 717), both by Dr. Simon Newcomb.
The smallest major planet. How it presents the same face always to the sun.	MERCURY (Vol. 18, p. 154), by Dr. Simon Newcomb.
Venus: Its peculiar rotation and cloudy atmosphere. Has Venus a satellite?	VENUS (Vol. 27, p. 1013), by Dr. Simon Newcomb.
The earth as a member of the solar system.	EARTH (Vol. 8, p. 799).

Our nearest neighbour. Is it inhabited? Similarity of physical conditions to those of the earth.	MARS, illustrated (Vol. 17, p. 761), by Dr. Simon Newcomb, with a summary by Professor Lowell, of the observations at Flagstaff.
The largest planet. Its belts, spots, markings and surface. Is the great red spot a floating island?	JUPITER, illustrated (Vol. 15, p. 562), by W. F. Denning, formerly president, Liverpool Astronomical Society.
The ringed planet. Physical constitution of rings.	SATURN (Vol. 24, p. 232), by Dr. Simon Newcomb.
Uranus: Its discovery, physical characteristics and satellites.	URANUS (Vol. 27, p. 788), by Dr. Simon Newcomb.
The outermost known planet. Dimensions. Resemblance to Uranus.	NEPTUNE (Vol. 19, p. 385), by Dr. Simon Newcomb.
Wonderful story of its discovery (1845).	ADAMS, JOHN COUCH (Vol. 1, p. 177). LEVERRIER, U. J. J. (Vol. 16, p. 510), by Agnes M. Clerke, author of *A Popular History of Astronomy*.
The moon. Its aspects, phases and constitution. Its mountains and atmosphere.	MOON, illustrated (Vol. 18, p. 802), by Dr. Simon Newcomb.
Development of Practical and Observational Astronomy.	

Current mode of star nomenclature adopted (1603). First planetary transit observed by Gassendi (1631).	ASTRONOMY, *History of Astronomy* (Vol. 2, p. 813), by Agnes M. Clerke, author of *A Popular History of Astronomy*.
Astronomical Instruments.	
How co-ordinates used in astronomical research are determined.	ASTRONOMY, *Practical Astronomy* (Vol. 2 p. 807), by Dr. Simon Newcomb.
Telescope: Discovery and history. Parts and mounting. Great telescopes of the world.	TELESCOPE, illustrated (Vol. 26, p. 557), by Sir David Gill, formerly Astronomer Royal at the Cape of Good Hope, and H. Dennis Taylor, inventor of the Cooke Photographic Lens.
The Transit Circle due to Tycho Brahe. Description and use.	TRANSIT CIRCLE, illustrated (Vol. 27, p. 181), by J. L. E. Dreyer, Armagh Observatory, author of *Planetary Systems from Thales to Kepler*, etc.
Measuring machines. Importance and use in astronomy.	MICROMETER, illustrated (Vol. 18, p. 381), by Sir David Gill.
Measuring the sun's diameter.	HELIOMETER, illustrated (Vol. 13, p. 224), by Sir David Gill.

Old time instruments. "Nearly every one of the modern instruments used for the observatories of practical astronomy is part of the perfected astrolabe."	ASTROLABE, illustrated (Vol. 2, p. 795), by Lady Huggins, author of *Life and Work of G. P. Mazzini*.
Complete list of observatories throughout the world, date of foundation, their equipment and their specialized work.	OBSERVATORY (Vol. 19, p. 953), by J. L. E. Dreyer, director Armagh Observatory, author of *Planetary Systems from Thales to Kepler*.

LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA ON ASTRONOMY

Aberration

Ablatitious

Adams, John Couch

Airy, Sir George B.

Albategnius

Albedo

Albumazar (Abu-Maaschar)

Algol

Alidade

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Amici, Giovanni B.

Amplitude
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Proctor, Richard A.
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CHAPTER LIV
PHYSICS

Early Ideas of the World

More than two thousand years ago the poet Lucretius, reviewing the physical knowledge and theories of the Greeks, described, as the Britannica tells us, how "the world was formed by the conjunctions of streams of atoms, which condensed into the earth, with its attendant water, air, and aether, to form a self-contained whole," and went on to tell how in the changes of infinite time all possible forms of life appeared, but only those fittest to survive persisted. Here we have an unconscious anticipation of the nebular hypothesis and the theory of natural selection, two of the most tremendous of modern speculations. Four hundred years earlier Democritus, the greatest of the Greek natural philosophers, had said: "According to convention there is a sweet and a bitter, and according to

convention there is colour. In truth there are atoms and a void." Democritus came near announcing the doctrines of the indestructibility of matter and the conservation of energy, yet the conventions which he assailed persisted for generations: colour, taste and other qualities of a substance being regarded as of its essence and as much realities as the substance itself. The theories of the Greeks in fact held the field for centuries, until, during the Renaissance, men's minds attacked the secrets of nature in a more modern spirit. Yet, long as has been its history, physical science, as we know it to-day, is but a few years old, the result of the feverish activity which has been the obsession of the generation now passing (Vol. 24, p. 396).

There are many entertaining touches in the historical account of the development of the physical sciences with which this section of the Britannica is enriched, for every branch of the subject has been treated from the historical point of view. The articles, too, have been written by masters who can describe clearly because they see clearly, and no reader, desiring a sound knowledge of the general principles on which science rests, and of the conclusions to which the latest investigations have directed scientific thought, will go away empty handed.

The section of the Physical Sciences in the Britannica covers, of course, an enormous field which for general purposes may be conveniently divided into:—

(*i*)

Matter and Motion

(*ii*)

Sound

(*iii*)

Light

(*iv*)

Heat

(*v*)

Electricity and Magnetism

As a preliminary to any one of these and to the whole subject the reader will be well advised to read the article SCIENCE (Vol. 24, p. 396), by W. C. D. Whetham of Trinity College, Cambridge, author of *Recent Development of Physical Science*; those on UNITS, PHYSICAL (Vol. 27, p. 738), and UNITS, DIMENSIONS OF (Vol. 27, p. 736), are also of fundamental importance; and those on SPACE AND TIME (Vol. 25, p. 525), and TIME, MEASUREMENT OF (Vol. 26, p. 983), may profitably be consulted.

(*I*) *Matter and Motion*

Matter

Since all physical phenomena are manifestations, in one form or other, of matter in motion, this first division of the subject is introductory to all the rest, and should preferably be studied first. The latest theories in connection with the properties of MATTER (Vol. 17, p. 891) are discussed by Sir J. J. Thomson, professor of experimental physics, Cambridge University, who has led the way in the investigation of the electrical theory of matter. The article is directed to the establishment of the electronic

theory, and in view of the vast amount of original work which the author has carried out in this field, his treatment in the Britannica should be welcome to all students of physical science. Supplementing this are the following: ELEMENT, by Wilhelm Ostwald (Nobel Prizeman in Chemistry, 1909), especially the concluding remarks (Vol. 9, p. 253); ATOM (Vol. 2, p. 870); ELECTRICITY, *Electronic Theory* (Vol. 9, p. 192). Early hypotheses are described under SCIENCE (Vol. 24, p. 397); MOLECULES (Vol. 18, p. 654); ALCHEMY (Vol. 1, p. 521); and modern conceptions are discussed under LIQUID GASES, *Cohesion* (Vol. 16, p. 756); and SPECTROSCOPY (Vol. 25, p. 625). Reference should also be made to the articles DENSITY (Vol. 8, p. 46); DIFFUSION (Vol. 8, p. 255); and especially GRAVITATION (Vol. 12, p. 384), by Professor Poynting of the University of Birmingham, and AETHER (Vol. 1, p. 292), by Sir Joseph Larmor, secretary of the Royal Society.

Motion

The principal articles dealing with motion are: MOTION, LAWS OF (Vol. 18, p. 906), which deals mainly with Newton's Laws; and ENERGY (Vol. 9, p. 398), and ENERGETICS (Vol. 9, p. 390), both by Sir Joseph Larmor. Of as great importance from the physical point of view are WAVE (Vol. 28, p. 424), the part of the article MECHANICS dealing with simple harmonic motion (Vol. 17, p. 975) and elliptic harmonic motion (p. 978), and HARMONIC ANALYSIS (Vol. 12, p. 956), all by Professor Lamb of the University of Manchester. Other articles which should be consulted are CAPILLARY ACTION (Vol. 5, p. 256), and PERPETUAL MOTION (Vol. 21, p. 180).

(*II*) *Sound*

The main article SOUND (Vol. 25, p. 437) is by Prof. J. H. Poynting of the University of Birmingham, and very completely covers the subject; the reader will, however, wish to refer to several other articles for supplementary information. Thus in the article HEARING (Vol. 13, p. 124), the range of audibility is discussed (see also TARTINI, Vol. 26, p. 436, for an account of Tartini's tones), while with regard to quality of tone the reader will find suggestive matter under VIOLIN (Vol. 28, p. 104). An account of experiments in balloons on the propagation of sound, will be found (Vol. 1, p. 267) under AERONAUTICS. Reference should also be made to the articles WAVE (Vol. 28, p. 425), ELASTICITY, *Vibrations and Waves* (Vol. 9, p. 158), and HARMONIC ANALYSIS (Vol. 12, p. 956) for a discussion of the form of sound waves. For applications of the principles of sound production, see also the articles PHONOGRAPH (Vol. 21, p. 467), GRAMOPHONE (Vol. 12, p. 333), and especially STRINGED INSTRUMENTS (Vol. 25, p. 1038), WIND INSTRUMENTS (Vol. 28, p. 709), and other articles on musical instruments (see the chapter on *Music* in this Guide). For accounts of the researches of KUNDT (Vol. 15, p. 946), LAGRANGE (Vol. 16, p. 75) and STOKES (Vol. 25, p. 951), see those articles.

(*III*) *Light*

The main article LIGHT (Vol. 16, p. 608) is in four parts. The *Introductory* and *Historical* sections are by C. Everitt; that on the *Nature* of Light by Professor Lorentz of the University of Leiden; that on its *Velocity* by the late Simon Newcomb, the eminent American astronomer. The different phenomena

connected with the subject may conveniently be grouped and studied as follows:—

(a) COLOUR (Vol. 6, p. 728); Intensity, see PHOTOMETRY (Vol. 21, p. 525), a brilliant article by Prof. H. H. Turner, of Oxford University; ILLUMINATION (Vol. 14, p. 320).

(b) REFLECTION OF LIGHT (Vol. 23, p. 2); ABSORPTION (Vol. 1, p. 76); REFRACTION (Vol. 23, p. 25); DISPERSION (Vol. 8, p. 315); INTERFERENCE (Vol. 14, p. 685); POLARIZATION OF LIGHT (Vol. 21, p. 932).

(c) SHADOW (Vol. 24, p. 738); DIFFRACTION (Vol. 8, p. 238); CALORESCENCE (Vol. 5, p. 60); FLUORESCENCE (Vol. 10, p. 375); PHOSPHORESCENCE (Vol. 21, p. 476).

(d) MIRROR (Vol. 18, p. 575); LENS (Vol. 16, p. 421); CAUSTIC (Vol. 5, p. 558); ABERRATION (Vol. 1, p. 54).

(e) CORONA (Vol. 7, p. 184); HALO (Vol. 12, p. 864); MIRAGE (Vol. 18, p. 573); RAINBOW (Vol. 22, p. 861); SKY (Vol. 25, p. 202); TWILIGHT (Vol. 26, p. 492)—see also DUST (Vol. 8, p. 713).

(f) TELESCOPE (Vol. 26, p. 557); MICROSCOPE (Vol. 18, p. 392); OBJECTIVE (Vol. 19, p. 948); CAMERA LUCIDA (Vol. 5, p. 104); CAMERA OBSCURA (Vol. 5, p. 104); BINOCULAR INSTRUMENT (Vol. 3, p. 949); STEREOSCOPE (Vol. 25, p. 895).

(g) VISION (Vol. 28, p. 130).

Far reaching developments are described in PHOTOGRAPHY (Vol. 21, p. 485) and SPECTROSCOPY (Vol. 25, p. 619). In the former article Sir W. de W. Abney describes in great detail photographic *Processes*; Major-General Waterhouse, *Apparatus* and *Lenses*, while A. H. Hinton discusses the *Pictorial* aspect of the subject. There are also valuable articles

on CELESTIAL PHOTOGRAPHY (Vol. 21, p. 523), by Professor Turner, and on the SPECTROHELIOGRAPH (Vol. 25, p. 618), by the inventor, G. E. Hale, director of the Solar Observatory of the Carnegie Institution at Mount Wilson, Cal. The relation between magnetism and light is discussed in an article MAGNETO-OPTICS (Vol. 17, p. 388), by Sir J. J. Thomson.

(*IV*) *Heat*

The treatment of this subject in the Encyclopaedia Britannica has been generally organized by Prof. H. L. Callendar, of the Royal College of Science, London, who was designated by Lord Kelvin as his successor in this department of the work. In pursuing the subject the following order may conveniently be followed:

(a) HEAT (Vol. 13, p. 135), THERMOMETRY (Vol. 26, p. 821), CALORIMETRY (Vol. 5, p. 60), and THERMODYNAMICS (Vol. 26, p. 808), all by Professor Callendar; COLD (Vol. 6, p. 663).

(b) CONDUCTION OF HEAT (Vol. 6, p. 890); RADIATION, THEORY OF (Vol. 22, p. 785); RADIOMETER (Vol. 22, p. 806).

(c) FUSION (Vol. 11, p. 369); VAPORIZATION (Vol. 27, p. 897); CONDENSATION OF GASES (Vol. 6, p. 844); LIQUID GASES (Vol. 16, p. 744); THERMOELECTRICITY (Vol. 26, p. 814).

(*V*) *Electricity and Magnetism*

Historical

We are so accustomed to think of electricity as the peculiar possession of our own age (the first crude attempts at an electric light were only two score years ago) that we are apt to forget that the first experiments in the science were made at least 2500 years ago. The first effort to place it on a true experimental and inductive basis dates back more than three centuries to the publication of the researches of WILLIAM GILBERT (see Vol. 12, p. 9), the most distinguished man of science of his time, whom Queen Elizabeth appointed her private physician at the "usual" salary of £100. A hundred years later, VOLTA (Vol. 28, p. 198), who might be called the patron saint of electricity, produced the first electric current with the pile which bears his name. Meanwhile BENJAMIN FRANKLIN (Vol. 11, p. 30) had been experimenting with his famous kite, and CAVENDISH (Vol. 5, p. 580) and COULOMB (Vol. 7, p. 508) had been paving the way for the startling developments which resulted from Volta's invention. In the 19th century FARADAY (Vol. 10, p. 173), AMPÈRE (Vol. 1, p. 878), OHM (Vol. 20, p. 34), LORD KELVIN (Vol. 15, p. 721), JAMES CLERK MAXWELL (Vol. 17, p. 929) and other brilliant investigators in rapid succession developed the field, until the science and application of electricity have attained a position absolutely dominating our daily life.

Analysis of the Subject

The section of the Britannica treating this great subject is therefore one of the most important in the whole work, and it was in the fullest recognition of the fact that the editor asked Prof. J. A. Fleming, of the University of London, famous for his original work in both the mathematical and the experimental

branches of the science, to organize the sections for the new edition. The ground is generally covered in the four articles, on electricity, electrostatics, electrokinetics, and electromagnetism, all contributed by Prof. Fleming himself. The article ELECTRICITY (Vol. 9, p. 179) is the key article to the subject, and should be read first. The two great branches of electrical theory then follow: (a) ELECTROSTATICS (Vol. 9, p. 240), in connection with which the article ELECTRICAL MACHINE (Vol. 9, p. 176) should also be studied, with reference to ELECTROSCOPE (Vol. 9, p. 239) and ELECTROPHORUS (Vol. 9, p. 237). (b) ELECTROKINETICS (Vol. 9, p. 210) and, supplementing it, CONDUCTION, ELECTRIC (Vol. 6, p. 855). The latter is divided into three parts: (i.) *Conduction in Solids*, by Prof. Fleming; (ii.) *Conduction in Liquids* by W. C. D. Whetham; (iii.) *Conduction in Gases*, by Sir J. J. Thomson. In connection with (ii.) should be read ELECTROLYSIS (Vol. 9, p. 217), by W. C. D. Whetham, and with (iii.) RÖNTGEN RAYS (Vol. 23, p. 694) and VACUUM TUBE (Vol. 27, p. 834), both by Sir J. J. Thomson, whose article ELECTRIC WAVES (Vol. 9, p. 203) is of fundamental importance. The general principles of electrical engineering are set out in the article ELECTRIC SUPPLY (Vol. 9, p. 193) with reference to DYNAMO (Vol. 8, p. 764); MOTORS, ELECTRIC (Vol. 18, p. 910); TRANSFORMERS (Vol. 27, p. 173); ACCUMULATOR (Vol. 1, p. 126); POWER TRANSMISSION, *Electric* (Vol. 22, p. 233); TRACTION, *Electric Traction* (Vol. 27, p. 120); LIGHTING, *Electric* (Vol. 16, p. 659); see also ELECTROCHEMISTRY (Vol. 9, p. 208) and ELECTROMETALLURGY (Vol. 9, p. 232); TELEGRAPH (Vol. 26, p. 510); TELEPHONE (Vol. 26, p. 547).

A bridge to MAGNETISM (Vol. 17, p. 321), an

article by Shelford Bidwell, former president of the Physical Society, is the article ELECTROMAGNETISM (Vol. 9, p. 226), by Prof. Fleming. This article leads also to the study of manifestations in nature of electricity and magnetism: see the articles ATMOSPHERIC ELECTRICITY (Vol. 2, p. 860); AURORA POLARIS (Vol. 2, p. 927); EARTH CURRENTS (Vol. 8, p. 813); and MAGNETISM, TERRESTRIAL (Vol. 17, p. 353); and to the applications of its principles in the COMPASS (Vol. 6, p. 804).

An alphabetical list of the articles in the Britannica on the subjects treated in this chapter is given below. The biographies of distinguished physicists, included in the list, are valuable as containing accounts of their contributions to science, and are full of human interest.

ARTICLES ON THE PHYSICAL SCIENCES IN THE BRITANNICA, INCLUDING THOSE ON FAMOUS PHYSICISTS

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Accumulator

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Acoustics

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Permeameter
Perpetual Motion
Phonograph

Phosphorescence
Photography
Photometry
Pint
Plateau, J. A. F.
Pneumatics
Poggendorff, J. C.
Polarity
Polarization of Light
Pood
Potentiometer
Pound
Power Transmission
Prévost, Pierre
Pyrometer
Radiation, Theory of
Radiometer
Rayleigh, Lord
Reflection of Light
Refraction
Rod
Röntgen Rays
Röntgen, W. K.
Rowland, Henry A.
Rumford, Count
Saussure, H. B. de

Science
Shadow
Siemens, E. Werner von
Sky
Sound
Space and Time
Spectacles
Spectroscopy
Speculum
Spherometer
Standard
Stereoscope
Stewart, Balfour
Sun or Photo Copying
Swan, Sir Joseph W.
Tait, Peter G.
Talbot, W. H. Fox
Talent
Tartini, G.
Telegraph
Telephone
Thermodynamics
Thermoelectricity
Thermometry
Thomson, James
Torricelli, E.

Transformers
Trumpet, Speaking and Hearing
Tyndall, John
Units, Dimensions of
Units, Physical
Vacuum Tube
Vaporization
Vision
Volta, Alessandro
Voltmeter
Wattmeter
Wave
Weber, W. E.
Weighing Machines
Weights and Measures
Wheatstone's Bridge
Wheatstone, Sir Chas.
Wiedemann, G. H.
Young, Thomas

CHAPTER LV
CHEMISTRY

We have traveled far since Chemistry had as its simple basis four elements: fire, air, water, and earth,

regarded as perfect and complete since they embody every essence of which a body was supposedly capable: for fire was hot and dry; air, hot and wet; water, cold and wet; earth, cold and dry. We have outlived the belief in the philosopher's stone which animated the Middle Ages. Yet these fallacies are but manifestations of the effort—old as thought—to reduce the manifoldness of matter to primordial elements, from which, in one form or other, every substance should be capable of being built up. The ultimate problem of chemistry is, therefore, the constitution of matter, and the fight around this is waged on the marches of the physical and chemical sciences.

Triumphs of Chemistry

The great commercial triumphs of chemistry are, of course, those due to the conquest of waste, to the utilization of by-products which for thousands of years had been regarded as useless. We are all familiar with the uses to which the by-products of coal-tar are put; we swallow one derivative to relieve headache, we may sugar our tea and flavour our ice-cream with others; with one derivative we clean our clothes which have been dyed with others; and we disinfect them with yet another. Phenacetin, saccharin, synthetic vanilla, benzine, naphthaline, analine dyes, carbolic acid, are only a few of the many substances won to the consumer by the chemist in his laboratory; and this is only one field of research. The chemist is always busy (as now with rubber, camphor, etc.), working at the synthesis of natural products in the hope that he will be able to find a means of manufacturing them in quantities at a cost which will make them, commercially possible,

and thus lessen the drain on the world's natural supply. In almost every detail of our lives this science enters so familiarly that we forget that the many things made possible by the chemist do not simply "happen," but are the result of laborious research in the laboratory.

It is not possible to attain proficiency in any experimental science without laboratory work; but to the student of chemistry the lucid and original articles in the Britannica will provide a most useful commentary on his work with test-tube and burner. The general reader will find in these articles an admirable survey of the subject, and of its bearings on problems of daily life. The main article CHEMISTRY (Vol. 6, p. 33) generally covers the ground, and serves as an introduction to separate articles on important divisions of the subject. Following its arrangement the scheme outlined below suggests a useful course of reading.

(i.) Chemistry, *History* (Vol. 6, p. 33). Supplementary to this section are the articles ALCHEMY (Vol. 1, p. 519), ELEMENT (Vol. 9, p. 253), MOLECULE (Vol. 18, p. 654), ATOM (Vol. 2, p. 870); and reference may also be made to MEDICINE, *Iatro-chemical School* (Vol. 18, p. 50).

(ii.) Chemistry, *General Principles* (Vol. 6, p. 39), with reference to VALENCY (Vol. 27, p. 847), CHEMICAL ACTION (Vol. 6, p. 26), CATALYSIS (Vol. 5, p. 501), ISOMERISM (Vol. 14, p. 881), STEREO-ISOMERISM (Vol. 25, p. 890), RADIOACTIVITY (Vol. 22, p. 793).

(iii.) *Inorganic Chemistry* (Vol. 6, p. 44). See also ACID (Vol. 1, p. 145), ALKALI (Vol. 1, p. 674), and the list of 138 elements and compounds under this heading below.

(iv.) *Organic Chemistry* (Vol. 6, p. 47), with all the 240 articles enumerated under this heading below, especially that on POLYMETHYLENES (Vol. 22, p. 29); see also EXPLOSIVES (Vol. 10, p. 81).

(v.) *Analytical Chemistry* (Vol. 6, p. 60), with which may be consulted, BLOW PIPE (Vol. 4, p. 89), DISTILLATION (Vol. 8, p. 318), ELECTROLYSIS (Vol. 9, p. 217), INDICATOR (Vol. 14, p. 482), SOLUTION (Vol. 25, p. 368), STOICHIOMETRY (Vol. 25, p. 939).

(vi.) *Physical Chemistry* (Vol. 6, p. 65) supplemented by ENERGETICS (Vol. 9, p. 390), CHEMICAL ACTION (Vol. 6, p. 26), THERMOCHEMISTRY (Vol. 26, p. 804), SOLUTION (Vol. 25, p. 368), DISTILLATION (Vol. 8, p. 318), CONDENSATION OF GASES (Vol. 6, p. 844), with the important articles PHOTOCHEMISTRY (Vol. 21, p. 484), ELECTROCHEMISTRY (Vol. 9, p. 208), METALLURGY (Vol. 18, p. 203), ELECTROMETALLURGY (Vol. 9, p. 232), ASSAYING (Vol. 2, p. 776).

Among the contributors to the chemical department of the Britannica are: Professor Ernest Rutherford, of the University of Manchester; Walter Nernst, professor of physical chemistry in the University of Berlin; W. C. D. Whetham, author of *Theory of Solution*, etc.; Prof. James Walker of the University of Edinburgh; Johannes Diderik van der Waals, professor of physics, University of Amsterdam; W. R. E. Hodgkinson, professor of chemistry and physics, Ordnance College, Woolwich, perhaps the greatest living authority on explosives.

The following is a classified list of the articles on Chemistry which are contained in the Britannica. For discussions of the application of chemistry to photography, the reader should consult the article

PHOTOGRAPHY (Vol. 21, p. 485), of which the chemical section is by Sir W. de W. Abney, adviser in Science to the English Board of Education.

CHEMISTRY—GENERAL

Affinity, Chemical

Alchemy

Alembic

Allotropy

Amorphism

Analysis

Assaying

Atmolysis

Atom

Blowpipe

Catalysis

Chemical Action

Chemistry

Combustion

Condenser

Crystallization

Decolourizing

Desiccation

Dialysis

Dissociation

Distillation

Electrochemistry
Electrolysis
Element
Elixir
Equivalent
Explosives
Flame
Formula
Gas
Hydrolysis
Iatrochemistry
Indicator
Isomerism
Matrass
Molecule
Photochemistry
Pigments
Pyrophorus
Radioactivity
Solution
Stereochemistry
Stereo-isomerism
Stoichiometry
Thermochemistry
Valency

INORGANIC CHEMISTRY

Acid
Algaroth, Powder of
Alkali
Alkali Manufacture
Alkaline Earths
Alum
Aluminium
Amalgam
Ammonia
Antimony
Argon
Arsenic
Azoimide, or Hydrazoic Acid
Azoth
Barium
Base
Beryllium, or Glucinum
Bichromates and Chromates
Bismuth
Bittern
Borax
Boric Acid, or Boracic Acid
Boron
Brimstone

Bromine
Cadmium
Caesium
Calcium
Calomel
Carbide
Carbon
Carbonates
Carbon Bisulphide
Carbonic Acid
Carborundum
Caustic
Cerium
Charcoal
Chlorates
Chlorine
Chromium
Cobalt
Colcothar
Columbium, or Niobium
Copper
Copperas
Corrosive Sublimate
Didymium
Earth
Epsom Salts

Erbium
Europium
Fluorine
Gadolinium
Gallium
Germanium
Glauber’s Salt
Glucinum
Gold
Gunpowder
Halogens
Hartshorn, Spirits of
Helium
Hydrate
Hydrazine
Hydrochloric Acid
Hydrogen
Hydroxylamine
Hyposulphite of Soda
Ice
Indium
Iodine
Iron
Kelp
Kermes
Lamp-black

Lanthanum
Lead
Lime
Lithium
Magnesium
Manganese
Mercury
Microcosmic Salt
Molybdenum
Nickel
Niobium
Nitre
Nitric Acid
Nitrogen
Ochres
Orpiment
Osmium
Oxide
Oxygen
Oxyhydrogen Flame
Ozone
Palladium
Phosphates
Phosphorus
Plaster of Paris
Platinum

Potashes
Potassium
Radium
Rare Earths
Rhodium
Rouge
Rubidium
Rust
Ruthenium
Sal Ammoniac
Salt
Saltpetre
Samarium
Scandium
Schlippe’s Salt
Selenium
Silica
Silicon
Silver
Sodium
Steam
Strontium
Sulphur
Sulphuric Acid
Tantalum
Tellurium

Terbium
Thallium
Thorium
Tin
Titanium
Tungsten
Ultramarine
Umber
Uranium
Vanadium
Vermilion
Vitriol
Ytterbium (Neo-ytterbium)
Yttrium
Zinc
Zirconium

ORGANIC CHEMISTRY

Acenaphthene
Acetic Acid
Aceto-acetic Ester
Acetone
Acetophenone
Acetylene
Acid Amides

Acridine
Adenine
Adipocere
Albumin, or Albumen
Alcohol
Alcohols
Aldehydes
Alizarin
Alkahest
Alkaloid
Alkanet
Allantoin
Alloxan
Alloxantin
Allyl Alcohol
Amidines
Amines
Amygdalin
Amyl Alcohols
Amyl Nitrate
Aniline
Anthracene
Anthraquinone
Antipyrine
Argol
Asparagine

Azo Compounds
Azoximes
Benzaldehyde
Benzene
Benzidine
Benzoic Acid
Benzoin
Benzophenone
Benzyl Alcohol
Berberine
Betaïne
Brucine
Butyl Alcohols
Butyric Acid
Caffeine
Camphors
Carbazol
Carbohydrate
Carbolic Acid, or Phenol
Carvacrol
Cellulose
Chloral
Chloroform
Chlorophyll
Chlorpicrin
Chrysene

Cinnamic Acid
Cinnolin
Citric Acid
Coal-tar
Cocaine
Collodion
Conine
Coumarin
Coumarones
Creosote
Cresols
Crotonic Acid
Cyanamide
Cyanic Acid and Cyanates
Cyanide
Cyanogen
Cytisine
Dextrine
Diazo Compounds
Diphenyl
Durene
Dynamite
Ecgonine
Erythrite
Esters
Ether

Ethers
Ethyl
Ethyl chloride
Ethylene
Eugenol
Eupion
Flavin
Fluoranthene
Fluorene
Fluorescein
Formalin, or Formaldehyde
Formic Acid
Fructose, or Fruit-sugar
Fuchsine
Fulminic Acid
Fumaric and Maleic Acids
Furazanes
Furfurane, or Furane
Fusel Oil
Gallic Acid
Gelatin or Gelatine
Glucose
Glucoside
Glutaric Acid
Glycerin
Glycols

Guanidine
Guncotton
Hippuric Acid
Hydantoin
Hydracrylic Acid
Hydrastine
Hydrazone
Hydrocarbon
Imidazoles or Glyoxalines
Indazoles, or Glyoxalines
Indazoles
Indene
Indigo
Indole
Indulines
Inulin
Iodoform
Isatin
Isoxazoles
Ketenes
Ketones
Lactic Acid
Lactones
Laevulinic Acid
Litmus
Malic Acid

Malonic Acid
Mandelic Acid
Marsh Gas
Mellitic Acid
Mercaptans
Mesoxalic Acid
Methyl Alcohol
Mucic Acid
Murexide
Mustard Oils
Naphtha
Naphthalene
Naphthols
Naphthylamines
Nicotine
Nitrobenzene
Nitro Compounds
Nitroglycerin
Olefine
Oleic Acid
Orcin
Oxalic Acid
Oxazoles
Oximes
Palmitic Acid
Paraffin

Paraldehyde
Phenacetin
Phenanthrene
Phenazine
Phenolphthalein
Phthalazines
Phthalic Acids
Picene
Picric Acid
Pilocarpine
Piperazin
Piperine
Piperonal
Polymethylenes
Primuline
Propiolic Acid
Propyl Alcohols
Prussic Acid
Purin
Pyrazines
Pyrazoles
Pyrene
Pyridine
Pyrimidines
Pyrocatechin
Pyrogallol

Pyrones
Pyrrol
Pyruvic Acid
Quercitron
Quinazolines
Quinoline
Quinones
Quinoxalines
Resorcin
Retene
Saccharic Acid
Saccharin
Safranine
Salicylic Acid
Stearic Acid
Styrolene
Succinic Acid
Sugar
Sulphonal
Sulphonic Acids
Tannin or Tannic Acid
Tar
Tartar
Tartaric Acid
Terpenes
Tetrazines

Tetrazoles
Thiazines
Thiazoles
Thiophen
Thymol
Toluene
Triazines
Triazoles
Triphenylmethane
Tropine
Urea, or Carbamide
Urethane
Uric Acid
Urotropin
Valeric Acid
Verdigris
Veronal
Xanthic Acid
Xanthone
Xylene

BIOGRAPHIES

Abel, Sir Frederick A.
Achard, F. C.
Andrews, Thomas

Baeyer, Adolf von
Balard, Antoine J.
Baumé, Antoine
Becher, J. J.
Bell, Jacob
Bergman, Torbern Olof
Berthelot, M. P. E.
Berthollet, C. L.
Berzelius, J. J.
Black, Joseph
Boussingault
Brande, William Thomas
Brown, S. M.
Bunsen, R. W. von
Calvert, F. Crace
Cannizzaro, Stanislao
Cavendish, Henry
Chevreul, M. E.
Clark, Thomas
Crookes, Sir William
Dalton, John
Daniell, John F.
Davy, Sir Humphry
Dewar, Sir James
Döbereiner, J. W.
Dulong, Pierre Louis

Dumas, J. B. A.
Erdmann, Otto Linné
Fehling, Hermann von
Fischer, Emil
Fittig, Rudolf
Flamel, Nicolas
Fourcroy, A. F., de
Frankland, Sir Edward
Frémy, Edmond
Fresenius, Karl R.
Friedel, Charles
Fuchs, Johann N. von
Gannal, J. N.
Gay-Lussac, J. L.
Geber
Geoffroy, E. F.
Gerhardt, Charles F.
Gibbs, Oliver Wolcott
Gilbert, Sir Joseph H.
Gladstone, John Hall
Glaser, Christopher
Glauber, Johann R.
Gmelin (family)
Graham, Thomas
Guimet, Jean B.
Guyton de Morveau

Harcourt, W. Vernon
Helmont, Jean B. van
Henry, William
Hofmann, A. W. von
Homberg, William
Kekulé, F. August
Klaproth, M. H.
Kolbe, A. W. Hermann
Kopp, Hermann F. M.
Kunkel von Lowenstjern
Lavoisier, A. L.
LeBlanc, Nicolas
Lemery, Nicolas
Liebig, J. von, baron
Lunge, Georg
Magnus, H. G.
Marggraf, Andreas S.
Marignac, J. C. G. de
Mayow, John
Mendeléeff, Dmitri I.
Meyer, J. Lothar
Meyer, Victor
Mitscherlich, E.
Mohr, K. Friedrich
Moissan, Henri
Mond, Ludwig

Murray, John
Muspratt, J. and J. S.
Newlands, John A. R.
Nobel, Alfred B.
Pasteur, Louis
Pelouze, T. Jules
Perkin, Sir W. H.
Pettenkofer, M. J. von
Plattner, K. F.
Priestley, Joseph
Proust, Joseph Louis
Prout, William
Ramsay, Sir William
Raoult, François M.
Regnault, H. V.
Richter, J. B.
Roebuck, John
Roscoe, Sir H. E.
Rose (family)
Rouelle, G. F.
Sainte-Claire Deville
Scheele, K. W.
Schönbein, C. F.
Schützenberger, P.
Silliman, Benjamin
Stahl, G. E.

Stas, J. S.
Tennant, Charles
Tennant, Smithson
Thénard, L. J.
Thomsen, Julius
Thomson, Thomas
Van't Hoff, J. H.
Vauquelin, L. N.
Weldon, Walter
Wenzel, K. F.
Williamson, A. W.
Wislicenus, J.
Wöhler, Friedrich
Wollaston, W. H.
Wurtz, C. A.
Young, James

CHAPTER LVI
GEOLOGY

The Province Geology or Sermons in Stones

Shakespeare tells us that "there are sermons in

stones." No science, except possibly astronomy, appeals more to the imagination or carries one further away from our present workaday world than geology. While geology "claims as its peculiar territory the rocky framework of the globe," its object is, says the Encyclopaedia Britannica (Vol. 11, p. 638) "to trace the structural progress of our planet from the earliest beginnings of its separate existence through its various stages of growth down to the present condition of things." It goes back millions and hundreds of millions of years to the first beginnings of things and unravels complicated processes by which the earth and each of the continents on it has been built up.

"It follows, even into detail, the varied sculpture of mountain and valley, crag and ravine." It shows "that the present races of plants and animals are the descendants of other and very different races which once peopled the earth. It teaches that there has been a progressive development of the inhabitants." Dead and cold though the rocks seem, they are filled, to one who can read their secret, with the tragedy of past life. Parts of Florida are but the graves where millions of corals, now crushed into massive limestone, once lived and died; the coal of Pennsylvania tells of ferns and other terrestrial plants matted together into a bed whence they originally grew; "the snails and lizards which lived and died within a hollow tree, the insects which have been imprisoned within the exuding resin of old forests, the footprints of birds and quadrupeds, the trails of worms left upon former shores—these and innumerable other pieces of evidence" tell of the tragedies of former times and "enable the geologist to realize in some measure what the faunas and floras of successive periods have been."

The foundation for the study of the whole subject in the Britannica is the article GEOLOGY (Vol. 11, p. 638), equivalent to 125 pages of this Guide. It is by the highest authority in the world, Sir Archibald Geikie, long director general of the Geological Survey of the United Kingdom, and director of the Museum of Practical Geology, London. It deals with the general principles and gives an outline of the subject matter of the science. In particular it treats of,

The historical development of geological science;

The cosmical aspects of geology;

Geognosy;

Dynamical Geology;

Geotectonic or Structural Geology;

Palaeontological Geology;

Stratigraphical Geology;

Physiographical Geology.

Age of the Earth

While the student will doubtless be interested equally in each of these departments, the general reader will be especially interested in the historical development which—it is worthy of note—is almost the only concise account of geological history hitherto published in English. Especially interesting is the question, fully discussed, of the age of the earth. Lord Kelvin (Vol. 11, p. 653) declared some few years ago that the time "was more than twenty and less than forty millions of years and probably much nearer twenty than forty." But the trend of later investigations, and especially the study of radio-

activity, has led to the belief that the period must have been much longer. Sir Archibald Geikie sums up the evidence as follows (Vol. 11, p. 653): “In the present state of science it is out of our power to state positively what must be the lowest limit of the age of the earth, but we cannot assume it to be less, and it may possibly have been much more than one hundred millions of years.”

Geological Formations

The general reader will find of interest, too, the table (Vol. 11, p. 670) representing the geological record or order of succession of the formations of the earth’s crusts from the earliest Archean, through Cambrian, Silurian, Devonian and Carboniferous to the Post-glacial or Human of to-day. A separate article is to be found on each of these different formations, namely: ARCHEAN (Vol. 2, p. 360); CAMBRIAN (Vol. 5, p. 86); SILURIAN (Vol. 25, p. 109); DEVONIAN (Vol. 8, p. 124); CARBONIFEROUS (Vol. 5, p. 309); PERMIAN (Vol. 21, p. 176); TRIASSIC (Vol. 27, p. 258); JURASSIC (Vol. 15, p. 567); CRETACEOUS (Vol. 7, p. 414); EOCENE (Vol. 9, p. 661); OLIGOCENE (Vol. 20, p. 81); MIOCENE (Vol. 18, p. 565); PLIOCENE (Vol. 21, p. 846); PLEISTOCENE (Vol. 21, p. 835); Recent, Post-glacial or Human under article QUATERNARY (Vol. 22, p. 718).

Full local geological information is found in geographical articles. See, for instance, in the article UNITED STATES, the section on *Geology* (Vol. 27, pp. 624–632), by Professors R. D. Salisbury and T. C. Chamberlin of the University of Chicago; the section *Geology* in the article ENGLAND (Vol. 9, pp. 415–416), by H. R. Mill, editor of *The International Geography*; the section *Geology* in the article AFRICA

(Vol. 1, pp. 323–325), by Walcot Gibson, author of *Mineral Wealth of Africa*, etc. These special treatments are accompanied by sketch maps. Similarly, the articles on each of the different states of the Union has a section giving information on the geology, the flora and fauna, the climate, and the geography of the state. And in such articles on geographic topics as GREAT SALT LAKE, NIAGARA, by G. Karl Gilbert, and GRAND CANYON, by R. S. Tarr, there is valuable geological information.

Other important articles which the reader should consult are PETROLOGY (Vol. 21, p 323), equivalent to 40 pages of this Guide, largely illustrated, by Dr. J. S. Fleet, petrographer to the Geological Survey of Great Britain; MINERALOGY (Vol. 18, p. 509), equivalent to 25 pages of this Guide, by L. J. Spencer, editor of the *Mineralogical Magazine*; MINERAL DEPOSITS (Vol. 18, p. 504), equivalent to 15 pages of this Guide, by James F. Kemp, professor of geology of Columbia University, and geologist to the United States and New York Geological Surveys; CRYSTALLOGRAPHY (Vol. 7, p. 569), equivalent to 60 pages of this Guide, also by L. J. Spencer; MINING (Vol. 18, p. 528), equivalent to 40 pages of this Guide, by Henry Smith Munroe, professor of mining, Columbia University, New York; PALAEONTOLOGY (Vol. 20, p. 579), profusely illustrated, equivalent to 35 pages of this Guide, by Prof. Henry Fairfield Osborn of Columbia University, and president of the American Museum of Natural History of New York; PALAEOBOTANY (Vol. 20, p. 524), profusely illustrated, equivalent to 100 pages of this Guide, written by three of the leading geological writers of the day: Dr. D. H. Scott, president of the Linnean Society, author of *Studies in Fossil Botany*; A. E. Steward, professor of botany of the University of

Cambridge; and Clement Reid, author of *Fossil Flora of Tegelen*.

Of more popular interest are the three articles, Earthquake, Seismometer and Volcano. The article EARTHQUAKE is in two parts. The first (Vol. 8, p. 817) is an historical account telling of the extent and damage done by many earthquakes, including the terrible San Francisco earthquake of April 18, 1906, and that of Calabria and Sicily, December 28, 1908, by F. W. Rudler, president of the Geologists' Association; the other part (Vol. 8, p. 820), by Dr. J. Milne, late professor of geology in the Imperial University of Tokio, deals with the physical theory of earthquakes. The article VOLCANO (Vol. 28, p. 178), equivalent to 45 pages of this Guide, is by F. W. Rudler, and gives us the reasons for and the history of volcanic disturbances. It is of interest both to the scholar and to the casual reader. Thus we learn that "while Herculaneum was buried beneath a flood of mud swept down from Vesuvius" in 79 A.D., Pompeii "was overwhelmed in great measure by loose ashes, capable of removal with comparative ease." Nearly everyone of middle age remembers the famous eruption of Krakatoa in 1883 and the famous sunsets of that year. Concerning this the Britannica article tells us (p. 180):

> Enormous quantities of dust ejected from Krakatoa in 1883 were carried to prodigious distances, samples having been collected at more than a thousand miles from the volcano; whilst the very fine material in ultramicroscopic grains which remained suspended for months in the higher regions of the atmosphere seems to have enjoyed an almost world-wide distribution, and to have been responsible for the remarkable sunsets at that period.

The article DUST (Vol. 8, p. 713), by John Aitken, inventor of the machine for counting particles of

dust, explains the mechanical causes of this suspension. Besides there is much concrete information about volcanoes in articles on volcanic regions: for instance, on volcanoes in the possessions of the United States, see articles HAWAII, ALASKA, PHILIPPINES.

The student should read also the articles on the different minerals, many of them long and important and all by well-known authorities. Thus the article DIAMOND (Vol. 8, p. 158), illustrated, equivalent to 20 pages of this Guide, is by Henry Alexander Miers, editor of the *Mineralogical Magazine*. Besides dealing with the general character of this stone, the article pays particular attention to diamond mining in South Africa, the text being illustrated by plates showing the Kimberley and DeBeers workings. The article GEM (Vol. 11, p. 560), is equivalent to 25 pages of this Guide. The article GEM, ARTIFICIAL (Vol. 11, p. 569) is by the well-known chemist and physicist, Sir William Crookes. It tells of the changes induced by radioactive emanations and of the artificial production of the diamond, ruby, sapphire, Oriental emerald, amethyst and topaz. The reader will be interested, too, in the article LAPIDARY AND GEM CUTTING (Vol. 16, p. 195), by Dr. George F. Kunz, gem expert for Messrs. Tiffany & Co., New York.

There are special biographical articles in the Britannica on all the well-known geologists, and in these articles special stress has been laid on the part played by the subject of the memoirs in promoting the science. This is well shown, for instance, in the articles AGASSIZ (Vol. 1, p. 367); HUTTON (Vol. 14, p. 16) and LYELL (Vol. 17, p. 158).

Geology, by its study of earth deposits, age of rocks, etc., and by its estimate of the date of certain extinct animals like the mammoth and hairy

elephant, or of the time when certain animals, e.g., the elephant and reindeer, were found in parts of the world where they no longer occur, is an important adjunct to the science of anthropology, especially in the question of the antiquity of man. On this see the section of antiquity of man in the article ANTHROPOLOGY (Vol. 2, p. 114), and, in general, the chapter in this Guide on *Anthropology and Ethnology*.

From one point of view geology is only a branch of geography and the student of geology should consult the elaborate article on GEOGRAPHY in the Britannica, especially all parts dealing with physical geography or physiography. For a clue to this part of the book see the chapter in this Guide on *Geography*.

