

PHILLIPS-LOOMIS MATHEMATICAL SERIES

ELEMENTS OF GEOMETRY

BY

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PREFACE

THE mathematical series of which this book is the first to be published is founded on the works of the late Professor Elias Loomis. In the present instance, however, the work can scarcely be called a revision. We have utilized many of the terse and accurate statements and definitions of the Loomis Geometry, and have aimed to maintain the high standard of that work for rigorous demonstrations, but, aside from these similarities, the arrangement and method of presentation are essentially new.

While the book speaks for itself, we would call attention to some of its most important features.

The *Introduction* presents in the shortest possible compass the general outlines of the science to be studied, and leads at once to the actual study itself.

The *definitions* are distributed through the book as they are needed, instead of being grouped in long lists many pages in advance of the propositions to which they apply. An alphabetical index is added for easy reference.

The *constructions* in the Plane Geometry are also distributed, so that the student is taught how to make a figure at the same time that he is required to use it in demonstration.

In the Geometry of Space, the figures consist of half-tone engravings from the *photographs of actual models* recently constructed for use in the class-rooms of Yale University. By the side of these models are skeleton diagrams for the student to copy.

Extensive use has been made of *natural* and *symmetrical* methods of demonstration. Such methods are used for deducing the formula for the sum of the angles of a triangle, for the sum of the exterior and interior angles of a polygon, for parallel lines, for the theorems on regular polygons, and for similar figures in both Plane and Solid Geometry.

The *theory of limits* is treated with rigor, and not passed over as self-evident.

Attention is also called to the theorems of *proportion*, the use of *corollaries* as *exercises* to supply the need of "inventive geometry," and the Introduction to Modern Geometry.

We would here express our grateful acknowledgments to all who have aided in the preparation of this book; to Miss Elizabeth H. Richards, whose successful experience in fitting students for college in Plane Geometry has rendered her criticisms and suggestions most valuable, to Mr. E. H. Lockwood, of the Sheffield Scientific School, whose skill as a draughtsman has been of essential service in the preparation of the figures, and to our colleagues, Messrs. W. M. Strong and Joseph Bowden, Jr. Mr. Strong has selected, for the most part, the exercises at the end of the book, and has written a large part of the Introduction to Modern Geometry. Mr. Bowden, whose large experience in teaching successive Freshman classes has given him an unusual equipment, has written a considerable portion of the Solid Geometry, and has examined critically the references and proof-sheets of the book.

ANDREW W. PHILLIPS,
IRVING FISHER.

YALE UNIVERSITY, *June*, 1896.

ELEMENTS OF TRIGONOMETRY

By ANDREW W. PHILLIPS, Ph.D., and WENDELL
M. STRONG, Ph.D., Professors in Yale University

Plane and Spherical Trigonometry. With Tables	\$1.40
The same. Without Tables90
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IN this text-book full recognition is given to the rigorous ideas of modern mathematics in dealing with the fundamental series of trigonometry. Both plane and spherical trigonometry are treated in a simple, direct manner, free from all needless details. The trigonometric functions are defined as ratios, but their representation by lines is also introduced at the beginning, because certain parts of the subject can be treated more simply by the line method, or by a combination of the two methods, than by the ratio method alone.

¶ Many valuable features distinguish the work, but attention is called particularly to the graphical solution of spherical triangles, the natural treatment of the complex number, and the hyperbolic functions, the graphical representation of the trigonometric, inverse trigonometric, and hyperbolic functions, the emphasis given to the formulas essential to the solution of triangles, the close and rigorous treatment of imaginary quantities, the numerous cuts which simplify the subject, and the rigorous chapter on computation of tables.

¶ Carefully selected exercises are given at frequent intervals, affording adequate drill just where it is most needed. An exceptionally large number of miscellaneous exercises are included in a separate chapter.

¶ The tables include, besides the ordinary five-place tables, a complete set of four-place tables, a table of Napierian logarithms, tables of the exponential and hyperbolic functions, a table of constants, etc.

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By ALBERT E. CHURCH, LL.D., late Professor of
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GEORGE M. BARTLETT, M.A., Instructor in
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Among the salient features of the book are the following: The figures and text are included in the same volume, each figure being placed beside the corresponding text; General cases are preferred to special ones; A sufficient number of problems are solved in the third angle to familiarize the student with its use; A treatment of the profile plane of projection is introduced; Many exercises for practice have been introduced; Several new problems have been added; The old figures have been redrawn, and many of them have been improved; Several of the more difficult elementary problems have been illustrated by pictorial views; In the treatment of curved surfaces, all problems relating to single-curved surfaces are taken up first, then those relating to warped surfaces, and finally those relating to surfaces of revolution. Experience proves this order to be a logical one, as the procedure is from the simple to the more complex. Also the student is more quickly prepared for work on intersections and developments.

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PLANT LIFE AND PLANT USES

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AN elementary textbook providing a foundation for the study of agriculture, domestic science, or college botany. But it is more than a textbook on botany—it is a book about the fundamentals of plant life and about the relations between plants and man. It presents as fully as is desirable for required courses in high schools those large facts about plants which form the present basis of the science of botany. Yet the treatment has in view preparation for life in general, and not preparation for any particular kind of calling.

The subject is dealt with from the viewpoint of the pupil rather than from that of the teacher or the scientist. The style is simple, clear, and conversational, yet the method is distinctly scientific, and the book has a cultural as well as a practical object.