The following is a list of the more important articles on Geology in the Encyclopaedia Britannica:

LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA OF SPECIAL INTEREST TO STUDENTS OF GEOLOGY

Abich, O. W. H. von

Abraum salts

Acadian

Acmite, or Aegirite

Agalmatolite

Agate

Agglomerate

Agricola, Georg

Aikin, Arthur

Alabaster

Albertite
Albian
Albite
Alexandrite
Allophane
Allport, Samuel
Alluvium
Almandine
Alquifou
Alunite, or Alumstone
Amazon Stone, or Amazonite
Amber
Amblygonite
Amethyst
Amianthus
Amphibole
Amphibolite
Amygdaloid
Analcite
Anatase
Andalusite
Andesine
Andesite
Anglesite
Anhydrite
Ankerite

Annabergite
Anning, Mary
Anorthite
Ansted, David Thomas
Anthracite
Apatite
Aphanite
Aplite
Apophyllite
Aptian
Aquamarine
Aragonite
Archean System
Archiac, vicomte d’
Arenig Group
Argentite
Argyrodite
Asbestos
Assise
Asteria, or Star-stone
Atacamite
Atherstone, W. G.
Augite
Autunite
Aventurine, or Avanturine
Avonian

Axinite
Aymestry Limestone
Azurite, or Chessylite
Bagshot Beds
Baily, William Hellier
Bain, Andrew Geddes
Bajocian
Bakewell, Robert
Bala Series
Barrande, Joachim
Barrett, Lucas
Barrois, Charles
Barton Beds
Barytes
Barytocalcite
Basalt
Basin
Batholite
Bathonian Series
Bathvillite
Bauxite
Bed
Beecher, C. E.
Belt, Thomas
Bembridge Beds
Benett, Etheldred

Benitoite
Bernician Series
Beryl
Beryllonite
Beudant, François S.
Beyrich, H. E. von
Bigsby, J. J.
Binney, E. W.
Biotite
Bismuthite
Bitumen
Blanford, W. T.
Blende, or Sphalerite
Bloodstone
Boase, Henry Samuel
Bole
Bomb
Bone Bed
Bonney, Thomas George
Boracite
Born, I. von
Borolanite
Bort, or Boart
Bostonite
Boucher de Crévecoeur de Perthes, J.
Boué, Ami

Boulder
Boulder Clay
Bournonite
Bovey Beds
Bowerbank, J. S.
Bracklesham Beds
Bradford Clay
Brander, Gustavus
Breccia
Breislak, Scipione
Bristow, H. W.
Brocchi, G. B.
Brochant de Villiers, A. J. F. M.
Brochantite
Brodie, P. B.
Brogger, W. C.
Bromlite
Brongniart, Alexandre
Bronn, Heinrich Georg
Bronzite
Brookite
Brucite
Brückmann, Franz Ernst
Buch, Baron von
Buckland, William
Bunter

Bytownite
Cainozoic
Cairngorm
Calamine (Smithsonite)
Calcite
Callovian
Cambrian System
Cancrin, F. L. von
Caradoc Series
Carbonado
Carboniferous System
Carnelian
Cassiterite
Cat’s-eye
Cave
Celestine
Cerargyrite
Cerussite
Chabazite
Chalcedony
Chalk
Chalybite
Charnockite
Childrenite
Chlorite
Chromite

Chrysoberyl
Chrysocolla
Chrysolite
Chrysoprase
Cinnabar
Cinnamon Stone
Clarke, William B.
Clay
Clay-with-Flints
Clinoclastite
Clintonite
Close, Maxwell H.
Cobaltite
Colemanite
Columbite
Concretion
Conglomerate
Connellite
Conybeare, W. D.
Copalite, or Copaline
Cope, Edward D.
Copper-glance
Copper-pyrites, or Chalcopyrite
Coprolites
Corallian
Cornbrash

Corundum
Cotta, Bernard von
Covellite
Crater
Credner, C. F. H.
Cretaceous System
Crocidolite
Crocoite
Croll, James
Crosskey, Henry W.
Cryolite
Crystallite
Crystallography
Culm
Cumming, Joseph G.
Cuprite
Cyanite
Dacite
Dalradian
Dana, James D.
Danburite
Datolite
Daubeny, Charles G. B.
Daubree, G. A.
Davidson, Thomas
Dawson, Sir John W.

Dechen, E. H. K. von
De la Beche, Sir H. T.
Delesse, A. E. O. J.
Deluc, Jean Andre
Demantoid
Des Cloizeaux, Alfred
Descloizite
Deshayes, G. P.
Deslongchamps, J. A. E.
Desmarest, Nicolas
Desnoyers, J. P. F. S.
Desor, P. J. E.
Devonian System
Diabase
Diallage
Diamond
Diaspore
Dick, Robert
Diluvium
Diopside
Dioptase
Diorite
Dolerite
Dolomieu
Dolomite
Dopplerite

Drift
Dufrenoy, O. P. A. P.
Dumont, André Hubert
Dumortierite
Duncan, Peter Martin
Durocher, J. M. E.
Earth pillar
Earthquake
Eclogite
Egerton, Sir P. de M.
Ehrenberg, C. G.
Eichwald, K. E. von
Elaterite
Elie De Beaumont
Emerald
Emery
Emmons, Ebenezer
Enniskillen, 3rd earl of
Enstatite
Eocene
Epidiorite
Epidosite
Epidote
Erubescite
Erythrite
Escher von der Linth

Esker
Etheridge, Robert
Ettingshausen, Baron
Euclase
Fall-line
Farey, John
Faujas de Saint-Fond
Fault
Favre, Jean Alphonse
Felsite
Felspar
Fitton, William Henry
Flint
Fluor-spar
Flysch
Fold
Forbes, David
Forchhammer, J. G.
Foster, Sir C. le Neve
Fouque, F. A.
Fournet, J. J. B. X.
Fox, Robert Were
Franklinite
Freestone
Freieslebenite
Fulgurite

Fuller’s Earth
Fumarole
Gabbro
Galena
Garnet
Gaudry, Jean Albert
Gault
Geikie, Sir Archibald
Geikie, James
Geinitz, H. B.
Gem
Geology
Gesner, Abraham
Geyser
Giebel, C. G. A.
Gilbert, Grove K.
Gilsonite
Glacial Period
Glauconite
Gneiss
Godwin-Austen, R. A. C.
Goldfuss, G. A.
Goniometer
Göthite, or Goethite
Granite
Granulite

Graphite
Gravel, or Pebble Beds
Green, A. H.
Greenockite
Greenough, G. B.
Greensand
Greisen
Greywacke
Griffith, Sir Richard J.
Groth, P. H. von
Guettard, J. E.
Gumbel, K. W. von
Guyot, A. H.
Gypsum
Haast, Sir J. F. J. von
Haematite
Haidinger, W. K. von
Hall, James
Hall, Sir James
Halleflinta
Harkness, Robert
Harmotome
Hatchettite
Hauer, F. von
Haughton, Samuel
Hausmann, J. F. L.

Hayden, F. V.
Hebert, Edmond
Heddle, M. F.
Heer, Oswald
Heim, A. von St. Gallen
Helmersen, Gregor von
Hemimorphite
Henslow, John Stevens
Henwood, William Jory
Heulandite
Hicks, Henry
Hiddenite
Hitchcock, Edward
Hochstetter, F. C. von
Holocene
Hone
Hopkins, William
Hornblende
Horner, Leonard
Hornes, Moritz
Hornfels
Hulke, J. W.
Humite
Hunt, Robert
Hunt, T. Sterry
Hutton, James

Hyacinth
Hypersthene
Idrialin
Ijolite
Ilmenite
Iolite
Itacolumite
Jade
Jameson, Robert
Jargoon
Jarosite
Jasper
Jet
Joints
Jones, T. Rupert
Jukes, J. B.
Jurassic System
Kaolin
Karrer, Felix
Karsten, K. J. B.
Kayser, F. H. E.
Kenngott, G. A.
Keuper
Kidd, John
Kimeridgian
King, Clarence

Kirwan, Richard
Kjerulf, Theodor
Kobell, W. X. F. von
Koenig, K. D. E.
Koksharov, N. I. von
Koninck, L. G. de
Kunzite
Labradorite
Laccolite
Lacroix, A. F. A.
Lamprophyres
Lapilli
Lapis Lazuli
Lapparent, A. A. C. de
Lapworth, Charles
Lasaulx, A. C. P. F. von
Laterite
Laumont, F. P. N. G. de
Lava
Leadhillite
Le Conte, Joseph
Lehmann, J. G.
Lepidolite, or Lithia-Mica
Lesley, J. Peter
Leucite
Lévy, A. M.

Lewis, Henry Corvill
Lias
Lignite
Limburgite
Limestone
Limonite
Lindstróm, Gustaf
Liroconite
Lister, Martin
Llandeilo Group
Llandovery Group
Llwyd, Edward
Loess
Logan, Sir William E.
London Clay
Lonsdale, William
Lory, Charles
Ludlow Group
Lyell, Sir Charles
McCoy, Sir Frederick
Macculloch, John
Maclure, William
Magnesite
Magnetite
Malachite
Mallet, Robert

Manganite
Mantell, G. A.
Marble
Marcasite
Marcou, J. B.
Marl
Martin, William
Meek, F. B.
Meerschaum
Melaconite
Mesozoic
Metamorphism
Metasomatism
Meteorite
Meyer, C. E. H. von
Mica
Mica-schist
Microcline
Micropegmatite
Miller, Hugh
Miller, W. H.
Millerite
Millstone Grit
Mimetite
Mineral deposits
Mineralogy

Miocene System
Mispickel
Mocha Stone
Mofetta
Mohs, Friedrich
Mojsisovics von Mojsvar, J. A. G. E.
Moldavite
Molybdenite
Monazite
Monzonite
Moonstone
Morris, John
Münster, Georg, count zu
Murchison, Sir R. I.
Muschelkalk
Muscovite
Mylonite
Napoleonite
Natrolite
Naumann, G. A. C. F.
Neck
Neocomian
Nepheline
Nepheline-syenite
Nephelinites
Neumayr, Melchior

Newberry, J. S.
Niccolite
Nicholson, H. A.
Nicol, James
Nitre
Noeggerath, J. J.
Obsidian
Oldham, Thomas
Oligocene System
Oligoclase
Olivenite
Olivine
Omalius d'Halloy, J. d'
Onyx
Oolite
Opal
Oppel, C. A.
Orbigny, A. D. d'
Ordovician System
Orthoclase
Osborn, H. F.
Oxfordian
Ozokerite, or Ozocerite
Palaeozoic
Parisite
Parkinson, James

Peach, C. W.
Pegmatite
Pendleside Series
Pengelly, William
Peperino
Peridot
Peridotite
Perlite
Permian System
Perovskite
Petalite
Petrology
Pharmacosiderite
Phenacite
Phillips, John
Phillips, William
Phillipsite
Phlogopite
Phonolite
Phosgenite
Phosphates
Phosphorite
Phyllite
Picrite
Pictet, de la Rive, F. J.
Pitchblende, or Uraninite

Pitchstone
Plagioclase
Pleistocene System
Pliocene System
Plot, Robert
Plumbago
Pneumatolysis
Pollux, or Pollucite
Porphyry
Portlandian
Portlock, J. E.
Powell, J. W.
Pre-Cambrian
Prehnite
Prestwick, Sir Joseph
Prévost, Constant
Proustite
Psilomelane
Pumice
Purbeckian
Puy
Pyrargyrite
Pyrites
Pyrolusite
Pyromorphite
Pyrope

Pyrophyllite
Pyroxene
Pyroxenite
Pyrrhotite
Quartz
Quartzite
Quartz-porphyry
Quarternary
Quenstedt, F. A. von
Rammelsberg, K. F. A.
Ramsay, Sir Andrew C.
Rath, Gerhard von
Reading Beds
Realgar
Renard, A. F.
Renevier, Eugène
Retinite
Reusch, Hans Henrik
Reuss, A. E. von
Rhaetic
Rhodochrosite
Rhodonite
Rhyolite
Rock
Rock-crystal
Roemer, F. A.

Rogers, H. D.
Rome de l'Isle, J. B. L.
Roth, J. L. A.
Rubellite
Ruby
Russell, Israel Cook
Rutile
Rutley, Frank
Salt
Salter, John William
Sand
Sandberger, K. L. F. von
Sandstone
Sapphire
Sard
Sardonyx
Satin-spar
Savi, Paolo
Scapolite
Scheelite
Schists
Schlotheim, Baron von
Schorl
Scolecite
Scoria
Scrope, G. J. Poulett

Sedgwick, Adam
Seismometer
Selwyn, A. R. C.
Sénarmont, H. H. de
Serpentine
Sharpe, Daniel
Sill
Sillimanite
Silurian System
Sinter
Slate
Smaltite
Smith, William
Smithson, James
Smyth, Sir W. W.
Sodalite
Soffioni
Solfatara
Sorby, Henry C.
Speeton Beds
Sphene
Spherulites
Spinel
Spodumene
Spratt, Thomas A. B.
Stalactites

Stannite
Staurolite
Steno, Nicolaus
Stephanite
Stibnite
Stilbite
Stoliczka, Ferdinand
Stone
Stoppani, Antonio
Stratigraphy
Strickland, Hugh E.
Strontianite
Studer, Bernhard
Suess, Edward
Sunstone
Syenite
Sylvanite
Sylvite
Symonds, William S.
Szabó von Szentmiklos
Tachylytes
Talc
Tate, Ralph
Tchihatcheff, P. A. de
Tertiary
Tetradymite

Tetrahedrite
Theralite
Thorianite
Thorite
Tonalite
Topaz
Torbernite
Torell, Otto Martin
Torridonian
Tourmaline
Trachyte
Trass
Tremolite
Triassic System
Tridymite
Trimmer, Joshua
Tuff
Turquoise
Vanadinite
Variolite
Variscite
Veins
Verneuil, P. E. P. de
Vesuvianite
Vivianite
Vogt, Karl C.

Volcano
Waagen, W. H.
Wachsmuth, Charles
Wad
Walcott, Charles D.
Waltershausen
Wavellite
Wealden
Webster, Thomas
Wenlock Group
Werner, A. G.
Whiteaves, J. F.
Whitney, J. D.
Willemite
Witherite
Wolframite
Wollastonite
Wood, S. V.
Woodward, John
Woodward, Samuel
Woolwich-and-Reading Beds
Wright, Thomas
Wulfenite
Yoredale Series
Zoelites
Zincite

Zircon

Zirkel, Ferdinand

Zittel, Karl A. von

Zoisite

CHAPTER LVII
BIOLOGY
GENERAL AND INTRODUCTORY

The Britannica tells us that Sir Thomas Browne, the famous 17th century physician and author, once ventured to doubt "whether mice may be bred by putrefaction," and Alexander Ross, the poet scientist of 200 years ago, commenting on his scepticism wrote, "So may he doubt whether in cheese and timber worms are generated; or if beetles and wasps in cows' dung; or if butterflies, locusts, grasshoppers, shell-fish, snails, eels, and such like, be procreated of putrefied matter, which is apt to receive the form of that creature to which it is by formative power disposed. To question this is to question reason, sense and experience. If he doubts of this let him go to Egypt, and there he will find the fields swarming with mice, begot of the mud of Nylus, to the great calamity of the inhabitants" (Vol. 1, p. 64). To-day science gives no offhand answer to the question of the origin of life. Abiogenesis, or "spontaneous generation," so-called, finds a far less simple definition and research still in vain bends its best energies to solving this problem of problems.

The subject is so vast, dealing as it does with all

the phenomena manifested by living matter, that in this Guide that branch of the subject which studies the human organism is separately dealt with in the chapter *Health and Disease*. This chapter, therefore, is confined to the still enormous subject of biology considered as dealing with the general problem of life; botany and zoology are treated in the following chapters. The student of either of the two last subjects should preface, or at least supplement, his studies, by reading the main general articles included below.

The Study of Life

The guiding article BIOLOGY (Vol. 3, p. 954), which should be read first, serves as a key to the discussion of the biological sciences. It is not long, for the main divisions of the subject are treated more conveniently and logically under their own appropriate headings. P. Chalmers Mitchell, secretary of the Zoological Society of London, who organized the whole subject for the new Britannica, is the contributor. Supplementing this, the article LIFE (Vol. 16, p. 600), also by Chalmers Mitchell, should be read, with those on PROTOPLASM (Vol. 22, p. 476), SPECIES (Vol. 25, p. 616), ABIOGENESIS (Vol. 1, p. 64), BIOGENESIS (Vol. 3, p. 952). In the two articles last named the theory of spontaneous generation is examined and found wanting, or at best unproved.

Structure

Living matter may be regarded under four aspects: structure, distribution, physiology, evolution. For the first, the article MORPHOLOGY (Vol. 18, p. 863) leads the discussion, followed by CYTOLOGY (Vol. 7, p. 710), and EMBRYOLOGY (Vol. 9, p. 314), in which the growth of cell structures is discussed. These

articles are introductory to the whole subject. Supplementing them reference may be made to the Morphology sections of the articles PLANT (Vol. 21, p. 728) and ZOOLOGY (Vol. 28, p. 1022).

Distribution

A most fascinating branch is that which is concerned with the where and when of the existence of organisms. The articles in the Britannica are worthy of the interest of the subject. Under PALAEONTOLOGY (Vol. 20, p. 579) H. F. Osborn, Columbia University, New York, president of the American Museum of Natural History, New York, treats of the archaeology of the biological sciences, of the extinct species which once inhabited the earth; while Clement Reid, of the Geological Survey of Great Britain, A. C. Seward, professor of botany, Cambridge University, and Dr. D. H. Scott, president of the Linnean Society, perform the same service for plant life in the article PALAEOBOTANY (Vol. 20, p. 524). The distribution of present types is discussed under ZOOLOGICAL DISTRIBUTION (Vol. 28, p. 1002), PLANTS, *Distribution* (Vol. 21, p. 777), and PLANKTON (Vol. 21, p. 720), in which Prof. G. H. Fowler of University College, London, describes a science which is still young—that of tracing the drift and distribution of deep sea life. See also ACCLIMATIZATION (Vol. 1, p. 114), by Alfred Russel Wallace and Frank Finn, of the Indian Museum of Calcutta.

Physiology

The properties, processes, and functions of living things fall in the province of PHYSIOLOGY (Vol. 21, p. 554), and kindred articles; among the latter the following may profitably be consulted: ANIMAL HEAT (Vol. 2, p. 48), and PLANTS, *Physiology* (Vol. 21, p.

744).

Evolution

The gradual development of species is considered in a number of valuable articles such as EVOLUTION (Vol. 10, p. 22), HEREDITY (Vol. 13, p. 350), REPRODUCTION (Vol. 23, p. 116), MENDELISM (Vol. 18, p. 115), TELEGONY (Vol. 25, p. 509), VARIATION AND SELECTION (Vol. 27, p. 906).

Following is an alphabetical list of the *general* biological articles (those not dealing directly with either Botany or Zoology), which are to be found in the Britannica:

Abiogenesis

Acclimatization

Acephalous

Acuminate

Adaptation

Aestivation

Albino

Alveolate

Anabolism

Anastomosis

Aporose

Auricle

Autogeny

Bathybius

Biogenesis

Biology

Bipartite
Catabolism
Chemotaxis
Cilia
Cytology
Embryology
Enzyme
Evolution
Fermentation
Habitat
Heredity
Hibernaculum
Histology
Hybridism
Life
Longevity
Mendelism
Metabolism
Microtomy
Monotypic
Morphology
Oecology, or Ecology
Osteology
Parasitism
Protoplasm
Reproduction

Rhacis, or Rachis

Species

Telegony

Variation and Selection

BIOGRAPHIES OF BIOLOGISTS

The life and work of the world's great biologists may be studied in the Britannica, and an alphabetical list of the principal articles follows.

Acharius, Erik

Adams, A. L.

Adanson, Michel

Afzelius, Adam

Agassiz, A. E.

Agassiz, J. L. R.

Aiton, William

Albinus (Weiss), B. S.

Aldrovandi, Ulissi

Allman, George James

Alpini, Prospero

Alston, Charles

Ambrosini, Bartolomeo

Anderson, James

Arrenotokous, A.

Artedi, Peter

Audebert, J. B.

Audouin, Jean Victor

Audubon, John James

Avebury, J. Lubbock, Baron

Baer, Karl Ernst von

Baird, S. F.

Balfour, F. M.

Banks, Sir Joseph

Barton, B. S.

Bates, Henry Walter

Bauhin, Gaspard

Belon, Pierre

Bentham, George

Berkeley, M. J.

Blainville, H. M. Ducrotay de

Bloch, Mark Eliezer

Blumenbach, J. F.

Bonpland, A. J. A.

Bory de Saint-Vincent, J. B. G. M.

Bose, L. A. G.

Brisson, M. J.

Broderip, W. J.

Brongniart, A. T.

Broussonet, P. M. A.

Brown, Robert

Buckland, F. T.

Buffon, G. L. L. de

Caesalpinus, Andreas
Camerarius, Joachim
Camerarius, R. J.
Camper, Peter
Candolle, A. P. de
Carpenter, W. B.
Cavanilles, A. J.
Claparède, J. L. R. A. E.
Cobbold, T. S.
Cohn, Ferdinand Julius
Combe, George
Coues, E.
Cuvier, Baron
Darwin, Charles R.
Darwin, Erasmus
Daubenton, L. J. M.
De Bary, H. A.
Desfontaines, R. L.
Dillen (Dillenius), J. J.
Donovan, Edward
Dryander, Jonas
Duhamel de Monceau
Dutrochet, R. J. H.
Edwards, George
Eschscholtz, J. F.
Fabricius, J. C.

Falconer, Hugh
Flourens, M. J. P.
Flower, Sir William H.
Forbes, Edward
Forskal, Peter
Fortune, Robert
Fraas, Karl Nikolas
Fries, Elias Magnus
Fuchs, Leonard
Gall, Franz Joseph
Gaudichaud-Beaupré
Gegenbaur, Carl
Geoffroy Saint-Hilaire, E.
Geoffroy Saint-Hilaire, I.
Gerard, John
Gervais, Paul
Gesner, K. von
Gosse, Philip Henry
Gould, A. A.
Gray, Asa
Gray, John Edward
Grew, Nehemiah
Haeckel, E. H.
Hagenbeck, Carl
Hales, Stephen
Hasselquist, Frederik

Hofmeister, W. F. B.

Hooker, Sir Joseph D.

Hooker, Sir William J.

Huber, François

Huxley, T. H.

Hyatt, Alpheus

Jäger, Gustav

Jesse, Edward

Jussieu, De (family)

Kaup, Johann Jakob

Kirby, William

Kölliker, R. A. von

Kühne, Willy

Lacépède, B. G. E. de La Ville, comte de

Lamarck

Latreille, P. A.

Lawes, Sir John B.

Leeuwenhoek, A. van

Leidy, Joseph

Lindley, John

Linnaeus

Lombroso, Cesare

Ludwig, K. F. W.

Macgillivray, W. and J.

Malpighi, Marcello

Marsh, O. C.

Martius, C. F. P. von
Martyn, John
Michaux, André
Milne-Edwards, Henry
Mivart, St. George J.
Mohl, Hugo von
Morgagni, G. B.
Müller, F. von, baron
Müller, J. P.
Naegeli, K. W. van
Nees von Esenbeck
Newton, Alfred
North, Marianne
Nuttall, Thomas
Oken, Lorenz
Ormerod, Eleanor A.
Owen, Sir Richard
Pennant, Thomas
Pringsheim, Nathanael
Quatrefages de Bréau
Ray (or Wray), John
Réaumur, R. A. F. de
Richardson, Sir John
Romanes, G. J.
Royle, John Forbes
Sachs, Julius von

Saint-Hilaire, A. de
Saussure, N. T. de
Schleiden, M. J.
Schultze, M. J. S.
Schwann, Theodor
Senebier, Jean
Sibthorp, John
Siebold, C. T. E. vo
Sowerby, James
Spallanzani, Lazaro
Sprengel, Kurt
Spurzheim, J. C.
Swammerdam, Jan
Swartz, Olof
Thomson, Sir C. W.
Thunberg, K. P.
Thuret, G. A.
Tiedemann, Friedrich
Torrey, John
Tournefort, J. P. de
Treviranus, G. R.
Tylor, E. B.
Virchow, Rudolf
Wagner, Rudolph
Wallace, A. Russel
Waterton, Charles

Weismann, August

White, Gilbert

Williamson, W. C.

Willughby, Francis

Wilson, Alexander

Wolff, C. F.

Wood, John George

Yarrell, William

CHAPTER LVIII
BOTANY

There are many gardeners and lovers of gardens, but comparatively few have even the most elementary knowledge of botany. How many, for instance, know or remember that in the leaves of plants are situated the kitchens in which they prepare their food, or more than vaguely recognize the presence of a nervous system in plant organisms (Vol. 21, p. 747)? The majority, indeed, ignore the fact that a little study will add a hundred-fold to their enjoyment, and that, unlike most scientific subjects, botany can be studied with a minimum of trouble or toil, and with the simplest apparatus. His own garden, the woods and fields, will give the inquirer ample subjects for his investigations, and, as in every other undertaking, the longer he pursues it the more he will see, and the more intense will be his pleasure in the contemplation of the garden of his cultivation.

Botany is, of course, one branch of an enormous subject. The student will, therefore, do well to familiarize himself with the general articles which cover the science of living matter, as outlined in the chapter on *Biology*. In that chapter references have in fact already been given to certain sections of the strictly botanical articles. The general arrangement of the subject in the Britannica is as follows:—(i.) articles dealing with the broad aspects of the science; (ii.) articles on "systematic" botany treating of the various families of plants; (iii.) articles describing members of their families.

General Principles

Following the most convenient and at the same time the most logical course, the article BOTANY (Vol. 4, p. 299) gives a key to the treatment of the whole subject in the Britannica. This is by A. B. Rendle, keeper of the Department of Botany, British Museum, who acted as general adviser to the editor in the arrangement of this branch of biology in the Britannica. The main article on the subject is under the heading PLANTS (Vol. 21, p. 728), by a number of eminent authorities. The article is divided as follows: *Classification*, by A. B. Rendle; *Anatomy and History and Bibliography*, by A. G. Tansley, lecturer in botany in the University of Cambridge; *Physiology*, by J. R. Green, formerly lecturer on plant physiology, University of Liverpool; *Pathology*, by H. M. Ward, formerly professor of botany, University of Cambridge; *Ecology*, which comprises the study of the relations of the individual plant, or species, or the plant community, with its habitat, by C. E. Moss, curator of the Cambridge University Herbarium; *Cytology*, which treats of the cell structure of plant organisms, by H. W. T. Wager, president of the Botanical section of the British Association, 1905; *Morphology*, by S. H. Vines, professor of botany, University of Oxford, and president of the Linnean Society, 1900–1904; *Distribution*, by Sir W. T. Thiselton-Dyer, director of the Kew Botanical Gardens. Supplementary to the article PLANTS are the following, which should all be read carefully: ROOT (Vol. 23, p. 712), STEM (Vol. 25, p. 875), LEAF (Vol. 16, p. 322), FLOWER (Vol. 10, p. 553), FRUIT (Vol. 11, p. 254). A very important article is that on PALAEOBOTANY (Vol. 20, p. 524), which treats of the distribution, etc., of plant life in prehistoric periods.

The contributor is Clement Reid of the Geological Survey of England and Wales, an original investigator in this important field. The advances in the study of minute plant organisms in the past few years have been very great and they receive treatment in the brilliant article BACTERIOLOGY (Vol. 3, p. 156), by Prof. H. M. Ward of Cambridge University, and V. H. Blackmann, professor of botany in the University of Leeds.

Other articles in the Britannica which refer to the general principles of the science will be found enumerated at the end of this chapter.

Divisions and Classification

The student must, of course, make himself familiar with the primary divisions of the vegetable kingdom. These are considered in order below. By far the biggest and the most important is that of the Angiosperms. They will be treated first.

Angiosperms: Dicotyledons

The division ANGIOSPERMS (Vol. 2, p. 9) includes all those flowering plants whose seeds are enclosed in capsules. This division is again divided into two classes: the Dicotyledons (Vol. 8, p. 185), which are distinguished by the presence of a pair of seed-leaves or cotyledons in the embryo contained in the seed; and the Monocotyledons (see Vol. 2, p. 13), which contain only one. The former embraces most of the flowerbearing plants, and includes the following families:—BORAGINACEAE (Vol. 4, p. 242) to which order belongs such plants as forget-me-nots, borage, heliotrope, etc. CAPRIFOLIACEAE (Vol. 5, p. 290), which include elder, honeysuckle, etc. CARYOPHYLLACEAE (Vol. 5, p. 439), with the pinks,

carnations, etc. COMPOSITAE (Vol. 6, p. 811), which is the largest order in this division and includes one-tenth of the whole number of flowering plants, with such varieties as lettuce, dandelion, artichoke, sunflower, chrysanthemum, etc. CONVOLVULACEAE (Vol. 7, p. 67), among which are the convolvulus, sweet potato, bindweed. CRASSULACEAE (Vol. 7, p. 380), which include a quantity of African plants. CRUCIFERAE (Vol. 7, p. 521), with the wallflower, stock, mustard, cabbage, radish, nasturtium, etc. CUCURBITACEAE (Vol. 7, p. 611), among which are the cucumber, melon, etc. CUPULIFERAE (Vol. 7, p. 635), with the hazel, oak, beech, alder. ERICACEAE (Vol. 9, p. 739), with the rhododendron, arbutus, whortleberry, heather. EUPHORBIACEAE (Vol. 9, p. 892), which include the castor-oil plant, box, euphorbia, etc. GENTIANACEAE (Vol. 11, p. 601), with the gentian, yellow-wort, bog-bean, etc. GERANIACEAE (Vol. 11, p. 762), whose name is derived from the geranium. LABIATAE (Vol. 16, p. 3), with peppermint, marjoram, thyme, sage, ground-ivy. LEGUMINOSAE (Vol. 16, p. 381), which embrace gorse, furze, scarlet runner, mimosa, acacia, rest-harrow, etc. MALVACEAE (Vol. 17, p. 517), with the mallow, hibiscus, hollyhock. The MORACEAE (Vol. 18, p. 814), with the fig, mulberry, banyan, etc. ONAGRACEAE (Vol. 20, p. 104), including the evening primrose, fuschia, etc. POLYGONACEAE (Vol. 22, p. 26), with dock, rhubarb, buckwheat, etc. PRIMULACEAE (Vol. 22, p. 341), including primrose, cowslip, pimpernel. RANUNCULACEAE (Vol. 22, p. 895), with the varieties buttercup, clematis, aconite, larkspur, columbine, marsh marigold, anemone. ROSACEAE (Vol. 23, p. 722), to which the rose gives the name, and which include strawberry, raspberry, apple, pear, plum, spiraea, blackthorn, etc.

RUBIACEAE (Vol. 23, p. 808), with gardenias, chincona, coffee, madder. SAXIFRAGACEAE (Vol. 24, p. 263), saxifrage, japonica, gooseberry, hydrangea. SCROPHULARIACEAE (Vol. 24, p. 485), with veronica, foxglove, snapdragon, etc. SOLANACEAE (Vol. 25, p. 356), which embrace henbane, tobacco, deadly nightshade, cape gooseberry, capsicum. UMBELLIFERAE (Vol. 27, p. 575), to which belong ivy, carrot, hemlock, celery, caraway, parsley. URTICACEAE (Vol. 27, p. 805), which include the nettle tribes.

Angiosperms: Monocotyledons

The Monocotyledons include the ALISMACEAE (Vol. 1, p. 671), to which belong the arrow-head, the water plantain, the butomus (so called because the leaves cut the tongues of oxen feeding on them), and other water plants. AROIDEAE (Vol. 2, p. 640), so called from the Arum family. The BROMELIACEAE (Vol. 4, p. 632), including pineapple, Spanish-moss. CYPERACEAE (Vol. 7, p. 692), with bulrush, cotton grass, etc. GRASSES (Vol. 12, p. 369), a most valuable article. HYDROCHARIDEAE (Vol. 14, p. 112), which include a number of water plants. Iridaceae (Vol. 14, p. 793), which include besides the iris, the crocus, gladiolus, etc. The JUNCACEAE (Vol. 15, p. 555), or Rush family; and the LILIACEAE (Vol. 16, p. 683), which include asparagus, hyacinth, star of Bethlehem, fritillary, bluebell, etc.

Other Divisions

Another big division is that of the GYMNOSPERMS (Vol. 12, p. 754). These have naked seed pods; that is to say, the seeds are not enclosed in capsules. The best known and largest division of this class contains the conifers: pines, firs, cedars, larches, etc.

PTERIDOPHYTA (Vol. 22, p. 605), or spore-producing plants, including the fern families as the largest and most important of its members.

BRYOPHYTA (Vol. 4, p. 700), the second great sub-division of the vegetable kingdom, comprises the mosses and liverworts.

ALGAE (Vol. 1, p. 585), plants usually devoid of differentiation into roots, stem, and leaf, coming under the general class of Bryophyta, and including sea-weeds as the main group.

LICHENS (Vol. 16, p. 578), compound dual organisms, part algae and part fungus, interesting because the dual organism enables the plant to live where neither of its compounds could live alone. Iceland moss, valuable both for its nutritive and medicinal qualities, comes under this division.

FUNGI (Vol. 11, p. 333), an enormous class, comprising, according to Saccardo, 32,000 different species.

Bacteria (see BACTERIOLOGY, Vol. 3, p. 156), minute organisms, also known as microbes, bacilli, etc., technically called Schizomycetes.

INSECTIVOROUS PLANTS (Vol. 14, p. 644), more correctly termed Carnivorous, belong to a number of distinct natural orders, but agree in the extraordinary habit of adding to the supplies of nitrogenous material offered them by the soil and atmosphere by the capture and consumption of insects and other small animals.

These are the main divisions, and from the articles describing them the student will acquire a sound knowledge of the characteristics which distinguish each. As a matter of fact, interest in botany as a subject is first inspired by the particular rather than the general—that is to say, the love of individual

flowers leads to the study of their habits and life history, thence to a comparison which leads to the recognition of similar characteristics in plants having apparently widely different functions, so that the following section of the subject, touching the natural history of plants, though really placed last in a logical course of reading in botany, will contain much that is already known to the student who wishes to pursue the subject systematically.

Natural History

In the Britannica from the various articles concerning the natural history of individual plants it is easy to trace back to what family and main division each plant belongs. To the student beginning the subject it will be most suggestive to look up the accounts of the plants which are cultivated in his garden, or which he can find near his home, and find out the family relationship between subjects which appear to differ very widely both in habits and characteristics. From the outline given above in the paragraph devoted to systematic botany an indication will be given him of the surprises which are in store for him as he pursues his investigation. He would not at first suspect, for example, that asparagus and hyacinths were cousins, that roses, apples, and blackthorn are closely related, or that chrysanthemums and artichokes have any connection with one another, let alone cabbage and wallflowers. An excellent scheme to arouse the interest of the young student would therefore be to encourage him to pick out from the list below the names of plants with which he is familiar and of which he can get specimens, and thence work backward until the meanings of the main divisions of the vegetable kingdom are clear to him.

In the natural history section of the following list will be found in alphabetical order the plants which have separate articles in the Britannica. Many plants besides these are of course described. They will be found in the Index, where the volume and page on which a description will be found are given.

CLASSIFIED LIST OF ARTICLES IN THE BRITANNICA ON BOTANY

(For biographies of botanists, see the end of the chapter on Biology)

Botany: General

Acaulescent

Acerose

Acinus

Acorn

Alburnum

Angulate

Ascus

Autogamy

Auxanometer

Axile, or Axial

Bacteriology

Botany

Boll

Bur, or Burr

Caducous
Caespitose
Cane
Capsule
Cataphyll
Chlorosis
Colleter
Corn
Cystolith
Deciduous
Fairy Ring
Flower
Fruit
Galls
Glaucous
Graft
Herb
Herbarium
Humus
Idioblast
Leaf
Marcescent
Meristem
Nut
Palaeobotany
Pin-eyed

Pistil
Plants
Pollination
Root
Ruderal
Sap
Sarcocarp
Sarmentose
Scion
Secund
Seed
Stem
Synanthy
Thorn
Thrum-eyed
Tree
Vegetable
Witch brooms

Botany: Systematic

Acotyledones
Acrogenae
Algae
Alismaceae
Amentiferae, or Amentaceae

Angiosperms
Aroideae (Arum family)
Boraginaceae
Bromeliaceae
Bryophyta
Caprifoliaceae
Caryophyllaceae
Compositae
Convolvulaceae
Crassulaceae
Cruciferae
Cucurbitaceae
Cupuliferae
Cyperaceae
Diatomaceae
Dicotyledons
Dictyogens
Ericaceae
Euphorbiaceae
Fungi
Gentianaceae
Geraniaceae
Grasses
Gymnosperms
Hydrocharideae
Insectivorous Plants

Iridaceae
Juncaceae
Labiatae
Leguminosae
Lichens
Liliaceae
Malvaceae
Moraceae
Onagraceae
Polygonaceae
Primulaceae
Pteridophyta
Ranunculaceae
Rosaceae
Rubiaceae
Saxifragaceae
Scrophulariaceae
Solanaceae
Umbelliferae
Urticaceae

Botany: Natural History

Aal
Aaron’s Rod
Abaca

Abutilon
Acacia
Acanthus
Achimenes
Acorus Calamus
Adonis
African Lily
Agave
Agrimony
Ailanthus
Alder
Aleurites
Alexanders
Algum, or Almug Tree
Allamanda
Alliaria officinalis
Allium
Almond
Aloe
Amadou
Amanita
Amaranth
Amaryllis
Ammoniacum, or Gum Ammoniac
Ampelopsis
Anatto

Anemone
Angelica
Animé
Anise
Apple
Apricot
Araucaria
Arbor Vitae
Archil
Aristolochia
Arrowroot
Artichoke
Ash
Asparagus
Aspen
Asphodel
Aspidistra
Aster
Aubergine
Aucuba
Auricula
Avocado Pear
Azalea
Bael Fruit
Balm
Bamboo

Banana
Baneberry
Banksia
Baobab
Barberry
Barley
Bdellium
Bean
Beech
Beet
Begonia
Benzoin, or Gum Benjamin
Betel Nut
Bilberry
Birch
Bird’s Eye
Blackberry
Bladder-wort
Boletus
Borage
Botrytis
Bottle-brush Plants
Bouvardia
Boxwood
Bracket-fungi
Brazil Nuts

Brazil Wood
Bread-fruit
Brooklime
Broom
Broom-rape
Buchu, or Buka Leaves
Buck-bean, or Bog-Bean
Buckthorn
Buckwheat
Bulrush
Burnet
Buttercup
Butter-nut
Butterwort
Cabbage
Cactus
Calabash
Calabash Tree
Calceolaria
Camellia
Campanula
Candytuft
Cannon-ball Tree
Capers
Caraway
Cardamom

Cardoon
Carnation
Carrot
Cashew Nut
Cassava
Cassia
Casuarina
Catalpa
Catha
Cayenne Pepper
Ceanothus
Cecropia
Cedar
Celandine
Celery
Centaurea
Centaury
Chantarelle
Chenopodium
Cherry
Chestnut
Chicory
Chive
Chrysanthemum
Cicely
Cimicifuga

Cinchona
Cineraria
Cinnamon
Citron
Cleavers
Clematis
Climbing Fern
Cloudberry
Clover
Cloves
Coca, or Cuca
Cocculus Indicus
Cock’s-comb
Cocoa
Coco de Mer
Coco-nut Palm
Codiaeum
Coffee
Colchicum
Coleus
Colocynth
Colt’s-foot
Columbine
Compass Plant
Cotton
Copaiba, or Copaiva

Copal
Coriander
Cork
Corn-salad
Correa
Cotoneaster
Cow-tree
Cranberry
Cress
Crinum
Crocus
Crowberry
Cryptomeria
Cucumber
Cumin, or Cummin
Currant
Custard Apple
Cyclamen
Cypress
Daffodil
Dahlia
Daisy
Dame’s Violet
Dammar, or Dammer
Dandelion
Daphne

Darlingtonia
Date Palm
Dewberry
Dividivi
Dock
Dodder
Dogwood
Dracaena
Dragon’s Blood
Dropwort
Duckweed
Dulse
Duramen
Durian
Durra
Earth-nut
Earth-star
Ebony
Edelweiss
Eglantine
Elder
Elecampane
Elephant’s Foot
Elm
Endive
Entada

Esparto, or Spanish Grass
Eucharis
Euonymus
Euphorbia
Evergreen
Everlasting, or Immortelle
Fennel
Fenugreek
Fern
Fig
Filmy Ferns
Finger-and-toe
Fir
Flax
Fool’s Parsley
Forget-me-not
Foxglove
Freesia
Fritillary
Frog-bit
Fuchsia
Fumitory
Funkia
Furze, Gorse, or Whin
Fustic
Gale

Gardenia
Garlic
Genista
Gentian
Geranium
Geum
Gillyflower
Ginger
Gladiolus
Glasswort
Gloriosa
Gloxinia
Golden Rod
Gooseberry
Gourd
Grains of Paradise
Gram, or Chick-pea
Granadilla
Grass of Parnassus
Greenheart
Ground Nut
Groundsel
Guava
Guelder Rose
Gulfweed
Gum

Gumbo, or Okra
Gutta Percha
Hackberry
Harebell
Hawthorn
Hazel
Heath
Heliotrope, or Turnsole
Hellebore
Hemlock
Hemp
Henbane
Henna
Hickory
Hippeastrum
Holly
Hollyhock
Honey Locust
Honeysuckle
Hop
Horehound
Hornbeam
Horseradish
Horsetail
Houseleek
Huckleberry

Huon Pine
Hyacinth
Hydrangea
Hyssop
Iceland Moss
Ice-plant
Impatiens
Iris
Irish Moss, or Carrageen
Iron-wood
Ivy
Jarrah Wood
Jasmine, or Jessamine
Jew’s Ears
Job’s Tears
Judas Tree
Jujube
Juniper
Jute
Kaffir Bread
Kauri Pine
Kerguelen’s Land Cabbage
Kumquat
Labrador Tea
Laburnum
Lac

Lace-bark Tree
Lancewood
Larch
Larkspur
Lattice Leaf Plant
Laurel
Laurustinus
Lavender
Leek
Lemon
Lentil
Lettuce
Lilac, or Pipe Tree
Lily
Lime, or Linden
Liquidambar, or Sweet Gum
Litchi, or Lee-Chee
Lobelia
Loco-weeds, or Crazy Weeds
Locust-tree
Loosestrife
Loquat
Lotus
Lucerne
Lupine
Lycopodium

Madder, or Dyer’s Madder
Magnolia
Mahogany
Maidenhair
Maize, or Indian Corn
Mallow
Mammee Apple
Mandrake
Mangel-Wurzel
Mango
Mangosteen
Mangrove
Manila Hemp
Manna
Maple
Mare’s-tail
Marguerite
Marigold
Marjoram
Mastic, or Mastich
Maté, or Paraguay Tea
Medlar
Melon
Mesquite, or Honey Locust
Mignonette
Mildew

Milkwort
Millet
Mimosa
Mimulus
Mint
Mistletoe
Moly
Momordica
Moonseed
Moonwort, or Moonfern
Moreton Bay Chestnut
Mucuna
Mulberry
Mushroom
Mustard
Myrobalans
Myrrh
Myrtle
Narcissus
Nasturtium
Nettle
Nettle Tree
Nightshade
Nutmeg
Oak
Oat

Oleander
Oleaster
Olive
Onion
Orach, or Mountain Spinach
Orange
Orchids
Orris-Root
Osier
Oxalis
Paeony
Palm
Palmetto
Pansy, or Heartsease
Papyrus
Parsley
Parsnip
Passionflower
Pea
Peach
Pear
Pellitory
Pennyroyal
Pentstemon
Pepper
Peppermint

Pepper Tree

Persimmon

Petunia

Phlox

Phormium, or New Zealand Flax

Pimento

Pine

Pine-apple

Pink

Pistachio Nut

Pitcher-plants

Plane

Plantain

Plum

Poinsettia

Pokeberry, or Pokeweed

Polyanthus

Polypodium

Pomegranate

Pondweed

Poplar

Poppy

Potato

Potentilla

Primrose

Privet

Puff-ball
Pumpkin
Purslane
Pyrethrum
Quince
Radish
Ramie
Ramsons
Ranunculus
Rape
Raspberry
Reed
Rhododendron
Rice
Richardia
Robinia, or Locust-tree
Rocambole
Rose
Rosemary
Rosewood
Rosin, or Colophony
Royal Fern
Rubber
Rue
Rush
Rye

Sabicu Wood
Safflower
Saffron
Sago
Sainfoin
St. John’s Wort
Salsafy, or Salsify
Salvia
Sapan Wood
Sarracenia
Satin Wood
Saxifrage
Scammony
Scorzonera
Screw-pine
Sea-kale
Seawrack
Sedum
Sequoia
Service Tree
Sesame
Shaddock
Shallot
Sisal Hemp
Skirret
Snake-root

Snapdragon
Snowdrop
Soap-bark
Sorghum
Sorrel
Spanish Broom
Spikenard, or Nard
Spinach
Spruce
Stink-wood
Strawberry
Strophanthus
Sudd
Sumach
Sundew
Sunflower
Sunn, or India Hemp
Sweet Potato
Sweet-sop
Switch Plants
Tallow Tree
Tamarind
Tamarisk
Tea
Teak
Teasel

Terebinth
Thistle
Thyme
Tiger-flower
Toadstool
Tobacco
Tomato
Tonqua Bean
Toothwort
Traveller’s Tree
Tree-fern
Truffle
Tuberose
Tulip
Tulip Tree
Tumble-weed
Turmeric
Turnip
Vanilla
Vegetable Marrow
Venus’s Fly-trap
Venus’s Looking-glass
Veratrum
Verbena
Vetch
Vine

Violet
Walnut
Water-lily
Water-thyme
Wax-tree
Wheat
Willow
Willow-herb
Wintergreen
Winter’s-bark
Witch-hazel
Woad
Wormwood
Yam
Yew
Yucca
Zinnia

CHAPTER LIX
ZOOLOGY

At the very outset of his zoological studies the reader will find that the doctors still differ as to the best and most scientifically logical system to be employed in classification. So important is it that the connotation

and denotation of every zoological designation should be definite, that Sir Edwin Ray Lankester devotes the title article ZOOLOGY (Vol. 28, p. 1022) mainly to a discussion of systems of classification, and besides there is a separate article ZOOLOGICAL NOMENCLATURE (Vol. 28, p. 1021) by P. Chalmers Mitchell, Secretary of the Zoological Society of London, university demonstrator in comparative anatomy and assistant to the Linacre Professor at Oxford, and adviser to the editor in the organization of the whole subject of zoology in the Britannica.

The Britannica articles may be classified in three divisions: dealing with (i) *General Principles*, (ii) *Systematic*, (iii) *Natural History*.

General Principles

The student should read at any rate some of the general articles mentioned in the chapter on *Biology*; and these will prepare him for the difficult questions involved in the articles ZOOLOGY and ZOOLOGICAL NOMENCLATURE. Supplementary to these are the following: ANIMAL (Vol. 2, p. 48), in connection with which should be read the article PROTISTA (Vol. 22, p. 476) where the borderland between the animal and vegetable kingdoms is further discussed, and the very valuable article PROTOZOA (Vol. 22, p. 479) in which E. A. Minchin, professor of protozoology in the University of London, discusses the minute animal organisms, which in the last decade have proved immensely important in the study of parasitic diseases. In LARVAL FORMS (Vol. 16, p. 224), and METAMORPHOSIS (Vol. 18, p. 221) Prof. Adam Sedgwick, of the Imperial College of Science and Technology in London, discusses the early history of larvae and their change from larval to adult growth. The articles METAMERISM (Vol. 18, p. 215), by Sir

Edwin Ray Lankester, and *Regeneration of Lost Parts* (Vol. 23, p. 36), by P. Chalmers Mitchell, discuss the capacity for repeating parts (as in the case of the common earth worm) and for the formation of new parts to take the place of those lost by accident or injury. The article MONSTER (Vol. 18, p. 740) by Dr. Charles Creighton will be found very suggestive.

Protective Modifications

The eyes of most of us are shut to the wonders of the animal kingdom. We know by hearsay that the colouring of an animal or insect, brilliant and startling though it often be, is designed by nature for protection by enabling it to assimilate itself to that of its surroundings. But how many of us have taken the trouble to verify this? The articles COLOURS OF ANIMALS, *Bionomics* (Vol. 6, p. 731), by Prof. Poulton of Oxford, and MIMICRY (Vol. 18, p. 495), by R. I. Pocock, superintendent of the Zoological Gardens in London, will suggest to the reader many objects for observation. Especially interesting in the former article is the section on the use of colour for warning and signaling. In connection with these articles, those on EGG (Vol. 9, p. 13) and FEATHER (Vol. 10, p. 224), by W. P. Pycraft, of the British Museum, may be read, and NIDIFICATION (Vol. 19, p. 666), by Prof. Alfred Newton of Cambridge University, and Hans Gadow, Strickland curator and lecturer on zoology in the University of Cambridge; especially those sections concerned with the precautions taken by the birds for protection and concealment. A very fascinating subject is discussed in the articles dealing with the distribution and movements of animal life. These are ZOOLOGICAL DISTRIBUTION (Vol. 28, p. 1002), by the well-known zoologist Richard

Lydekker; MIGRATION (Vol. 18, p. 433), by Hans Gadow; and PLANKTON (Vol. 21, p. 720), by G. H. Fowler of University College, London. Reference to these articles has already been made in the chapter on *Biology*. Closely connected with them is the article on PALAEONTOLOGY (Vol. 20, p. 579), by Prof. H. F. Osborn, Columbia University and American Museum of Natural History, in which the distribution of prehistoric life is discussed; and, as will be seen from the list below, all the principal species now only found in fossil remains are described in separate articles.

Intelligence of Animals

The editor succeeded in getting the psychologist, Prof. C. Lloyd Morgan, of the University of Bristol, who has made a specialty of this particular subject, to write extremely illuminating articles on INSTINCT and on INTELLIGENCE IN ANIMALS (Vol. 14, pp. 648 and 680). Interesting as throwing a side light on either the instinct or intelligence of birds, is the section on their song in the article SONG (Vol. 25, p. 413). It is hardly possible to look through any of these articles, or those on mimicry and colour, above alluded to, without coming across some striking and interesting fact, as for instance, the sudden change from a divine melody to an anxious croak in the utterance of the male nightingale as soon as the brood is hatched. These articles will be read for their great interest by many who do not intend systematically to pursue the subject of Zoology.

Animals in Captivity

The housing of animals in captivity is discussed in the articles AQUARIUM (Vol. 2, p. 237), by Professor

G. H. Fowler, University College, London; AVIARY (Vol. 3, p. 60), by D. Seth-Smith, curator of birds to the Zoological Society of London; and ZOOLOGICAL GARDENS (Vol. 28, p. 1018), by P. Chalmers Mitchell. The first two contain some very useful hints for the care of small aquaria and aviaries; and young people who like to have aquaria at home, and are often disappointed by their failure to keep alive some of their specimens, especially larval and other surface-swimming animals, will find one of their difficulties solved. These surface-swimming animals die of exhaustion from their unaided efforts to keep off the bottom, lacking the support given in their surroundings by the natural flow of the water, native tides, and surface currents. The article describes a very simple arrangement by which this motion of the water can be simulated.

Other articles which will be found very interesting are those on HIBERNATION (Vol. 13, p. 441) and on INCUBATION AND INCUBATORS (Vol. 14, p. 359). In the latter many will be surprised to note that incubators have been in use in Egypt from time immemorial under the name MAMAL. In one district of Egypt alone 90,000,000 eggs are annually hatched out in these old time incubators, of which the secret has been handed down, jealously guarded, from father to son. In the article TAXIDERMY (Vol. 26, p. 464), Montagu Browne, a practical taxidermist, deals with the artistic as well as the technical aspects of the craft.

Classification and Divisions

Turning to the articles of the chief divisions of the animal kingdom, the most useful arrangement will be to enumerate them in their order. As has been

already said, zoologists do not yet agree as to the best system of classification; the one which is given in the Britannica is that upon which the very eminent zoologists who have contributed the special articles, agree as being the most suitable. There are two main grades. The PROTOZOA (Vol. 22, p. 479) contain the animalcules, mainly microscopic. These are the most elementary forms of life and consist of single cells. The other and more important grade is that of the METAZOA, which are built up of many cells.

Protozoa

The main subdivisions (called phyla) of the Protozoa are: phylum i. SARCODINA (Vol. 24, p. 208); phylum ii. MASTIGOPHORA (Vol. 17, p. 873); phylum iii. SPOROZOA (Vol. 25, p. 734); phylum iv. INFUSORIA (Vol. 14, 557).

Metazoa

Coming next, the Metazoa in their order are, as follows: phylum i. Porifera (see SPONGES, Vol. 25, p. 715); phylum ii. HYDROMEDUSAE or HYDROZOA (Vol. 14, pp. 135 and 171) which include aquatic animals of the coral kind; phylum iii. SCYPHOMEDUSA (Vol. 24, p. 519) which include groups of shell fish; phylum iv. ANTHOZOA (Vol. 2, p. 97) with the corals; phylum v. CTENOPHORA (Vol. 7, p. 592) including the jelly fish; phylum vi. PLATYELMIA (Vol. 21, p. 826) a group of animals in which creeping first became habitual; phylum vii. Nematoidea (see NEMATODA, Vol. 19, p. 359) which include certain kinds of worms; phylum viii. CHAETOGNATHA (Vol. 5, p. 789) an isolated class of transparent pelagic organisms; phylum ix. NEMERTINA (Vol. 19, p. 363) worm families; phylum x. MOLLUSCA (Vol. 2, p. 669) shell-bearing animals.

Phylum xi. APPENDICULATA (Vol. 2, p. 220) which include the sub-phyla ROTIFERA (Vol. 23, p. 759), CHAETOPODA (Vol. 5, p. 789), and ARTHROPODA (Vol. 2, p. 673), the sub-phylum which comprises practically the whole insect family. Important articles on animals in this class are: HEXAPODA (Vol. 13, p. 418) which include the wasp, beetle, and other families; the CRUSTACEA (Vol. 7, p. 552) which cover a field wide enough to embrace species as different outwardly as lobsters, wood-lice, and minute water fleas; and ARACHNIDA (Vol. 2, p. 287) the spider family. Phylum xii. ECHINODERMA (Vol. 8, p. 871) with all the sea-urchins and star fish.

Phylum xiii. VERTEBRATA (Vol. 27, p. 1047) to which man belongs as an order of a sub-class of a class of a sub-phylum. The most important sub-phylum of the Vertebrata is the Craniata (see Vol. 27, p. 1048). The sub-phyla HEMICHORDA (Vol. 13, p. 257), Urochorda (see TUNICATA, Vol. 27, p. 379), and Cephalochorda (see AMPHIOXUS, Vol. 1, p. 886) deal with the lower orders of Vertebrata. The sub-phylum Craniata comprises the following classes: class i. Pisces, see ICHTHYOLOGY (Vol. 14, p. 243) with the fishes; class ii. BATRACHIA (Vol. 3, p. 521), with the frog tribe; class iii. Reptilia (see REPTILES, Vol. 23, p. 136); and in close connection with this—class iv. Aves (see BIRD, Vol. 3, p. 959, and ORNITHOLOGY, Vol. 20, p. 299); class v. MAMMALIA (Vol. 17, p. 520) to which man belongs.

Phylum xiv. MESOZOA (Vol. 18, p. 187) minute parasitic animals intermediate between the Protozoa and the Metazoa. Phylum xv. POLYZOA (Vol. 22, p. 42) aquatic animals forming colonies by budding. Phylum xvi. ACANTHOCEPHALA (Vol. 1, p. 109) including the parasitic worms. Phylum xvii. PODAXONIA (Vol. 28, p. 1023), and phylum xviii.

GASTROTRICHA (Vol. 11, p. 526) minute animals living at the bottom of ponds and marshes.

Natural History

This is an outline of the main division of the animal kingdom in their order as now classified. The subject of zoology is so vast that the student will probably confine himself to one branch of the subject, perhaps to one small fraction of a division, of which he proposes to investigate the complete natural history. As will be seen from the list below, which is classified, the Britannica offers an immense amount of material bearing on the subject. But of course the study of any one sub-class needs a general knowledge of the foundations of zoological science, so that some acquaintance with the principles on which the animal world is classified is indispensable. As in Botany, it will be easy to see from the article on any individual animal to which family it belongs so that the young student can work back from the particular to the general and find out the whole relationship of the subject in which he is interested by reference to the "systematic" article.

LIST OF ARTICLES IN THE ENCYCLOPAEDIA BRITANNICA ON ZOOLOGY

(For biographies of Zoologists, see the end of the chapter on Biology)

Zoology: General

Abomasum

Acetabulum

Animal
Aquarium
Aviary
Beak
Breeds and Breeding
Carapace
Colours of Animals
Comparative Anatomy
Conch
Contractile Vacuole
Crepuscular
Dew-claw
Dewlap
Dorsiventral
Dredge
Egg
Feather
Grub
Herd
Hibernation
Incubation and Incubators
Instinct
Intelligence in Animals
Karyogamy
Larval Forms
Meganucleus

Membranelle
Metamerism
Metamorphosis
Micronucleus
Migration
Mimicry
Mongrel
Monster
Moult
Nest
Nidification
Plankton
Proboscis
Pylome
Quill
Regeneration of Lost Parts
Sex
Song (of Birds)
Taxidermy
Vermin
Zoology
Zoological Distribution
Zoological Gardens
Zoological Nomenclature

Zoology, Systematic: Invertebrata

Acanthocephala
Acineta
Actinozoa
Algae
Amoeba
Annelida
Anthozoa
Appendiculata
Aptera
Arachnida
Arcella
Arthropoda
Articulata
Aspirotrochaceae
Brachiopoda
Campodea
Cephalopoda
Chaetognatha
Chaetopoda
Ciliata
Coccidia
Coelentera
Coleoptera
Crustacea
Ctenophora
Cystoflagellata

Dendrocometes
Desmoscolecida
Difflugia
Dinoflagellata
Diptera
Echinoderma
Echiuroidea
Ectospora
Endospora
Entomostraca
Epistylis
Filosa
Flagellata
Foraminifera
Gastropoda
Gastrotricha
Gephyrea
Globigerina
Gnathopoda
Gregarines
Gymnostomaceae
Haemosporidia
Haplodrili
Heliozoa
Hemiptera
Heterokaryota

Hexapoda
Hydromedusae
Hydrozoa
Hymenoptera
Infusoria
Kinorhyncha
Labyrinthulidea
Lamellibranchia
Lepidoptera
Malacostraca
Mastigophora
Medusa
Mesozoa
Mollusca
Molluscoida
Mycetozoa
Myonemes
Myriapoda
Myzostomida
Nematoda
Nematomorpha
Nemertina
Neuroptera
Nummulite
Opalina
Orthoptera

Paramecium
Pedipalpi
Pelomyxa
Pentastomida
Peripatus
Perissodactyla
Phoronidea
Planarians
Platyelmia
Polyp
Polyzoa
Priapuloidea
Proteomyxa
Protista
Protogenes
Protomyxa
Protozoa
Pseudopod
Pycnogonida, or Pantopoda
Radiata
Radiolaria
Rhizopoda
Rotifera
Sarcodina
Scaphopoda
Scyphomedusae

Sipunculoidea
Sponges
Sporozoa
Stentor
Thyrostraca
Thysanoptera
Thysanura
Trematodes
Trypanosomes
Vampyrella
Vorticella

Zoology, Systematic: Vertebrata

Amphibia
Artiodactyla
Amphioxus
Balanoglossus
Batrachia
Bovidae
Caecilia
Carnivora
Cetacea
Chaetosomatida
Chiroptera
Cyclostomata, or Marsipobranchii

Cyprinodonts
Edentata
Equidae
Hemichorda
Hyracoidea
Insectivora
Marsupialia
Monodelphia
Monotremata
Pecora
Proboscidea
Pterobranchia
Ratitae
Rodentia
Ruminantia
Salmon and Salmonidae
Sauropsida
Selachians, or Elasmobranchii
Suina
Tardigrada
Teleostomes
Tunicata
Tylopoda
Ungulata
Vertebrata

Zoology, Natural History: Mammals

Aard-vark
Aard-wolf
Addax
Agouti
Alpaca
Ant-eater
Antelope
Anthropoid Apes
Aona
Ape
Argali
Armadillo
Ass
Aurochs
Avahi
Aye-aye
Babirusa
Baboon
Badger
Bandicoot
Bandicoot-rat
Bantin
Barbary Ape
Bat

Bear
Beaver
Beluga
Bharal
Binturong
Bison
Black Ape
Black Buck
Boar
Bongo
Bottlenose Whale
Bronco
Buck
Buffalo
Bushbuck
Ca'ing Whale
Calf
Camel
Capuchin Monkey
Capybara
Caracal
Cat
Catarrhine Ape
Cattle
Cavy
Chacma

Chamois
Cheeta
Chevrotain
Chimpanzee
Chinchilla
Chiru
Civet
Clouded Leopard
Coati
Colugo
Coyote
Coypu
Dasyure
Deer
Diana Monkey
Dingo
Dog
Dolphin
Dormouse
Douroucouli
Dromedary
Dugong
Duiker
Echidna
Eland
Elephant

Elk
Ermine
Eyra
Fallow-deer
Ferret
Field-mouse
Filander
Flying-fox
Flying Squirrel
Foussa
Fox
Galago
Galeopithecus
Gaur
Gayal
Gelada
Genet
Gerbil
Gerenuk
Gibbon
Giraffe
Glutton, or Wolverine
Gnu
Goat
Gopher
Goral

Gorilla
Green Monkey
Grison
Grivet
Groove-toothed Squirrel
Ground-squirrel
Guanaco
Guenon
Guereza
Hamster
Hare
Hartebeest
Hedgehog
Heifer
Heron
Hind
Hippopotamus
Horse
Hound
Howler
Humpback-whale
Hunting Dog
Hyena
Ibex
Ichneumon
Indri

Jackal
Jaguar
Jaguarondi
Jennet
Jerboa
Jumping-hare
Jumping-mouse
Jumping-shrew
Kangaroo
Kangaroo-rat
Kinkajou
Kit-fox
Klipspringer
Koala
Kudu
Langur
Lemming
Lemur
Leopard
Linsang
Lion
Llama
Loris
Lynx
Macaque
Macrauchenia

Mammalia
Manati
Mandrill
Mangabey
Manul
Mare
Markhor
Marmoset
Marmot
Marshbuck
Marsupial Mole
Marten
Merino
Mink
Mole
Mole-rat
Mole-shrew
Mona Monkey
Monkey
Moose
Mouflon
Mouse
Mule
Muntjac
Musk-deer
Musk-ox

Musk-rat
Musk-shrew
Mustang
Nilgai
Ocelot
Octodon
Okapi
Opossum
Orang-utan
Oribi
Oryx
Otter
Ox
Paca
Palla
Palm-civet
Panda
Pangolin
Panther
Pariah Dog
Patas Monkey
Peccary
Père David’s Deer
Phalanger
Pica
Pig

Pithecanthropus Erectus
Platypus
Pluto Monkey
Pocket-gopher
Pocket-mouse
Polecat
Pony
Porcupine
Porpoise
Potoroo
Potto
Pouched-mouse
Prairie-marmot
Primates
Proboscis-monkey
Prongbuck
Puma
Quagga
Rabbit
Raccoon
Raccoon-dog
Ram
Rat
Ratel
Reedbuck
Reindeer

Rhinoceros
Rhytina
River-hog
Rocky-Mountain Goat
Roebuck
Rorqual
Sable Antelope
Saiga
Saki
Seal
Serow
Serval
Sheep
Shrew
Sifaka
Sirenia
Skunk
Sloth
Snow-leopard
Souslik
Sperm-whale
Spider-monkey
Spiny Squirrel
Springbuck
Squirrel
Squirrel Monkey

Star-nosed Mole
Suricate
Swine
Tahr
Takin
Tapir
Tarsier
Tenrec
Thylacine
Tiger
Tiger-cat
Timber-Wolf
Tree Kangaroo
Tree-shrew
Udad, Aoudad, or Audad
Uakari
Vampire
Vervet
Vicugña
Viscacha
Vole
Wallaby
Walrus
Waltzing Mouse
Wanderu
Wart-hog

Waterbuck
Water-deer
Water-opossum
Weasel
Whale
Wolf
Wombat
Yak
Zebra

Zoology, Natural History: Birds

Albatross
Auk
Beccafico
Bird
Birds of Paradise
Bittern
Blackbird
Blackcock
Bullfinch
Bunting
Bustard
Buzzard
Canary
Capercally

Cassowary
Chaffinch
Cockatoo
Cock-of-the-Rock
Condor
Coot
Cormorant
Crane
Crossbill
Crow
Cuckoo
Curassow
Curlew
Diver
Dodo
Dove
Duck
Eagle
Eider
Emeu
Falcon
Fieldfare
Finch
Flamingo
Flycatcher
Fowl

Frigate-bird
Fulmar
Gadwall
Gannet
Gare-fowl
Garganey
Goatsucker
Godwit
Golden-eye
Goldfinch
Goose
Gos-hawk
Grackle
Grebe
Greenfinch
Greenshank
Grosbeak
Grouse
Guacharo
Guan
Guillemot
Guinea Fowl
Gull
Harpy
Harrier or Hen Harrier
Hawfinch

Hawk
Hen
Heron
Hoactzin, or Hoatzin
Honey-eater
Honey-guide
Hoopoe
Hornbill
Humming-bird
Ibis
Icterus
Jabiru
Jacamar
Jacaná
Jackdaw
Jay
Kakapo
Kestrel
Killdeer
King-bird
Kingfisher
Kinglet
Kite
Kiwi, or Kiwi-Kiwi
Knot
Lammergeyer

Lapwing
Lark
Linnet
Loom, or Loon
Lory
Love-bird
Lyre-bird
Macaw
Magpie
Mallemuck
Manakin
Manucode
Martin
Megapode
Merganser
Mew
Moa
Mocking-bird
Moor-hen
Morillon
Motmot
Mouse-bird
Nestor
Nightingale
Noddy
Nonpareil

Nutcracker
Nuthatch
Ocydrome
Oriole
Ornithology
Orthonyx
Ortolan
Osprey
Ostrich
Ousel, or Ouzel
Owl
Oyster-catcher
Parrot
Partridge
Peacock
Pelican
Penguin
Petrel
Pheasant
Pica
Pigeon
Pipit
Pitta
Plover
Pochard, Pockard, or Poker
Pratincole

Ptarmigan
Puff-bird
Puffin
Quail
Quezal, or Quesal
Rail
Raven
Razorbill
Redbreast, or Robin
Redshank
Redstart
Redwing
Rhea
Rifleman-bird
Roller
Rook
Ruff
Sand-grouse
Sandpiper
Scaup
Scoter
Screamer
Scrub-bird
Secretary-bird
Seriema, or Cariama
Shearwater

Sheathbill
Sheld-drake
Shoe-bill
Shoveler
Shrike
Siskin
Skimmer
Skua
Snake-bird
Snipe
Sparrow
Spoonbill
Starling
Stilt, or Long-legged Plover
Stork
Sugar-bird
Sun-bird
Sun-bittern
Swallow
Swan
Swift
Tanager-bird
Tapaculo
Teal
Tern
Thrush

Tinamou
Titmouse
Tody
Toucan
Touracou
Tree-creeper
Trogan
Tropic-bird
Trumpeter
Turkey
Turnstone
Vulture
Wagtail
Warbler
Waxwing
Weaver-bird
Wheatear
Whitethroat
Wigeon, or Widgeon
Woodchuck
Woodcock
Woodpecker
Wren
Wry-neck
Zosterops

Zoology, Natural History: Reptiles

Adder
Alligator
Alytes
Amphisbaena
Anaconda
Asp
Basilisk
Boa
Chameleon
Cobra
Cockatrice
Crocodile
Cryptobranchus
Dragon
Gecko
Iguana
Lizard
Proteus
Python
Rattlesnake
Reptiles
Sea-serpent
Snakes
Sphenodon

Tortoise

Viper

Zoology, Natural History: Fishes

Anchovy

Angler

Barbel

Beluga

Bitterling

Bleak

Bream

Brill

Burbot

Carp

Cat-fish

Char

Chub

Cichlid

Coal-fish

Cod

Dace, Dare, or Dart

Dog-fish

Dory, or John Dory

Eel

Electric Eel

File-fish and Trigger Fish
Flat-fish
Flounder
Fluke
Flying-fish
Gar-fish
Globe-fish
Goby
Goldfish
Goramy, or Gouramy
Grampus
Grayling
Gudgeon
Gurnard
Gwyniad
Haddock
Hag-fish
Hair-tail
Hake
Halibut
Hammer-Kop, or Hammerhead
Herring
Horse Mackerel
Ichthyology
Kipper
Lamprey

Ling
Loach
Lump-sucker
Mackerel
Mahseer, or Mahaseer
Menhaden
Miller’s Thumb
Minnow
Mormyr
Mullet
Muraena
Murray Cod
Narwhal
Opah
Parr
Parrot-fishes
Perch
Pike
Pike-perch
Pilchard
Pilot-fish
Pipe-fishes
Plaice
Pollack
Pollan
Pout

Ray
Ribbon-fishes
Roach
Rudd, or Red-eye
Salmon
Sand-Eel
Sea-horse
Sea-wolf
Shad
Shark
Sheepshead
Silverfish
Smelt
Sole
Sprat
Stickleback
Sturgeon
Sun-fish
Sword-fish
Tench
Trout
Tunny
Turbot
Vendace
Weever
Whitebait

Whitefish
Whiting
Wrasse

Zoology, Natural History: Batrachians

Axolotl
Batrachia
Frog
Newt
Salamander
Siren
Surinam Toad
Tadpole
Toad
Tree Frog

Zoology, Natural History: Insects

Acarus
Alder-fly
Ant
Ant Lion
Aphides
Bee
Beetle

Bird-louse
Bug
Butterfly and Moth
Caddis-fly and Caddis-worm
Caterpillar
Chafer
Cicada
Cochineal
Cockroach
Cricket
Cuckoo-spit
Death-watch
Dragon-fly
Earwig
Entomology
Fire Brat
Fire-fly
Flea
Fly
Glow-worm
Gnat
Grasshopper
Ground-pearl
Harvest-bug
Harvester
Hemimerus

Ichneumon-fly
Insect
Katydid
Lacewing-fly
Lantern-fly
Leaf-insect
Locust
Louse
Mantis
Mantis-fly
May-fly, or Ephemeridae
Mosquito
Moth
Palmer
Phylloxera
Saw-fly
Scale-insect
Scorpion-fly
Snake-fly
Springtail
Stick-insect
Stone-fly
Tarantula
Termite
Ticks
Tsetse-fly

Wasp
Water-boatman
Water-scorpion
Weevil
Wireworm

Zoology, Natural History: Other Invertebrata

Abalone
Asterid
Barnacle
Bêche-de-Mer, or Trepang
Book-scorpion
Centipede
Chiton
Cockle
Cowry
Crab
Crayfish
Cuttle Fish
Earthworm
King-crab
Leech
Lobster
Millipede
Mite

Mussel
Nautilus
Octopus
Oyster
Prawn
Scorpion
Sea-urchin
Shrimp
Snail
Spider
Starfish
Tapeworms
Teredo
Water-flea
Wood-louse
Worm

Zoology, Palaeontology

Amblypoda
Anclyopoda
Anthracotherium
Archaeopteryx
Arsinoïtherium
Creodonta
Dinotherium

Diplodocus
Dryopithecus
Ganodonta
Glyptodon
Graptolites
Ichthyosaurus
Iguanodon
Litopterna
Machaerodus
Mammoth
Mastodon
Megatherium
Multituberculata
Mylodon
Odontornithes
Oreodon
Ostracoderms, or Ostracophores
Palaeontology
Palaeospondylus
Palaeotherium
Phenacodus
Phorohacos
Plesiosaurus
Pterodactyles
Sparassodonta
Tillodontia

Titanotheriidae

Toxodontia

Trilobites

CHAPTER LX
PHILOSOPHY AND PSYCHOLOGY

Definitions

Philosophers, says Plato, are “those who are able to grasp the eternal and immutable”; their pursuit is wisdom. The history of philosophy is, therefore, the history of the ideas which have animated successive generations of man; so that in the wide sense the investigation includes all knowledge; the natural as well as the moral sciences; and the Greeks, to whom the western world owes the direction of its thought, so understood it. The several divisions of PHILOSOPHY (Vol. 21, p. 440), as we reckon them, were all fused by Plato in a semi-religious synthesis, with resulting confusion. Aristotle, the encyclopaedist of the ancient world, saw that the several issues should be regarded as separate disciplines, and became the founder of the sciences of logic, psychology, ethics, and aesthetics. His “first philosophy,” or, as we should say, “first principles,” which stood as introductions to his separate special inquiries, gradually acquired the name metaphysics. In more recent times the natural sciences: biology, physics, chemistry, medicine, etc., have been

regarded as outside the strict boundaries of the philosophic schools; and theology, is excluded on the ground that its subject matter is so extensive that it may be looked upon as a separate science. The main divisions of philosophy are: EPISTEMOLOGY (Vol. 9, p. 701), which is concerned with the nature and origin of knowledge, i. e., the possibility of knowledge in the abstract; METAPHYSICS (Vol. 18, p. 224), the science of being, often called ONTOLOGY (Vol. 20, p. 118), dealing, that is to say, with being as being; and PSYCHOLOGY (Vol. 22, p. 547), the science of mind, an analysis of what "mind" means.

Some Important Articles and Their Writers

Metaphysics and Logic

It will be of interest to the reader if, at this point, we enumerate some of the more important articles in the Britannica covering this field with the names of their authors. Andrew Seth Pringle-Pattison, professor of logic and metaphysics in the University of Edinburgh, wrote the general article PHILOSOPHY, which is a key to the whole subject, as well as the articles MYSTICISM (Vol. 19, p. 123), SCEPTICISM (Vol. 24, p. 306), SCHOLASTICISM (Vol. 24, p. 346), SPINOZA (Vol. 25, p. 687), and others. Of fundamental importance is the article LOGIC (Vol. 16, p. 879), which would occupy 124 pages of this Guide. It is divided into two parts: the first, by Thomas Case, president of Corpus Christi College, Oxford, formerly professor of moral and metaphysical philosophy in that university, treats of the science generally, and examines in detail the processes of inference. The second, by H. W. Blunt,

of Christ Church, Oxford, and formerly fellow of All Soul's, gives a brilliant account of the *history* of logic, that is, the history of the ideas which have been the basis of all attempts to regulate these processes of inference. This account is unique in that it is the first critical review of the types of logical theory that has been attempted. A lucid discussion of a most difficult subject is that given under METAPHYSICS (Vol. 18, p. 224); equivalent to 100 pages in this Guide by Professor Case, to whom, as one of the most distinguished of modern Aristotelians, the article ARISTOTLE (Vol. 2, p. 501) was also assigned. The life and work of PLATO are examined in a valuable article (Vol. 21, p. 808), the equivalent in length to 54 pages of this Guide, by the late Professor Lewis Campbell, of St. Andrews, one of the best known Platonists of the time.

Henry Sturt, author of *Personal Idealism* and many other books, is responsible for brilliant discussions of UTILITARIANISM (Vol. 27, p. 820), NOMINALISM (Vol. 19, p. 735), METEMPSYCHOSIS (Vol. 18, p. 259), SPACE AND TIME (Vol. 25, p. 525), etc. And F. C. S. Schiller, of Corpus Christi College, Oxford, who, under the wider, and historically more significant title "Humanism," has further developed the pragmatic philosophy of William James, contributed the articles on PRAGMATISM, HERBERT SPENCER, and NIETZSCHE.

Psychology

The very important article on PSYCHOLOGY (Vol. 22, p. 54), equal to nearly 200 pages of this Guide was contributed by James Ward, professor of mental philosophy, Cambridge, who has devoted his whole life to psychological research. In addition to PSYCHOLOGY he also contributed the articles

HERBART (Vol. 13, p. 335), and NATURALISM (Vol. 19, p. 274). James Sully, the well-known psychologist, former professor of the philosophy of the mind and logic, at University College, London, contributes the article AESTHETICS (Vol. 1, p. 277). The article ETHICS (Vol. 8, p. 808), equivalent to about 100 pages of this Guide, and WILL (Vol. 28, p. 648), both of primary importance, were the work of the Rev. H. H. Williams, lecturer in philosophy, Hertford College, Oxford.

Very interesting articles are ASSOCIATION OF IDEAS (Vol. 2, p. 784), DREAM (Vol. 8, p. 588), INSTINCT (Vol. 14, p. 648) and, very important, WEBER'S LAW (Vol. 28, p. 458), which expresses the relation between sensation and the stimulus which induces it.

Of recent years the psychology of crowds has received a good deal of attention; in fact, the need of an understanding of the phenomena attending it is of increasing importance in this age of universal suffrage. Interesting light is thrown upon the subject in the articles SUGGESTION (Vol. 26, p. 48), by W. M. McDougall, Wilde reader in mental philosophy at Oxford; IMITATION (Vol. 14, p. 332); and RELIGION (Vol. 23, p. 66). A line of inquiry of vital importance to the social body is examined in the articles CRIMINOLOGY (Vol. 7, p. 464), by Major Griffith, for many years H. M. Inspector of Prisons, in which Lombroso's theory of the possession by criminals of special anatomical and physiological characteristics is criticized, and the problem is shown to be one of abnormal psychology; see also CESARE LOMBROSO (Vol. 16, p. 936). For discussions of other forms of abnormal psychology, see the chapter *For Physicians and Surgeons* in this Guide, and in particular the article INSANITY (Vol. 14, p. 597).



Psychical Research

Perhaps more popular, certainly more sensational, than the more legitimate branches of psychology, is that classed under PSYCHICAL RESEARCH (Vol. 22, p. 544). The title article was written by Andrew Lang, who wrote POLTERGEIST (Vol. 22, p. 14), as well as articles on SECOND SIGHT (Vol. 24, p. 570), APPARITIONS (Vol. 2, p. 209), etc. The article DIVINATION (Vol. 8, p. 332) was written by Northcote Thomas, government anthropologist to Southern Nigeria, and author of *Thought Transference* and other books; and Mrs. Henry Sidgwick, formerly principal of Newnham College, Cambridge, and secretary to the Society for Psychical Research, was responsible for the article SPIRITUALISM (Vol. 25, p. 705). Among the biographical articles in this section, interest will be felt in the biography of Daniel Dunglas HOME, the original of Robert Browning's poem, "Sludge the Medium."

Classification

We now may classify the principal subjects belonging to the main divisions of philosophy, the sciences of epistemology, metaphysics, and psychology. The wider phases of thought roughly belonging to the division of metaphysics are, in their historical order: Platonism (see PLATO, Vol. 21, p. 808), and Aristotelianism (see ARISTOTLE, Vol. 2, p. 501), the two great Greek systems of the classical period; NEOPLATONISM (Vol. 19, p. 372), the last school of pagan philosophy, which grew up mainly among the Greeks of Alexandria from the 3rd century A.D. onwards; SCHOLASTICISM (Vol. 24, p. 346), which gave expression to the most typical products of medieval thought; IDEALISM (Vol. 14, p.

281), the philosophy of the "absolute," which, though it has given a tinge to philosophic thought from the days of Socrates to the present time, is in its self-conscious form a modern doctrine; MATERIALISM (Vol. 17, p. 878), which regards all the facts of the universe as explainable in terms of matter and motion; REALISM (Vol. 22, p. 941), which is a sort of half-way house between Idealism and Materialism; PRAGMATISM (Vol. 22, p. 246), the philosophy of the "real," which expresses the reaction against the intellectualistic speculation that has characterized most of modern metaphysics. LOGIC (Vol. 16, p. 879), the art of reasoning, or, as Ueberweg expresses it, "the science of the regulative laws of thought," clearly belongs to the division of epistemology. Aspects of psychology, since they depend essentially upon perceptions of the human mind in relation to itself or its environment, are ETHICS (Vol. 9, p. 808), or moral philosophy, the investigation of theories of good and evil; and AESTHETICS (Vol. 1, p. 277), the philosophy or science of the beautiful, of taste, or of the fine arts.

History of Thought Personal

The articles enumerated will give the reader a clear idea of the drift of thought currents throughout the course of history, and they will introduce him to the detailed discussions of the various systems which have been propounded by the little band of men who have contributed something vital to the treasury of thought. Each has been in and out of fashion at different times. In the Britannica the contributions to philosophic thought by the great philosophers are discussed in biographical articles, to which we now turn.

Breaking the Ground

The father of Greek philosophy and indeed of European thought was THALES of Miletus (Vol. 26, p. 720), who founded the IONIAN SCHOOL (Vol. 14, p. 731) at the end of the 7th century B.C. He first, as far as we know, sought to go behind the infinite multiplicity of phenomena in the hope of finding an all embracing infinite unity. This unity he decided was water. HERACLITUS (Vol. 13, p. 309), the "dark philosopher," nicknamed from his aristocratic prejudices "he who rails at the people," later selected fire. The never ending fight between advocates of the "One" and the "Many" had therefore begun. Sophistry (see SOPHISTS, Vol. 25, p. 418) has now an unpleasant connotation, inherited from the undisciplined reasonings of the schools of which PROTAGORAS (Vol. 22, p. 464), GORGIAS (Vol. 12, p. 257), PARMENIDES of Elea (Vol. 20, p. 851), and ZENO, also of Elea (Vol. 28, p. 970), were leaders. The "science of the regulative laws of thought" had not yet been developed and fallacies were the rule rather than the exception. Protagoras, the first of the Sophists, in his celebrated essay on Truth, said that "Man is the measure of all things, of what is, that it is, and what is not, that it is not." In other words, there is no such thing as objective truth. After nineteen-hundred years we are still seeking the answer to Pilate's question, "What is truth?" Gorgias, in his equally famous work on Nature or on the Nonent (notbeing) maintained that "(a) nothing is, (b) that, if anything is, it cannot be known, (c) that, if anything is and can be known, it cannot be expressed in speech." The paradoxes with which Zeno, the pupil and friend of Parmenides, adorned his arguments are proverbial. Who has not heard of

Achilles and the tortoise? And it is a little curious that in quite modern times his sophisms have, after centuries of scornful neglect, been reinstated and made the basis of a mathematical renaissance by the German professor Weierstrass, who shows that we live in an unchanging world, and that the arrow, as Zeno paradoxically contended, is truly at rest at every moment of its flight (Vol. 28, p. 971).

The Socratic Schools

The teaching of SOCRATES (Vol. 25, p. 331) was oral, and his philosophy is handed down to us in the refined and elaborated system which PLATO (Vol. 21, p. 808) developed in his dialogues. The "One" and the "Many" were united in the philosophy of Plato. To him we owe a debt which is simply incalculable, for, as is shown in the Britannica, "to whatever system of modern thought the student is inclined he will find his account in returning to this wellspring of European thought, in which all previous movements are absorbed, and from which all subsequent lines of reflection may be said to diverge." The germs of all ideas, even of most Christian ones, are, as Jowett remarked, to be found in Plato. The teaching of Socrates bore fruit in strangely divers forms. Plato, his legitimate successor, and the expounder of his philosophy, has been referred to, but there were other very different developments. The CYNICS (Vol. 7, p. 691), of whom DIOGENES (Vol. 8, p. 281) is the notorious prototype, uncouthly preached the asceticism which was to become so fashionable in a later era; but, their central doctrine, "let man gain wisdom—or buy a rope," contains more than a germ of truth. The CYRENAICS (Vol. 7, p. 703), under ARISTIPPUS (Vol.

2, p. 497), starting from the two Socratic principles of virtue and happiness, differed from the Cynics in emphasizing the second. The MEGARIANS (Vol. 18, p. 77), the "friends of ideas," as Plato called them, united the Socratic principles of virtue (as the source of knowledge) with the Eleatic doctrine (Vol. 9, p. 168) of the "One" as opposed to the "Many." Their strength lay in the intellectual pre-eminence of their members, not so much in the doctrine, or combination of doctrines, which they inculcated.

Aristotle

Plato had done much, he had laid the foundation of modern thought; it remained to classify it and to systematize it. This task was reserved for ARISTOTLE (Vol. 2, p. 501), one of the greatest geniuses of any age. He invented the sciences of logic, ethics, aesthetics, and psychology, as separate sciences. He was at once a student, a reader, a lecturer, a writer, and a book collector. He was the first man whom we know to have collected books, and he was employed at one time by the kings of Egypt as consulting librarian. His system of aesthetics still remains the best foundation of the critic's training. The fundamental difference between Aristotle and Plato is that Platonism is a philosophy of universal forms, and Aristotelianism one of individual substances. As Professor Case puts it in the Britannica: "Plato makes us think first of the supernatural and the kingdom of heaven, Aristotle of the natural and the whole world." His inquiries, therefore, pre-eminently implied that "transvaluation of all values," of which Nietzsche was to boast more than two thousand years later. A contemporary of Aristotle, whose philosophy occupies a somewhat independent position, is EPICURUS (Vol. 9, p. 683). His advice to a

young disciple was to "steer clear of culture." His system, in fact, led him to go back from words to realities in order to find in nature a more enduring and a wider foundation for ethical doctrine; "to give up reasonings, and get at feelings, to test conceptions and arguments by a final reference to the only touchstone of truth—the senses." A famous Roman who subscribed to the doctrines of Epicurus was the poet-philosopher-scientist, LUCRETIUS (Vol. 17, p. 107), whose theories in his poem *De Rerum Natura* so curiously anticipated much of modern physics and psychology.

The Last Greek Schools

Two schools remain to be considered before the Greek philosophy can be dismissed: the STOICS (Vol. 25, p. 942) and the Neoplatonists (see NEOPLATONISM, Vol. 19, p. 372). The Stoics caught the practical spirit of the age which had been evoked by Aristotle and provided a popular philosophy to meet individual needs. They showed kinship with the Cynics, but under the inspiration of their founder, Zeno of Citium, they avoided the excesses of that school, and formulated a system which fired the imagination of the time and finally bequeathed to Rome the guiding principles which were to raise her to greatness. Zeno is regarded as the best exponent of anarchistic philosophy in ancient Greece, and he and his philosophers opposed the conception of a free community without government to the state-Utopia of Plato; see ANARCHISM (Vol. 1, p. 915). Of Neoplatonism Adolph Harnack says in the Britannica (Vol. 19, p. 372):

> Judged from the standpoint of empirical science, philosophy passed its meridian in Plato and Aristotle, declined in the postAristotelian systems, and set in the

darkness of Neoplatonism. But, from the religious and moral point of view, it must be admitted that the ethical "mood" which Neoplatonism endeavored to create and maintain is the highest and purest ever reached by antiquity.

The most famous exponents of this system were PLOTINUS (Vol. 21, p. 849), an introspective mystic, and PORPHYRY (Vol. 22, p. 103), who edited Plotinus's works and wrote his biography. Neoplatonism, coming as it did early in our era, formed a link between the pagan philosophy of ancient Greece and Christianity.

Medieval Ecclesiasticism

With the death of BOETIUS (Vol. 4, p. 116), in 524 A.D., and with the closing of the philosophical schools in Athens five years later, intellectual darkness settled over Europe and hung there for centuries. When in the Middle Ages, the speculative sciences once again attracted men's minds, Christianity had already impressed its mark. SCHOLASTICISM (Vol. 24, p. 346) as a system began with the teaching of SCOTUS ERIGENA (Vol. 9, p. 742) at the end of the 9th century, and culminated three centuries later with ALBERTUS MAGNUS (Vol. 1, p. 504), with his greater disciple THOMAS AQUINAS (Vol. 2, p. 250), whose ideas have animated orthodox philosophic thought in the Catholic Church to this day, and with MEISTER ECKHART (Vol. 8, p. 886), the first of the great speculative mystics (see MYSTICISM, Vol. 19, p. 123).

Modern Ideas

With the Reformation an assertion of independence made itself heard. Man's relation to man assumed an importance comparable to that of

his relation to God; and the first steps on the path which was to lead to the rationalism of the French Encyclopaedists and of the English Utilitarians were taken by Albericus GENTILIS (Vol. 11, p. 603), and Hugo GROTIUS (Vol. 12, p. 621). In England, FRANCIS BACON (Vol. 3, p. 135) was independently working out the same problems. In philosophy his position was that of a humanist. The remarkable success of Grotius's treatise *De Jure Belli et Pacis* brought his views of natural right into great prominence, and suggested such questions as: "What is man's ultimate reason for obeying laws? Wherein exactly does their agreement with his rational and social nature exist? How far and in what sense is his nature really social?" The answers which HOBBES (Vol. 13, p. 545), who was considerably influenced by Bacon, gave to these fundamental questions in his *Leviathan* marked the starting point of independent ethical inquiry in England. **The Utilitarians** From this time on the drift of thought in England, though of course often profoundly affected by the speculations of continental philosophers, mainly ran in utilitarian channels; and the succession of ideas may be traced through LOCKE (Vol. 16, p. 844), whose influence on the French Encyclopaedists was far reaching, HUME (Vol. 13, p. 876), Jeremy BENTHAM (Vol. 3, p. 747) with his famous principle of the "greatest happiness for the greatest number," J. S. MILL (Vol. 18, p. 454), and Herbert SPENCER (Vol. 24, p. 634), with his philosophy of the "unknowable."

Back to Dreams

Meanwhile, on the continent of Europe, DESCARTES (Vol. 7, p. 79), in the *Discourse of Method*, had stated his famous proposition "*Cogito,*

ergo sum," and had laid down those fundamental dogmas of logic, metaphysics, and physics, from which started the subsequent inquiries of LOCKE, LEIBNITZ (Vol. 16, p. 385), and NEWTON (Vol. 19, p. 583). But CARTESIANISM (Vol. 5, p. 414), as Dr. Caird points out in the Britannica, includes not only the work of Descartes, but also that of MALEBRANCHE (Vol. 17, p. 486) and of SPINOZA (Vol. 25, p. 687), who, from very different points of view, developed the Cartesian theories, the former saturated with the study of Augustine, the latter with that of Jewish philosophy.

The Rights of Man

There follows a group of men whose speculations left a deep mark on the course of events in Europe and America: VOLTAIRE (Vol. 28, p. 199), MONTESQUIEU (Vol. 18, p. 775), Jean Jacques ROUSSEAU (Vol. 23, p. 775), and Denis DIDEROT (Vol. 8, p. 204). The antiecclesiastical animus which informed the writings of the first, the *Esprit des Lois* of the second, the *Contrat Social* of the third, and the famous encyclopaedia of the last, had political results, but their influence on metaphysical inquiry was practically nil.

Transcendentalism

Outstanding, of course, in the 18th century was the influence of Immanuel KANT (Vol. 15, p. 662), who summed up the teachings of Leibnitz and Hume, carried them to their logical issues, and immensely extended them. In fact, Kant and his disciple FICHTE (Vol. 10, p. 313), as Prof. Case shows in the article METAPHYSICS (Vol. 18, p. 231), "became the most potent philosophic influences on European thought in the 19th century, because their emphasis was on man." They made man believe in himself and in his

mission. They fostered liberty and reform, and even radicalism. They almost avenged man on the astronomers, who had shown that the world is not made for earth, and therefore not for man. Kant half asserted, and Fichte wholly, that Nature is man's own construction. The *Kritik* and the *Wissenschaftslehre* belonged to the revolutionary epoch of the "Rights of Man," and produced as great a revolution in thought as the French Revolution did in fact. Instead of the old belief that God made the world for man, philosophers began to fall into the pleasing dream "I am everything, and everything is I"—and even "I am God." The term TRANSCENDENTALISM (Vol. 27, p. 172) has been specially applied to the philosophy of Kant and his successors, which is based on the view that true knowledge is intuitive, or supernatural. The famous Transcendental Club founded, 1836, by EMERSON (Vol. 9, p. 332) and others in New England, was not "transcendental" in the Kantian sense; its main theme was regeneration, a revolt from theological formalism, and a wider literary outlook; see also BROOK FARM (Vol. 4, p. 645), THOREAU (Vol. 26, p. 877), A. BRONSON ALCOTT (Vol. 1, p. 528), and MARGARET FULLER (Vol. 11, p. 295).

Idealism

SCHELLING'S position (Vol. 24, p. 316), like that of his disciple HEGEL (Vol. 13, p. 200), differed from the transcendentalism of Kant and Fichte in regarding all noumena, or things comprehended (Vol. 19, p. 828), as knowable products of universal reason—the Absolute Ego, and, the absolute being God, nature as a product of universal reason, "a direct manifestation not of man but of God." This was the starting point of noumenal idealism in

Germany, and showed a reversion to the wider opinions of Aristotle. Hegelianism in which this idealism is carried to its limit is professedly one of the most difficult of philosophies. Hegel said “One man has understood me and even he has not.” His obscurity lies in the manner in which, as William Wallace shows in his article on the philosopher (Vol. 13, p. 204), he “abruptly hurls us into worlds where old habits of thought fail us.” The influence of Hegel on English thought has been wide and lasting.

Realism

SCHOPENHAUER (Vol. 24, p. 372) was essentially a realist. He led the inevitable reaction against the absorption of everything in reason which is the keynote of the Kantian system. In the very title of his chief work, *The World as Will and Idea*, he emphasizes his position in giving “will” equal weight with “mind” or “idea” (*Vorstellung*). His “Will to Live” embodies a wholesome practical idea. Eduard von HARTMANN (Vol. 13, p. 36) in his sensational *Philosophy of the Unconscious* established the thesis: “When the greater part of the Will in existence is so far enlightened by reason as to perceive the inevitable misery of existence, a collective effort to will non-existence will be made, and the world will relapse into nothingness, the Unconscious into quiescence.” He thus goes a step further in pessimism than did Schopenhauer, and the essence of his doctrine is the will to non-existence—*not* to live, instead of a will to live. German realism is, however, so strongly coloured by the idealistic cast of the national thought that we have to go to France and England for the most thorough-going statement of the realist position. In France the eclecticism of V. COUSIN (Vol. 7, p. 330) marked a doctrine of

comprehension and toleration, opposed to the arrogance of absolutism and to the dogmatism of sensationalism which were the tendencies of his day. In England a reversion to Baconian ideas produced the natural or intuitive realism of REID (Vol. 23, p. 51), DUGALD STEWART (Vol. 25, p. 913), SIR WILLIAM HAMILTON (Vol. 12, p. 888) and their followers, and led to the synthetic philosophy of HERBERT SPENCER (Vol. 25, p. 634).

Materialism

The materialists go a step further than the realists. In its modern sense materialism is the view that all we know is body (or matter), of which the mind is an attribute or function. This attitude was induced by the rapid advances of the natural sciences, and by the unifying doctrine of gradual evolution in nature. It was also heralded by a remarkable growth in commerce, manufactures, and industrialism. The leaders of the movement were BÜCHNER (Vol. 4, p. 719) whose *Kraft und Stoff* became a text book of materialism, and HAECKEL (Vol. 12, p. 803) who in his *Riddle of the Universe* asserts that, sensations being an inherent property of all substance, neither mind nor soul can have an origin.

The 19th Century and Beyond

In the inquiries of LOTZE (Vol. 17, p. 23), and FECHNER (Vol. 10, p. 231), the latter an experimental psychologist, lies the germ of much of the speculative thought of the present day. Lotze, as the well-known psychologist Henry Sturt says in his article in the Britannica (Vol. 17, p. 25), “brought philosophy out of the lecture room into the market place of life.” He saw that metaphysics must be the foundation of psychology, and that the current

idealist theories of the origin of knowledge were unsound; and he concluded that the union of the regions of facts, of laws, and of standards of values, can only become intelligible through the idea of a personal deity. Like a brilliant meteor NIETZSCHE (Vol. 19, p. 672) flashed across the philosophic sky. His theories of the super-man are known to everyone. His brilliant essays are all in the nature of prolegomena to a philosophy which, embodied in a master work, the "Will to Power," was to contain a transvaluation of all existing ethical values. Unfortunately he did not live to complete the work, which remains a fragment; but the drift of his thought is clearly indicated. One other system should be mentioned, that of POSITIVISM (Vol. 22, p. 172), which its founder, AUGUSTE COMTE (Vol. 6, p. 814) hoped would supersede every other system. Comte's philosophy confines itself to the data of experience and declines to recognise a priori or metaphysical speculations. The system of morality which he built up on it, and in which God is replaced by Humanity, has largely failed, in spite of the brilliant ideas which animate it, because it is in many of its aspects retrograde. A most interesting review of present day tendencies in the regions of Metaphysics will be found at the end of that article, with special reference to the brilliant work of WUNDT (see also Vol. 28, p. 855), who constructing his system on the Kantian order—sense, understanding, reason, exhibits most clearly the necessary consequence from psychological to metaphysical idealism. His philosophy is the best exposition of modern idealism —that we perceive the mental and, therefore, all we know and conceive is mental.

The Historical Clue

This sketch of the course of events in philosophical speculation will at least enable the reader to follow the historical clue to the evolution of ideas. Every student must, in order to attain a true perspective, know the *genealogy* of the ideas he is studying. It will therefore be best that he first read the general articles referred to in the beginning of this chapter, supplementing them by the accounts given of the separate systems under the headings of their authors.

A list of the philosophical and psychological articles (more than 500 in number) in the Britannica will be found in the Index (Vol. 29, p. 939) and it is not repeated here.

Part III
Devoted to the Interests of Children

CHAPTER LXI
FOR PARENTS

The Science of Rearing Children

The new Encyclopaedia Britannica is full of encouragement for parents who are tempted to feel that the proper care and training of a child require almost superhuman skill and energy. Many of the fears and doubts by which they are beset rest upon vague traditions, handed down from a day when a child's health was threatened by more dangers and greater dangers than now, and when much less was known than is known to-day about the training of a child. Statistics are dull things, as a rule, but it would be difficult to find pleasanter reading than the statistical tables which show how much the modern progress of science has done for children. And these figures, in many Britannica articles on various

diseases and localities, by showing how much safer children's lives are than they used to be, also indicate a *decrease of children's suffering* and an *increase of children's happiness* which cannot be expressed in numbers. Sheer ignorance caused much of the pain that children used to suffer and also much of the neglect that led to bodily and mental deficiency in later life. There is still room for improvement; but it is no exaggeration to say that the child of the average American mechanic is more intelligently cared for than was, a hundred years ago, the heir to a European kingdom.

Every branch of science has contributed to these improved conditions. Medical and surgical research have no doubt been the great factors, as disease and deformity were the worst evils; but the child's mind has been as carefully studied as its body. Here, again, figures cannot tell the whole story. They can show the universal benefits of our public school system, but they cannot show how greatly the children of well-read and thoughtful parents benefit by home influences intelligently exerted. That element of education begins as soon as a child is born, and it is based upon such observation of its individual needs as only a parent's affection and sympathy can achieve. And in this part of the parent's task, as in the case of the child's health, it is essential to be guided by specialists of the highest authority, such as those who wrote for the Britannica the articles of which a brief account is given in this chapter.

The child's individuality, physical and mental, is largely inherited.

What is Known about Heredity

The vast subject of heredity has indeed not yet

been reduced to an exact science, but the newest theories advanced by Weismann, Hertwig, and others, with such confirmation as has already been obtained, are clearly set forth in Dr. P. Chalmers Mitchell's article HEREDITY (Vol. 13, p. 350). As for our knowledge of the physiological process of heredity, the foundation may be said to have been laid by the labours of the Austrian monk Mendel, and biologists are rapidly extending his work in various directions. What has been done in the past thirteen years since scientists rediscovered Mendel's work is described in MENDELISM (Vol. 18, p. 115), by R. C. Punnett, professor of biology, Cambridge University. There is no subject of greater interest or fascination before the world to-day, and there is no better or simpler introduction to it than Professor Punnett's able article. As he says, "Increased knowledge of our heredity means increased power of control over the living thing." We know very little as yet, but that little "offers the hope of a great extension at no very distant time. If this hope is borne out, if it is shown that the qualities of man, his body and his intellect, his immunities and his diseases, even his very virtues and vices, are dependent upon the ascertainable presence or absence of definite unit-characters whose mode of transmission follows fixed laws, and if also man decides that his life shall be ordered in the light of this knowledge, it is obvious that the social system will have to undergo considerable changes."

The relations between parent and offspring are also dealt with in REPRODUCTION (Vol. 23, p. 116), by Dr. Mitchell; and those who wish to study the development of the organism will find such information in EMBRYOLOGY (Vol. 9, p. 314), by Adam Sedgwick, who is professor of zoology at the

Imperial College of Science and Technology, London. This masterly account is supplemented by a section (p. 329) on the *Physiology of Development* by Dr. Hans A. E. Driesch, of Heidelberg University.

The New-Born Child

The article INFANCY (Vol. 14, p. 513), by Dr. Harriet Hennessy, is devoted to the care of the child during its first year. The first bath, care of the eyes, clothing, increase of weight, etc., are thoroughly discussed, and the directions for artificial feeding contain tables of milk-dilution and of the amounts to be given. In CHILD (Vol. 6, p. 136) will be found a valuable table of average heights and weights of children from the ages of one to fifteen, and a full bibliography of works relating to child-study.

The main points to be considered for each sex in the difficult period between childhood and maturity are concisely set forth in ADOLESCENCE (Vol. 1, p. 210). An ideal system of child raising is outlined, dealing with hygiene, clothing, and moral and physical training. See also GYMNASTICS AND GYMNASIUM (Vol. 12, p. 752), by R. J. McNeill.

The Vital Question of Food

Parents must have a thorough and clear understanding of the question of bodily nourishment. This is most imperative. It means sound bodies for the children, their good health in after years, their efficiency and success in life. On this point the new Britannica provides information of a character that for authoritativeness and completeness can nowhere else be matched.

The important matter of feeding a family is treated

at great length in DIETETICS (Vol. 8, p. 214), by the late Prof. W. O. Atwater of Wesleyan University, known the world over as an authority on this subject, and R. D. Milner, formerly assistant in the U. S. Department of Agriculture. The article gives information as to the composition and nutritive values of foods and their adaptation to the use of people in health. There are tables of food composition, of the digestibility of nutrients, of the quantities of available nutrients, etc. The hygienic and pecuniary economy of food are discussed in such a way as to be of real service. For those who desire further information on the subject of food assimilation reference may be made to NUTRITION (Vol. 19, p. 920), by Dr. D. Noel Paton, professor of physiology, University of Glasgow, and Dr. E. P. Cathcart, lecturer in chemical physiology in the same institution.

Maintenance of Health

In regard to the maintenance of general health of children without reference to specific ailments there is a vast fund of information to be extracted by consulting the new Britannica. The titles of a few of the articles will sufficiently indicate information to which every parent should have constant access: ANTISEPTICS (Vol. 2, p. 146); DISINFECTANTS (Vol. 8, p. 312); CARBOLIC ACID, *Pharmacology and Therapeutics*, (Vol. 5, p. 305); SALICYLIC ACID, *Medicine and Therapeutics* (Vol. 24, p. 70); EMETICS (Vol. 9, p. 336); ACONITE, *Therapeutics* (Vol. 1, p. 152); COLCHICUM, *Pharmacology* (Vol. 6, p. 662); PHENACETIN (Vol. 21, p. 363); PEPSIN (Vol. 21, p. 130); RHUBARB (Vol. 23, p. 273); SENNA (Vol. 24, p. 646); POISON, with list of poisons and antidotes (Vol.

21, p. 893); HAEMORRHAGE, how to tell the different kinds (Vol. 12, p. 805); WOUND, nature of bruises and treatment (Vol. 28, p. 837); BURNS AND SCALDS (Vol. 4, p. 860); SUNSTROKE, nature of heat prostration (Vol. 26, p. 110); nature and treatment of frost-bite, MORTIFICATION (Vol. 18, p. 878); ULCER (Vol. 27, p. 565); CHILBLAINS (Vol. 6, p. 134); ECZEMA (Vol. 8 p. 920); relief from choking, OESOPHAGUS (Vol. 20, p. 14); BONE, *Fractures*, special fractures in the young (Vol. 4, p. 201); DROWNING AND LIFE SAVING (Vol. 8, p. 592); SLEEP, amount of sleep necessary at different ages (Vol. 25, p. 238); DISEASES OF VISION (Vol. 28, p. 142); with its special section (p. 144) on the care of the eyesight of children; BLINDNESS, *Causes and Prevention* (Vol. 4, p. 60), by Sir F. J. Campbell, principal, Royal Normal College for the Blind, London; SHOCK, injuries and accidents (Vol. 24, p. 991). There is a section on *Action of Baths on the Human System*, in BATHS AND BATHING (Vol. 3, p. 518), telling of the effects of cold, tepid, warm, hot, and very hot baths.

Parents will be most grateful to the Britannica for the complete descriptions of infantile diseases, dealing with symptoms and principles of cure and treatment.

Treatment of Infantile Diseases

The British Medical Journal commenting on the nature of the medical section of the new Britannica has said that it is “an admirable example of the kind of exposition which will enable the head of a family, without embarrassing him with technical details, to deal with a situation with which he may be confronted at any moment.” Realizing the great necessity for a popular yet authentic discussion of

diseases, the editors have produced a work which has received the highest approval of the medical world for its quality of practical usefulness.

In the first place, parents should devote much study to Sir T. Lauder Brunton's most clear and able discussion of THERAPEUTICS (Vol. 26, p. 793), dealing in a general manner with the means employed to treat disease. Here we learn about the action of microbes, the nature of inflammation and fever (which are protective processes calculated to defend the organism against the attacks of microbes but which often become injurious), about defensive measures and principles of cure, proper nutrition and elimination, flatulence, constipation, etc. It is also important to know something about the action of drugs, and this is fully explained in PHARMACOLOGY (Vol. 21, p. 350), by Dr. Ralph Stockman, of Glasgow University, while Dr. H. L. Hennessy in the same article (p. 352) explains the terms used in the classification of drugs.

Before describing the material devoted to the special diseases of children, it is well to remind parents of a valuable illustrated article on PARASITIC DISEASES (Vol. 20, p. 770), by Dr. G. Sims Woodhead, professor of pathology in Cambridge University. It is about the length of 52 pages in this Guide. The information as to the origin of various diseases, of those which are due to vegetable and those due to animal parasites, of the infective diseases in which no organism yet discovered has surely been connected with the malady (as is the case with scarlet fever), and of infective diseases, such as measles, mumps, and whooping-cough, not yet traced to microorganisms, will prove of the highest interest because the facts related have a most important influence upon present methods of

treatment.

Diseases most Common to Childhood

CROUP (Vol. 7, p. 511) is a concise account of spasmodic croup—so terrifying to all parents. The treatment is carefully described. The same is true of TONSILLITIS (Vol. 27, p. 11). For other common throat diseases see BRONCHITIS (Vol. 4, p. 634); RESPIRATORY SYSTEM, *Pathology of* (Vol. 23, p. 195) by Dr. Thomas Harris, a noted authority, and Dr. Harriet Hennessy, and LARYNGITIS (Vol. 16, p. 228), which fully describes the paroxysmal laryngitis so peculiarly fatal to infants. In all these articles reference is made to adenoids as a contributing cause of the maladies described. There is a separate account of these recently discovered troublesome growths, ADENOIDS (Vol. 1, p. 191), and of the comparatively simple operation for their removal, by Dr. Edmund Owen, consulting surgeon to the Children's Hospital, London.

The great attention which, in recent years, has been paid to DIPHTHERIA (Vol. 8, p. 290) has produced most striking results. We know its cause and nature, we understand the conditions which influence its prevalence; and a "specific" cure in an antitoxin has been found. Specialists now trace to diphtheria many of the serious cases which would formerly have been thought due to other diseases, and especially to croup.

WHOOPING COUGH (Vol. 28, p. 616) is one of the most common diseases of infancy, but, except in the most extreme cases, does not require the regular attendance of a physician. The malady has three recognized stages, in the second of which

complications are apt to arise which may become a source of danger greater than the malady itself. Parents should also understand the curious structural changes in the lungs which sometimes remain after the disease has run its course.

Of all the diseases of earlier childhood, MEASLES (Vol. 17, p. 947) is the most prevalent, and its spread is largely due to the fact that its initial symptoms are slight and not easily recognizable. The proper understanding of these is, therefore, most necessary, as well as a thorough appreciation of possible complications and their consequences. The best mode of treatment is also indicated in this article. There are several well-marked varieties of SCARLET FEVER (Vol. 24, p. 303) of which the chief are simple scarlatina, septic scarlatina, and malignant scarlatina; and the complications and effects of the disease are among the most important features which should be understood. The list of infantile diseases is too long for specific description, but parents can appreciate the value and significance of this valuable department of the work by referring to such articles as MUMPS (Vol. 18, p. 968); DYSENTERY (Vol. 8, p. 785); CHOLERA (Vol. 6, p. 262), with a special section on children's simple cholera; see also DIGESTIVE ORGANS, *General and Local Diseases* (Vol. 8, p. 262) by Dr. A. L. Gillespie, lecturer on modern gastric methods, Edinburgh Post-Graduate School, and MENINGITIS, *Cerebro-Spinal* (Vol. 18, p. 130), with an account of the new and successful serum treatment.

Mental Training

In planning the groundwork of education, parents should have a clear idea of the principles of modern instruction. Here the Britannica again comes to their

assistance. The biographies of PESTALOZZI (Vol. 21, p. 284) and of FROEBEL (Vol. 11, p. 238) describe the insistence of these leaders on the need of educating a child through his own activity, and the results they obtained by this method. Further elaboration of the subject is given in EDUCATION, *Theory* (Vol. 8, p. 951), by James Welton, professor of education in the University of Leeds, to which article there are added detailed accounts of national systems of education. An interesting supplementary article is SCHOOLS (Vol. 24, p. 359), by A. F. Leach, describing the stages of experiment by which our modern idea of a school has been developed. There is an admirably instructive article, TECHNICAL EDUCATION (Vol. 26, p. 487), by Sir Philip Magnus, formerly member of the Royal Commission of Technical Instruction.

Assistance at Home in School Education

The new Britannica performs a service of the greatest importance in responding to the opening mind of the child. Children are the greatest of question askers, and the Britannica is the best question answerer ever devised. They want to know about the races of men, the different animals and plants they see; in fact, almost every object that comes under their observation. The inestimable advantage of answering an inquiry fully and correctly and not in an offhand manner is too obvious to need mention. *Let your young children see you go to your Britannica for information and as soon as they are old enough they will naturally do the same, and then the volumes will be performing their most efficient work in the household.*

For helping children with their school “themes” and “compositions,” for elucidation or amplification of any topic that comes up in the course of their studies, there is no medium so useful as the new Britannica—the most exhaustive compendium of knowledge which has ever been devised, with its elaborate index of 500,000 alphabetical references, giving instant access to every fact in the whole work. Of equal assistance will be its employment in connection with Sunday School lessons; for the accounts of the Bible and its separate books, giving the latest results of Biblical criticism, are the product of the highest learning of the age.

The World of Nature

For the instruction of children about the history of mankind, the nature of the universe, the animal, plant, and mineral world, the new Britannica offers a complete fund of necessary knowledge. There are 277 astronomical articles, including biographies; 889 zoological articles; 675 on plants; 380 on minerals and rocks. The classified subject-list in the Index Volume places the whole of this material immediately before the eye.

The articles ANTHROPOLOGY (Vol. 2, p. 108), by Dr. Edward B. Tylor of Oxford University, dean of living anthropologists, and ETHNOLOGY AND ETHNOGRAPHY (Vol. 9, p. 849) describe the races of mankind, man’s place in nature, the origin of man, and his antiquity. The main article ZOOLOGY (Vol. 28, p. 1022), by Sir Edwin Ray Lankester, of London University, is an introduction to knowledge of the whole of the animal world, which is amplified, with minute details, in separate accounts of all members of the animal kingdom. ZOOLOGICAL DISTRIBUTION

(Vol. 28, p. 1002), by the noted naturalist, Richard Lydekker, is a mine of information about the distribution of living animals and their forerunners on the surface of the globe. Articles of great importance are BOTANY (Vol. 4, p. 299), by Dr. A. B. Rendle of the British Museum, and the great article PLANTS (Vol. 21, p. 728), in the various sections of which the whole story of the vegetable world is told by eight famous specialists. There are, of course, separate articles on all plants. We also recommend to parents a careful study of the section (Vol. 23, p. 120) of REPRODUCTION, *Reproduction of Plants*, by Dr. S. H. Vines, and POLLINATION (Vol. 22, p. 2), from which they can give their children much necessary instruction. Such a course is now strongly advised by educators and authorities in child-study as the best method of preparing the mind for a healthy, sane knowledge of sex matters in later years.

What Happens on the Earth and in the Air

All the facts about the earth's surface will be found in GEOGRAPHY, in the section *Principles of Geography* (Vol. 11, p. 630), by Dr. H. R. Mill, formerly president of the Royal Meteorological Society; and see also OCEAN AND OCEANOGRAPHY (Vol. 19, p. 967), by Dr. Otto Krümmel, professor of geography, University of Kiel, and Dr. H. R. Mill. Everything about the weather, storms, etc., may be learned from METEOROLOGY (Vol. 18, p. 264), by Dr. Cleveland Abbe, professor of meteorology in the U. S. Weather Bureau; and from ATMOSPHERIC ELECTRICITY (Vol. 2, p. 860), by Dr. Charles Chree of the National Physical Laboratory, England.

Clouds always appeal strongly to a child's

imagination. The article CLOUD (Vol. 6, p. 557), by A. W. Clayden, author of *Cloud Studies*, has beautiful illustrations of cloud forms, with explanations.

Lord Rayleigh, a winner of the Nobel prize and one of the most distinguished of living scientists, in the article SKY (Vol. 25, p. 202) explains why the blue of the sky varies as it does.

Parents will find a great deal to tell their children about phenomena of nature in such articles as EARTHQUAKE (Vol. 8, p. 817), by F. W. Rudler, formerly president of the Geologists' Association, England, and Dr. John Milne, author of *Earthquakes*; and VOLCANO (Vol. 28, p. 178), by F. W. Rudler. Glaciers and their effects are described in GLACIER (Vol. 12, p. 60), by E. C. Spicer.

In teaching rudimentary things about the heavens, it is well to note that CONSTELLATION (Vol. 7, p. 11), by Charles Everitt, contains star-maps by which the positions may easily be recognized. After reading STAR (Vol. 25, p. 784), by A. S. Eddington, of the Royal Observatory, Greenwich, many wonders of the heavens about the number of the stars, their distances, the variable and double stars, etc., may be told the child. The same is true of the articles PLANET (Vol. 21, p. 714), by Dr. Simon Newcomb, director of the American Nautical Almanac and professor of mathematics in the Navy, and of the separate accounts of all the different planets; COMET (Vol. 6, p. 759), by Dr. Newcomb; and NEBULA (Vol. 19, p. 332), by A. S. Eddington, etc. These are all very fully illustrated. Ideas as to the structure of the universe, the origin of the solar system, etc., will be found in NEBULAR THEORY (Vol. 19, p. 333), by Sir Robert S. Ball, professor of astronomy, Cambridge University.



The Training of the Hand

A great many children show a liking for the mechanical arts and are curious about processes of manufacture. Parents will find in the new Britannica complete information about the marvelous things ingenious machines do and how they do them; for example, SPINNING (Vol. 25, p. 685), by T. W. Fox, professor of textiles in the University of Manchester; COTTON-SPINNING MACHINERY (Vol. 7, p. 301), also by Professor Fox; WEAVING (Vol. 28, p. 440), by Professor Fox, with illustrations; HOSIERY (Vol. 13, p. 788), by Thomas Brown, of the Incorporated Weaving, Dyeing and Printing College, Glasgow; CARPET (Vol. 5, p. 392), by A. S. Cole, assistant secretary for art, Board of Education, England; SILK (Vol. 25, p. 96), by Frank Warner, president of the Silk Association of Great Britain and Ireland; Richard Snow, examiner in silk throwing and spinning for the City and Guilds of London Institute, and Arthur Mellor; FLOUR AND FLOUR MANUFACTURE (Vol. 10, p. 548), by G. F. Zimmer, author of *Mechanical Handling of Material*; ROPE AND ROPE MAKING (Vol. 23, p. 713), by Thomas Woodhouse, head of the weaving and textile department, Technical College, Dundee; SUGAR, *Sugar Manufacture* (Vol. 26, p. 35), by A. Chapman, designer and constructor of sugar machinery, and Valentine W. Chapman.

The Foundation of Good Taste

An important service to education is rendered by the Britannica in the way that it supplements and extends education received in the school. There, far too often children learn little or nothing of the world of art, of the beautiful creations of the human

intellect by means of which, even before the dawn of history, men attempted to express in concrete form their sense of beauty. It is surely most desirable for children to have an idea, at least, of principles and styles of architecture; of ancient and modern painting and sculpture—to know the chief characteristics of schools of art; to have a little knowledge of musical forms, of what a symphony, a concerto, a sonata, an opera, are; to be able to recognize a piece of Dresden, Sèvres, Italian faience, Copenhagen, or Wedgwood ware when they see it; to know the different periods and styles of furniture; to tell Bohemian from Venetian glass; to be familiar with lovely textiles and fabrics and to appreciate their true value. Such knowledge is the foundation of good taste. It serves to arouse appreciation of, and respect for, the objects with which a child is surrounded, and leads to delightful interests, recreations and occupations in later years. There are few better and more constant uses to which the Britannica can be put than the systematic education of children in matters of general culture and refined taste.

Knowledge of the Fine Arts

A list of articles to serve this purpose would be too long to give here. They are easily found by means of other chapters in this Guide. But special mention may be made of ARCHITECTURE (Vol. 2, p. 369), by R. Phené Spiers, master of the architectural school, Royal Academy, London, by John Bilson, of the University of Manchester, and others; PAINTING (Vol. 20, p. 459), by Prof. G. B. Brown of Edinburgh University; L. Bénédite, keeper of the Luxembourg Gallery, Paris; Richard Muther, professor of modern

art, Breslau University; and John C. Van Dyke, professor of history of art, Rutgers College; SCULPTURE (Vol. 24 p. 488), by Marion H. Spielmann, formerly editor, *Magazine of Art*, P. G. Konody, art critic of the *Observer*, L. Bénédite, and Dr. J. H. Middleton, Slade professor of fine art, Cambridge University; CERAMICS (Vol. 5, p. 703), by Hon. William Burton, chairman, Joint Committee of Pottery Manufacturers of Great Britain, R. L. Hobson of the British Museum, and other authorities; GLASS (Vol. 12, p. 86), by Alexander Nesbitt, H. J. Powell, author of *Glass Making*, and Dr. W. Rosenhain of the National Physical Laboratory, England; LACE (Vol. 16, p. 37), by A. S. Cole, author of *Embroidery and Lace*; FURNITURE (Vol. 11, p. 363), by J. Penderel-Brodhurst. All of these articles are superbly illustrated, and this feature alone would give them a direct educational value for young people.

The Best Picture-Book in the World

In fact, the new Britannica may be said to be the greatest and most varied picture book in existence. There are 7,000 text illustrations and 450 full-page plates. This suggests at once a special use for the work in making children familiar, by purely pictorial means, with objects they should learn to recognize. When a child asks for a description of some object whose name has aroused his curiosity, it is safe to say that an accurate picture of it will be found in the new Britannica. Suppose that he has heard of a dirigible balloon and wants to know how it differs from the ordinary balloon which he has seen. The index will guide his instructor to the article AERONAUTICS (Vol. 1, p. 260), with two full-page plates of dirigible balloons. A child can learn to

distinguish the breeds of domestic animals from the illustrations alone. Thirst for mechanical knowledge may be satisfied by such articles as STEAM ENGINE (Vol. 25, p. 818), with about 70 illustrations, by Prof. J. A. Ewing, of Cambridge University; WATCH (Vol. 28, p. 362), by Lord Grimthorpe and Sir H. H. Cunynghame; LIGHTHOUSE (Vol. 16, p. 627), by W. T. Douglass and N. G. Gedye; TELEPHONE (Vol. 26, p. 547), by Emile Garcke; and LOCK (Vol. 16, p. 841), by A. B. Chatwood—all fully illustrated.

Sport and Recreation

The new Britannica is an exhaustive and practical compendium of sports, games, and recreations of all kinds. Part 6 of this Guide contains a survey of this department in the book. There are over 260 articles on sports and games alone, and they describe clearly how each is played, and also give expert advice. There is also much that is extremely interesting in the historical development of pastimes, a knowledge of which heightens the interest and pleasure of those who participate in them; and parents can be of real assistance to their children in instructing them about their sports, and by acquiring this information themselves can give sympathetic appreciation to the children's amusements. Among the noteworthy contributions on sports and games there are CHILDREN'S GAMES (Vol. 6, p. 141), an article for parents by Alice B. Gomme, an expert on this subject; GAMES, CLASSICAL (Vol. 11, p. 443), an account which every boy will read with pleasure, by Francis Storr, editor of the *Journal of Education*, London; ATHLETIC SPORTS (Vol. 2, p. 846); BASE-BALL (Vol. 3, p. 458), by Edward Breck; BASKET-BALL (Vol. 3, p. 483), FOOTBALL (Vol. 10, p. 617), of which the

American section is written by Walter Camp, the football expert; KITE-flYING (Vol. 15, p. 839), by Major-Gen. Baden Powell; MARBLES (Vol. 17, p. 679), by W. E. Garrett Fisher; LAWN TENNIS (Vol. 16, p. 300), by R. J. McNeill; SWIMMING (Vol. 26, p. 231), by William Henry, founder and chief secretary of the Royal Life Saving Society; SKATING (Vol. 25, p. 166), and COASTING (Vol. 6, p. 603).

Diverting Occupations

Recreation in the form of diverting occupations is sometimes more attractive to children, especially to those of a practical turn of mind, than sports and games. It is often difficult for parents to encourage these inclinations, since they themselves may not be familiar with the subjects for which their children show a special aptitude, and a real talent may thus fail to be cultivated. As soon as any particular bent in the child is discovered, a parent ought to consider it a duty to learn to help the boy or girl.

The new Encyclopaedia Britannica will, on all subjects of diverting occupations, prove of immense practical assistance to parents. They will find all that they need to know to help their children under such headings as PHOTOGRAPHY (Vol. 21, p. 485), by Sir William de Wiveleslie Abney, formerly president of the Royal Photographic Society, James Waterhouse also a former president of the same society, who writes on photographic apparatus, and A. H. Hinton, author of *Practical Pictorial Photography*, etc.; BEE, *Bee Keeping* (Vol. 3, p. 628), by W. B. Carr, formerly editor of the *Bee-Keeper's Record*; the article AVIARY, on the keeping of birds (Vol. 3, p. 60), by David Seth-Smith, formerly president of the Avicultural Society; POULTRY AND POULTRY FARMING (Vol. 22,

p. 213), by Lewis Wright, author of *The Practical Poultry-Keeper*; BASKET, *Basket Making* (Vol. 3, p. 481); HORTICULTURE (Vol. 13, p. 741), by M. T. Masters, late editor of *The Gardener's Chronicle*, W. R. W. Williams, superintendent of London County Council Botany Centre, John Weathers, author of *Practical Guide to Garden Plants*, Prof. Liberty Hyde Bailey, director of the College of Agriculture, Cornell University, and Peter Henderson; CARPENTRY (Vol. 5, p. 386), by James Bartlett, lecturer on construction, at Kings College, London; CONJURING (Vol. 6, p. 943), by John Algernon Clarke, G. Faur, and John Nevil Maskelyne.

CHAPTER LXII
FOR SCHOOL-CHILDREN

Importance of Correct First Impressions

When a stick of hot glass is drawn out, no matter how far it is stretched, the slender stick retains the original shape of the piece—square, round or oval. In the same way, a child's mind retains in after life the shaping originally given to it. Everyone knows from personal experience how difficult it is to rid the mind of a wrong impression received in childhood. The editors of the new Britannica feel that they have solved a great problem in making a work of the most *accurate* and *authoritative* character *interesting to children*, for they have received much valuable

testimony that this end has been attained. Dr. Charles W. Eliot, president-emeritus of Harvard University, was an early subscriber for two sets for the use of his grandchildren. He said that he found the work "altogether admirable; and my grandchildren, who are at the most inquisitive ages, are of the same opinion." Professor W. G. Hale, of the University of Chicago, wrote, "My children feel the same fascination in it that I do." Judge J. P. Gorter, of the Baltimore Supreme Court, has expressed his opinion that "every family with growing children seeking information should have this invaluable work in the library." The owner of the new Britannica should constantly encourage his children to go to the volumes for further information on topics included in the course of the day's studies at school. It will not take long to make them realize that the volumes open an inexhaustible mine of knowledge, and answer any question as to which curiosity has been aroused. With a little help from you, at the beginning, they will soon learn to use the Britannica for themselves.

The Britannica Interesting to Children

The love of reading is quickly developed in children. Some are attracted to history, to the lives of great men, to exploration and to adventure; others become more interested in the world of nature; still others have a natural bent toward science and the mechanical arts. Whatever the inclination may be, the Britannica stands at the child's service, giving to him the true facts in such a way that he can easily understand them.

The following suggestions will help children to

pursue their favourite lines of reading. They may like to begin with the heroes of myth and history. Andrew Lang contributes a most comprehensive article on MYTHOLOGY (Vol. 19, p. 128). The classified subject-list in Vol. 29 (Index) indicates nearly 500 separate articles on the gods and mythological beings of ancient Greece and Rome, Asia, Egypt, Europe and America. The central hero of medieval romance, ARTHUR (Vol. 2, p. 681), is described by Miss Jessie L. Weston, author of *Arthurian Romances*. The famous deeds of the CID (Vol. 6, p. 361), the foremost man of Spain's heroic period, are related by H. E. Watts, the well-known translator of *Don Quixote*. ROLAND, LEGEND OF (Vol. 23, p. 464), tells another stirring story.

Heroes and Heroines of History, Romance and Adventure
The Romance of the Middle Ages
Heroes of Later Times
Famous Women of History

Of peculiar interest to children are such articles as *Cyrus (The Great)*, (Vol. 7, p. 706), by Dr. Eduard Meyer, professor of ancient history, University of Berlin, author of the world-famous *History of Antiquity*; ALEXANDER III (THE GREAT), (Vol. 1, p. 545), by the noted Hellenist, Edwyn R. Bevan; CAESAR, JULIUS (Vol. 4, p. 938), by Henry Stuart Jones, of Oxford University; HANNIBAL (Vol. 12, p. 920), by M. O. B. Caspari, of London University; THEODORIC (Vol. 26, p. 768), the great ruler of the

Gothic nation, by Theodore Hodgkin, author of *Italy and her Invaders*; CHARLEMAGNE, founder of the Holy Roman Empire (Vol. 5, p. 891), by Arthur W. Holland; CHARLES MARTEL (Vol. 5, p. 942), a great type of courage and activity, by Christian Pfister, professor at the Sorbonne, Paris; ALFRED THE GREAT (Vol. 1, p. 582), by Rev. Charles Plummer, author of *The Life and Times of Alfred the Great*; CRUSADES (Vol. 7, p. 524), by Ernest Barker, of Oxford University, a narrative with all the action and interest of the best tales for children; TEMPLARS (Vol. 26, p. 591), by W. Alison Phillips, author of *Modern Europe*, etc.; LOUIS IX (Saint) (Vol. 17, p. 37), by Prof. James T. Shotwell, of Columbia University; CONRADIN (Vol. 6, p. 968), the pathetic life of this marvelous boy who perished at the age of seventeen; HUNDRED YEARS' WAR (Vol. 13, p. 893), by Jules Viard, archivist of the National Archives, Paris; FROISSART, JEAN (Vol. 11, p. 242), a notable biography, by Sir Walter Besant; CHARLES V (Vol. 5, p. 899), by Edward Armstrong, author of *The Emperor Charles V*, etc.; CROMWELL, OLIVER (Vol. 7, p. 487), by Philip Chesney Yorke, of Oxford, Capt. C. F. Atkinson, and R. J. McNeill; GUSTAVUS ADOLPHUS (Vol. 12, p. 735), by R. Nisbet Bain, author of *Scandinavia*, etc.; MARLBOROUGH (Vol. 17, p. 737), by Dr. W. P. Courtney; FREDERICK II (THE GREAT) (Vol. 11, p. 52), by James Sime, author of *History of Germany*, and W. Alison Phillips; NAPOLEON I (Vol. 19, p. 190), by J. Holland Rose; NELSON (Vol. 19, p. 352), by David Hannay, author of *Short History of the Royal Navy*; WELLINGTON (Vol. 28, p. 507); WASHINGTON, GEORGE (Vol. 28, p. 344), by Dr. William MacDonald, professor of American History in Brown University; LINCOLN, ABRAHAM (Vol. 16, p. 703), by John G. Nicolay, private secretary to

President Lincoln, and Charles C. Whinery, assistant editor of the Encyclopaedia Britannica; GRANT, ULYSSES S. (Vol. 12, p. 355), by Capt. C. F. Atkinson, and John Fiske, author of *The American Revolution*; LEE, ROBERT E. (Vol. 16, p. 362); BOADICEA (Vol. 4, p. 94), by Dr. F. J. Haverfield, professor of ancient history, Oxford University; MATILDA (THE GREAT COUNTESS) (Vol. 17, p. 888), by Prof. Carlton H. Hayes, of Columbia University; JOAN OF ARC (Vol. 15, p. 420), by Prof. J. T. Shotwell, of Columbia University; ISABELLA (Vol. 14, p. 859); ELIZABETH, QUEEN OF ENGLAND (Vol. 9, p. 282), by A. F. Pollard, professor of English history, London University; MARY, QUEEN OF SCOTS (Vol. 17, p. 817), by Algernon C. Swinburne, the great poet, author of *Mary Stuart*, etc.; CATHERINE DE' MEDICI (Vol. 5, p. 528); VICTORIA, QUEEN (Vol. 28, p. 28), by Hugh Chisholm, editor, Encyclopaedia Britannica.

The biographies are not dry outlines of the subjects' lives, but narratives of a thoroughly interesting and often most entertaining nature. There has been a generous amount of space alloted the biographical articles in the Encyclopaedia Britannica. The article on Napoleon I is equivalent to 60 pages of this Guide; that of George Washington to 13 pages; of Abraham Lincoln to 23 pages; of Queen Victoria 23 pages. Such length provides space for the picturesque details which make the articles especially appropriate for children, and will establish a taste for this kind of reading in later years.

Readings in Natural History

Many children show a bent for knowledge of the world of nature, and to them the new Britannica will prove a faithful, constant companion. Their pleasure

in going to the encyclopaedia will be heightened by the many beautiful pictures they will find in it. The articles on the domestic animals not only relate in simple, readable fashion the very interesting facts about their history and development, but are splendidly illustrated with pictures of the different breeds so that by this means alone anyone may learn to distinguish them. CAT (Vol. 5, p. 487), is by Richard Lydekker, the noted naturalist; CATTLE (Vol. 5, p. 539) is by Dr. William Fream, author of *Handbook of Agriculture*, and Robert Wallace, professor of agriculture, Edinburgh University; DOG (Vol. 8, p. 374) is by Walter Baxendale, kennel editor of *The Field*, and Dr. F. Chalmers Mitchell; HORSE (Vol. 13, p. 712) is by Sir William Henry Flower, the noted biologist, author of *The Horse, a Study in Natural History*, Richard Lydekker, E. D. Brickwood, Dr. William Fream and Robert Wallace; PIG (Vol. 21, p. 594) is by Robert Wallace, and SHEEP (Vol. 24, p. 817) is by Dr. Fream and Professor Wallace.

In too many books for children about the habits of wild animals, the facts of nature are grossly distorted with the idea of impressing the imagination. We are all familiar with the recent spirited controversy over "nature fakers" and the reaction to more sober statement which it brought about. It is the truth about the animal world that is wanted; for it is quite wonderful and fascinating enough as it is. And the new Britannica supplies this need in a most satisfactory and thorough manner. Children never tire of natural history, and parents may be assured that the information in the entertaining articles by noted naturalists, in the pages of the Britannica, is of the most reliable and accurate character.

The Habits and Doings of Clever

Animals

Nothing, for instance, could be more absorbing to the average school-child than the article ANT (Vol. 2, p. 85), by Prof. George H. Carpenter of the Royal College of Science, Dublin, who wrote the well-known book *Insects; their Structure and Life*. Here he tells how colonies of ants are founded, and how they live, and how they receive other insects as guests in order to obtain the food they desire, and how some species make slaves of other species. Numerous examples of their sense and intelligence are given, and the question as to whether their actions are rational or instinctive is discussed in the light of the most recent knowledge. The story of the BEE (Vol. 3, p. 625), also by Professor Carpenter, is equally wonderful, for we learn all about the solitary and social bees, the social organization of the hive, and how the worker bees are victimized. Both of these articles are fully illustrated. SPIDERS (Vol. 25, p. 663), by R. I. Pocock, superintendent of the Zoological Gardens, London, is another example of the adaptability of the Britannica to children's reading. The accounts of their webs, nests and modes of catching prey hold the attention throughout.

A great deal of the most curious and recent knowledge of the animal kingdom is related in supplementary articles such as COLOURS OF ANIMALS (Vol. 6, p. 731), by Dr. E. B. Poulton, Hope professor of zoology at Oxford, author of *The Colours of Animals*, and MIMICRY (Vol. 18, p. 495), by R. I. Pocock. The latter tells how animals protect themselves from their enemies by resemblance to other animals or objects.

Knowledge about Plants and

Animals

Space will not permit further specific mention. The life-story of the entire animal kingdom, detailed information about plants and flowers are to be found in the pages of the new Britannica. The accurate and beautiful illustrations and the text, written in every case by naturalists of acknowledged reputation, and written always in the clearest language, help to give the work its unique position as the greatest source of authoritative and easily comprehended knowledge.

Marvelous Machines

Children delight in machinery and what it accomplishes, and the Britannica tells about this with great thoroughness in its complete section dealing with processes of manufacture. A number of the articles on this subject have been suggested in the last chapter as suitable for parents who wish to interest their children in the industrial world, and the list may be further extended for the benefit of older children by including such articles as TEXTILE PRINTING (Vol. 26, p. 694), by Dr. Edmund Knecht, of Manchester University; FINISHING (Vol. 10, p. 378) also by Professor Knecht; WOOL, WORSTED AND WOOLLEN MANUFACTURES (Vol. 28, p. 805), by Aldred F. Barker, professor of textile industries, Bradford Technical College; TYPOGRAPHY, *Modern Practical Typography* (Vol. 27, p. 542), by John Southward, author of *Practical Printing*, and H. M. Ross; PRINTING (Vol. 22, p. 350), by C. T. Jacobi, managing director of the Chiswick Press, London; DREDGE AND DREDGING (Vol. 8, p. 562), by Walter Hunter, a noted consulting engineer; REAPING (Vol. 22, p. 944), by Primrose McConnell, author of *Diary of a Working Farmer*, etc.

Boys with a practical, mechanical turn of mind will delight in such articles as BRIDGES (Vol. 4, p. 533), by Prof. W. C. Unwin, with many illustrations; MOTOR VEHICLES (Vol. 18, p. 914), by the late C. S. Rolls, a pioneer of motoring, and Edward S. Smith; FLIGHT AND FLYING, *Artificial Flight* (Vol. 10, p. 510), which describes, with many pictures, flying machines from the earliest types to the latest, and CYCLING (Vol. 7, p. 682), an historical and pictorial account of the velocipede and bicycle. Nothing could be more interesting and instructive than SHIP (Vol. 24, p. 860), of which the historical part is by Rev. Edmond Warre, formerly head master of Eton College, and the account of modern ships by Sir Philip Watts, who designed the "Dreadnought" and the "Mauretania." It is a real story, equivalent in length to 190 pages of this Guide, with nearly 130 illustrations of all sorts of craft including modern warships, ocean liners and vessels for inland navigation. Under RAILWAYS (Vol. 22, p. 819) there is an equally good history of the railway by H. M. Ross, editor of *The Times Engineering Supplement*, and others.

Electrical Apparatus

The remarkable attraction possessed by electrical apparatus for many boys will doubtless send them to such articles as DYNAMO (Vol. 8, p. 764), by C. C. Hawkins, author of *The Dynamo*; TELEPHONE (Vol. 26, p. 547), by Harry R. Kempe, electrician to the General Post Office, London; TELEGRAPH (Vol. 26, p. 510), also by H. R. Kempe, and the chapter on *Wireless Telegraphy* (p. 529), by J. A. Fleming, professor of electrical engineering in the University of London. These accounts are full of the most practical information, and will be of inestimable help

to any boy who wishes to experiment for himself.

Industrial Processes

Many industrial processes, while not employing complicated machinery, nevertheless possess much interest, both from an historical and a technical point of view, and on these the new Britannica is as complete and authentic as in all other departments. Especially useful and entertaining to children will be found the material relating to the manufacture of the common objects by which they are surrounded. Such, for instance, are CERAMICS (Vol. 5, p. 703), by William Burton and several other experts, with beautiful illustrations; GLASS (Vol. 12, p. 86), by Harry James Powell, author of *Glass Making*, etc., Alexander Nesbitt, and William Rosenhain of the National Physical Laboratory, England; and PROCESS (Vol. 22, p. 408), an illustrated account, by Edwin Bale, of the photomechanical processes by which illustrations are reproduced in printing.

These and hundreds of similar articles will prove most helpful and suggestive to school-children who are constantly called on to prepare “themes” and write compositions. As soon as a child makes acquaintance with the new Britannica he will quickly realize its inexhaustible resources, and the aid it lends him in his studies will be continued throughout the course of his life, in his business and in his general reading.

Explorers’ Voyages and Journeys

Children love to read adventures of explorers in forcing their way to unknown lands. The impression they make is much clearer when the child has

learned to distinguish the different motives which have led to discovery and to exploration—commercial expansion, fresh conquests, religious zeal, flight from persecution, or the advancement of knowledge for its own sake. With such information he will read in a new light the stirring history of adventure, the great story of hardship and endurance.

The Britannica presents all this on a definite, scientific plan. The inquirer starts on his trip through any field of learning with guide-posts clearly marked, and successive ones in sight one from the other; so that there is no going astray, no uncertain wandering. A reader—young or old—with taste for exploration and adventure may turn first to GEOGRAPHY, *Progress of Geographical Discovery* (Vol. 11, p. 623), by Dr. H. R. Mill, editor of *The International Geography*. This article outlines geographical discovery in chronological order from the days of the Phoenicians. The reader will doubtless make excursions into other parts of the books for more detailed accounts, but he has always this main article to guide him. He will go to the article on HERODOTUS (Vol. 13, p. 381), the traveler, by Canon George Rawlinson, the great Oriental archaeologist, and the Rev. E. M. Walker of Oxford University; and to the story of PYTHEAS (Vol. 22, p. 703), the Greek navigator who brought the first definite news of northwestern Europe to the Mediterranean world, by Sir Edward H. Bunbury, author of *A History of Ancient Geography*, and Dr. C. R. Beazley of the University of Birmingham. Other stories of exploration and adventure are: VIKING (Vol. 28, p. 62), by Charles F. Keary, author of *The Vikings in Western Christendom*; LEIF ERICSSON (Vol. 16, p. 396), the first European to set foot on the

American continent, by Prof. C. R. Beazley; VINLAND (Vol. 28, p. 98), with all the latest known facts of Leif's discovery, by Prof. J. E. Olson of the University of Wisconsin; the marvelous career of the great Venetian discoverer, POLO, MARCO (Vol. 22, p. 7), boldest of medieval travelers, by Sir Henry Yule, author of *The Book of Ser Marco Polo*, and Prof. C. R. Beazley; HENRY OF PORTUGAL (the Navigator) (Vol. 13, p. 296); DIAZ DE NOVAES (Vol. 8, p. 172); COLUMBUS, CHRISTOPHER (Vol. 6, p. 741)—all of these by Professor Beazley; **America—Its Discoverers and Conquerors** GAMA, VASCO DA (Vol. 11, p. 433), who discovered the Cape route to India; PINZON (Vol. 21, p. 631); VESPUCCI, AMERIGO (Vol. 27, p. 1053), by Professor Beazley; BALBOA, VASCO NUÑEZ DE (Vol. 3, p. 241), discoverer of the Pacific Ocean; CABOT (Vol. 4, p. 921), by H. P. Biggar, author of *The Voyages of the Cabots to Greenland*; MAGELLAN, FERDINAND (Vol. 17, p. 302), the first circumnavigator of the globe, by Professor Beazley; SOTO, FERDINANDO DE (Vol. 25, p. 435), wrongly called the discoverer of the Mississippi; PERU, *History* (Vol. 21, p. 274), by Sir Clements R. Markham, author of *Travels in Peru and India*, a full account of Pizarro's conquest; CORTES, HERNAN (Vol. 7, p. 205), a concise and able description of the conquest of Mexico; CARTIER, JACQUES (Vol. 5, p. 433), which tells of the discovery of the St. Lawrence; HUDSON, HENRY (Vol. 13, p. 849); BAFFIN, WILLIAM (Vol. 3, p. 192); LA SALLE (Vol. 16, p. 230), by C. C. Whinery, assistant editor of the Encyclopaedia Britannica; **Great Voyages** CHAMPLAIN, SAMUEL DE (Vol. 5, p. 830), by Dr. N. E. Dionne, author of *Life of Samuel Champlain*, etc.; DRAKE, SIR FRANCIS (Vol. 8, p. 473); BUCCANEERS (Vol. 4, p. 709), by David Hannay, a stirring account

of the piratical adventurers of different nationalities who united against Spain in the 17th century, and COOK, JAMES (Vol. 7, p. 71), by Professor Beazley.

Modern Exploration

The story of geographical discovery and exploration is continued in such articles as AMERICA, *General Historical Sketch* (Vol. 1, p. 806), by David Hannay; AFRICA, *History: Exploration and Survey since 1875* (Vol. 1, pp. 331 and 352), by F. R. Cana, author of *South Africa from the Great Trek to the Union*; ASIA, *Exploration* (Vol. 2, p. 738), by Col. Sir Thomas H. Holdich, formerly superintendent of the Frontier Surveys of India; AUSTRALIA, *Discovery and Exploration* (Vol. 2, p. 958); and POLAR REGIONS (Vol. 21, p. 938), by Dr. Fridtjof Nansen, the Arctic explorer, and Dr. H. R. Mill, which gives a brilliant survey of all the attempts to conquer the frozen world. In connection with these articles should be read the full and interesting biographies of the great modern explorers such as BAKER, SIR SAMUEL WHITE (Vol. 3, p. 227); BURTON, SIR RICHARD F. (Vol. 4, p. 864), by Dr. Stanley Lane-Poole; LIVINGSTONE, DAVID (Vol. 16, p. 813), by John Scott Keltie, secretary of the Royal Geographical Society; STANLEY, SIR HENRY MORTON (Vol. 25, p. 779), by F. R. Cana; EMIN PASHA (Vol. 9, p. 340); SPEKE, JOHN H. (Vol. 25, p. 633); PARRY, SIR WILLIAM EDWARD (Vol. 20, p. 865); FRANKLIN, SIR JOHN (Vol. 11, p. 30); KANE, ELISHA KENT (Vol. 15, p. 650); NORDENSKIÖLD, NILS ADOLF ERIK (Vol. 19, p. 740); NANSEN, FRIDTJOF (Vol. 19, p. 162); PEARY, ROBERT EDWIN (Vol. 21, p. 30). See the chapter on *Geography* in this Guide.

A Complete

History of the World

A strong taste for history is often found in children, and the new Britannica is, among other things, a complete history of the world, by the greatest historians of the present day. In respect to the treatment and arrangement of the historical section there are many things that make it especially adapted for young people's reading. In the first place the great episodes of history, such as FRENCH REVOLUTION, RENAISSANCE, REFORMATION, MIDDLE AGES, and CRUSADES, are discussed in separate articles. Also every battle, siege, campaign, or war of importance has its article, apart from its treatment in the histories of countries. The historical articles in the new Britannica will send those a little older to other articles dealing with government, and thus help them to cope intelligently with the social and civic problems of the age—in other words, enable them to become the best kind of citizens. The chapter in this Guide headed *Questions of the Day* covers this ground; and see the chapters on *History*.

A child is naturally curious to know about mountains, rivers, caverns, the causes of rain, dew and wind. Just as this encyclopaedia shows itself the best of instructors in regard to the plant and animal world, so with natural phenomena it serves to bring the child into close, sympathetic touch with the truths of science.

Physical Geography made Interesting

The principles of physical geography are clearly explained in GEOGRAPHY, *Principles of* (Vol. 11, p. 630), by Dr. H. R. Mill; and when these are learned

young people will turn with eager interest to such articles as ALPS (Vol. 1, p. 737), partly by W. A. B. Coolidge, author of *The Alps in Nature and in History*; ANDES (Vol. 1, p. 960); APPALACHIAN MOUNTAINS (Vol. 2, p. 207), by Dr. Arthur C. Spencer, geologist to the Geological Survey of the United States; HIMALAYA (Vol. 13, p. 470); VOLCANO (Vol, 28, p. 178), by F. W. Rudler, of the Museum of Practical Geology, London; VESUVIUS (Vol. 27, p. 1063), by Sir Archibald Geikie and Dr. Thomas Ashby; EARTHQUAKE (Vol. 8, p. 817), by F. W. Rudler and Dr. John Milne, author of *Earthquakes*, etc.; GEYSER (Vol. 11, p. 913); CAVE (Vol. 5, p. 573), by Dr. William Boyd Dawkins, author of *Cave Hunting*, etc.; MAMMOTH CAVE (Vol. 17, p. 531), by Rev. Horace C. Hovey, author of *Celebrated American Caverns*, etc.; LURAY CAVERN (Vol. 17, p. 127), also by Dr. Hovey; GRAND CANYON (Vol. 12, p. 347), by R. S. Tarr, late professor of physical geography, Cornell University; GREAT SALT LAKE (Vol. 12, p. 421); YOSEMITE (Vol. 28, p. 937), by Dr. John Muir, president of the American Alpine Club, and author of *The Mountains of California*; YELLOWSTONE NATIONAL PARK (Vol. 28, p. 912); GLACIER (Vol. 12, p. 60), by Rev. E. C. Spicer, of Oxford University; NIAGARA (Vol. 19, p. 634), by Dr. G. K. Gilbert, author of *Niagara Falls and their History*; MISSISSIPPI RIVER (Vol. 18, p. 604); AMAZON (Vol. 1, p. 783), by Col. George E. Church, the famous American explorer of the Amazon; ORINOCO (Vol. 20, p. 275), also by Colonel Church; RHINE (Vol. 23, p. 240), by Dr. J. F. Muirhead, editor of many of Baedeker's Guide Books, and Philip A. Ashworth; NILE (Vol. 19, p. 692), by F. R. Cana and Sir W. E. Garstin, governing director, Suez Canal Co.; NIGER (Vol. 19, p. 674) and CONGO (Vol. 6, p. 914), by F. R. Cana; YANGTSZE-KIANG (Vol. 28, p. 903), by

George Jamieson, formerly British consul-general at Shanghai; DESERT (Vol. 8, p. 92), by Dr. H. N. Dickson, professor of geography, University College, Reading; SAHARA (Vol. 23, p. 1004), by Edward Heawood, librarian of the Royal Geographical Society, London, and F. R. Cana. There are also separate articles on the oceans and large lakes.

Astronomy is a science which is peculiarly attractive to children, since it arouses the imagination and makes a strong appeal to their delight in all that is marvelous. There are 277 astronomical articles in the new Encyclopaedia Britannica to which the classified list in the Index Volume (Vol. 29, p. 888) is the key.

Readings in Astronomy

In the preceding chapter are mentioned a few articles which will serve for the beginning of an acquaintance with astronomy. When a child has learned to know the zodiacal constellations he will certainly want to read ZODIAC (Vol. 28, p. 993), by Agnes M. Clerke, author of *A History of Astronomy in the 19th Century*, for the story of the signs and what they meant to the nations of past ages. There are separate articles on the principal constellations and stars. ASTROLOGY (Vol. 2, p. 795), by Prof. Morris Jastrow of the University of Pennsylvania, will prove both entertaining and instructive.

Those who wish to know about methods of observation will find the complete story in TELESCOPE (Vol. 26, p. 557), a beautifully illustrated article by H. Dennis Taylor, author of *A System of Applied Optics*, and Sir David Gill, formerly astronomer royal at the Cape of Good Hope.

Games and

Pastimes

In the preceding chapter a few articles on games were mentioned as being useful to parents helping very young children to amuse themselves. A little later, the child will be delighted to choose for himself among the 260 articles on sports and pastimes; and the analysis of this department of the Britannica, in Part 6 of this Guide, will then be of service. We may mention here the articles GOLF (Vol. 12, p. 219), by H. G. Hutchinson, golf champion and author of *Hints on Golf*; LACROSSE (Vol. 16, p. 54); BOWLING (Vol. 4, p. 344); ROWING (Vol. 23, p. 783), by C. M. Pitman, formerly stroke of the Oxford University Eight; MODEL-YACHTING (Vol. 18, p. 640); ANGLING, *Methods and Practice* (Vol. 2, p. 24); CRICKET (Vol. 7, p. 435); ARCHERY, *Pastime of* (Vol. 2, p. 364), by the late W. J. Ford. A long list of indoor and out-door games will be found in the classified subject-list (Vol. 29, p. 946).

Diverting and Profitable Occupations

The aptitude of children for diverting and often profitable occupations is admirably fostered by the new Britannica through many of its very practical articles. This matter has been discussed in the last chapter. In addition it is worthy of note that an ingenious boy could learn to make and set up a sun-dial with the help of DIAL AND DIALLING (Vol. 8, p. 149), by Hugh Godfray; and could experiment and amuse himself with a CAMERA LUCIDA or a CAMERA OBSCURA (Vol. 5, p. 104), from the articles written by Charles J. Joly, late Astronomer Royal of Ireland; while even a younger child could quickly learn to tie any kind of a knot from KNOT (Vol. 15, p. 871), with

54 illustrations, by P. G. Tait, the famous British physicist. All the crafts that produce objects of household utility are practically taught in articles by experts, so that the Britannica is a complete guide to the use of every kind of tool.

Reading for Girls

In the field of girls' occupations there is in the Britannica much material that serves to give knowledge of the best methods of home making.

A great number of articles for girls' reading will be found among those named in the chapter For Women.

In these days parents, and especially mothers, are devoting more and more time to the study of child development. The importance and value of intelligent sympathetic guidance in everything a child does—and every active child strives to do something—has been fully realized. The chief problem before the parent is, therefore, to have at hand some ready means of meeting every expression of a child's interests, every indication of budding talents. A short experience with the new Britannica will show this to be one of its many valuable functions. Children do not need to be driven to the volumes. They need only to be made acquainted with them.

CHAPTER LXIII
SOME QUESTIONS CHILDREN SOMETIMES ASK, AND SOME QUESTIONS TO ASK CHILDREN

A child gains a great part of its knowledge by asking questions, and he should be encouraged to ask them. But parents often find the child's questions, even those about the objects he sees every day, so difficult to answer, that he is told "not to bother." With the new Encyclopaedia Britannica at hand, there is hardly any intelligent question that cannot be answered after a glance at the Index and at the page to which it refers the reader. Again, there is no better way at once of amusing and instructing the child than to ask him questions and help him find his way to the answers. Here are a few questions: some of the kind that a child might ask, and some that may be put to a child. The Britannica supplies interesting answers to all of them, and some of these answers are given here.

What makes people snore?

The answer, found at once by referring to "snoring" in the Index, is that the cause is breathing through the mouth, which makes the soft palate vibrate. When the child is told this, it should also be told what the Britannica says about mouth-breathing being a dangerous habit for children to form, as it often leads to sore throats.

How does one ant tell another to go to work?

By patting it with its feelers. The article ANT, by Professor Carpenter, will supply you with stories to tell children as fascinating as any fairy tale.

What makes the colours of sunset?

Dust. If it were not for the dust floating in the air, we should lose not only the brilliant sunsets but the glorious cloud scenery as well, and there would be no twilight. Furthermore, all the moisture in the air, which now condenses on the particles of floating dust, would settle on our clothes and on the walls of

our rooms. You will find many other curious facts in the article DUST, by John Aitken, who invented the machine for counting the particles of dust in the atmosphere.

How does the brightness of moonlight compare with that of sunlight?

Most people would guess that sunlight is twenty, or, at most, fifty times as strong; yet it is really half a million times stronger. The article MOON, by Dr. Simon Newcomb, is full of such curious information and of delightful pictures.

Why did the Israelites in bondage need straw to put in their bricks, although we do not use it in ours?

The article BRICK tells you that their bricks were made of Nile mud, which would not bind without something to hold it together.

When sea-water freezes, does the salt go into the ice?

Only one-fifth of it, the article ICE says.

Are you sure you like the taste of vanilla?

This is an excellent puzzle to put to a bright child. The curious answer, found in the article TASTE, is that vanilla, like onions and some other substances which we think have strong flavors, really has no taste at all. We smell them as we eat them, and therefore we imagine we taste them. This you can prove to a child by blindfolding it, while its nose is firmly closed, holding a slice of onion and a slice of apple near its open mouth, and touching its tongue first with one and then with the other.

What is a beaver's favourite food?

Of all unlikely things—water-lilies! This, and other things that will delight children, you will find in the article BEAVER, by Richard Lydekker, the famous naturalist.

Why is it harder to guess the width of a river than to guess the width of a field as wide?

The article VISION will tell you.

Why are new-born babies' eyes often slate-blue, for a time?

The article EYE will tell you.

Why is not spiders' silk manufactured?

Unfortunately, although the silk is of the finest quality, quite equal to the silkworm's, the spiders are such fierce cannibals that each one would have to be kept in a separate box, and this would make the silk too costly. The article SPIDERS, by R. I. Pocock, superintendent of the London Zoological Gardens, also tells you how spiders make their way through the air to islands in the sea; how the wolf-spider builds a nest with a hinged door, and how the common pond-spider builds his thimble-shaped house under water and fills it with air by swimming down to it, time after time, on each trip taking down a tiny bubble of air.

Why do not animals that sleep all through the winter starve to death?

Because they live on the fat they have put on during the summer, as the article HIBERNATION explains.

Why could not the Norsemen who visited America in the 11th century found permanent settlements?

The natives were hostile and the Norsemen had no firearms. The wonderful story of the first voyages to America is told in the article VINLAND.

How can you tell how far away a flash of lightning is?

Sound travels so much more slowly than light does, that if the flash is a mile away you see it five seconds before you hear the report; so by counting

the seconds you can measure the distance. The Index, under "Lightning: distance" refers you to the article SOUND, by Professor Poynting.

Why does your hair stand on end when you are frightened?

The article SKIN, by Professor Parsons, will tell you about this curious action of the muscles.

Why do we count by tens?

Because people began by counting on their fingers and thumbs, and when they got to ten they had to begin again. Some tribes used to make twenty their basis for counting, adding in their toes. The article ARITHMETIC tells you this; and a newspaper critic said of this article that he was amazed to find it one of the most readable things in the Britannica. The truth is that there are no subjects that are dull in themselves. There is a dull way of treating them, and there is also the Britannica way, which is to show you *how things came to be as they are*. That is why children are delighted when "Britannica time" comes, the hour when the parent sits down by the bookcase and tells them true stories out of the volumes and shows them the exquisite pictures.

Are men or women oftener stammerers?

The article STAMMERING, which tells you that men are much oftener afflicted than women, is one that all parents should read. If a child's speech is carefully watched, the first trouble of this kind may sometimes be checked before it becomes a habit.

Why does a room look smaller with red than with violet wall-paper?

Read the article VISION and you will understand this and many other curious facts about the way our eyes do their work. Furthermore, you will be reminded that slight defects in a child's sight should

be noticed and treated by an oculist before permanent harm has been done.

Why is winter colder than summer?

Simply because the sun's rays, coming aslant instead of from overhead, travel through more miles of air and are thus robbed of much of their heat before they reach us. The polar regions actually get more hours of sunlight in a year than we get in the United States, more even than there are at the equator, but the sun is never high above the horizon at the poles.

Can a snake cross a frozen pond?

No, nor move on any other smooth surface, as the article SNAKES shows.

How long was Abraham Lincoln at school?

Less than a year in all, as shown by the article LINCOLN, ABRAHAM, by J. G. Nicolay (Lincoln's private secretary) and C. C. Whinery. But although he could not get much teaching, he read over and over again every book he could get hold of.

Here are a few questions without the answers; but the numbers after each question show the volume and page of the Britannica where each answer can be found:

What makes blood clot? (Vol. 4, p. 81.)

Are there any red-haired human races? (Vol. 12, p. 823.)

Why does a cut apple turn brown? (Vol. 21, p. 756.)

What makes negroes black? (Vol. 25, p. 190.)

Are men or women oftener colour-blind? (Vol. 28, p. 139.)

Why do stars twinkle? (Vol. 23, p. 29.)

What happens in your throat when you sob? (Vol. 23,

p. 195.)

What change in water, as it freezes, makes ice float? (Vol. 14, p. 227).

Why is the shadow cast by an electric light sharper-edged than the shadow cast by the sun? (Vol. 24, p. 758).

Why does fright make people faint? (Vol. 27, p. 942).

What makes the beautiful "ice-flowers" on a frosted window-pane? (Vol. 14, p. 226).

How do trappers prepare valuable fur-skins so as to preserve them until they get to market?

The skins are simply dried in the air, as stated in the article *Fur*, which was written by the head of a great wholesale fur business.

How does the amount of air in a room spoiled by an ordinary gas-burner, or a small reading-lamp, compare with the amount spoiled by a man's breathing?

The gas burner or the lamp spoils four times as much air, as shown in the article VENTILATION.

What part of your weight is blood?

One-twentieth. (Vol. 27, p. 939).

What domestic animal is oftenest born with only one eye?

The pig. (Vol. 18, p. 743).

Which covers the more space, the United States (without Alaska) or Europe?

Europe. (Vol. 27, p. 612, and Vol. 9, p. 907.)

If you looked at the moon all night every night, how soon would you have seen all its surface?

Never. Four-tenths of it can never be seen from the earth. (Vol. 18, p. 803.)

What was the great difference between the destruction of Pompeii and that of Herculaneum?

Pompeii was covered by ashes and Herculaneum by mud. (Vol. 22, p. 50, and Vol. 13, p. 342.)

Why do not high mountains, where more snow falls than melts, keep growing higher?

Because pressure forces the snow, changed into ice, to descend in the form of glaciers, as explained in the article GLACIER.

Who wrote to George Washington, on behalf of a number of officers in the United States army, asking him to make himself king of the United States?

Col. Lewis Nicola. The article WASHINGTON, GEORGE, by Professor MacDonald of Brown University, gives you the words of Washington's indignant reply.

How deep has anyone ever dived in diver's dress?

The article DIVERS tells you: 210 feet.

In baseball, how is a fielding-record calculated?

To get the fielder's average, you divide the number of chances he has made the most of by the total number of chances he has had. (Vol. 3, p. 461.)

How tall must a giant be?

Seven feet, to be properly called a giant. (Vol. 18, p. 741).

Where were the first lighthouses built?

In lower Egypt, as stated in the article LIGHTHOUSE, which describes all the great lighthouses and gives pictures of the towers and of the wonderful lamps.

When ships are going through the Panama Canal, from the Atlantic to the Pacific, will they be heading to the eastward or to the westward?

Oddly enough, to the eastward; for the Isthmus curves so, just where the canal line lies, that the

Pacific end is much to the eastward of the Atlantic end. You can see this plainly on the detailed map in the article PANAMA CANAL.

Why does a tame rabbit die if it is held erect for half an hour?

Because the muscles of its abdomen are so weak that they cannot act as a belt, as our muscles do, and all the rabbit's blood settles below the heart. (Vol. 27, p. 942.)

For what price was Manhattan Island bought from the Indians in 1626?

For $24 worth of goods, as shown in the article NEW YORK.

Why do people, when they are in the polar regions, seldom catch cold?

Because colds are caused by microbes and there are very few microbes in places so far from any masses of people, as you can see from the article CLIMATE.

If North America were spread out on the surface of the moon, what share of the moon's surface would it cover?

About four-sevenths. (Vol. 18, p. 805, and Vol. 19, p. 764.)

Which is the greater: the highest mountain's height or the deepest sea's depth?

The sea's depth, which is 31,614 feet; while Mt. Everest is 29,002 feet high. (Vol. 19, p. 973, and Vol. 10, p. 7.)

Of what use are the hairs on a caterpillar?

Like the bristles on a dog-collar, they keep an enemy from biting him. (Vol. 6, p. 733.)

Why do you twist yourself into an uncomfortable position when you have a pain?

Because instinct teaches you that discomfort will help you by partially taking your attention away from the pain. (Vol. 22, p. 587.)

What warm-blooded creature has the longest average life?

Man, except possibly the whale; but not the elephant, as is generally believed. The article LONGEVITY tells how long all kinds of animals live.

What mistake about American history is caused in our minds by the celebration of the Fourth of July?

The belief that the Declaration of Independence was signed on the 4th of July. Congress did not order it to be engrossed for signature until July 19th. The article INDEPENDENCE, DECLARATION OF, also shows that the most important day was July 2nd, when Congress adopted the Resolution of Independence.

If you look up the answers to these questions, in the Britannica, you will incidentally learn, from the articles to which you turn, a great many things that will be of practical use to you in every-day life. For whether you turn to the volumes because you want only a single fact, or because you want to learn all about some important subject—or even because you merely want to pass a pleasant hour—you always get from them far more than you had hoped to find.

Part IV
Readings on Questions of the Day Which Relate to the Duties of American Citizenship and to Current Politics

CHAPTER LXIV
QUESTIONS OF THE DAY

An Intimate Book

The old idea of an encyclopaedia as a remote book, distant from every-day needs and the real public questions of the day, and to be consulted only for information about ancient history and medieval philosophy, was a wrong one. It was wrong *in theory*, if an encyclopaedia is to be a live and valuable book. And it was wrong *in practice*. It is not the case with the new Britannica. For the Britannica is full of information about current public questions; and even its treatment of the past, remote or near, is from a fresh and modern view-point, and is of the utmost value as throwing the light of history on the problems of modern politics and every-day life. The

spirit of to-day is an intensely wide-awake and inquisitive one, and people are no longer willing to believe that "whatever is, is right"—much less that a thing is right because it *has been*, no matter how long. Indeed the very phrase "has been" as now used in the vernacular implies the outworn, the discarded. The Britannica, a book for intimate use on the questions of the day, is a record *of what is*, as well as of what has been, and of the great changes, the constant flux, of the past and of the present.

Sociology

One of our symptoms of health is the development of a social sense, or, better, a social conscience. This is due in no small degree to the work of Herbert Spencer in founding a new science, called by him Sociology. For an inspiring and stimulating starting-point for the study in the Britannica of the great social and political questions of the day let the reader study the article SOCIOLOGY (Vol. 25, p. 322), by Benjamin Kidd, who wrote *Social Evolution*, and *Principles of Western Civilization*.

Education

Evolution, sociology, Spencerian psychology and the closer relation of the state to the individual are all important factors in the educational changes of the last few years; and their study is indispensable to a clear understanding of the great questions of education. A more concrete study may be based on the article EDUCATION (Vol. 8, p. 951) and particularly the part on education in the United States by Nicholas Murray Butler, president of Columbia University. An elaborate course of reading on education is given in another chapter of this Guide *For Teachers*. But it may be well to call attention here to the fact that there are in the articles

on individual states sections on the educational system of each state; and in the separate articles on each city similar descriptions of schools in those cities; and also that either in the article on the city or town in which it is situated, or in a separate article there is an estimate, a description, and a historical sketch of each of the great universities and colleges of the country. This information is not merely of value if one wishes to understand in a general way the trend of education, but of particular interest to one who is choosing the school best adapted to a special need. In the same way there are articles on other great educational institutions—for example a general article on MUSEUMS OF SCIENCE (Vol. 19, p. 64) and one on LIBRARIES (Vol. 16, p. 545), as well as articles on such special institutions as the Smithsonian, or treatment of them in the article on the places where the institution is—as in the article on Washington for the Library of Congress, the article on New York City for the Metropolitan Museum, etc.

Defectives and Their Training

But government, particularly in America, besides taking a direct interest and responsibility in the education of its youth, has begun within the last few years to assume the task of uplifting those of its citizens who are below the normal. Modern methods of dealing with criminals and of caring for defectives and the insane are based on a principle entirely different from that which obtained 50, or even 20, years ago. The whole article *Insanity* (Vol. 14, p. 597) might well be read as a preliminary to a study of this topic, since it treats of idiocy and imbecility as well as of the more violent forms of mental disorder, and

since it treats them all as forms of disease—the basis of the modern method of treatment which has substituted the hospital and the school for the mere place of detention. In particular, however, the last part of this article dealing with *Hospital Treatment* should be studied. It is by Dr. Frederick Peterson, the American specialist, and it describes the improved conditions of modern asylums. “Physical restraint is no longer practised.... The general progress of medical science in all directions has been manifested in the department of psychiatry by improved methods of treatment, in the way of sleep-producing and alleviating drugs, dietetics, physical culture, hydrotherapy and the like. There are few asylums now without pathological and clinical laboratories.... The colony scheme has been successfully adopted by the state of New York at the Craig Colony for Epileptics at Sonyea and elsewhere.... Many asylums have, as it were, thrown off detached cottages for the better care of certain patients.... But the ideal system is that of the psychopathic hospital and the colony for the insane.” It is with the “colony” plan that Dr. Peterson’s name is intimately connected, especially in New York state. In the Britannica article on New York state there is a full treatment (Vol. 19, p. 601) of the state’s charitable institutions, including its hospitals for the insane, the Craig Colony already mentioned, the Letchworth Village custodial asylum for epileptics and feeble-minded, and other institutions of the same kind. And in the same way the system in each state is described in the separate article on that state with special attention to the peculiar features in its administration of its hospitals and schools for insane and imbeciles.

The Blind

There has been a similar change in the education of the blind and the deaf—or rather education is now provided for these classes, whereas they formerly received none at all. And this education is coming under state control and, once under governmental supervision, is being transferred from departments in charge of penal or charitable institutions to the department of public schools. For the most striking instances of what has been accomplished by improved systems of training under private supervision see the articles on SAMUEL GRIDLEY HOWE (Vol. 13, p. 837), the great teacher of the blind at the Perkins Institution for the Blind in Boston; on his blind and deaf pupil, LAURA BRIDGMAN (Vol. 4, p. 559), and on HELEN ADAMS KELLER (Vol. 15, p. 718), another and even more remarkable blind and deaf student, whose education, coming as a product of a new sociology, has made her a most efficient social helper and social worker.

From these articles the student should go to *Blindness* (Vol. 4, p. 59), by Sir Francis J. Campbell, principal of the Royal Normal College for the Blind, Norwood, London; an article equivalent in length to 40 pages of this Guide. Its author, the founder of the college, is himself a blind man, who, born in Tennessee, in 1832, and educated at the Nashville school, and afterwards in music at Leipzig and Berlin, had from 1858 to 1869 been associated with Dr. Howe at the Perkins Institution, Boston, and was knighted in 1909 for his services to the education of the blind. The part of his article dealing with the education of the blind is, therefore, doubly valuable and interesting. The main topics with which it deals are: early training—other senses of the blind not *naturally* sharper than those of the seeing, but developed by cultivation of hearing and touch from

early childhood; physical training to increase the average of vitality; mental training; early manual training; choice of occupation; piano-forte tuning; musical training; deaf-mutes should not be educated with the blind as their needs are so different; blind boys and blind girls should not be taught together, as coeducation promotes intermarriage, which is a calamity. The remainder of the article deals with types and books for the blind, appliances for educational work, employment, and biographical matter, with a list of prominent blind people. See also, for literary men who were blind, the articles on JOHN MILTON, WILLIAM H. PRESCOTT, and PHILIP BOURKE MARSTON.

The Deaf

DEAF AND DUMB (Vol. 7, p. 880) is by the Rev. Arnold Hill Payne, chaplain to the Oxford Diocesan Mission to the deaf and dumb, late normal fellow of the National Deaf Mute College, Washington, D. C., and author of many books on the subject. He points out the mistaken use of the word "dumb"—"In the case of the deaf and dumb, as these words are generally understood, dumbness is merely the result of ignorance in the use of the voice, this ignorance being due to deafness." After discussing causes of deafness, the condition of the deaf in childhood, their natural language, which the contributor thinks is "sign" rather than purely oral, and their social status, he deals with education of the deaf, giving an elaborate historical account including the "oral" revival in Germany and the work in the United States of Dr. Thomas Hopkins Gallaudet—see also the separate article on him and his two sons (Vol. 11, p. 416)—and of the National Deaf-Mute College at Washington, D. C. (on which see also the article

WASHINGTON, D. C.). This interesting article closes with a section on the blind-deaf, telling the story of several remarkable cases in England less well-known and more recent than Laura Bridgman or Helen Keller.

Psychology

This chapter began with a reference to the article on SOCIOLOGY with the recommendation that it be used as a basis for the study of present-day problems. The reader will often have heard vague allusions to sociology, and his reading this article in the Britannica will certainly sharpen and define his own idea of the meaning and the value of the science. Has he not heard much oftener of psychology, and heard it mentioned as if it were some sort of magic spell to charm away many of the difficulties of our modern complex world? But has he a full comprehension of the meaning of psychology and of the knowledge newly gained in regard to the "psychology of the senses"? The corrective for any vagueness of ideas about psychology is best found in the article PSYCHOLOGY (Vol. 22, p. 547) by Professor James Ward, whose articles for the Britannica have been reprinted and used as text-books in schools and colleges all over the country. Put in a few words, the lesson of psychology is that the senses, sensations, thoughts and feelings, which, even when they are our own, we too often speak of as if they were things apart and independent, are subject to certain natural laws in much the same way as are the forces treated by the science of physics. The reader who would study the subject of psychology in the Britannica should make use of the analysis of many articles in the chapter in this Guide *For Teachers*.

Crime

As with general education, special education of defectives, state training of feeble-minded, and restraint of the insane, so with the state's attitude toward the criminal there has been in recent years a great change which is still working toward full fruition, so that prison administration, children's courts, delinquency, probation, etc., are live topics of interest.

Just as the whole new science of sociology was based by Spencer on biology and on the Darwinian theory of evolution, so in this field of delinquency a "science" has been devised called criminology by its "inventor" Cesare Lombroso. The article LOMBROSO (Vol. 16, p. 936) in the Britannica criticizes his theories as showing "an exaggerated tendency to refer all mental facts to biological causes." His theory of a criminal type points to a "practical reform ... a classification of offenders, so that the born criminal may receive a different kind of punishment from the offender who is tempted into crime." The article CRIMINOLOGY (Vol. 7, p. 464), by Major Arthur Griffiths, Inspector of Prisons, should be read carefully. It lists the supposed criminal traits as follows:

> Various brain and cerebral anomalies; receding foreheads; massive jaws, prognathous chins; skulls without symmetry; ears long, large and projecting; noses rectilinear, wrinkles strongly marked, even in the young and in both sexes, hair abundant on the head, scanty on the cheeks and chin; eyes feline, fixed, cold, glassy, ferocious; bad repellent faces.... Other peculiarities are:—great width of the extended arms, extraordinary ape-like agility; left-handedness as well as ambi-dexterism; obtuse sense of smell, taste and sometimes of hearing, although the eyesight is superior to that of normal people.... So much for the anatomical and physiological peculiarities of the criminal. There remain the psychological or mental

> characteristics, so far as they have been observed. Moral insensibility is attributed to him, a dull conscience that never pricks and a general freedom from remorse. He is said to be generally lacking in intelligence, hence his stupidity, the want of proper precautions, both before and after an offence, which leads so often to his detection and capture. His vanity is strongly marked and shown in the pride taken in infamous achievements rather than personal appearance.

Although Major Griffiths thinks that criminality is oftener due to environment than to congenital defects, he closes his article with this estimate of what has been accomplished by Lombroso and his followers:

> The criminologists have strengthened the hands of administrators, have emphasized the paramount importance of child-rescue and judicious direction of adults, have held the balance between penal methods, advocating the moralizing effect of open-air labour as opposed to prolonged isolation, and have insisted upon the desirability of indefinite detention for all who have obstinately determined to wage perpetual war against society by the persistent perpetration of crime.

The article CRIME (Vol. 7, p. 447) is full of interesting statistics and facts. It tells us that "the growth of criminals is greatly stimulated where people are badly fed, morally and physically unhealthy, infected with any forms of disease and vice," and after proving by the records of various countries that men everywhere are more addicted to crime than are women, ends with this statement: "It has been well said that women are less criminal according to the figures, because when a woman wants a crime committed she can generally find a man to do it for her."

Other important articles on the subject are DEPORTATION (Vol. 8, p. 56) and PRISON (Vol. 22, p.

361). For English prison reforms, see also the article on JOHN HOWARD and that on ELIZABETH FRY, with an outline of the growth in Pennsylvania and New York (Auburn and Sing Sing), of the method of solitary confinement and of its adoption in England, and of the development in New York (see also the article on ELMIRA for the work of Zebulon R. Brockway), and in Massachusetts (Concord), of distinct and different treatment for first offenders.

Children's Courts

JUVENILE OFFENDERS (Vol. 15, p. 613) describes the work of Charles Dickens and others in England, the reform in Europe and in the United States; the philanthropic criminal code proposed by EDWARD LIVINGSTON (see the biographical article, Vol. 16, p. 811); the Randall's Island House of Refuge, the Elmira (N. Y.) Reformatory, the reformatory for women at Sherborn, Massachusetts, and the George Junior Republic at Freeville, New York, and its offshoots—see also the separate article GEORGE JUNIOR REPUBLIC (Vol. 11, p. 749); and the Borstal scheme, a modification of the American state reformatory system adopted in England in 1902.

CHILDREN'S COURTS (Vol. 6, p. 140) calls attention to the origin of these tribunals in the United States, in Massachusetts and Illinois, and their success in Chicago, Indianapolis, Denver and Washington, leading to their adoption in England; see also the article PROBATION (Vol. 22, p. 404) in general and, for particular and local methods, the articles on BIRMINGHAM (Vol. 3, p. 985), BOSTON (Vol. 4, p. 294), CHICAGO (Vol. 6, p. 124), COLORADO (Vol. 6, p. 722), EGYPT (Vol. 9, p. 29), ILLINOIS (Vol. 14, p. 308), and UTAH (Vol. 27, p. 818). The articles on individual states also contain detailed information

about local penal institutions of all kinds.

The reader should also study the articles POLICE (Vol. 21, p. 978), FINGER PRINTS (Vol. 10, p. 376), IDENTIFICATION (Vol. 14, p. 287), PUNISHMENT (Vol. 22, p. 653), CAPITAL PUNISHMENT (Vol. 5, p. 279), GUILLOTINE (Vol. 12, p. 694), HANGING (Vol. 12, p. 917), and ELECTROCUTION (Vol. 9, p. 210), the last by Professor Edward Anthony Spitzka, the American authority on the subject. In the article on Utah, already mentioned, the reader will find that "a person sentenced to death may choose one of two methods of execution—hanging or shooting."

Alcohol

If a respectable citizen of a century ago could return to earth he could not fail to be greatly surprised at dinner, whether in a private home or in a hotel, to see how much less alcoholic beverages are used, how much lighter they are, and how much more common are other drinks. If he "returned" to certain parts of the United States he would find that he could get no alcohol except on a doctor's prescription stating the reason why the patient needed it, and he would learn that such a prescription could be filled only once, and then only by a registered pharmacist of good character. No matter to what place he came back, he would find a constant interference with or supervision of the manufacture, sale and consumption of alcoholic liquors on the part of the government. He would probably wonder why the state should interfere with private and personal liberty in such matters. We have already pointed out that the state now *does* interfere, and that this is one of the distinguishing marks of the government of the day. For information on this particular form of interference, its prevalence, its

necessity, and its advisability, the student may confidently turn to the Britannica. The hygienic side of the question is outlined in the chapter of this Guide on *Health and Disease*. The social or sociological side claims our attention here. Read the article DRUNKENNESS (Vol. 8, p. 601), and for the relation between alcohol and mental disease, the section *Toxic Insanity* (Vol. 14, p. 609) in the article on INSANITY already mentioned, and also NEUROPATHOLOGY (Vol. 19, p. 429); then the article INEBRIETY, LAW OF (Vol. 14, p. 409); that on LIQUOR LAWS (Vol. 16, p. 759), with a special section referring to the United States, which deals with local prohibition, state prohibition, public dispensaries, and taxation; and for a general and elaborate summary of the whole question the article TEMPERANCE (Vol. 26, p. 578) equivalent to about 50 pages of this Guide, by Dr. Arthur Shadwell, author of *Drink, Temperance and Legislation*. In the section on the *Use and Abuse of Alcohol* Dr. Shadwell summarizes the results of modern scientific investigation of the abuse in its bearings upon crime, poverty, insanity, mortality, longevity, and heredity.

In such articles as those on THEOBALD MATHEW ("Father Mathew") (Vol. 17, p. 886), NEAL DOW (Vol. 8, p. 456), JOHN B. GOUGH (Vol. 12, p. 282), and FRANCES E. WILLARD (Vol. 28, p. 658) the reader will find biographies relating to the temperance movement; and in the separate articles on states there is information about state prohibition, local option, and the state dispensary system.

Heredity and Eugenics

Dr. Shadwell's remarks on the relation of alcoholism to heredity may remind us that the very

word “heredity” would seem strange to the typical man of a century ago, whose return to life we have imagined. We should be no more shocked by the occasional crudeness of his intimate and excited phraseology than he would be at our frankness in discussing even in mixed company such subjects as birth, reproduction, sexual morality, the social evil and the white slave trade. The growth of interest in these topics may be traced in part to Darwin, Huxley and Mendel, to what they did to make biology a science. Read in the Britannica the interesting story, in the article MENDELISM (Vol. 18, p. 115), of the investigations of Gregor Mendel, Abbot of Brünn, in his cloister garden, in crossing peas and classifying the inheritance of peculiarities. Then read the articles HEREDITY (Vol. 13, p. 530), by Prof. Chalmers Mitchell, and HYBRIDISM (Vol. 14, p. 26), by the same contributor, and turn to the articles EUGENICS (Vol. 9, p. 855) and SIR FRANCIS GALTON (Vol. 11, p. 427), for an account of the attempt to found a practical science to improve the breed of men.

Especially within the last few years has the public conscience been aroused on the white slave traffic and prostitution, both in Great Britain and the United States, and particularly in the great cities, where this form of vice, if left under the jurisdiction of the police, gives rise to a singularly dangerous form of corruption and to the general disrepute of the defenders of public safety. The many important aspects of the subject, which need not be rehearsed here, are to be found in Dr. Shadwell’s article PROSTITUTION (Vol. 22, p. 457) and Dr. Edmund Owen’s article VENEREAL DISEASES (Vol. 27, p. 983).

One of the remedies most commonly suggested for the evils of prostitution in general and of the white

slave trade in particular is a minimum wage. Dr. Shadwell's article on prostitution gives "excessively laborious and ill-paid work" as only one of many secondary causes for women's taking to a life of evil repute. Indolence, love of excitement, dislike of restraint, and abnormal sexual appetite, he counts as primary causes; and among secondary causes he names the difficulty of finding employment; harsh treatment at home, promiscuous living among the overcrowded poor; overcrowding in factories; the example of luxury, self-indulgence and loose manners set by the wealthy; demoralizing literature and amusements; and the arts of profligate men. But the subject of wages is an important one in itself, and as an introduction to the study of the labour question, it may well be taken up here, even if the efficacy of minimum-wage laws, or of any legislation, in producing a higher sexual morality has been exaggerated.

Wages and Labour

Read the article WAGES (Vol. 28, p. 229, equivalent to 20 pages of this Guide), by Joseph Shield Nicholson, professor of political economy at Edinburgh University. The difficulty of an exact definition, and, specifically, of one that distinguishes between "wages" and "profits," leads the author to adopt as the best the definition of Gen. Francis A. Walker, the American economist, "the reward of those who are employed in production with a view to the profit of their employers and are paid at stipulated rates." The distinction between a nominal and real wage is based on the difference between the money value and the purchasing value of the wage as affected by variation in the cost of living. Irregularity of employment and other elements of

uncertainty, such as liability to accident or to occupational diseases, are factors to be considered in estimating real wages. Professor Nicholson discusses the wage-fund theory, corrects it by Adam Smith's observation that wages are paid from the product of labour; and treats "relative" wages, the state-regulation of wages (which he does not consider feasible); poor relief in aid of wages; factory legislation; trade unions; the effects of machinery on wages; and the progress of the working-classes.

Labour Legislation

The subject of factory legislation brings us back to the general topic of "state interference with private matters" as the old school of political scientists would have called it. Two treatises in the Britannica are important for the study of this subject—the general article LABOUR LEGISLATION (Vol. 16, p. 7), equivalent to 70 pages of this Guide, by Adelaide Mary Anderson, principal lady inspector of factories to the British Home Office, and Carroll D. Wright, late U. S. Commissioner of Labor; and the article EMPLOYERS' LIABILITY AND WORKMEN'S COMPENSATION (Vol. 9, p. 356), which is of peculiar interest now that in the United States recent laws in regard to employers' liability and workmen's compensation have shown a change in legislative theory and practice. Statutes of this kind have been passed by the legislatures of several states where nothing of the sort would have been attempted a generation ago, although legislatures have always been readier than courts to approve radical laws, and have been far more readily influenced by popular sentiment. After their passage they have in some states been held unconstitutional, and in other states the highest court has recognized them as valid; the

decisions perhaps depending to some extent on the attitude of the court toward the opposed claims of capital and labour. Here as elsewhere the student should remember that much information of a local character is to be found in the articles on different states of the Union. The article LABOR DAY (Vol. 16, p. 6) describes an official recognition of the claims of labour in the United States.

Organized Labour

On labour organizations and their work see the articles: TRADE UNIONS (Vol. 27, p. 140), and particularly the section *Economic Effects of Trade Unionism*, and the section on trade unions in the United States, by Carroll D. Wright, late U. S. Commissioner of Labor, who deals with such topics as railway brotherhoods, national unions, the "International," Knights of Labor, American Railway Union, federations of labour, especially the American Federation of Labor, and estimated strength of trade unions. For the earlier history of trade unions or similar organizations see TRADE ORGANIZATION (Vol. 27, p. 135), GILDS (Vol. 12, p. 14), LIVERY COMPANIES (Vol. 16, p. 809), and APPRENTICESHIP (Vol. 2, p. 228).

STRIKES AND LOCK OUTS, particularly the sections *Economic Effects* (Vol. 25, p. 1028), *Important British Strikes and Lock Outs* (p. 1029), and on strikes in the United States (p. 1033),—the last by Dr. Carroll D. Wright, who describes, among others, the Homestead strike of 1892, the Pullman strike of 1894, the steel strike of 1901, and the coal strike of 1902. For these and other strikes see the local articles on such storm-centres as Homestead, Pullman, Leadville, Cripple Creek, Chicago.

See also BOYCOTT (Vol. 4, p. 353); and

INJUNCTION (Vol. 14, p. 570), and, for a "classic" use of the injunction against boycott, the article on WILLIAM HOWARD TAFT (Vol. 26, p. 354);

ARBITRATION AND CONCILIATION (Vol. 2, p. 331) for attempts by the state to regulate the relations of capital and labour at variance.

Related topics which have not been analyzed here will be found in the articles UNEMPLOYMENT (Vol. 27, p. 578), LABOUR EXCHANGE (Vol. 16, p. 7), and VAGRANCY (Vol. 27, p. 837).

Immigration

Closely connected with the American labour problems, since growing American industries demand a supply of workmen that cannot be filled by natural increase in the population, is the question of immigration. The article MIGRATION (Vol. 18, p. 427) is divided into two parts, the second dealing with migration in zoology. The first section, dealing with emigration and immigration and internal migration of populations, is for the most part by Richmond Mayo-Smith, late professor of political economy and social science in Columbia University, New York City. It is appropriate that the subject should be treated by an American and with special attention to the United States, since this country owes its origin to an immigration three centuries ago; as the presence of many recent immigrants puts a strain on our powers of assimilation and gives rise to other serious problems; and as internal migrations are markedly affecting social conditions. In a preliminary historical sketch the author deals with: prehistoric migrations in search of booty, through the desire of the stronger to take possession of the lands of the weaker, or by pressure of population on the food supply; Greek and Roman colonization; the

German conquest; minor migratory movements such as the introduction of Flemish weavers to England and the forced migration of the Huguenots from France; the great colonization period after the discovery of America; and modern migration—characterized by its magnitude, by the change of the emigrant's political allegiance, and by the circumstance that it is a movement of "individuals seeking their own good without state direction or aid." In a statistical discussion of immigration to the United States (Vol. 18, p. 430) there is much valuable information. "At first the Irish and Germans were most prominent. Of later years, the Italians, Czechs, Hungarians and Russians were numerously represented." Immigration to other countries, especially Canada and South America; the balance of migration and temporary emigration; and the effects of migration on the country "from which" and the country "to which"—are topics considered in the article, which also discusses the restriction of immigration. As to Asiatic immigration see CALIFORNIA (especially p. 20, Vol. 5), SAN FRANCISCO (p. 148, Vol. 24), and COOLIE (Vol. 7, p. 77). See also the article UNITED STATES, section *Population and Social Conditions* (p. 634, Vol. 27), and, in separate articles on states and larger cities of the United States, the analysis of foreign-born population, that of foreign parentage, etc. For instance, in the article MASSACHUSETTS (Vol. 17, p. 854), there is a most interesting account of the varying sources of immigration and of the replacing of Irish labour by Canadians and Italians. Boston is the second immigrant port of the country. A large part of the transatlantic immigrants pass speedily to permanent homes in the West, but by far the greater part of the Canadian influx remains there.

The article on NEW YORK CITY (p. 617 of Vol. 19) remarks that

> there are in New York City more Germans than in any city of Germany, save Berlin, and more Irish than in Dublin. There are many well-defined foreign communities in the city, such as "Little Italy" about Mulberry Street, "Chinatown" on Mott, Pell and Doyers Streets, the Hebrew quarter on the upper Bowery and east of it, a "German Colony" east of Second Avenue below Fourteenth Street, French quarters south of Washington Square about Bleecker Street and on the West Side between Twentieth and Thirty-fourth Streets; a Russian quarter near East Broadway, a "Greek Colony" about Sixth Avenue in the 40's, and negro quarters on Thompson Street and on the West Side in the 50's, and there are equally well-defined Armenian and Arab quarters.

Chicago, as the article on that city shows, is the second largest Bohemian city in the world, the third Swedish, the fourth Norwegian, the fifth Polish and the fifth German.

Negro Problem

The Southern states of the Union, though they have much less immigration than the North or West, have a population problem that is even more difficult in some respects—that of the negro. Many immigrant elements are readily "amalgamated" or assimilated into the native local population—by marriage, by trade, and indeed even by physical environment. It seems certain, for instance, that the physical type of the children of Italian or Hebrew immigrants in New York City is different from that of their parents and more like a local type, even in such respects as the shape and contour of the head and its ratio of length to breadth. But the negro does not assimilate physically or, to any considerable degree, mentally; and the communities in America in which he is most

plentiful are so far from eager to assimilate him that they socially and politically isolate him. The reader should go to the article NEGRO (Vol. 19, p. 344), in which there is a general study of the race by T. Athol Joyce, assistant in the Department of Ethnography, British Museum, and a section on *Negroes in the United States* by Dr. Walter Francis Willcox, late chief statistician U. S. Census Bureau and professor of social science and statistics, Cornell University. The magnitude of the negro problem may be deduced from Professor Willcox's remark that the present number of negroes in the United States "is greater than the total population of the United States was in 1820, and nearly as great as the population of Norway, Sweden and Denmark." Birth and mortality statistics in regard to negroes show that they are increasing much less rapidly than whites; but it must be remembered that there is an absolute increase, that there is no prospect of the negro problem being solved by the dying out of the race, and that even the fact that negroes constitute a smaller proportion of the population than formerly does not greatly affect the problem. There is also much relevant information of value in the articles on the Southern states, particularly in the sections on population, education and government; and as to education see the articles TUSKEGEE (Vol. 27, p. 487), BOOKER T. WASHINGTON (Vol. 28, p. 344) and S. C. ARMSTRONG (Vol. 2, p. 591). See also the article LYNCH LAW (Vol. 17, p. 169) by Prof. W. L. Fleming of the Louisiana State University.

Trusts

There is a very close relation between the economic problems connected with labour and those which have to do with capital and especially with

capital in its organized and monopolistic forms. A monopoly of the supply, sale, or manufacture of any class of goods was, especially in England under the Tudors and Stuarts, a crown grant; and the theory of patent and copyright law is based on such grants, as is shown in the articles MONOPOLY (Vol. 18, p. 733), LETTERS PATENT (Vol. 16, p. 501), and PATENTS (Vol. 20, p. 903). On the modern monopoly which, far from being cherished by government, is constantly being regulated, checked or "crushed," see the article TRUSTS (Vol. 22, p. 334) by Prof. J. W. Jenks, formerly of Cornell and now of New York University, whose treatment is from the American point of view—the problem is peculiarly an American one—but with sections on European experience, including paragraphs on Great Britain, Germany, France and Austria.

Among the questions answered by this article—questions that are continually presenting themselves to the mind of every intelligent citizen, but that are seldom lucidly answered even by the most intelligent—are:

What are trusts? Why are they formed?

Why were they not formed before the latter years of the 19th century?

Why can combination be successfully applied in some industries and not in others? Why do some industries thrive better under competition than under combination? Why are some combinations bound to fail?

In what respect has the trust advantages over the individual competitor?

How do trusts benefit by protective tariffs and by discrimination in rates of transportation?

What has been the history of trusts in Europe?

The question of most interest to the ordinary person is: Do trusts raise prices? To this the Encyclopaedia Britannica answers: "Experience seems to show, beyond question, that whenever the combinations are powerful

enough to secure a monopolistic control it has usually been the policy to increase the prices above those which obtained during the period of competition preceding the formation of the combination." Besides this increased price, the evils of combinations are: loss to investors through promotion and speculation by directors; loss to wage-earners, corruption of legislatures, and the suppression of independent activity.

The most obvious remedies are "more rigid laws with reference to the methods of incorporation and to the responsibility of directors to stockholders and to the public," greater publicity and closer government inspection, and the abolition of special favours granted by government and shipping companies.

Government Control

For American legislation in regard to trusts see the article INTERSTATE COMMERCE (Vol. 14, p. 711), equivalent to 10 pages of this Guide, by Prof. Frank A. Fetter, formerly of Cornell and now of Princeton University. This article shows the constitutional basis for action by the Federal government and the power given to Congress to regulate commerce among the several states; and it describes the Interstate Commerce Act of 1887, amended in 1903 by the Elkins Act, and the Sherman Anti-Trust Act of 1890. See also in the article UNITED STATES, the section *History*, §§ 353, 357, 396 (pp. 725, 726, 733 of Vol. 27).

But although there have been great changes in the relation of government to the individual in his private and business life, the extent of practical government control is still much less than many theorists would like to see. It is true that in many countries of Europe railways are owned and operated

by the state—see p. 826 of Vol. 22, in the article RAILWAYS. See also the article NEW ZEALAND and the summary of conditions there (p. 307, Vol. 25), in part as follows:

> The government owns not only the railways, but two-thirds of the whole land, letting it on long leases. It sets a limit to large estates. It levies a progressive income-tax and land tax. It has a labour department, strict factory acts and a law of compulsory arbitration in labour disputes (1895). There are old-age pensions (1898), government insurance of life (1871) and against fire (1905). Women have the suffrage, and, partly in consequence, the restriction of the liquor traffic is severe. There is a protective tariff, and Oriental labour is excluded. The success of the experiment is not yet beyond doubt; compulsory arbitration, for example, did not work with perfect smoothness, and was amended in 1908.... It is fair to add that the experiment is probably on too small a scale to show what might happen in larger countries. New Zealand has only 100,000 sq. m. of territory and about one million of inhabitants, mainly rural and of picked quality. The conditions of combined isolation and security are not easily obtained elsewhere. The action of the state has been in the great majority of instances rather regulative than constructive.

Socialism, etc.

But in general governments have extended their control more or less along the conventional lines of law and legislative theory, and have not undertaken ownership and operation—even in New Zealand, as we have just seen, public action being "rather regulative than constructive." See the general article SOCIALISM (Vol. 25, p. 310) and biographies of those connected with the Socialist movement, such as Marx, Lassalle, Robert Owen, Rodbertus, Bebel, Liebknecht, Jaures, Ballance, William Morris, Edward Bellamy, and Henry George. On communism,

see the article on that subject, the biographies of Owen, Saint-Simon, Fourier, Cabet, etc., and descriptions of the more important American communistic experiments in the articles on Brook Farm, Shakers, Amana, Nauvoo, Harmony, Oneida Community, Hopedale, etc. For communism merely as a business scheme see the article CO-OPERATION (Vol. 7, p. 82) and the biographies of Raiffeisen and Schulze-Delitzsch.

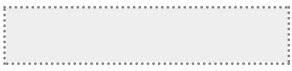
Finance

We have now run through the more strikingly novel public questions of the day, and we come next to questions which have been long discussed and longer recognized as being within the sphere of government. The one of these that is most intimately connected with the economic problems we have just been discussing is the subject of public finance and revenue. On this read the articles FINANCE (Vol. 10, p. 374), TAXATION (Vol. 26, p. 458), and NATIONAL DEBT (Vol. 19, p. 266); and, on American public finance, see Vol. 27, p. 654; on Congressional legislation and finance, p. 661 of the same volume; for a general and statistical treatment of American finance, the sections headed *Finance* in each article dealing with a state of the Union, the articles GOLD (Vol. 12, p. 192), SILVER (Vol. 25, p. 112), and BIMETALLISM (Vol. 3, p. 946), and the biographies of ROBERT MORRIS (Vol. 18, p. 871), ALEXANDER HAMILTON (Vol. 12, p. 880), and JAY COOKE (Vol. 7, p. 73).

Tariff

Of perennial interest in the field of public finance is the question of tariff reform. This is true both in the United States and in the United Kingdom, but strangely enough “tariff reform” is used with

absolutely opposite meanings in the two countries. Tariff reform in England is linked with Imperialism and means the introduction of higher tariffs for protection of colonial as well as British industries. In the United States the typical tariff reformer is usually an opponent of Imperialism (which, of course, does not mean the same thing in the two countries), and tariff reform here involves lowering duties, doing away with protection, and, in short, adopting approximately the very system now in vogue in the United Kingdom, and the very system that the followers of Joseph Chamberlain wish to replace with something not entirely unlike the American protective system as it has been since the Civil War. On this subject see the article TARIFF (Vol. 26, p. 422), by the American economist, F. W. Taussig, professor at Harvard, the articles PROTECTION (Vol. 22, p. 464), by E. J. James, president of the University of Illinois, and author of the *History of American Tariff Legislation*, and FREE TRADE (Vol. 11, p. 88), by the Venerable Dr. William Cunningham, Archdeacon of Ely, and author of *The Growth of English Industry and Commerce*; the biographies of ALEXANDER HAMILTON (Vol. 12, p. 880), and HENRY CLAY (Vol. 6, p. 470), for the foundation of American protection; and the articles on H. C. CAREY (Vol. 5, p. 329), FRIEDRICH LIST (Vol. 16, p. 776), and WILLIAM MCKINLEY (Vol. 17, p. 256) for the principal exponents, theoretical and practical, outside of Great Britain, of protection; the lives of RICHARD COBDEN (Vol. 6, p. 607) and JOHN BRIGHT (Vol. 4, p. 567) and the article CORN-LAWS (Vol. 7, p. 174) for the genesis of free trade in Great Britain; and the article on JOSEPH CHAMBERLAIN (in particular pp. 816–817 of Vol. 5) for English tariff reform in politics.



Banking Laws

Another topic in public finance of great interest at the present moment is the banking laws,—the interference of government with banking and similar business. Local regulations in regard to banking will be found in sections on legislation and finance in articles on each of the states of the Union. The article OKLAHOMA (Vol. 20, p. 57), for example, contains the following summary of the first radical state enactment—constitutional in this case,—providing bank guarantees:

> The unique feature of the banking system (with amendments adopted by the second legislature becoming effective on the 11th of June, 1909) is a fund for the guaranty of deposits. The state banking board levies against the capital stock of each state bank and trust company, organized or existing, under the laws of the state to create a fund equal to 5% of average daily deposits other than the deposits of state funds properly secured. One-fifth of this fund is payable the first year and one-twentieth each year thereafter; 1% of the increase in average deposits is collected each year. Emergency assessments, not to exceed 2%, may be made whenever necessary to pay in full the depositors in an insolvent bank; if the guaranty fund is impaired to such a degree that it is not made up by the 2% emergency assessment, the state banking board issues certificates of indebtedness which draw 6% interest and which are paid out of the assessment. Any national bank may secure its depositors in this manner if it so desires. The bank guarantee law was held to be valid by the United States Supreme Court in 1908, after the attorney-general of the United States had decided that it was illegal.

More general treatment is to be found in the articles BANKS AND BANKING (Vol. 3, p. 334), SAVINGS BANKS (Vol. 24, p. 243) and TRUST COMPANY (Vol. 27, p. 329); and see further the articles listed in the chapter in this Guide *For Bankers*

and Financiers.

Insurance

Another sphere of private finance over which government restriction and regulation has been greatly extended during the last few years, is insurance. The entire subject of insurance is, moreover, of interest not merely to the citizen as a member of the body politic but to the individual as the head of a family and as an investor for his own protection in old age. To every one, therefore, the article INSURANCE (Vol. 14, p. 656) will be of the utmost value, by reason of its rare combination of interest and authority. For a full analysis of this article and of related topics see the chapter in this Guide *For the Insurance Man*.

Legislation and Courts

Much of the earlier part of the present chapter has been devoted to the rapid extension of governmental control, regulation and supervision through legislation. Interesting and novel though this is, it is far less important for an intelligent comprehension of government than is a careful study of the foundations and principles of legislation. Only the specialist will wish to pursue a complete course in political science, but every well-informed citizen of the United States should study the general powers and functions of national and state legislatures and courts. This material is given briefly, lucidly and critically by the Hon. James Bryce, late British Ambassador to the United States, former President of the British Board of Trade, and author of *The American Commonwealth*, in the section *Constitution and Government*, article UNITED STATES (Vol. 27, pp. 646–658). Part of this section deals with the

governments of the states, as to which there is also special information in the section on government of the article on each state. Regarding city governments similar sections will be found in the articles on the larger cities. For a full analysis and a list of articles see the chapter *For Lawyers* in this Guide. Constitutional restrictions of all delegated powers must be continually kept in mind in the study of the action of legislatures and courts, and of the questions that arise in regard to legislation or to court decisions. Although the legislature represents the people more or less directly—the lower house being commonly called the House of Representatives—and so has delegated to it from the people the power of making laws, still, in the Federal and state constitutions (except those of a very recent date) there is a system of checks on every delegated power. The result is that an act passed by Congress does not become law without the approval of the president, nor, in most states, a local statute without that of the governor, and—more important—is not a valid law if the highest Federal Court (or, if it be a state enactment, the highest state court) holds it contrary to the terms of the constitution. **The System of Checks** For a summary of the historical arguments for this system of checks see the section on the Constitution (Vol. 27, p. 686), in the article UNITED STATES and such biographical articles as JAMES MADISON (Vol. 17, p. 284); ALEXANDER HAMILTON (Vol. 12, p. 880), and GOUVERNEUR MORRIS (Vol. 18, p. 869). The working of this system in nation and state has been greatly affected by the distinction between the legislators' mandate and that of the judge. Legislators have shorter terms of service than judges, and especially judges of the higher courts, and so may be said to be in much closer and

more constant contact with the people; and the legislator is bound by what he thinks the people need and want,—something that is continually changing. On the other hand, the judge is bound by the written law, unchanged and unchangeable except by constitutional amendments or slightly varying interpretation of the constitution. The result has been dissatisfaction with the courts and with legislatures. The definite expression of this dissatisfaction is in constitutional amendments or in new constitutions, adopted in order that future action of the courts may more nearly accord with the present sentiment of the people. The story of the constitution of each state in the Union is told, with a summary of important constitutional changes, in the section on government of each article on a separate state. In his analysis of the state constitutions, Mr. Bryce says (Vol. 27, p. 647):

Initiative, Referendum and Recall

> Comparing the old constitutions with the new ones, it may be said that the note of those enacted in the first thirty or forty years of the republic was their jealousy of executive power and their careful safeguarding of the rights of the citizen; that of the second period, from 1820 to the Civil War (1861–65), the democratization of the suffrage of institutions generally; that of the third period (since the war to the present day), a disposition to limit the powers and check the action of the legislature, and to commit power to the hands of the whole people voting at the polls.

And at the close of his treatment of local government in the United States, the same authority writes (Vol. 27, p. 651):

> Several state constitutions now contain provisions

enabling a prescribed number (or proportion) of the voters in a state or city to submit a proposition to all the registered voters of the state (or city) for their approval. If carried, it takes effect as a law. This is the Initiative. These constitutions also allow a prescribed number of voters to demand that a law passed by the state legislature, or an ordinance passed by the municipal authority, be submitted to all the voters for their approval. If rejected by them, it falls to the ground. This is the Referendum. Some cities also provide in their charters that an official, including the mayor or a member of the council, may be displaced from office if, at a special election held on the demand of a prescribed number of the city voters, he does not receive the largest number of votes cast. This is the Recall. All these three institutions are in operation in some Western states and are spreading to some of the Eastern cities. Their working is observed with lively interest, for they carry the principle of direct popular sovereignty to lengths unprecedented except in Switzerland. But it is not merely to the faith of the Western Americans in the people that their introduction is due. Quite as much must be ascribed to the want of faith in the legislature of states and cities, which are deemed too liable to be influenced by selfish corporations.

In connection with the above reference to the referendum and initiative in Switzerland, see the description of the Swiss system of continuous control by the electors (Vol. 26, p. 243).

On previous experience, outside the United States, with the referendum and the initiative, see the article REFERENDUM (Vol. 23, p. 1), by the Rev. Dr. W. A. B. Coolidge, an American whose life has been chiefly spent in, and devoted to the study of, Switzerland, where the system was evolved. In the United States the system was first tried in Oregon, and the student should read the description in the article OREGON of the legislative department (Vol. 20, p. 246), which

also deals with the recall of officers. See also under OKLAHOMA (Vol. 20, p. 59), and the articles on SOUTH DAKOTA and LOS ANGELES.

Suffrage

On suffrage in the United States see p. 647 of Vol. 27, describing the requirements in different states and pointing out that "by the Federal Constitution state suffrage is also the suffrage for Federal elections, viz. elections of representatives in Congress and of presidential electors." On representation see the passage on p. 653 of Vol. 27, a portion of which has been quoted above; and on representation in state legislatures see p. 647 of Vol. 27 and consult the articles on the separate states, where in the sections headed *Government* there is also supplementary information about election and ballot laws. It is interesting to note, in the articles on Mississippi, Virginia, North Carolina, South Carolina, Georgia, Alabama, Louisiana and Oklahoma, that these states have practically disfranchised the negro. For a concrete instance of the awkward working of the electoral college, in the choice of the president in 1876, see the article ELECTORAL COMMISSION (Vol. 9, p. 172). On the position of aliens see the articles ALLEGIANCE (Vol. 1, p. 689) and NATURALIZATION (Vol. 19, p. 275); and articles on various states. In the article OREGON, for instance (Vol. 20, p. 245), the reader will find that "the constitution provides that no Chinaman, not a resident of the state at the time of the adoption of the constitution, shall ever hold any real estate or mining claim, or work any mining claim in the state."

See also, on the whole subject, the articles BALLOT (Vol. 3, p. 279); VOTE (Vol. 28, p. 216); VOTING MACHINES (Vol. 28, p. 217); ELECTION (Vol. 9, p.

169); REPRESENTATION (Vol. 23, especially pp. 112–116, for proportional voting, second choice voting, etc.), and WOMEN (Vol. 28, p. 782) for the history of the woman's suffrage movement. In that connection it is curious to note in this article (p. 787) that, owing to an oversight in the wording of the first constitution of New Jersey, women could vote in that state from 1776 to 1807. For any thorough knowledge of practical, as contrasted with theoretical representative government in the United States, the student should read what Mr. Bryce has to say about *Party Government* (Vol. 27, p. 658–660); a large part of the article on the history of the United States after the adoption of the Constitution (Vol. 27, pp. 688–735); articles on the great parties, FEDERALIST (Vol. 10, p. 235), DEMOCRATIC (Vol. 8, p. 2), and REPUBLICAN (Vol. 23, p. 177); and the lives of the great party leaders from Hamilton and Jefferson to McKinley, Roosevelt, Bryan and Woodrow Wilson. A fuller outline for the study of United States history will be found in another chapter of this Guide, on *History of the United States*.

Municipal Government

But the Federal government and even the state governments do not touch any one of us so closely as does the local government of our city and township; and Mr. Bryce gives (Vol. 27, p. 650) a valuable criticism of the American system of local government,—which, in some cities, indeed, seems a lack of system in the business sense of that word, and a control of the government by political parties prone to corruption, bribery and the granting of special privilege. Mr. Bryce dwells on the over-developed power of the state in legislating for the

cities or other minor governmental units, and the consequent activity of local city interests in state and national politics, but he also points to the growing tendency of the states to permit cities to enact their own charters. The movement to take the city government out of politics has reached its greatest force—and its greatest success—in government by commission.

In 1902 the city of Galveston, in Texas, adopted a new form of municipal government by vesting all powers in a commission of five persons, elected by the citizens on a "general ticket," one of whom is mayor and head of the commission, while each of the others has charge of a department of municipal administration. A similar plan, differing in some details, was subsequently introduced in the city of Des Moines, in Iowa; and the success which has attended this new departure in both cities has led to its adoption in many others, especially, but not exclusively, in the Western states.

For a fuller account see the articles on GALVESTON and DES MOINES, where, as in other articles on towns and cities, there is a summary of their government and particularly of the distinctive features of local administration.

International Relations

What we have said, up to this point, has all dealt with our country as a self-contained unit—except that we have touched on tariffs and on immigration and on the treatment of aliens. In the article ALIEN (Vol. 1, p. 662) the reader will find the sentence: "In the United States the separate state laws largely determine the status of an alien, but subject to Federal treaties." And Mr. Bryce (Vol. 27, p. 652) characterizes some of the powers allotted to the national government "which relate to its action in

the international sphere." See particularly Mr. Bryce's remarks (Vol. 27, p. 656) on the powers of the president:

> In time of war or of public disturbance, however, the domestic authority of the president expands rapidly. This was markedly the case during the Civil War. As commander-in-chief of the army and navy, and as 'charged with the faithful execution of all laws,' he is likely to assume, and would indeed be expected to assume, all the powers which the emergency requires. In ordinary times the president may be almost compared to the managing clerk in a large business establishment, whose chief function is to select his subordinates, the policy of the concern being in the hands of the board of directors. But when foreign affairs reach a critical stage, or when disorders within the Union require Federal intervention, immense responsibility is then thrown on one who is both commander-in-chief of the army and the head of the civil executive. In no European country is there any personage to whom the president can be said to correspond. He may have to exert more authority, even if he enjoys less dignity, than a European king. He has powers which are in ordinary times narrower than those of a European prime minister; but these powers are more secure, for instead of depending on the pleasure of a parliamentary majority, they run on to the end of his term.

In this connection you should read the articles INTERNATIONAL LAW and INTERNATIONAL LAW (PRIVATE), TREATIES, PEACE, PEACE CONFERENCES, PAN-AMERICAN CONFERENCES and ARBITRATION, INTERNATIONAL; the last showing plainly how large a part the United States has played in promoting better international feeling throughout the world.

> Such articles as these tell how peace has changed from a purely negative condition to a positive subject of international regulation and an object of active political effort. They answer the following concrete questions on the subject:

What was the earliest plan of peace known to history? What were the Pax Romana, the "Truce of God," the "Grand Design" of Henry IV, and other schemes for the preservation of peace?

What was the greatest deliberate effort ever made to secure the peace of the world?

What has been done by the two Hague Conferences, and when will the next one be held?

How far can disarmament be carried out?

What standing-peace agreements have been executed?

What is the history of popular effort for international peace, and what peace societies exist to-day?

What are the present recognized limitations of international arbitration?

What are the first steps toward an era of universal peace?

What has been accomplished by the Pan-American Conferences?

International Affairs

On international affairs of to-day in which the United States has a special interest there is a wealth of information in the Britannica. The first topic that will naturally present itself to the mind of the reader is the Panama canal. On this see the article PANAMA CANAL (Vol. 20, p. 666), with a large-scale map, a history of the project and a description of the engineering features; and on the politics, national and international, of the question of building the canal, the articles COLOMBIA, PANAMA, ROOSEVELT, UNITED STATES, *History* (Vol. 27, pp. 730 and 732), JOHN HAY, and PAUNCEFOTE.

Our relations with Colombia in connection with the canal will naturally lead the student to a general consideration of the relation of the United States with the Latin-American countries. Here the most

interesting factor is the Monroe Doctrine, which has been characterized "as one of the things that every one knows about but that few can explain." Read the article MONROE DOCTRINE (Vol. 18, p. 738), by Dr. T. S. Woolsey, Professor of international law, Yale University; the article JAMES MONROE (Vol. 18, p. 736), and, in the article UNITED STATES, *History* § 156 (Vol. 27, p. 695).

A second topic in the story of Latin-America and the United States is Cuba; and this part of the story has probably never been told as accurately and interestingly as in the articles CUBA (Vol. 7, p. 594), and HAVANA (Vol. 13, p. 76) in the Britannica, both by Dr. F. S. Philbrick.

American relations with the Orient is a third subject of importance in the foreign affairs of the United States; and in this subject the most interesting topic is Chinese and Japanese exclusion. On this see the articles CALIFORNIA, SAN FRANCISCO, COOLIE, and UNITED STATES, *History* § 339 (Vol. 27, p. 723). At the end of the article JAPAN (Vol. 15, p. 156) there is a section on *The Claims of Japan*, by Baron Dairoku Kikuchi, which is of great interest in this connection.

Sea-Power

The place of the United States as a world power, we are proud to say, depends little on its army or navy—because of its enormous latent strength, its commanding geographical position, etc. But the comparatively greater importance of navy over army is now admitted by nearly every serious thinker—it was the concrete lesson of the Spanish-American War of 1898 as it was the point of the valuable historical essays on sea-power written before and since that war by the American naval officer, Rear-Admiral A.

T. Mahan. The American navy and the navies of the world are matters of interest to every one—and like all matters of importance they are to be found treated in the Britannica.

In general see the elaborate articles NAVY (Vol. 19, p. 299); SEA-POWER (Vol. 25, p. 548); and SEA, COMMAND OF THE (Vol. 24, p. 529); and for a detailed course of reading on naval history and theory see the chapter in this Guide *For Naval Officers*.

The Greater United States

The topics just discussed will serve as an introduction to the study of the Imperial United States, which may be pursued in the articles ALASKA, HAWAII, PHILIPPINE ISLANDS, PORTO RICO, GUAM and CUBA, and the articles on the towns and cities in the outlying possessions.

The result of reading these articles will be a determination to know *more* about your country, to master its history, its industries and its commerce as well as its political conditions.

Part V
Readings for Women

CHAPTER LXV
FOR WOMEN

It would be absurd, in the full stream of the 20th century, to imagine that any of the articles in the new edition of the Encyclopaedia Britannica can be either beyond the comprehension of women or unlikely to interest women. And since any method of selection is also a method of elimination, it may be illogical to suggest that any one class of articles especially merits their attention. But the difficulty is purely formal. For perhaps the greatest victory of the feminist movement lies in the demonstrated proposition that women can, in one field after another, establish their equality with men, without losing any of their superiority in the exercise of those arts to which they were formerly restricted. And this chapter, therefore, after describing the articles which relate to the present political and economic position of women, naturally turns to subjects such as domestic science and the adornment of the home,

which in all ages and all countries have been considered to be the special province of women.

Women Contributors

If the question of women's ability to do a full share of the world's work any longer admitted of argument, there would be no more vivid way of coming to an appreciation of the versatility and range as well as the high quality of women's intellectual capacity than by looking at the contributions by women to the Britannica itself. First in mass, and first in practical value as because it vastly increases the usefulness of the entire book, is the Index volume with its 975 pages, its 500,000 index entries, its classified list of articles covering nearly 70 pages and its list of contributors and their principal signed articles. This volume was the work of a large and carefully organized staff under the supervision of Miss Janet Hogarth (now Mrs. W. L. Courtney). The following is a partial alphabetical list of women contributors to the Britannica with the more important articles they wrote:

Contributors	*Articles*
Adelaide Mary Anderson (Principal Lady Inspector of Factories, British Home Office).	LABOUR LEGISLATION (in part).
Gertrude Atherton (Author of *Rezánov, The Tower of Ivory*, etc.).	REZÁNOV.
Mary Bateson (Late Fellow of Newnham College, Cambridge; Author of *Borough Customs,* etc.).	BOROUGH ENGLISH.

Gertrude Bell (Author of *The Desert and the Sown*).	DRUSES (in part).
Isabella Bird Bishop (Author of *Korea and her Neighbours*, etc.).	KOREA (in part).
Lady Broome (Author of *Station Life in New Zealand*).	WESTERN AUSTRALIA, *History*.
Margaret Bryant	ALEXANDER THE GREAT, *Legends*; CAESAR, *Medieval Legends*; CHARLEMAGNE, *Legends*; VIRGIL, *the Virgil Legend*; etc.
Agnes Muriel Clay (Joint Editor of *Sources of Roman History*).	AGRARIAN LAWS (in part); CENTUMVIRI; CURIA; DECURIO; MUNICIPIUM; PATRON AND CLIENT (in part); SENATE.
Agnes M. Clerke (Hon. Member Royal Astronomical Society, Author of *History of Astronomy*, etc.).	ASTRONOMY, *History*; BRAHE, TYCHO; COPERNICUS; FLAMSTEED; HALLEY; HUYGENS; KEPLER; ZODIAC; etc.
Mrs. Craigie ("John Oliver Hobbes") (Author of *The School for Saints*, etc.).	GEORGE ELIOT.
Lady Dilke (Author of *French Painters*, etc.).	GREUZE; INGRES; MILLET, J. F.
Mme. Duclaux (Author of *Life of Renan*, etc.).	RENAN.
Lady Eastlake (Author of *Five Great Painters*, etc.).	GIBSON, JOHN.

Lady Gomme (Author of *Traditional Games of Great Britain*, etc.).	CHILDREN'S GAMES.
Dr. Harriet L. Hennessy, L.R.C.S.I.	GYNAECOLOGY; INFANCY; INTESTINAL OBSTRUCTION; MEDICAL EDUCATION, *U. S. A.* (in part); RESPIRATORY SYSTEM, *Pathology* (in part); TUBERCULOSIS, etc.
Lady Huggins (Author, with Sir William Huggins, of *Atlas of Representative Stellar Spectra*, etc.).	ARMILLA; ASTROLABE.
Lady Lugard (Author of *A Tropical Dependency*, etc.).	BRITISH EMPIRE; BAUCHI; BORNU; KANO; KATAGUM; NASSARAWA; NIGERIA; RHODES, CECIL; SOKOTO; ZARIA.
Kate A. Meakin	MOROCCO (in part); TETUAN; SUS.
Alice Meynell (Author of *The Rhythm of Life*, etc.).	BROWNING, ELIZABETH BARRETT.
Hilda M. R. Murray (Lecturer on English, Royal Holloway College).	ENGLISH LANGUAGE (in part).
Mrs. H. O. O'Neill (Formerly Fellow of Manchester University).	PECKHAM, JOHN; PREBENDARY; PRELATE; PRIOR; PROCURATOR; VICAR.
Dr. Anna C. Paues (Author of *A Fourteenth Century Biblical Version*, etc.).	ENGLISH BIBLE (in part).

Mrs. W. Alison Phillips (Associate of Bedford College, London).	LOUIS XVIII; MARIE ANTOINETTE, etc.
Bertha S. Phillpotts (Formerly Librarian of Girton College, Cambridge).	GERMANY, *Archaeology*; NORWAY, *Early History*; SCANDINAVIAN CIVILIZATION.
Kathleen Schlesinger (Author of *The Instruments of the Orchestra*, etc.).	BAGPIPE; BUGLE; DRUM; HARP; HORN; ORGAN, *Ancient History*; PIANOFORTE (in part); SPINET; TIMBREL; VIOL; etc.
Mrs. Henry Sidgwick (Hon. Secretary to the Society for Psychical Research, late Principal of Newnham College).	SPIRITUALISM.
Mrs. Alec. Tweedie (Author of *Porfirio Diaz*).	DIAZ, PORFIRIO.
Mme. Villari (English translator of works of Prof. Villari).	SAVONAROLA.
Mrs. Humphry Ward (Author of *Robert Elsmere*, etc.).	LYLY.
Lady Welby (Author of *What is Meaning?* etc.).	SIGNIFICS.

Jessie L. Weston (Author of *Arthurian Romances*, etc.).	KING ARTHUR; ARTHURIAN LEGEND; THE HOLY GRAIL; GUENEVERE; LANCELOT; MALORY, SIR THOMAS; MAP, WALTER; MERLIN; PERCEVAL; THE ROUND TABLE; TRISTAN; ESCHENBACH, WOLFRAM VON.
Alice Zimmern (Author of *The Renaissance of Girls' Education*, etc.).	MARY CARPENTER.

This remarkable list shows that women have contributed to the Britannica on subjects so varied as astronomy, medieval literature, medicine, sociology, linguistics, literary biography, art criticism, law and politics, political science and sociology, musical instruments, education, the Bible and ecclesiastical history, and philosophy.

Woman's Advance

It may be noted as indicating the advance of women during the last century and a half that in the first edition of the Encyclopaedia Britannica, which was published in 1771, the article on women consisted of the following eight words "WOMAN,—the female of man—see HOMO." In the present 11th edition, published nearly a century and a half later, one single article entitled WOMEN in volume 28, beginning on page 782, is equivalent in its contents to 22 pages of this Guide.

What woman has accomplished in scholarship, literature, art and science has been done very largely in the last hundred years. In authorship and, to a

greater degree, on the stage her activity dates back a little further. In Shakespeare's time all women's parts on the stage were taken by boys. In fact as the Britannica tells us (Vol. 8, p. 521) in the days of Queen Elizabeth and Shakespeare "No woman might appear at a playhouse, unless masked."

It is only in comparatively recent times that the real "emancipation" of woman began; and this explains why the list of women famous in history is so much longer than any of the other lists given in this part of the Guide. Through earlier periods women attained power only by birth, by marriage, or by being "queens uncrowned," but none the less powerful on that account, like Aspasia, Nell Gwyn, Jane Shore and the Pompadour.

There can be no question that during most of the world's history, woman's only place was in the home. And it is certain that no matter how far her emancipation may be carried the home will be *a* sphere for her. Her relation to her husband and her children, her right to a share of his property and of theirs—and to her own—as now more liberally granted and interpreted by law, are outlined in the Britannica. The status of women in early times is described in the article in the Britannica on women. It is, with variations in different places, everywhere a story of dependence. Even in Roman law a woman was completely dependent. If married she and her property passed into the power of her husband; if unmarried she was (unless a vestal virgin) under the perpetual tutelage of her father during his life, and after his death of her agnates, that is, of those of kinsmen by blood or adoption who would have been under the power of the common ancestor had he lived. Under English civil law a girl can contract a valid marriage at 12, a boy at 14. Under the common

law “the father was entitled as against the mother to the custody of a legitimate child up to the age of sixteen, and could only forfeit such right by misconduct.” But the Court of Chancery sometimes “took a less rigid view of the paternal rights and looked more to the interest of the child, and consequently in some cases to the extension of the mother’s right at common law. Legislation has tended in the same direction.” In England women are still under two remarkable disabilities: “the exclusion of female heirs from intestate succession unless in the absence of a male heir; and the fact that a husband could obtain a divorce for the adultery of his wife, while a wife could only obtain it for her husband’s adultery if coupled with some other cause, such as cruelty or desertion.”

The Legal Status of American Women

In the United States the legal and political status of woman varies largely with the laws of the different states. For example, as is well known, in certain states women have the same right as men to the ballot. Wyoming (1869) and Colorado (1893) were the first women’s suffrage states. In more than half the states, roughly everywhere except in the South and a few eastern states, she has the right to vote for the members of school boards and has a general school suffrage. In Louisiana since 1898 women taxpayers may vote on questions of tax levies. As regards property rights, in the state of New York, a woman in possession of property, who marries, has the unqualified use, irrespective of the wishes of her husband, of her property. That is, she owns and can spend as she pleases the whole of the income of her

property, while, on the other hand, her husband is compelled by law to give her a certain proportion of his income. In other states, Mississippi, notably, the laws as regard property of married women are precisely the same as that for married men. If the husband is compelled to give a certain proportion of his income to his wife, she is compelled to give the same proportion of her income to him. This is true in several states, Michigan, for example, except that married women cannot usually convey property without the husband's permission. In the state of New York a married woman making her will has a right to dispose of her property as she pleases; whereas in other states, Missouri for instance, the law prescribes that at least one-half shall go to her husband, if there are no children. In other words, in no two states of the Union is the legal and political status of woman the same. It is often important, and in these days always a matter of interest, for a woman to know just what her legal position is in the state in which she lives. This information the Britannica gives.

What a mother can do for her children she may learn from the Britannica articles indicated in the chapters of this Guide *For Children* and in the chapter *For Teachers*. Similarly she will find assistance in choosing, building or furnishing a house from the chapters *For Builders and Architects*, *For Designers*, *For Manufacturers of Furniture*, etc.

Such articles as LACE, EMBROIDERY, CARPETS, TAPESTRY, FURNITURE, PAINTING, SCULPTURE, JEWELRY, PLATE, particularly as they are all remarkably well illustrated, will be of great value either for the general formation of taste or for giving definite information about a particular style. For the adornment of "the House Beautiful" the Britannica is,

however, valuable not merely because of the information it contains. The set on India paper, compact, slender and graceful, handsomely bound in leather, and contained in one of the "period" bookcases designed especially for the books, is in itself an adornment and an ornament for any library or drawing room. For the country home with flower or vegetable gardens the article HORTICULTURE (Vol. 13, p. 741) will be found full of helpful information, both in its general treatment, and in the gardeners' calendar for the United States, which tells in the most practical fashion what to do each month in the garden.

Home Making

For the transformation of a house, well-situated, well-built, well-furnished, well-decorated into a home,—for *home-making*,—any course of study in the Britannica should be helpful to a woman, by broadening her sympathies and her knowledge and by making a more interesting and better-informed companion to her husband, a more competent hostess to his and her guests, and a wiser mother to her children. But home-making is an art and not a science—or, if the modern woman will forgive the use of so old-fashioned a phrase, it is a spiritual grace rather than an intellectual achievement—and even a Guide to readings in the Britannica cannot give an exact formula for it.

Domestic Science

But there is a science whose field is the home and whose formulas are definite, and this "domestic science" may be learned from the Britannica. Of primary interest is the article DIETETICS (Vol. 8, p. 214), equivalent in length to 25 pages of this Guide. It is by the late Dr. Wilbur Olin Atwater, professor of

chemistry, Wesleyan University, Middletown, Connecticut, who was special agent of the U. S. Department of Agriculture in charge of nutrition investigations, and R. D. Milner, formerly of the same Department. It contains 6 valuable tables: I. Percentage Composition of some Common Food Materials (64 in all); II. Digestibility (or Availability) of Nutrients in Different Classes of Food Materials (22 in all); III. Estimates of Heats of Combustion and of Fuel Value of Nutrients in Ordinary Mixed Diet; IV. Quantities of Available Nutrients and Energy in Daily Food Consumption of Persons in Different Circumstances; V. Standards for Dietaries—Available Nutrients and Energy per Man per Day; and VI. Amounts of Nutrients and Energy Furnished for one Shilling in Food Materials at Ordinary Prices (22 food materials, at 44 different prices). The topics of the article are:

Food and its functions—refuse, water, mineral matter, protein, including albuminoids and gelatinoids, fats, carbohydrates.

Conversion of food into body-material and of food and body-material into heat, muscular energy, etc., with results obtained from Dr. Atwater's famous experiments with men in the "respiration calorimeter," from measurement and analysis of food and drink, and from measurement of energy expended as heat and as external muscular work.

Composition of food materials.

Digestibility or availability of foods.

Full value of food.

Food consumption.

Quantities of nutrients needed—tentative estimates of the average daily amounts required.

Hygienic economy of food: Eat what agrees with you and use foods which give needed nutriment, but do not burden the body with superfluous material. The

importance of good cooking, neatness and cleanliness.

Pecuniary economy of food.

Read also the article NUTRITION (Vol. 19, p. 920, equivalent to 25 pages of this Guide), by Dr. D. N. Paton, professor of physiology, University of Glasgow, and Dr. E. P. Cathcart, lecturer in chemical physiology, University of Glasgow. This article considers "the mode of digestion, the utilization and the elimination of the end products of the three great constituents, proteins, carbohydrates and fats," discussing in detail:

Chemistry of Digestion—digestion in the mouth, stomach and the intestines; bile.

Mode of Formation of Digestive Secretions—the salivary and gastric glands, secretion in the pancreas, intestinal juice.

Mechanism of the Alimentary Canal—mastication, swallowing, stomach movements, intestinal movements, etc.

Absorption by the mouth, stomach and intestines.

Changes in the cells—proteins, carbohydrates, fats, fasting, muscular work, internal secretions, pancreas.

Excretion—urea, ammonia, sulphur, phosphorus, etc.

Cookery

There is much very practical information for the housewife in the article COOKERY (Vol. 7, p. 74), besides the interesting historical sketch. Cookery, says this article, as an art "is only remotely connected with the mere necessities of nutrition or the science of dietetics. Mere hunger, though the best sauce, will not produce cookery, which is the art of sauces." Oriental, Greek and Roman cookery, at least as we know them from literature, aimed at luxury, rich and rare foods, cost and show. After the Renaissance, the history of modern cookery began

with Italy, and from Italy Catherine de' Medici brought "Italian cooks to Paris and introduced there a cultured simplicity which was unknown in France before." *Forks and spoons were "Italian neatnesses" unknown in England until the early part of the 17th century*; their use "marked an epoch in the progress of dining, and consequently of cookery." French cookery advanced under Louis XIV and XV; received an apparent set back from the French Revolution—which, however, marked the rise of Parisian restaurants; but revived with brilliancy early in the 19th century, so that now "French cooking is admittedly the ideal of culinary art, directly we leave the plain roast and boiled. And the spread of cosmopolitan hotels and restaurants over England, America and the European continent, has largely accustomed the whole civilized world to the Parisian type."

The article closes with eminently useful "notes on broiling, roasting, baking, boiling, stewing and frying."

The article FOOD (Vol. 10, p. 611) describes particularly the best foods for infants and children; foods for adults are treated in NUTRITION, DIETETICS, already mentioned, and in the article VEGETARIANISM (Vol. 27, p. 967). Other articles of importance to the cook are:

FOOD PRESERVATION (Vol. 10, p. 612), by Otto Hehner, English public analyst, formerly president of the Society of Public Analysts; and the same authority's article on ADULTERATION (Vol. 1, p. 218), which deals with legislation against adulteration, and discusses arsenic in foods, preservatives such as formaldehyde and salicylic acid, boracic preservatives,—colouring matter in food, metallic impurities; American laws against

adulteration; German laws; particular articles adulterated—milk, condensed milk, cream, butter, margarine, cheese, lard, oils, flour and bread, sugar, marmalade, jams, tea, coffee, chocolate, cocoa, wine, beer, non-alcoholic drinks, vinegar, spirits, drugs. See the chapter *For Manufacturers of Foods*.

The following is an alphabetical list of the principal articles on foods and beverages:

Absinthe

Aerated Waters

Ale

Arrack

Aspic

Bacon

Bannock

Barm

Beef

Beer

Benedictine

Biltong

Biscuit

Bitters

Bohea

Brandy

Bread

Brewing

Butter

Calipash and Calipee
Caudle
Caviare, or Caviar
Chartreuse
Chasse
Cheese
Chocolate
Chupatty
Chutney
Cider
Claret
Confectionery
Cookery
Couscous
Curaçoa
Curry
Food Preservation
Ghee
Gin
Gravy
Haggis
Hippocras
Jams and Jellies
Junket
Kava (Cava, or Ava)
Kedgeree

Ketchup
Kirsch
Koumiss
Kvass, or Kwass
Lard
Liqueurs
Loaf
Macaroni
Malmsey
Malt
Marchpane, or Marzipan
Margarine
Marmalade
Mate
Mead
Mealie
Meat
Milk
Molasses
Mulligatawny
Negus
Omelette
Pemmican
Perry
Pilau
Porridge

Pudding
Pulque
Punch
Raisin
Ratafia
Rum
Saké
Salad
Scone
Sherbet
Sherry
Spirits
Steak
Suet
Syrup
Tapioca
Tart
Tea
Toast
Treacle
Venison
Vermicelli
Vermouth
Vinegar
Vodka
Whisky

Wine

Yeast

Costume and Ornament

Turning sharply from the useful to the ornamental —from the kitchen to the boudoir—the woman who uses the Britannica will find in it not merely the interesting information to which clues are given in the chapter for the jeweller and in the section on embroidery (Ch. 66) but many other articles about costume and dress, with illustrations which make the text far clearer and more valuable. With the constant turns of Fashion's wheel, dress, and especially women's dress, is always reverting to an earlier style or to a more primitive and semi-barbaric style of the present day—now Empire styles, Robespierre collars, close-fitting gowns of the pseudo-Greek style of the Napoleonic era, and now a quasi-folk style, Bulgarian, or Oriental, and again a hint of the ecclesiastical surplice, dalmatic, stole, or collar. The result is that the study of the styles of the past, especially when properly illustrated, may be not only interesting but actually valuable to a woman planning a new gown or a "novel" ornament for head or throat.

The article COSTUME (Vol. 7, p. 224), equivalent in length to 80 pages of this Guide, is written by T. A. Joyce of the Department of Ethnography, British Museum; by Stanley Arthur Cook, editor for the Palestine Exploration Fund, on Egyptian and Semitic costume; by Henry Stuart Jones, late director of the British School at Rome, on Aegean, Greek and Roman costume; by Oswald Barron, late editor of the *Ancestor*, on medieval and modern costume; and by

W. Alison Phillips, author of *Modern Europe*, etc. Its 51 illustrations are chosen with great care from original sources, tombs, wall-paintings, seals, statues and statuettes, brasses, and portraits of many periods, and they are supplemented by illustrations in other articles:—AEGEAN CIVILIZATION (Vol. 1, p. 245), see Plate III, Fig. 7 and Plate IV, Fig. 7, for multiple or flounced skirts and basques—like those of the early '80's—with short overskirt scalloped high on either side; GREEK ART, Figs. 2, 3, 21, 40, 42, 75; TERRACOTTA (Vol. 26, p. 653), see both plates and especially Fig. 4 of Tanagra and other figurines; ROMAN ART (Vol. 23, p. 474), see Figs. 11, 12, 16, 24, 28; BRASSES, MONUMENTAL (Vol. 4, p. 434), see all illustrations; ILLUMINATED MANUSCRIPTS (Vol. 14, p. 312), see Plates III and V; PAINTING (Vol. 20, p. 459), see Figs. 7, 10, 11, 14, 25, 27; LACE (Vol. 16, p. 37), see Figs. 4, 6, 8, 9, 10, 11, 12, 13, 15, 18, 33; MINIATURES (Vol. 18, p. 523), see both plates. One of the most interesting sources for the text of the article COSTUME is in the writings of satirists, who from period to period have praised the simplicity and frugality of the preceding generation and bewailed the extravagance in style and material of dress during the satirists' own day.

Besides this general article on costume there is special treatment of Chinese costume in the article CHINA (Vol. 6, p. 173) and a section on costume in the article INDIA (Vol. 14, p. 417), equivalent to 18 pages of this Guide, written by Col. Charles Grant, formerly inspector of military education in India, illustrated with 16 pen-and-ink drawings by J. Lockwood Kipling, who is best-known to most people as the father of Rudyard Kipling, and the illustrator of *Kim*, his son's story of native life in India. On Celtic dress see the article CLAN (Vol. 6, p. 421); on

that of the Hittites the article HITTITES (Vol. 13, p. 537); on modern Egyptian the article EGYPT (Vol. 9, p. 31), on Persian, the article PERSIA (Vol. 21, p. 193), etc.

And see the following articles on costume and similar topics:

Aigrette

Aiguillette

Apron

Backscratcher

Baldric

Bandana, or Bandanna

Beard

Beaver

Blouse

Bonnet

Braid

Burnous

Buskin

Caftan

Chape

Chatelaine

Costume

Cravat

Crinoline

Cuff

Cummerbund

Depilatory
Dolman
Doublet
Dress
Farthingale
Frock
Gaberdine
Girdle
Glove
Golosh, or Galosh
Gown
Haik
Hat
Hood
Hose
Jerkin
Kaross
Kilt
Kohl
Mantle
Mitten
Moccasin
Moustache
Muff
Parasol
Patten

Pelisse
Peruke
Petticoat
Plaid
Pomade
Pomander
Poncho
Puttee
Queue
Razor
Robes
Sandal
Scarf
Shampoo
Shirt
Sleeve
Snowshoes
Sombrero
Sporran
Stockings
Tabard
Tarbush
Toilet
Towel
Trousers
Tunic

Turban

Veil

Whisker

Wig

Biographical Study

A study of the lives of great women will interest any one, and if this study is pursued by means of the Britannica the reader will have the double advantage of getting full and authoritative material presented in the most attractive and excellent style. From the lists that follow of articles on women in the Britannica, interesting groups may easily be chosen, such as:

Famous American Women:—ANNE HUTCHINSON, ALICE AND PHOEBE CARY, MARGARET O'NEILL EATON, MARGARET FULLER, the GRIMKÉ sisters, HARRIET BEECHER STOWE.

Women of Ancient Times:—ACCA LARENTIA, LUCRETIA, AGRIPPINA, ARTEMISIA, ASPASIA, CLEOPATRA, CORNELIA, FAUSTINA, MESSALLINA, VIRGINIA, ERINNA, CORINNA, SAPPHO, HYPATIA, ZENOBIA.

Heroines of Fiction in History: compare Kingsley's *Hypatia* with the real woman, Ware's *Zenobia* with the queen as she is represented by a historian in the Britannica; the women of Dumas and of Scott in their historical novels and their originals as seen in the Britannica, for instance Mary Queen of Scots as portrayed by Sir Walter in *The Abbot* and by Swinburne in the Britannica, Elizabeth and Amy Robsart in *Kenilworth* and in the Britannica, Catherine de' Medici in *Chicot the Jester* and in fact; or the women of Shakespeare's historical plays as

compared with their true place in history.

Women in American political reform:—AMELIA B. BLOOMER, SUSAN B. ANTHONY, ELIZABETH CADY STANTON, LUCRETIA MOTT and LUCY BLACKWELL STONE.

The following is a partial list of articles in the Britannica dealing with Women, who may, for convenience, be booked under the broad head of *History* as distinct from Literature, the Arts and Science:—

Acca Larentia

Accoramboni, Vittoria

Acland, Lady Harriett

Adelaide

Agnes of Meran

Agreda, Abbess of

Agrippina

d'Aiguillon, Duchesse

Albany, Louise, countess of

Alice, Princess

Amalasuntha

Anna Amalia of Saxe-Weimar

Anna Leopoldovna

Anne of Brittany

Anne of Cleves

Anne of Denmark

Anne of England

Anne of France
Anne (of Russia)
Arria
Arsinoë
Artemisia
Aspasia
Barton, Elizabeth
Berenice
Blanche of Castile
Boadicea
Boleyn, Anne
Borgia, Lucrezia
Brunhilda
Cappello, Bianca
Caroline, Amelia Augusta
Caroline of England
Castro, Inez de
Catherine of Aragon
Catherine of Braganza
Catherine de' Medici
Catherine I and II (Russia)
Catherine of Valois
Châteauneuf, La Belle
Christina, Maria
Christina of Sweden
Clarke, Mary Anne

Cleveland, Duchess of
Cleopatra
Clotilda, St.
Colonna, Vittoria
Corday, Charlotte
Cornelia
Cornaro, Caterina
Diane de France
Diane de Poitiers
Du Barry
Eaton, Margaret O'Neill
Eleanor of Aquitaine
Elizabeth of Austria
Elizabeth (Carmen Sylva)
Elizabeth, Electress Palatine
Elizabeth of England
Elizabeth (princess)
Elizabeth of France
Elizabeth Petrovna
Este, Beatrice d'
Estrées, Gabrielle d'
Etampes, Duchesse d'
Eudocia
Eudoxia
Eugénie
Euphrosyne

Elizabeth Farnese
Faustina
Feuchères, Baronne de
Fredegond
Gilbert, M. D. E. R. (“Lola Montez”)
Godiva
Gontaut, Duchesse de
Grey, Lady Jane
Hachette, Jeanne
Henrietta Maria of England
Howard, Catherine
Ida of Bernicia
Irene
Isabella of Bavaria
Isabella of Castile
Isabella of Hainaut
Isabella II of Spain
Jacoba
Joan of Arc
Joan (Pope)
Joanna the Mad
Joanna of Naples
Josephine
Junot, Laure
Kingston, Elizabeth, Duchess of
La Fayette, Louise de

Lamballe, Princesse de
La Sablière, Marguerite de
La Vallière, Louise de
Lenclos, Ninon de
Lennox, Countess of
Lisle, Alice
Livia Drusilla
Longueville, Duchesse de
Louise of Prussia
Louise of Savoy
Lucretia
Macdonald, Flora
Maintenon, Mme. de
Maine, Duchesse du
Mailly, Comtesse de
Margaret of Austria
Margaret of Denmark
Margaret Maultasch
Margaret (Maid of Norway)
Margaret of Scotland, St.
Margaret of Scotland
Maria Stella
Marie Antoinette
Marie Leszczynska
Marie Louise
Marie de' Medici

Marie Amelie Thérèse
Marie Thérèse
Matilda of Tuscany
Mary of Burgundy
Mary I and II of England
Mary of Lorraine
Mary of Modena
Mary of Orange
Mary, Queen of Scots
Masham, Lady
Matilda
Messallina
Mignot, Claudine
Marquise de Montespan
Marquise de Montesson
Montpensier, Duchesse de
Octavia
Olga
Orkney, Countess of
Orleans, Henrietta of
Parr, Catherine
Perrers, Alice
Philippa of Hainaut
Phryne
Pompadour, Marquise de
Portsmouth, Duchess of

Prie, Marquise de
Radegunda, St.
Rich, Penelope
Robsart, Amy
Rosamond (“The Fair”)
Rothelin, Marquise de
Roxana
Semiramis
Serres, Olivia
Sforza, Caterina
Shore, Jane
Snell, Hannah
Sophia Aleksyeevna
Sophia of Hanover
Sophia Dorothea of Hanover
Sorel, Agnes
Stanhope, Lady Hester
Stuart, Arabella
Swynford, Catherine
Talbot, Mary Anne
Tanaquil
Tarpeia
Theodora
Theophano
Ursins, Princess des
Victoria

Virginia

Walter, Lucy

Wilhelmina

Zenobia

Quite as long and much more impressive is the list of women who have produced *literature*—excluding the heroines of mythology and literature—on whom there are separate articles in the Encyclopaedia Britannica.

Ackermann, Louise

Adam, Juliette

Agoult, Comtesse d'

Aguilar, Grace

Aisse, Mlle.

Alcott, Louisa May

Anna Commena

Arnim, Elisabeth von

Aulnoy, Baronne d'

Austen, Jane

Austin, Sarah

Baillie, Lady Grizel

Baillie, Joanna

Bartauld, Lady Anne

Barnard, Anna Letitia

Bashkirtseff, Maria

Behn, Aphra

Bekker, Elizabeth
Bernauer, Agnes
Berners, Juliana
Blamire, Susanna
Blessington, Marguerite, Countess of
Blind, Mathilde
Bosboom-Toussaint, Anna
Braddon, Mary Elizabeth
Bremer, Frederika
Brontë, Charlotte and Emily
Brooke, Frances
Browning, Elizabeth Barrett
Brunton, Mary
Burnett, Frances E. Hodgson
Carter, Elizabeth
Cary, Alice and Phoebe
Cenci, Beatrice
Centlivre, Susanna
Charrière, Agnes de
Child, Lydia Maria
Cockburn, Alicia
Coleridge, Sara
Colet, Louise
Cook, Eliza
Cooke, Rose Terry
Corelli, Marie

Corinna
Cork, Mary, countess of
Cottin, Marie
Cowley, Hannah
Craddock, Charles Egbert
Craigie, Pearl (“John Oliver Hobbes”)
Craik, Dinah Maria
Craven, Pauline
D’Arblay, Frances
Dashkov, Catherina
Deffand, Marquise du
Delany, Mary Granville
Dickinson, Anna Elizabeth
Droste-Hülshoff, Freiin von
Duff-Gordon, Lucie
Edgeworth, Maria
Edgren-Leffler, Anne Charlotte
Edwards, Amelia Ann Blandford
Eliot, George
Engelbrechtsdatter, Dorthe
Épinay, Louise d’
Erinna
Ewing, Juliana
Ferrier, Susan E.
Flygare-Carlén, Emilie
Foote, Mary Hallock

Fuller, Margaret
Fullerton, Lady
Gaskell, Elizabeth Cleghorn
Gay, Marie F. S.
Genlis, Comtesse de
Girardin, Delphine de
Godwin, Mary Wollstonecraft
Gore, Catherine G. F.
Gyllembourg-Ehrensvärd, Baroness
Gyp
Hahn-Hahn, Ida von
Havergal, Frances Ridley
Hamilton, Elizabeth
Haywood, Eliza
Hemans, Felicia Dorothea
Houdetot, Comtesse de
Howe, Julia Ward
Hrosvitha
Hypatia
Inchbald, Elizabeth
Ingelow, Jean
Jackson, Helen Maria (“H. H.”)
Jameson, Anna Brownell
Jewett, Sarah Orne
Kavanagh, Julia
Krüdener, Baroness von

Lamb, Mary
Lazarus, Emma
Lee, Sophia
Levy, Amy
Lewald, Fanny
Lyall, Edna
Malet, Lucas
Marguerite de Valois
Marie de France
Markham, Mrs.
Martineau, Harriet
Meynell, Alice C.
Mitford, Mary Russell
Molesworth, Mary Louise
Monk, Maria
Montagu, Elizabeth R.
Montagu, Mary Wortley
More, Hannah
Morgan, Lady Sydney
Moulton, Louise Chandler
Mundt, Klara (Luise Mühlbach)
Naden, Constance
Nairne, Baroness
Negri, Ada
Norton, Caroline E. O.
Oliphant, Margaret

Opie, Amelia
Orzeszko, Eliza
Ouida
Pardoe, Julia
Pardo-Bazan, Emilia
Philips, Katharine
Piozzi, Hester Lynch
Pisan, Christine de
Ploennies, Luise von
Porter, Jane
Praxilla
Radcliffe, Ann
Reeve, Clara
Rossetti, Christine
Sablé, Marquise de
Sand, George
Sappho
Schelling, Karoline
Schreiber, Charlotte Elizabeth
Scudéry, Madeleine de
Serao, Matilda
Sévigné, Marquise de
Seward, Anna
Sherwood, Mary Martha
Sigourney, Lydia H.
Smith, Charlotte

Southworth, Emma

Staal, Baronne de

Stael, Mme. de

Steele, Flora Annie

Stein, Charlotte von

Stowe, Harriet Beecher

Strickland, Agnes

Tautphoeus, Baroness von

Taylor, Ann and Jane

Thaxter, Celia

Tighe, Mary

Tucker, Charlotte Maria

Ward, Elizabeth Stuart Phelps

Ward, Mrs. Humphry

Wardlaw, Lady

Wiggin, Kate Douglas

Wilkins, Mary E.

Winchelsea, Countess of

Wood, Mrs. Henry

Wordsworth, Dorothy

Yonge, Charlotte Mary

Although women have appeared on the stage only in the last two centuries the list of actresses and singers on whom there are articles in the Britannica is a long one. A partial list in alphabetical order follows:

Abbott, Emma
Abington, Frances
Albani, Mme.
Albert, Mme.
Alboni, Marietta
Anderson, Mary
Ashwell, Lena
Bartet, Jeanne Julia
Bernhardt, Sarah
Birch-Pfeiffer, Charlotte
Bracegirdle, Anne
Campbell, Beatrice Stella
Calvé, Emma
Cary, Anna Louise
Celeste, Mme.
Chaminade, Cécile
Clairon, La
Clive, Catherine
Coghlan, Rose
Cushman, Charlotte
Després, Suzanne
Drew, Louisa Lane
Dumesnil, Marie
Duse, Eleanora
Elssler, Fanny
Farren, Elizabeth

Faucit, Helena

Félix, Lia

Fenton, Lavinia

Fiske, Minnie Maddern

Gilbert, Ann

Grisi, Giulia

Guilbert, Yvette

Guimard, Marie Madeleine

Gwyn, Nell

Hading, Jane

Horton, Christiana

Jordan, Dorothea

Keeley, Mary Anne

Kellogg, Clara Louise

Keene, Laura

Klafsky, Katharina

Lacy, Harriette Deborah

Langtry, Lillie

Lecouvreur, Adrienne

Lind, Jenny

Mara, Gertrude E.

Marlowe, Julia

Mars, Mlle.

Melba

Menken, Adah Isaacs

Modjeska, Helena

Morris, Clara
Neilson, Adelaide
Nethersole, Olga
Nisbett, Louisa C.
Nordica, Lilian
Oldfield, Anne
O'Neill, Eliza
Patey, Janet Monach
Philips, Adelaide
Pope, Jane
Porter, Mary
Raabe, Hedwig
Rachel
Raucourt, Mlle.
Rehan, Ada
Réjane, Gabrielle
Ristori, Adelaide
Robinson, Mary
Sacher, Rosa
Sainton-Dobly, C. H.
Schröder, Sophie
Schröder-Devrient, Wilhelmine
Seebach, Marie
Siddons, Sarah
Smithson, Henrietta C.
Sterling, Antoinette

Sterling, Fanny

Taglioni

Tempest, Marie

Terry, Ellen

Tietjens, Thérèse

Verbruggen, Susanna

Vestris, Lucia Elizabeth

Vincent, Mary Ann

Vokes, Rosina

Woffington, Peg

Yates, Mary Ann

Both in Great Britain and in the United States the great social reform movements of the last century numbered among their most able advocates brilliant and devoted women. This is true of temperance, abolition of slavery, prison reform, the treatment of the insane and defectives, and nearly every branch which this Guide has enumerated, especially in Part 4, where there is a general outline of these reforms. For the part played by women see the biographies of the women just mentioned and, among many others, JANE ADDAMS, CLARA BARTON, BARONESS BURDETT-COUTTS, DOROTHEA LYNDE DIX, EMILY FAITHFUL, ELIZABETH FRY, OCTAVIA and MIRANDA HILL, MARY A. LIVERMORE and LUCRETIA MOTT. More particularly the following list of names of women connected with educational progress will supplement what has been said in the chapter of this Guide *For Teachers* and in the part of the Guide dealing with advances in education and educational problems in the chapter *Questions of the Day*:

Astell, Mary

Beale, Dorothea

Bodichon, Barbara L. S.

Brace, Julia

Bridgman, Laura

Bass, Frances Mary

Carpenter, Mary

Clough, Anne Jemima

Crandall, Prudence

Keller, Helen

Lyon, Mary

Shirreff, Emily

Swanwick, Anna

And see also the articles CO-EDUCATION and articles on different colleges for women, e.g., MOUNT HOLYOKE, VASSAR, BRYN MAWR, SMITH, etc. One who wishes to realize the extent of feminine talent or genius should read the lives in the Britannica of the sculptor HARRIET HOSMER and of women painters including CECILIA BEAUX, ROSA BONHEUR, ARTEMISIA GENTILESCHI, KATE GREENWAY, ANGELICA KAUFFMANN, TERESA SCHWARTZE and MME. VIGÉE-LEBRUN. But the reader who is eager rather to know whether woman's intellectual powers —not her talent and her genius—compare favourably with those of the male, will find material in the biographical sketches of the physicist MME. CURIE; the geologist MARY ANNING; the travelers ISABELLA BIRD BISHOP and ALEXANDRINA TINNÉ; the biologists MARIANNE NORTH and ELEANOR

ORMEROD; the American ethnologist ALICE C. FLETCHER; and above all—since mathematics has always been considered above the capacity of women —the mathematicians MARIA GAETANA AGNESI and SOPHIE KOVALEVSKY and the astronomers AGNES MARY CLERKE, MARIA CUNITZ, CAROLINE HERSCHEL, MARIA MITCHELL and MARY SOMERVILLE.

It is pertinent to add that the present 11th edition of the Britannica indicates the advance of women not only by embodying their collaboration to an unprecedented extent and devoting an unprecedented amount of its space to biographies of women, but by the circumstance that it has, to a far larger extent than any previous edition, been purchased by women.

Part VI
Readings In Connection With Recreation and Vacations

CHAPTER LXVI
RECREATION AND VACATION

"Laying out your work" is a familiar phrase, and describes a common practice. But hardly one man in a hundred deliberately "lays out" his play, planning his recreation so as to get the best value out of every hour of his leisure time. Yet when he consults a doctor because his work is not running smoothly, one of the first questions he has to answer is about the amount and form of recreation he takes.

Recreative Reading about Recreation

An important branch of the art of playing is to learn the value of reading about play. The more a man knows about any form of amusement, the more he will enjoy the hours he devotes to it, and the better he will succeed in keeping his mind off his

business during these hours. But there is another and an even greater advantage in this kind of reading: *it will take your mind out-of-doors during hours of leisure that you are compelled to spend in-doors*. Everyone recognizes that out-door recreations, involving some degree of bodily activity, are the most wholesome for men whose work is sedentary, as is the case with nearly every reader of this Guide, and the best forms of out-door recreation are those in which the contrast with your work is accentuated by the complete change of scene and of habits which most men can only hope to get once a year, at vacation time.

Turn to the next best form of relaxation, the out-door amusements that lie close at hand. Here, again, your opportunities are limited, for all these pleasures require daylight, which, during a great part of the year, ends before your work is done; and most of them require weather conditions that you can only get at certain seasons. An hour spent in reading and thinking about out-door amusements and travel, and in making plans for such delights, even if the planning must be for a future that seems far away, is therefore always refreshing.

It is not the purpose of the present chapter to suggest a course of reading, in the strict sense of the phrase, for it cannot be assumed that everyone who would like to read about lawn-tennis would also like to read about tarpon-fishing. But a general account of the Britannica articles that afford information about recreation and vacations will give the reader a choice among subjects in which he is already interested and among others which may offer him new possibilities.

MOTORING

In connection with motoring, the possessor of the Britannica will not be surprised to find in it, as might be expected from its universal comprehensiveness, much fuller technical information in regard to the structure and operation of his engine, the fuel he employs, and the friction and other resistances he must overcome, than in any of the ordinary manuals on the subject. But it may not occur to him that in planning either a long or a short tour, he can find in the volumes information of other kinds that will give added interest and significance to everything he sees. It is not only when he crosses the Atlantic for his motoring trip that cities and villages and mountains and rivers have stories to tell. In our own country, place-names which may at first suggest nothing, are found, on reference to the Britannica, to be associated with episodes of early exploration, of Indian hostilities, of local agitation, of one or another war, with the lives of famous men, the growth of industries and of commerce, the first success in a new branch of farming, the early days of railroad and canal construction, or the development of transportation by river, lake or sea. And what is being done to-day, in these places, is often quite as interesting, and quite as difficult to ascertain from any source other than the Britannica. This use of the work as a guide-book, or rather as doing a great deal that guide-books lamentably fail to do, is discussed later in this chapter in connection with travel in general as a form of recreation; but motoring gives especial opportunities for observation enriched by knowledge.

The value of the Britannica in connection with the planning of a motoring trip may be illustrated by

brief notes on some of the articles you might read if you were about to make, for example, the run from New York through the Berkshire Hills and on to the White Mountains. *The following information is all from the Britannica, and from articles to which you would naturally turn in this connection.*

A Specimen Tour from New York to the White Mountains

Along the Hudson

Leaving New York by Broadway, your first point is YONKERS (Vol. 28, p. 922), where, as the Britannica tells you, stands "one of the best examples of colonial architecture in America," Philipse Manor Hall, now a museum of Revolutionary relics. Frederick Philipse, owner in 1779 of the Hall and of an estate extending for some distance along the bank of the Hudson, was suspected of Toryism, and all his property was confiscated by act of legislature. A mile and a half beyond Yonkers you get a magnificent view of the Hudson, disclosing the Palisades, of lava rock (Vol. 13, p. 852) which, in cooling, formed joints like those of the Giant's Causeway in Ireland. The impressive breadth of the Hudson and its navigability throughout the 151 miles to Troy, notwithstanding that in all that distance it falls only five feet (a good many New Yorkers would be amazed to be told that fact), is due to the low grade of the river bed, permitting the tide to enter and to back up the water, so that this long stretch of the river is really a fjord, not a stream. The article Fjord (Vol. 10, p. 452) tells you how such a rock basin or trough is formed by geological action. The article HENRY HUDSON (Vol. 13, p. 849) tells you how the great navigator, himself an Englishman, although employed by the Dutch East India Company in 1608 to find a westward route to China, sailed the little "Half Moon" as far up the river as Albany before he was convinced that the Pacific did not lie ahead of him.

The next point after Yonkers, DOBBS FERRY (Vol. 8, p. 349), was a strategic centre of great importance during

the Revolutionary War. “The American Army under Washington encamped near Dobbs Ferry on the 4th of July, 1781, and started thence for Yorktown in the following month,” and it was there that Washington and Governor Clinton, in 1783, “met General Sir Guy Carleton to negotiate for the evacuation by the British troops of the posts they still held in the United States.”

Sleepy Hollow

In TARRYTOWN, as the article under that title (Vol. 26, p. 433) recounts, Washington Irving, who made the legends of the Hudson immortal, built his home at “Sunnyside,” and was buried in the old Sleepy Hollow Cemetery. The article IRVING (Vol. 14, p. 856), by the late Dr. Richard Garnett, the famous literary critic, tells you all about Irving’s life; and Professor Woodberry of Columbia, in his article on AMERICAN LITERATURE (Vol. 1, p. 831), reminds you that, although Irving spent 21 of his adult years in Europe, he is the one American writer who has “linked his memory locally with his country so that it hangs over the landscape and blends with it forever.” “Kaakoot,” one of the large estates at Tarrytown, recalls the extraordinary career of its owner, described in the article JOHN D. ROCKEFELLER (Vol. 23, p. 433); and “Lyndhurst,” that of Jay Gould, of whom and of whose daughter, the well-known philanthropist, the Britannica tells in the article GOULD (Vol. 12, p. 284). On the post road near Tarrytown is the bronze statue of a Continental soldier, erected to commemorate the capture of Major André, whose life is told in the article ANDRÉ (Vol. 1, p. 968).

As you mount the hill and leave the Hudson, you enter the beautiful region of hills, lake and streams, upon which the city of New York long depended for its water; and you will be interested in comparing what New York has accomplished in this connection with what has been done by other great cities, as described in the article WATER SUPPLY (Vol. 28, p. 387), by G. F. Deacon. Many of the large country places you pass are the property of prominent New York men, of whom there are biographies

in the Britannica.

Your brief run through the hilly northwestern corner of Connecticut, of which the physical features are described and the history narrated in the article CONNECTICUT (Vol. 6, p. 951), takes you through SALISBURY (Vol. 24, p. 78), near Bear Mountain (2355 feet), "the highest point in the State." A few miles more and you cross the line into Massachusetts and enter the enchanting region of the Berkshire Hills. The article MASSACHUSETTS (Vol. 17, p. 851) says that "the Berkshire country—Berkshire, Hampden, Hampshire and Franklin counties—is among the most beautiful regions of the United States. It is a rolling highland, dominated by long, wooded hill-ridges, remarkably even-topped in general elevation, intersected and broken by deep valleys. Scores of charming lakes lie in the hollows."

Great Barrington

GREAT BARRINGTON (Vol. 12, p. 397) "was a centre of disaffection during Shays's Rebellion," an episode for which you may consult the article DANIEL SHAYS (Vol. 24, p. 815), and the account in the historical section of the article MASSACHUSETTS (Vol. 17, p. 860). In 1786 Shays was known as having been "a brave Revolutionary captain of no special personal importance." The State finances were in a bad condition and taxes were heavy. Mobs of discontented citizens, under Shays's leadership, assembled to prevent the courts from sitting, so that the collection of taxes and other debts might be obstructed. "The insurrection is regarded as having been very potent in preparing public opinion throughout the country for the adoption of a stronger national government." WILLIAM CULLEN BRYANT (Vol. 4, p. 698), "earliest of the master-poets of America," practiced law at Great Barrington for nine years.

Stockbridge

Leaving Great Barrington, you cross Monument Mountain (1710 feet) on your way to STOCKBRIDGE (Vol. 25, p. 929) with its famous avenue of elms—perhaps the

most characteristic New England scene in all the Berkshire country. The conspicuous bell-tower was erected by DAVID DUDLEY FIELD (Vol. 10, p. 321), the law reformer, whose proposed code of laws for the State of New York was the model on which most of the existing state codes have been based. The park was the gift of his brother, CYRUS W. FIELD (Vol. 10, p. 320), born at Stockbridge, to whom we owe the first Atlantic cable. In 1834, at the age of 15, he became a clerk in the great New York store described in the article A. T. STEWART (Vol. 25, p. 912); later embarked in the wholesale paper business in New York, failed, formed the firm of Cyrus W. Field & Co., and in 1853, at the age of 34, had made a quarter of a million, a large fortune in those days, paid off the debts of the paper business, and nominally retired. From that time he was chiefly occupied with the cable scheme, of which the early difficulties are described in the cable section of the article TELEGRAPH (Vol. 26, p. 527), although he operated actively in stocks, was associated with JAY GOULD (Vol. 12, p. 284) in completing the Wabash Railroad, and had a controlling interest in the New York Elevated Railroad, besides being chief proprietor of the New York *Mail and Express*.

When, in 1750, JONATHAN EDWARDS (Vol. 9, p. 3), the famous New England theologian, had to leave his church at Northampton, he became pastor at Stockbridge and missionary to the Housatonic Indians, remaining there until 1759. It was there that he wrote his famous treatise on the *Freedom of the Will*. In a cleft on Bear Mountain, just outside the village, is the curious Ice Glen, with caverns ice-lined even in midsummer.

Lenox

On the road from Stockbridge to Lenox you pass the beautiful lake called the Stockbridge Bowl, on the shore of which NATHANIEL HAWTHORNE, in 1851, wrote *The House of the Seven Gables*. His reason for adopting literature as a vocation is quaintly stated in a letter to his mother quoted in this Britannica biography. “I do not want to be a doctor and live by men’s diseases, nor a

minister to live by their sins, nor a lawyer and live by their quarrels. So I don't see that there is anything left for me but to be an author." LENOX (Vol. 16, p. 421) is surrounded by high hills, famous for their vivid coloring when the leaves change their hues in the fall, Yokun Seat (2080 feet), South Mountain (1200 feet), Bald Head (1583 feet) and Rattlesnake Hill (1540 feet). "The surrounding region contains some of the most beautiful country of the Berkshires—hills, lakes, charming intervales and woods. As early as 1835 Lenox began to attract summer residents. In the next decade began the creation of large estates, although the great holdings of the present day, and the villas scattered over the hills, are comparatively recent features." The township was named after the third Duke of RICHMOND AND LENNOX (Vol. 23, p. 307), "a firm supporter of the colonies in the debates on the policy that led to the War of American Independence; and he initiated the debate of 1778 calling for the removal of the troops from America."

Among other names associated with Lenox and with its famous schools are those of the actress FRANCES KEMBLE —"Fanny" Kemble (Vol. 15, p. 724); HENRY WARD BEECHER (Vol. 3, p. 639); HARRIET HOSMER (Vol. 13, p. 791), the sculptor; MARK HOPKINS (Vol. 13, p. 684), the famous president of Williams College; ALEXANDER H. STEPHENS (Vol. 25, p. 887), vice-president of the Confederate States, who, the article CONFEDERATE STATES OF AMERICA (Vol. 6, p. 899), says, was "during the war a strong antagonist of President Davis's policy;" and WILLIAM H. YANCEY (Vol. 28, p. 902), whose fortunes were influenced by a singular event. A lawyer, and editor of a little anti-nullification weekly in South Carolina, he married a wealthy woman; but a few years later, in 1839, the accidental poisoning of all the slaves on the estate forced him to return to the law; and he subsequently became one of the political leaders of the Confederacy.

Pittsfield

PITTSFIELD (Vol. 21, p. 682) is both a popular resort

and a prosperous manufacturing town, with ample water power supplied by the east and west branches of the Housatonic on either side of it. It was here that HENRY W. LONGFELLOW (Vol. 16, p. 977) wrote *The Old Clock on the Stairs* at "Elm Knoll," the house of his father-in-law, NATHAN APPLETON (Vol. 2, p. 224), a reference to whose biography in the Britannica discloses the interesting fact that his son, Thomas Gold Appleton, a famous wit in his day, originated the saying, "Good Americans when they die, go to Paris," which is generally attributed to Oliver Wendell Holmes. Just outside Pittsfield lies the village of the SHAKERS (Vol. 24, p. 771), the curious sect founded by Ann Lee, daughter of a blacksmith in Manchester, England, who came to America with a small party of her adherents in 1714. The road through ADAMS (Vol. 1, p. 181), affords a view of Greylock Mountain (3535 feet), the highest point in Massachusetts; and at NORTH ADAMS (Vol. 19, p. 760), there is a natural bridge 50–60 feet high across Hudson Brook; and you can see the ruins of Fort Massachusetts, captured in 1746 by the French with the aid of the Indians. Here is also the western end of the Hoosac Tunnel, 5¾ miles long. The article TUNNELS (Vol. 27, p. 405) says that the piercing of this tunnel, begun in 1835 and not finished until 1876, was marked by the first American use of air drills and nitroglycerin; and the article POWER TRANSMISSION (Vol. 22, p. 232) describes the influence which this successful employment of compressed air had in furthering its use for the noisy "gun" tools now so familiar.

Williamstown

WILLIAMSTOWN (Vol. 28, p. 685), the last town in Massachusetts on your route, is the seat of Williams College; and the "Haystack Monument" in Mission Park, stands where the prayer meeting was held which was the forerunner of the American foreign missionary movement described in the article MISSIONS (Vol. 18, p. 583), which contains the interesting statement that in the 3rd century the proportion of Christians to the whole human race was one to 150, while it is now one to three. The article

VERMONT (Vol. 27, p. 1025) contains an interesting summary of the early disputes over state boundaries in this part of New England.

Bennington

BENNINGTON (Vol. 3, p. 743) lies at the foot of the Green Mountains, near Mt. Anthony (2345 feet). "The Bennington Battle Monument, a shaft 301 feet high, is said to be the highest battle monument in the world. It commemorates the success gained on the 16th of August, 1777, by a force of nearly 2000 'Green Mountain Boys' and New Hampshire and Massachusetts militia ... over two detachments of General Burgoyne's army," of whom 700 were taken prisoners. The article AMERICAN WAR OF INDEPENDENCE (Vol. 1, p. 842) shows how important an effect this victory had on Burgoyne's campaign. In 1825 WILLIAM LLOYD GARRISON (Vol. 11, p. 477), the anti-slavery leader, edited a paper at Bennington, leaving it when BENJAMIN LUNDY (Vol. 17, p. 124), the Quaker abolitionist, determined to secure Garrison's co-operation on a Baltimore abolitionist magazine, "walked through the ice and snow of a New England winter from Boston to Bennington, 125 miles," and persuaded Garrison to join him. Bennington was the home of ETHAN ALLEN (Vol. 1, p. 691), the frontier hero who led the "Green Mountain Boys" and of SETH WARNER (Vol. 28, p. 327), who subsequently became their colonel.

Hanover

On leaving Bennington you can choose any one of several routes to bring you over to the Connecticut River, but, whichever you take, you will be fairly on the main route to the White Mountains (by which you would have gone from New York through Waterbury, Springfield and Greenfield if you had not included the Berkshires in your itinerary) when you reach HANOVER, N. H. (Vol. 12, p. 927). Here, "ranges of rugged hills, broken by deep, narrow gorges and by the wider valley of Mink Brook, rise near the river and culminate in Moose Mountain, 2326 feet above the sea." Near the foot of that peak is the birthplace of LAURA D. BRIDGMAN (Vol. 4, p. 559), the

first blind deaf-mute to be successfully educated. Dr. S. G. HOWE (Vol. 13, p. 837), who was head of the Perkins Institute for the Blind in Boston, heard of her case in 1837, took charge of her in October of that year, and by June, 1840, at eleven years of age, her mind had become as well developed as that of a normal child of her age. Charles Dickens saw her when he was in America in 1842, and his account of her case led to the introduction in England, and afterwards in all parts of Europe, of the Howe system of training.

Dartmouth College

The attractions which Hanover owes to its picturesque site are enhanced by the fine buildings and the notably beautiful campus of DARTMOUTH COLLEGE (Vol. 7, p. 838). The purpose for which this college was originally founded is quaintly expressed in its charter, granted by George III in 1769. See the article on INDIANS, NORTH AMERICAN (Vol. 14, p. 452). This document ordains "that there be a college erected in our Province of New Hampshire by the name of Dartmouth College, for the education and instruction of youth of the Indian Tribes in this Land in reading, writing and all parts of Learning which shall appear necessary and expedient for civilizing and christianizing children of pagans ... and also of English youth and any other."

With the name of Dartmouth College will always be associated that of DANIEL WEBSTER (Vol. 28, p. 460), not only because he was graduated there in 1801, but because the famous "Dartmouth College case," in which Webster appeared for the college before the United States Supreme Court, was the first in which that august tribunal fully asserted its power to support the Federal constitution by nullifying any usurpatory statutes passed by state legislatures.

When you turn away from the Connecticut River to go up the valley of the Ammonoosuc, you are fairly in the White Mountain region, which the Britannica (Vol. 19, p. 490) describes in part as follows:

The White

Mountains

"The White Mountains, a continuation of the Appalachian system, rise very abruptly in several short ranges and in outlying mountain masses from a base level of 700–1500 ft. to generally rounded summits, the heights of several of which are nowhere exceeded in the eastern part of the United States except in the Black and the Unaka mountains of North Carolina; seventy-four rise more than 3000 ft. above the sea, twelve more than 5000 ft., and the highest, Mount Washington, attains an elevation of 6293 ft.

The principal ranges, the Presidential, the Franconia and the Carter-Moriah, have a north-eastern and south-western trend. The Presidential, in the north-eastern part of the region, is separated from the Franconia on the south-west by the Crawford, or White Mountain Notch, about 2000 ft. in depth, in which the Ammonoosuc and Saco rivers find a passage, and from the Carter-Moriah, parallel to it on the east, by the Glen-Ellis and Peabody rivers, the former noted for its beautiful falls. On the Presidential range, which is about 20 m. in length, are Mount Washington and nine other peaks exceeding 5000 ft. in height: Mount Adams, 5805 ft.; Mount Jefferson, 5725 ft.; Mount Sam Adams, 5585 ft.; Mount Clay, 5554 ft.; Boot Spur, 5520 ft.; Mount Monroe, 5390 ft.; J. Q. Adams Peak, 5384 ft.; Mount Madison, 5380 ft.; and Mount Franklin, 5028 ft. On the Franconia, a much shorter range, are Mount Lafayette, 5269 ft.; Mount Lincoln, 5098 ft.; and four others exceeding 4000 ft. The highest peak on the Carter-Moriah range is Carter Dome, 4860 ft., but seven others exceed 4000 ft. Loftiest of the isolated mountains is Moosilauke noted for its magnificent view-point, 4810 ft. above the sea. Separating Franconia and Pemigewasset ranges is the romantic Franconia Notch, overlooking which from the upper cliffs of Profile Mountain is a remarkable human profile, *The Great Stone Face*, immortalized by Nathaniel Hawthorne; here, too, is the Franconia Flume, a narrow upright fissure, 60 ft. in height, with beautiful waterfalls.

> The whole White Mountain region abounds in deep narrow valleys, romantic glens, ravines, flumes, waterfalls, brooks and lakes.... The headwaters of the rivers are for the most part mountain streams or elevated lakes; farther on their swift and winding currents—flowing sometimes between wide intervales, sometimes between rocky banks—are marked by numerous falls and fed by lakes.
>
> The lakes and ponds, numbering several hundred, were formed by glacial action and the scenery of many of them is scarcely less attractive than that of the mountains. The largest and most widely known is Lake Winnepesaukee on the S. border of the White Mountain region; this is about 20 m. long and from 1 to 8 m. wide, is dotted by 274 islands, mostly verdant, and has clear water and a rather level shore, back of which hills or mountains rise on all sides. Among the more prominent of many others that are admired for their beauty are Squam, New Found, Sunapee and Ossipee, all within a radius of a few miles from Winnepesaukee; Massabesic farther S.; and Diamond Ponds, Umbagog and Connecticut lakes, N. of the White Mountains. The rivers with their numerous falls and the lakes with their high altitudes furnish a vast amount of water power for manufacturing, the Merrimac, in particular, into which many of the larger lakes, including Winnepesaukee, find an outlet, is one of the greatest power-yielding streams of the world."

After exploring the country thus described in the Britannica, you can take for your return trip to New York, the route by Portland, Me., that by Lake Winnepesaukee and Portsmouth, or, that by Plymouth and Manchester, N. H. By any of these ways, you will visit Boston, and its famous suburbs, Concord, Lexington, Brookline, Salem and Marblehead, whose historical and literary associations are fully described in the Britannica.

Automobiles

The article MOTOR VEHICLES (Vol. 18, p. 914), with 37 illustrations, is by the late C. S. Rolls, the famous builder and driver of motor cars, with a special section on commercial vehicles, by Edward Shrapnell Smith, editor of *The Commercial Motor*. The story of the development of the car, told at the beginning of the article, is full of human interest, for it shows how national characteristics affect industries. From 1802, when Richard Trevithick built, in England, the first practical road carriage, until 1885, all the most promising efforts to further mechanical road traffic were made by English inventors. As early as 1824 there was a regular motor-omnibus service between Cheltenham and Gloucester, at a speed that sometimes (perhaps down a hill) reached 14 miles an hour; and if inventors had been encouraged, the effort to lighten road engines would have produced the tubular boiler long before it actually appeared. But the influence of the landowning, horse-breeding, horse-loving English aristocracy was too strong, and one act of Parliament after another imposed destructive restrictions, culminating in the law passed in 1865, making 4 miles an hour the maximum speed, and requiring that a man showing a red flag should march ahead of the engine! Of course this drove every engine off the road except a steam roller or the heaviest type of traction engine. In 1885 Daimler invented the internal combustion engine, and for a moment Germany seemed likely to lead the world. But Daimler failed to hit upon a satisfactory system of transmission, and although his engine worked well in motor boats, the risk of starting a car on the road was too great. His boat, shown at the Paris Exposition of 1887, attracted the attention of the French firm of Panhard & Levassor, makers of wood-

working machinery. They bought the French rights, and Levassor devised the clutch, the gear-box and the whole system of connecting the engine with its work, which, save for improvements in detail, are all in use to-day. In 1895 the French car which won the race from Paris to Bordeaux covered the 744 miles at a mean speed of 15 miles an hour, and the world realized that the motor car was a practical means of transportation. But it was not until 1896 that the English parliament gave cars the freedom of the roads, and that English manufacturers could see a future for themselves.

In the United States, the industry began under great difficulties. The roads, except in the immediate outskirts of the larger cities, were abominable, and no system of suspension that could make them tolerable had yet been discovered. But though starting late, by 1906 the United States overtook and passed France, becoming the foremost car building and car using nation of the world. Nowhere else are factories worked upon so large a scale, and nowhere else are really serviceable cars so light and so cheap. And the greatest recent improvement in the gasolene engine, the Knight sleeve-valve, is an American invention. It is, altogether, a curious story, this struggle in which England, Germany and France, one after another, seemed destined to attain the leadership which in the end fell to the United States.

Turning to the subsidiary articles which relate to motoring, the gasolene engine is elaborately discussed in OIL ENGINE (Vol. 20, p. 35), by Dugald Clerk, an expert engineer and himself the inventor of the Clerk cycle engine. This article shows how complete a change in engineering practice was effected in 1883, when it was demonstrated that small engines could be run at a thousand revolutions

a minute, a speed four times as great as any previously contemplated. All the types of carburetter are described, with mechanical diagrams. Other diagrams show the action of the inner and outer sleeves of the Knight valves. Gasolene, and the experiments made in search of a less costly fuel, are dealt with in the article FUEL (Vol. 11, p. 274), by Prof. Georg Lunge, of the Zurich Polytechnic, the greatest of all authorities on the subject. Tires, the bugbear of every car-owner, form the subject of a separate article Tire (Vol. 26, p. 1006), by Archibald Sharp, which contains a number of curious and instructive diagrams showing the direction of the stress on a tire at the point where the road slightly flattens it. RUBBER (Vol. 23, p. 795), by W. R. Dunstan, president of the International Association of Tropical Agriculture, is well worth reading for its information as to the effect upon tires of exposure to air and light, apart from wear. The materials used, and the mechanical principles involved, in the construction of cars are discussed in a number of separate articles under obvious titles.

PHOTOGRAPHY

A large place, in any review of recreations, must be given to photography, which, even in its most elementary form, provides a record and an echo of an infinite variety of amusements, and, after a little study, not only does this all the better, but becomes a delightful art in itself, to be enjoyed in-doors as well as out-doors, at all hours and at all seasons. The amateur can find no more authoritative, full and yet concise manual of the subject than the Britannica article PHOTOGRAPHY (Vol. 21, p. 485), equivalent

to about 125 pages of this Guide. The first section on History and Technique is by Sir William de Wiveleslie Abney, author of *Instruction in Photography*, *Colour Vision*, etc. Next is a section on photographic apparatus by Major-Gen. James Waterhouse, whose photographic work in India is known throughout the world. And then comes a discussion of pictorial photography by A. Horsley Hinton, author of *Practical Pictorial Photography*. The following is an outline of the article:

History.—Eighteenth century experiments of Scheele, Senebier and Count Rumford. Early 19th century discoveries. The Daguerreotype and its improvements by Goddard, Claudet and Fizeau. The Fox-Talbot process. Albumen process on glass. Collodion process. Positive pictures by the collodion process. Moist collodion process. Dry-plates; alkaline developers with formulae for some of the most effective; developers of organic salts of iron; developer restrainers. Dry-plate bath process of R. Manners Gordon, with formula for preservative. Collodion emulsion processes—work of Bolton and Sayce and of M. C. Lea and W. Cooper; Bolton's modification; Col. Wortley introduces strongly alkaline developer. Formula for alkaline developer for collodion plates. Gelatin emulsion process—Maddox (1871), King (1873), Burgess (1873), Stas (1874), Bennett (1878), Abney (1879), van Monckhoven (1879) and his use of hydrobromic acid on silver carbonate with ammonia. Heating the emulsion—Wortley (1879), Mansfield (1879).

Relative rapidities of the processes described.

Daguerreotype, originally,	Half an hour's	exposure.
Calotype	2 or 3 minutes'	„
Collodion	10 seconds'	„
Collodion emulsion	15 seconds'	„

Rapid gelatin emulsion	$^1/_{15}$ second	„

The second part of the article deals with the technique of photography. The major topics in it are:

Gelatin emulsions: formulae and directions for emulsion with and without ammonia. Coating the plates. Exposure. Development, with formula for alkaline developer. Intensifying and varnishing the negative.

Printing processes. Albumen method of Fox-Talbot. Sensitizing bath. Toning and fixing the print—formulae for toning-bath. Collodio-chloride silver printing process: Simpson's formula. Gelatino-citrochloride emulsion: Abney's formula. Printing with uranium salts: an early formula. Self-toning papers. Printing with chromates: carbon prints—work of Ponton, Becquerel, Dixon, Fox-Talbot, Poitevin, Pouncey, Fargier, Swan, Johnson and Sawyer. Printing with salts of iron. Photo-mechanical printing processes: discoveries of Oreloth, de Motay, Marechal and Albert; "Lichtdruck" and heliotype. Woodbury type. Photolithography: the work of E. J. Asser, J. W. Osborne and Sir H. James.

Photographs in natural colours are next described, and their history is traced from 1810 when Seebeck of Jena made experiments described in Goethe's famous work on *Colours*. *The first successful colour photography was by Becquerel in 1848* on a daguerreotype plate, chlorinized. The later methods of Lippmann and Lumière, respectively, with collodion dry plates prepared with albumen and with dyed gelatin plates (orthochromatic), produce pictures in which the colours show only from an angle.

The section on the *Action of Light on Chemical Compounds*, with a plate showing spectra and graduation scales, contains valuable diagrams and a chronological table of observers of the action of light on different substances. The paragraphs of particular

interest to the practical photographer are those on:

Measurement of the Rapidity of a Plate.

Effect of Temperature on Sensitiveness.

Effect of Small Intensities of Light on a Sensitive Salt.

Effect of Very Intense Light on a Sensitive Salt.

Intermittent Exposure of a Sensitive Salt.

Effect of Monochromatic Light of Varying Wave-Lengths on a Sensitive Salt.

Reproduction of Coloured Objects by 3 Photographic Positives: Ives' process; Joly's process; Autochrome of Lumière; Positives in 3 Colours.

Another division (equivalent to 60 pages at least in this Guide) of the article is on Apparatus. It deals especially with the hand camera as developed from 1855 to 1888 when the Eastman Kodak came out. And it has separate paragraphs on Focusing; Plate-holders or Dark-slides (1 illustration); Studio cameras; Portable and Field cameras; Hand cameras (7 illustrations); Twin-lens and Reflex cameras (2 illustrations); Panoramic cameras (2 illustrations); 3 Colour cameras (1 illustration); Enlarging cameras and cinematographs.

A separate section deals with objectives, and contains 45 illustrations, giving special attention to: single achromatic (landscape) lens, including aplanatic; unsymmetrical doublets; symmetrical doublets; triple combinations; anastigmatic combinations; telephotographic objectives; anachromatic lenses; diaphragm apertures.

Then follows a discussion of instantaneous shutters (with 9 illustrations) and a discussion under "lateral" and "central" of flap, drop, drop and flap, rotary, roller blind, focal plane, moving blade, central and iris shutters.

Exposure meters (4 illustrations) with a discussion

of the actinic power of light; sensitive plates, films and papers: sensitive dry plates, plates for colour photography, celluloid films, photographic printing papers, apparatus for development (with 4 illustrations); photographic printing apparatus; bibliography.

The last division of this great article is on *Pictorial Photography*, and this is illustrated by three full-page plates. It deals not merely with portrait photography but with "artistic" landscape work, and combination printing, which "is really what many of us practiced in the nursery, that is, cutting out figures and pasting them into white spaces left for that purpose in the picture book."

In addition to this comprehensive treatise, in itself a complete manual of photography, there are other articles which will be useful to the advanced amateur who desires either to study the scientific aspects of the subject or to undertake the reproduction of his work by processes other than the ordinary printing. The production of chemical changes by the action of light are discussed in PHOTOCHEMISTRY (Vol. 21, p. 484). LENS (Vol. 16, p. 421) is by Dr. Otto Henker, of the staff of the Zeiss factory at Jena, Germany. ABERRATION (Vol. 1, p. 54) is by Dr. Eppenstein, another expert of the same establishment. The making of blocks from your own negatives is covered by the article PROCESS (Vol. 22, p. 408), by Edwin Bale, art director of Cassell & Co., and contains coloured plates showing the stages of superimposed printing. SUN COPYING (Vol. 26, p. 93), by F. Vincent Brooks, a practical printer, describes direct-contact printing without the use of a camera.

OUT-DOOR GAMES

The authority which is back of the articles in the Britannica and the fact that its articles are on a larger scale than those of other works of reference make its articles on sports and games singularly valuable. The reader who is interested in FOOTBALL, for instance, will find an article (Vol. 10, p. 617), of more than 12,000 words, part of it written by Walter Camp, the famous American expert. It includes a historical sketch; a description of the Rugby Union game by Charles James Nicol Fleming, inspector in the Scotch Education Department, and Charles John Bruce Marriott, secretary of the Rugby Football Union; of the Association game, by Charles William Alcock, late secretary of the Football Association, London, and Frederick Joseph Wall, secretary of the Football Association; and of the game in the United States, by Walter Camp and Edward Breck. The article GOLF is by H. G. Hutchinson, amateur golf champion in 1886–87, and author of *Golf*, *Book of Golf and Golfers*, etc. In the same way there are authoritative and full articles on the following subjects:

Athletic Sports

Acrobat

All-Round Athletics

Amateur

Archery

Ball

Base-ball

Battledore and Shuttlecock

Botori

Bowls

Boxing
Bull-fighting
Caber-Tossing
Caestus
Camping-Out
Children’s Games
Circus
Cricket
Croquet
Cycling
Discus
Football
Game
Games, Classical
Golf
Gymkhana
Hammer Throwing
Hurdle-Racing
Jumping
Kite-Flying
Lacrosse
Lawn-Tennis
Long Fives
Marbles
Matador
Palaestra

Pall-Mall
Pallone
Pelota
Pigeon Flying
Pole Vaulting
Potato Race
Pugilism
Pushball
Putting the Shot
Quarter Staff
Quintain
Quoits
Rackets
Ringgoal
Rounders
Rowing
Running
Scull
Skittles
Sport
Stadium
Stool-Ball
Swimming
Toreador
Tournament
Tug-of-War

Walking-Races

Water Polo

Weight-Throwing

And among active indoor games on which the Britannica contains articles, are FENCING, CANE FENCING, EPÉE-DE-COMBAT, FOIL-FENCING, SABRE-FENCING, SINGLE-STICK, BASKET BALL, BADMINTON, BOWLING, TENNIS, STICKÉ, FIVES, LONG FIVES, ROLLER-SKATING, SQUAILS, SHUFFLE-BOARD, TRAPEZE, WRESTLING.

Athletics

The distinction between games and athletic sports is an arbitrary one, and the articles on athletics have been included in the list of those on out-door games; but a few of them seem to call for special mention. The article ATHLETIC SPORTS (Vol. 2, p. 846) gives a general account of amateur associations and of national and international meetings; and contains a special section on the revived Olympic Games. ATHLETE (Vol. 2, p. 846) and GAMES, CLASSICAL (Vol. 11, p. 443) deal with the ancient Greek and Roman contests. ALL-ROUND ATHLETICS (Vol. 1, p. 709) describes the championship, instituted in this country, for the highest awards attained by one athlete in eleven different branches of sport. AMATEUR (Vol. 1, p. 782) is a very full and impartial discussion of the interminable controversies regarding the distinction between professionals and amateurs. Among the articles on special sports are RUNNING (Vol. 23, p. 853), dealing with every form of race from the 100–yard dash to the Marathon run; HURDLE-RACING (Vol. 13, p. 958); JUMPING (Vol. 15, p. 533); POLE VAULTING (Vol. 21, p. 977); WEIGHT-THROWING (Vol. 28, p. 494); PUTTING THE

SHOT (Vol. 22, p. 672); HAMMER THROWING (Vol. 12, p. 899); CABER-TOSSING (Vol. 4, p. 917); DISCUS (Vol. 8, p. 312); and TUG-OF-WAR (Vol. 27, p. 365).

Hunting

The reader interested in hunting will turn first to the articles on sporting weapons. GUN (Vol. 12, p. 717), by Sir Henry Seton Karr, one of the world's most famous big game shots, describes the modern shot gun in great detail, with full particulars as to barrels, locks and ejectors. RIFLE (Vol. 23, p. 325) of course includes full descriptions of the military rifles of all armies, and the sections on sporting rifles and target rifles (p. 334) are by the contributor of the article on shot guns just mentioned. PISTOL (Vol. 21, p. 654) gives a full account of the modern automatic pistol, with diagrams showing the mechanism of the Mauser and Colt types. A useful table shows the length-over-all, barrel-length, weight and composition of cartridges, of the eleven standard types of Colt and Smith & Wesson revolvers. AMMUNITION (Vol. 1, p. 864) deals with the cartridges used for guns, rifles and pistols. The "propellants" employed are discussed in GUNPOWDER (Vol. 12, p. 723), by Prof. Hodgkinson; EXPLOSIVES (Vol. 10, p. 81); and CORDITE (Vol. 7, p. 139). SHOOTING (Vol. 24, p. 995), by Percy Stephens, deals with the pursuit of birds, ground game and big game in all parts of the world. Among the varieties of American big game mentioned are the huge grizzlies of Alaska, the wapiti, moose, caribou, antelope, big horn and puma or mountain lion. The section on the hunter's personal equipment contains excellent practical hints as to outfit. Among other articles of interest in this connection are BIRD (Vol. 3, p. 959), by Prof. Hans Gadow; RABBIT (Vol.

22, p. 767), by Sir William Flower and Richard Lyddeker; DEER (Vol. 7, p. 923); ANTELOPE (Vol. 2, p. 89); ELK (Vol. 9, p. 290); BEAR (Vol. 3, p. 573); PUMA (Vol. 22, p. 644); and CARNIVORA (Vol. 5, p. 366). There is a separate article on PIGEON SHOOTING (Vol. 21, p. 597). On each species of African and Asiatic big game there is an elaborate article. The dogs used in sports of all kinds are described in the article DOG (Vol. 8, p. 374), by Walter Baxendale, kennel editor of the London *Field*, and Prof. Chalmers Mitchell, with five full-page plates.

Riding to hounds, including fox-hunting, stag-hunting, hare-hunting and the drag hunt, is covered by the article HUNTING (Vol. 13, p. 946), by A. E. T. Watson, editor of the *Badminton Library*. Other forms of the chase are dealt with in COURSING (Vol. 7, p. 321) and FALCONRY (Vol. 19, p. 141), by Lieut.-Col. Delmé Radcliffe.

Fishing

The key article on line fishing is ANGLING (Vol. 2, p. 21), in length equivalent to 35 pages of this Guide. It begins with a most interesting historical section, showing that, before the days of the earliest hooks, the cave-men used on their lines a little flake of flint or strip of stone, fixed in the bait, with a groove in the middle of it, around which the line was so fastened that when the pull came the instrument turned crossways in the fish's stomach and could not be disgorged. A delightful section on angling literature follows this historical matter; and then comes treatment of fresh water fishing, with fly-casting and the use of surface baits; live-baiting and spinning; and bottom-fishing; each of the three fully treated. A detailed study is then made of the habits

of the salmon and of the tackle and methods devised for his beguiling. Trout, muskelunge, bass, perch and roach are successively discussed; and then comes the section on sea-angling, the tarpon, tuna, jewfish and the giant black bass. The article ends with a complete bibliography of the subject. There are 96 articles on individual fish, all listed on p. 891 of Vol. 29, if the reader desires to refresh his memory as to the varieties. FISHERIES (Vol. 10, p. 429), by Prof. Garstang and Prof. Chalmers Mitchell is concerned with the industry rather than with sport, but it contains much information about sea fish which will be of use to the sea-angler.

Taxidermy

A thoroughly practical article is TAXIDERMY (Vol. 26, p. 464), by Montague Browne, author of a manual of the art. His book and Dr. W. T. Hornaday's *Taxidermy and Zoological Collecting* are the most important special books on the subject, and Mr. Browne in this article constantly refers to the improved methods introduced by Hornaday and other Americans. He points out the dangers of using arsenical soap and gives the formula for the substitute, quite safe except when hot, which he himself invented. Minute directions are given for skinning, mounting, etc. And the article also treats of the advantages of modelling as compared with the old method of "stuffing"; and the placing of specimens in natural surroundings, with panoramic back-grounds, top- and side-lighting, etc.

Sailing and Boating

On sailing, boating and kindred subjects the reader should first consult the article YACHTING (Vol. 28, p. 890), equivalent to 26 pages of this Guide, by B.

Heckstall-Smith, yachting editor the *Field*, and secretary of the Yacht Racing Association and of the International Yacht Racing Union. The historical part of this article traces yachting in England back to the state-barges of the Anglo-Saxon kings and through the pleasure ship of Elizabeth (1588), which was built at Cowes in the Isle of Wight, so that this place has been associated with the sport for more than three centuries. Charles II in 1660 received the present of a yacht from the Dutch, and at this time the Dutch word “yacht” first found its way into the English language. Yachting clubs date from the establishment in 1720 of the Cork Harbour Water Club, now the Royal Cork Yacht Club. At Cowes races were sailed as early as 1780 and a yacht club was organized there in 1812. The first yacht club in the United States was formed in 1844 and the first race in the United States was at New York in 1846 to Sandy Hook light-ship and back. The first important alteration in type was in 1848 when the “Mosquito” was built—a 50–ton vessel, 59 ft. 2 in. at water line, 15 ft. 3 in. beam, with a long hollow bow and a short and rather full after-body. The first races in the United States resulted in the building of the “America,” which in 1851 crossed the ocean and won a race round the Isle of Wight, bringing back to the New York Yacht Club the “America’s” cup. The later races for this cup are described in detail at the close of the article, with elaborate tables showing the exact tonnage or sailing length of competing yachts, dates of races, time allowance, elapsed time, corrected time, and margin by which each race was won. The article describes 1870–1880 as the first great era of yachting. Changes in the method of reckoning length, introduced in 1879, resulted in the “lead mine” or plank-on-edge type. In 1887 the

system of tonnage measurement was introduced and a method of rating by water-line length and sail area —and this "crushed the plank-on-edge type completely. There was not another boat of the kind built." The era of big cutters followed—in America notably the Herreshoff boats. The success of the bulb keels in the small classes threatened the use of "skimming dishes" in the larger classes—and a consequent lack of head room and cabin accommodation. New linear rating rules were therefore adopted—one in 1896 and another in 1901, followed in 1904 by international rating rules. The English types of Fife and Nicholson were succeeded by such boats from the Krupp yard at Kiel as the "Meteor" and "Germania." See also the article MODEL YACHTING (Vol. 18, p. 640).

Other articles on the subject of boating are CANOE (Vol. 5, p. 189); MACGREGOR, JOHN (Vol. 17, p. 232) (for the famous "Rob Roy"); CATAMARAN (Vol. 5, p. 502); and ROWING (Vol. 23, p. 783), by Charles Murray Pitman, formerly stroke of the Oxford University eight, with a special treatment of rowing in the United States and a comparison of English and American "styles." The articles SWIMMING (Vol. 26, p. 231) by William Henry, author of *Swimming* in the Badminton Library, and DROWNING AND LIFE SAVING (Vol. 8, p. 592) are of practical value.

Mountaineering

The article MOUNTAINEERING (Vol. 18, p. 937) is by Sir W. Martin Conway, famous for his ascent to a height of 23,000 feet in the Kara Koram Himalayas, for the High Level route through the Alps which he originated, and for his climbs in Spitsbergen. It contains paragraphs on the dangers from falling rocks, falling ice, snow avalanches, falls from rocks,

ice slopes, crevasses, and weather; and an outline of history of the sport, which has been systematically pursued only since 1854. GLACIER (Vol. 12, p. 60), by E. C. Spicer is another article of great interest to those who love climbing. Among the articles on individual mountains and on the great ranges, the first place must be given to the scene of the classic exploits of the early mountaineers. The relevant part of the article ALPS (Vol. 1, p. 737) is by W. A. B. Coolidge who, although an American by birth, is more at home in the Alps than any other living writer. This magnificent article, which would fill nearly 40 pages of this Guide, contains a table giving the heights of no less than 1,317 separate peaks and passes, and also a consecutive narrative of Alpine exploration. HIMALAYA (Vol. 13, p. 470) is by Sir Thomas H. Holdich, superintendent of Frontier Surveys in India. The best mountaineering section of the Rockies is described in a section of the article CANADA (Vol. 4, p. 145). ANDES (Vol. 1, p. 960) describes the peaks of the Southern Cordillera. Full articles on the mountaineering sections of our own country, such as the Appalachians, the Adirondacks, the Catskills and White Mountains will be found under the obvious titles.

Winter Sports

SKATING (Vol. 25, p. 166) deals with both speed skating and figure skating, and tells of the exploits at Newburgh, N. Y., of Charles June and of the famous Donoghue family. A table of amateur records is also given. Ice hockey is treated in a section of the article HOCKEY (Vol. 13, p. 554). CURLING (Vol. 7, p. 645) describes the “rink” and stones, as well as the game, and contains a glossary of technical terms. ICE YACHTING (Vol. 14, p. 241) explains the mechanical

paradox which makes it possible for a boat propelled by the wind to move faster than the wind is blowing. Ski-running and jumping, with the new development of military skiing in France and Italy, are described in SKI (Vol. 25, p. 186); and it will surprise many readers to learn that a clear jump of more than 130 feet has been made. Other articles dealing with winter sports are SNOWSHOES (Vol. 22, p. 296), COASTING (Vol. 6, p. 603) and TOBOGGANING (Vol. 26, p. 1042).

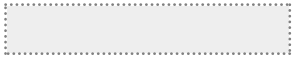
Driving, Riding and Polo

For information in regard to sports connected with the horse the reader should first study the article HORSE and particularly that part which concerns the history of horse breeding (pp 717–723 of Vol. 13), written by E. D. Brickwood, an English authority on sport, and the sections on "breeds of horses" by the late William Fream, agricultural correspondent of the London *Times*, and Prof. Robert Wallace, of Edinburgh University, who also wrote the section on management.

HORSE-RACING (Vol. 13, p. 726) contains a section on racing in the United States, including the development of trotting races and the stress put upon time records, pacing races, racing centres, the predominance of dirt-tracks as contrasted with the turf courses of England; a section on the history of English racing, including the institution of the St. Leger, the Derby, the Oaks, the Ascot races, the Goodwood, Two Thousand Guineas, etc., present conditions, including classic races, handicaps, with scale of weight for age, the £10,000 races, the two-year-old races, Newmarket, Ascot and other meetings, value of horses, trainers and jockeys,

foreign horses, time, the Jockey Club and steeplechasing, the Grand National; a section on racing in Australia; a section on racing in France, where, as in England, American owners and jockeys have for some years past been much to the front; and also a mention of the chief meetings in other European countries and in Australia. HORSEMANSHIP (Vol. 13, p. 726) is chiefly concerned with exhibition riding. DRIVING (Vol. 8, p. 585), by R. J. McNeill, discusses the intricacies of tandem and four-in-hand coachmanship, and contains a section on the use of the whip. The importance of acquiring a light hand, and the extent to which this depends on the proper use of the three joints in the arm, are clearly explained. COACH (Vol. 6, p. 574) tells about the amateur road coach and the four-in-hand clubs in America and elsewhere. The coaching horn or "post-horn," as it used to be called, is treated under HORN (Vol. 13, p. 697) by Kathleen Schlesinger, the great authority on musical instruments. CARRIAGE (Vol. 5, p. 401), by J. A. McNaught, notes that, although the buggy and rockaway are the characteristic pleasure vehicles of this country, the heavier dog-cart and ralli-cart are much used with horses of a certain type.

The article POLO (Vol. 22, p. 11), by Thomas F. Dale, steward of the Polo and Riding Pony Society, describes the twelve varieties of the game played during its existence of at least 2,000 years. The three modern forms are the Indian, the English and the American, the game in England dating from 1869 when it was introduced from India by the 10th Hussars—and more definitely from 1873 when it was adopted by the Hurlingham Club. The rules of the game are given, and its development is traced, and there is a section on the polo pony and the much discussed systems of measurement.



Gardening

Out-door recreation in the garden may be fully studied in the article HORTICULTURE (Vol. 13, p. 741), which is a book in itself, for its contents are the equivalent of about 140 pages of this Guide. It is written by Liberty Hyde Bailey, director of the College of Agriculture, Cornell University, who contributes a valuable gardeners' calendar for the United States, M. T. Masters, editor of *Gardeners' Chronicle*, and W. R. Williams, superintendent of the London County Council Botany Centre, who write on "principles"; and John Weathers, author of *Practical Guide to Garden Plants*, who writes on the "practice" of gardening. The following is a partial list of the topics treated in this article:

Roots, Root-Pruning and Lifting, Watering, Bottom-Heat; Stem; Leaves; Buds; Propagation by Buds; Layering; Grafting or "Working"; Planting; Pruning; Training; Sports or Bud Variations; Formation of Flowers; Forcing; Retardation; Double Flowers; Formation of Seed, Fertilization, Hybridization, Reversion, Germination, Selection—all to be supplemented by the article BOTANY (Vol. 4, p. 299) for more scientific and less practical discussion of these topics.

The Practice of Horticulture.

Formation and Preparation of the Garden—Site, Soil, Subsoil, Shelter, Water Supply, Fence, Walks, Edgings.

Garden Structures—Walls, Espalier Rails and other means of training; Plant Houses (with 12 illustrations), including Conservatory, Greenhouse, Fruit House, Vinery, Peach House, Forcing House, Pits and Frames, Mushroom House, Fruit Room, Heating Apparatus, Pipes, Boilers, Water Supply, Solar Heat, Ventilation, etc.

Garden Materials and Appliances—Soil, Loam, Sand, Peat, Leaf Mould, Composts. Manures, with descriptions and appraisals of different varieties, organic and inorganic. Tools, Tallies and Labels.

Garden Operations—Propagation—by seeds, offsets, tubers, division, suckers, runners, proliferous buds, grafts, with description and diagrams of different methods—buds, branch cutting, leaf cutting, root cutting, single-eye cutting, with 12 illustrations.

Planting and Transplanting; Watering; Pruning (with 9 illustrations); Ringing; Training—horizontal, fan, trellis, etc.

Flowers—Flower Gardens, Pleasure Grounds, Lawns; Hardy Annuals, with long list and description of plants recommended; Hardy Biennials, with list; Herbaceous Perennials, with classified list (containing more than the equivalent of 18 pages of this Guide); Hardy Trees; Bedding Plants, etc.

Vegetables.

Calendar for the United States.

A list of other articles on special aspects of gardening will be found in the chapter *For Farmers*.

INDOOR GAMES

For learning indoor games—excluding indoor athletic games which have been listed above—the Britannica is particularly valuable, because of its elaborate treatment by noted authorities and because the handy and convenient form of the India paper volume makes an article on any indoor game as easy to consult as a hand-book dealing with only one game.

For example, the article on BRIDGE (Vol. 4, p. 528) is by William Henry Whitfeld, card-editor of *The Field*. The article is the equivalent of 15 pages in this Guide; and it describes both auction and ordinary bridge, with paragraphs on advice to players, declarations, doubling, redoubling, play of the hand, playing to the score; and other forms of bridge,—

three-handed bridge, dummy bridge, misery bridge, and draw or two-handed bridge; and contains a list of authorities.

Even more elaborate, as befits the subject, is the article CHESS (Vol. 6, p. 93), equivalent to 45 pages of this Guide. It contains diagrams showing the arrangement of pieces and the English and German methods of notation and a vocabulary of terms of the game; it treats the comparative value of the pieces —"pawn 1, bishop 3.25, knight 3.25, rook 5, queen 9.5. Three minor pieces may more often than not be advantageously exchanged for the queen. The knight is generally stronger than the bishop in the end of the game, but two bishops are usually stronger than two knights, more especially in open positions." English, French and German modes of notation and names of pieces are given. The treatment of chess problems is accompanied by eight typical problems with diagrams and analyses. The section on the history of chess gives not merely very interesting early material but a study critical and biographical, of the great chess masters—for example: Ruy Lopez, the first chess analyst Greco; Philidor, a great blindfold and simultaneous player of the 18th century; Allgaier; Mahé de la Bourdonnais; the English school of the 19th century, Sarratt, Lewis, Mac Donnell, Evans (of the gambit), Staunton (on whom there is a separate article) and Buckle, the historian of civilization; the Berlin "Pleiades" and the Hungarians, Grimm, Szen and Löwenthal; Morphy, the American; and among the great players of the last half century, Steinitz, Paulsen, Blackburne, Zukertort, Horwitz, Mason, Teichman, Pillsbury, Lasker, Mieses, Marshall, Tarrasch, Tchigorin, etc. The results of international tournaments are given from 1851 on; and modern tournament play is

criticised. The article closes with an elaborate bibliography.

The article on DRAUGHTS or Checkers (Vol. 8, p. 547) is by J. M. M. Dallas, late secretary of the Edinburgh Draughts Club, and Richard Jordan, former draughts champion of the world, and gives the history of the game, with a study of the different openings.

The usefulness of the Britannica for card games in general may be easily tested. Let us turn for instance to the article POKER (Vol. 21, p. 899). It is equivalent in its contents to seven or eight pages of this Guide, and among other interesting features it contains a vocabulary of technical terms, including “big dog”, “little dog”, “cold feet”, “splitting”, and the following mathematical table of approximate chances.

To improve any hand in the draw, the Britannica tells us, the chances are:

Having in Hand	To make the Hand below	The Chance is
1 pair	To get two pairs (3-card draw)	1 in 4 ½
1 pair	To get three of a kind (3-card draw)	1 in 9
1 pair	To improve either way average value	1 in 3
1 pair and 1 odd card	To improve either way by drawing two cards	1 in 7
2 pairs	To get a full hand drawing one card	1 in 12
3’s	To get a full hand drawing two cards	1 in 15 ½

3's	To get four of kind drawing two cards	1 in 23 ½
3's	To improve either way drawing two cards	1 in 9 ⅖
3's and 1 odd card	To get a full hand by drawing one card	1 in 15 ⅓
3's and 1 odd card	To improve either way by drawing one card	1 in 11 ¾
4 straight	To fill when open at one end only or in the middle as 3 4 6 7, or A 2 3 4	1 in 11 ¾
4 straight	To fill when open at both ends as 3 4 5 6	1 in 6
4 flush	To fill the flush drawing one card	1 in 5
4-straight flush	To fill the straight flush drawing one card	1 in 23 ½
3-card flush	To make a flush drawing two cards	1 in 24

Among indoor games and kindred topics, each in a separate article, in the Britannica, are:

Ace

Acrostic

All-Fours

Ambigu

Boston

Bouillotte

Brag

Bridge

Calabresella

Cards, Playing
Casino
Catch the Ten
Charades
Checkers
Chess
Children’s Games
Commerce
Conjuring
Consolation
Conundrum
Crambo
Cribbage
Deuce
Dice
Doll
Dominoes
Draughts
Ecarté
Euchre
Fantan
Faro
Fast and Loose
Gaming and Wagering
Go, or Go-bang
Goose

Halma
Hazard
Hearts
Hoyle
Jones, Henry (“Cavendish”)
Juggler
Knucklebones
La Grâce
Legerdemain
Loo
Lotto
Matrimony
Mora
Napoleon
Nine Men’s Morris
Old Maid
Ombre
Pachisi
Patience
Petits-Chevaux
Ping-Pong
Pinochle
Piquet
Poker
Pope Joan
Prestidigitation

Primero

Puzzle

Raffle

Rebus

Riddles

Roulette

Salta

Shio-ghi

Skat

Snip Snap Snorem

Solitaire

Solo Whist

Speculation

Spelling Bee

Spillikins

Spoil-Five

Top

Toy

Trent et Quarante

Ventriloquism

Vingt-et-Un

Vint

Whist

Needlework, etc.

Needlework as treated in the Britannica has one element of peculiar value and novelty. In this

department, as throughout the book, the illustrations have been chosen upon a principle unusual in works of reference: they really illustrate; they throw light on the text; they are not mere pretty pictures intended to catch the eye and inserted in the book haphazard. Turn for instance to the article LACE (Vol. 16, p. 37). Among its 61 illustrations are not only small diagrams explaining different stitches and meshes and patterns and larger halftone illustrations of "Bone Lace" "Reticella Needlepoint", "Gros Point de Venise", "Point de Flandres à Brides" "Point de Venise à Brides Picotées," "Réseau Rosacé," etc., but there are reproductions of portraits of the 16th, 17th and early 18th centuries, showing not merely patterns of lace but the method in which it was used and how it "combined" and harmonized with styles of costume, and of hair dressing. These "lace portraits" are: one from the Louvre, about 1540 of Catherine de' Medici, wearing a linen upturned collar of cut work and needlepoint lace; one by Morcelse, about 1600, of Amelie Elisabeth, comtesse de Hainault, wearing a ruff of needlepoint reticella lace; one, 1614, of Mary, countess of Pembroke, wearing a coif and cuffs of reticella lace; one by Le Nain, about 1628, of Henri II, duc de Montmorency, wearing a falling lace collar; one by Riley, about 1685, of James II, wearing a jabot and cuffs of raised needlepoint lace; one, about 1664, of Mme. Verbiest, wearing pillow-made lace *à reseau*; one, about 1695, of Princess Maria Teresa Stuart, wearing a flounce or tablier of delicate needlepoint lace with small relief clusters; and one of de Vintimille, about 1730, wearing needlepoint of the *Point de Venise à brides picotées*. This article on Lace, equivalent in length to 60 pages of this Guide, is by A. Summerly Cole, author of *Ancient Needle Point and Pillow Lace*.

EMBROIDERY (Vol. 9, p. 309) is by Mr. Cole and A. F. Kendrick, keeper of the Victoria and Albert Museum, South Kensington; and is illustrated with 18 figures showing many styles of early embroidery. There are also articles on Tapestry, Needlework, Knitting, Yarn, etc.

Dancing, the Stage, etc.

On dancing and the stage there is much of interest in the Britannica. The article on the DANCE (Vol. 7, p. 794) distinguishes dancing as an expression of emotion, whether social joy or religious exultation; dancing for pleasure to the dancer or the spectator; and mimetic dancing, "to represent the actions or passions of other people." A section on primitive and ancient dancing describes various early dances, many of them not unlike the "trots" and "hugs" so notorious during the last few years. At an Aztec feast, "called Huitzilopochtli, the noblemen and women danced tied together at the hands, and embracing one another, the arms being thrown over the neck." Primitive imitative dances, the attitude of the ancient Romans towards the dance, religious dances and the attacks on the dance of such Puritan sects as the Albigenses and Waldenses close the section on ancient dancing.

"Modern dancing" describes the branle (or brawl), the pavane, saraband, minuet, gavotte, écossaise, cotillon, galop, lancers, schottische, bourrée, waltz, fandango, bolero, jota, Morris dances, hornpipe, and other English dances of the 17th and 18th centuries. In treating of present-day dancing the article deals especially with the waltz, quadrille, country-dance, lancers, polka, galop, Washington Post and other American barn-dances, polka-mazurka, Polonaise,

Schottische and Sir Roger de Coverley. And it discusses ballet dancing (on which there is also a separate article) and musical gymnastics. There are separate articles on the following dances: ALLEMANDE, BERGAMASK, CHACONNE, CHASSE, COURANTE, GAVOTTE, JIG, MAZURKA, MORRIS DANCE, PASSACAGLIA, PAVANE, POLKA, POLONAISE, QUADRILLE, SARABAND, SCHOTTISCHE.

For a sufficient knowledge of the theatre and the drama to heighten his enjoyment of a play, the theatre-goer should read up the subject, the period and the author in the Britannica. For a more serious and thorough study of opera, music in general and the drama as a literary form, he may turn to special chapters of this Guide.

TRAVEL AT HOME AND ABROAD

If the traveler would make the most of his vacation journeys—as has already been suggested—he should "read up" in the Britannica, even if he does not wish to make a systematic study of the literature, art, architecture, music, etc., of the country he is to visit. If he does wish to pursue systematic study he can use the Britannica to better advantage than a whole library of books of travel or special treatises.

The Britannica has often and successfully been used in this way. A single instance: The Rev. Dr. George R. Van DeWater of St. Andrews Church, New York City, in a letter addressed to the publishers of the new Britannica, wrote:

"I have recently had occasion to look up South America with a view to obtaining needed information for a proposed tour there, and I found all that I wanted to know and found it readily."

Among the general classes of valuable information for the traveler are:

The excellent maps, newly made with the greatest care from the best sources;

Articles on the great countries of the world. Particularly valuable sections are those at the beginning of each of these articles on physiography, climate, etc., and those on transportation by rail and water;

Articles on the states of the Union, similarly arranged, and like them accompanied by maps and with full descriptions of the surface of the country and the means of communication, climate, etc.;

Articles on regions, rivers, mountains, etc.,—for instance on the RIVIERA, ALPS, NILE, RHINE, HUDSON, YOSEMITE, YELLOWSTONE.

Articles on cities and towns, with descriptions of the principal places of interest, historical sketches, diagrams of battle-fields, etc.;

General articles such as ARCHITECTURE, PAINTING, MUSEUMS, which give critical and related accounts of great art treasures of different periods and schools. To this information, as bearing on the particular place the traveler intends to visit, he will be guided by the Index;

Biographical articles related to the special vicinity to be visited—as for instance, WORDSWORTH, COLERIDGE and DEQUINCEY for the Lake District.

This survey, already too long for the limited space of this Guide, yet far too brief to represent properly the aspect of the Britannica with which it deals, will have accomplished its purpose if it induces the possessor of the volumes to go to them when he needs relaxation. Articles of the kind described in this chapter, showing you how to make the most of

leisure hours, are doubly serviceable, giving pleasure while they are being read, and again when their suggestions are carried into effect.

But it is not only in the articles dealing with recreation that Britannica reading insures future as well as present enjoyment. Lafcadio Hearn said it was worth while to visit Japan if only because what one sees there makes one's dreams more beautiful all through later life. And so the fascination of history, of science, of biography, does not end, but only begins, with the reading which opens for you a gate leading into fresh fields. What you read this coming year, in any department of the Britannica, will be still, ten years from now, a source of pleasure, for knowledge, once acquired, brings continually renewed delight.

TRANSCRIBER'S NOTES

1. Typos fixed; non-standard spelling and dialect retained.

*** END OF THE PROJECT GUTENBERG EBOOK THE READER'S GUIDE TO THE ENCYCLOPAEDIA BRITANNICA ***

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