The text has a unity of organization. So far as practicable the familiar always precedes the unfamiliar in the sequence of topics, and the facts are made to hang together in order that the pupil may see relationships. Such topics as forestry, plant breeding, weeds, plant enemies and diseases, plant culture, decorative plants, and economic bacteria are discussed where most pertinent to the general theme rather than in separate chapters which destroy the continuity. The questions and suggestions which follow the chapters are of two kinds; some are designed merely to serve as an aid in the study of the text, while others suggest outside study and inquiry. The classified tables of terms which precede the index are intended to serve the student in review, and to be a general guide to the relative values of the facts presented. More than 200 attractive illustrations, many of them original, are included in the book.

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CLARK'S GENERAL SCIENCE

By BERTHA M. CLARK, Ph.D., Head of Science
Department, William Penn High School for Girls, Phila-
delphia, Pa.

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THIS course in general science, which was successfully developed by the author for use in her classes, is suitable for pupils in the high school course who do not go to college. While it deals with physics, chemistry and hygiene, the controlling idea has been to make the presentation as informal and untechnical as possible, to arouse the interest of the student, and to provide information which will broaden his horizon and be of real practical value. Each topic describes some interesting phenomenon commonly met in everyday life, and afterwards discusses in a popular style the scientific principles on which it is based. The meeting wisely of some of life's important problems, the conservation of energy, and the comprehension of many important inventions receive attention, yet throughout due regard is paid to mental training.

¶ Practical laboratory work in connection with the study of this book is provided in the Laboratory Manual, in which eighty-nine experiments are presented, which are designed to make the pupil familiar with some of the facts and theories discussed in the author's textbook on general science. The experiments, which are accompanied by full directions, can easily be performed with simple apparatus. Among the subjects treated are temperature, ventilation, composition and purity of foods, purification of water, lenses and photographic paper, tests for eyesight and hearing, some principles of machines, soap making, baking soda, bleaching powders, dyeing, artificial coloring and preservatives in foods, sound, electricity, etc.

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By GEORGE WILLIAM HUNTER, A. M., Head of
Department of Biology, De Witt Clinton High School,
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THIS new first-year course treats the subject of biology as a whole, and meets the requirements of the leading colleges and associations of science teachers. Instead of discussing plants, animals, and man as separate forms of living organisms, it treats of life in a comprehensive manner, and particularly in its relations to the progress of humanity. Each main topic is introduced by a problem, which the pupil is to solve by actual laboratory work. The text that follows explains and illustrates the meaning of each problem. The work throughout aims to have a human interest and a practical value, and to provide the simplest and most easily comprehended method of demonstration. At the end of each chapter are lists of references to both elementary and advanced books for collateral reading.

SHARPE'S LABORATORY MANUAL IN BIOLOGY

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IN this Manual the 56 important problems of Hunter's Essentials of Biology are solved; that is, the principles of biology are developed from the laboratory standpoint. It is a teacher's detailed directions put into print. It states the problems, and then tells what materials and apparatus are necessary and how they are to be used, how to avoid mistakes, and how to get at the facts when they are found. Following each problem and its solution is a full list of references to other books.

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ESSENTIALS OF PHYSICS

By GEORGE A. HOADLEY, C.E., Sc. D., Professor
of Physics, Swarthmore College.

\$1.25

THIS is the author's popular and successful Elements of Physics enriched and brought up to date. Despite the many changes and modifications made in this new edition, it retains the qualities which have secured so great a success for the previous book.

¶ It tells only what everyone should know, and it does this in a straightforward, concise, and interesting manner. It takes into consideration the character of high school needs and conditions, and, throughout, lays particular emphasis upon the intimate relation between physics and everyday life.

¶ While the subject matter, as a whole, is unchanged, the order of topics in many cases has been altered to adapt the development of the subject to the habits of thought of high school pupils. Instead of beginning the treatment of a subject with the definition and proceeding to a discussion of the sub-topics, the author starts with a discussion of well-known phenomena and leads up to the definition of the subject discussed. The text, wherever possible, has been simplified, more than fifty topics having been amplified, expanded, or reworded. More familiar illustrations of the topics treated are given, and the demonstrations of many of the experiments are simplified by the use of materials that are readily obtainable in the classroom.

¶ There have been added a number of new topics, mostly in connection with the recent advances in applied science. The number both of questions and problems has been greatly increased and the data in these all relate to actual, practical, physical phenomena. More than one-fifth of the illustrations in the book are new, many of the pictures of apparatus having been redrawn to show modern forms.

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A NEW ASTRONOMY

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By DAVID TODD, M.A., Ph.D., Professor of Astronomy and Navigation, and Director of the Observatory, Amherst College.

ASTRONOMY is here presented as preëminently a science of observation. More of thinking than of memorizing is required in its study, and greater emphasis is laid on the physical than on the mathematical aspects of the science. As in physics and chemistry the fundamental principles are connected with tangible, familiar objects, and the student is shown how he can readily make apparatus to illustrate them.

¶ In order to secure the fullest educational value astronomy is regarded, not as a mere sequence of isolated and imperfectly connected facts, but as an inter-related series of philosophic principles. The geometrical concept of the celestial sphere is strongly emphasized; also its relation to astronomical instruments. But even more important than geometry is the philosophical correlation of geometric systems. Ocean voyages being no longer uncommon, the author has given rudimental principles of navigation in which astronomy is concerned.

¶ The treatment of the planets is not sub-divided according to the planets themselves, as is usual, but according to special elements and features. The law of universal gravitation is unusually full, clear, and illuminating. The marvelous discoveries in recent years and the advance in methods of teaching are properly recognized, while such interesting subjects as the astronomy of navigation, the observatory and its instruments, and the stars and the cosmogony receive particular attention.

¶ The illustrations demand special mention; many of them are so ingeniously devised that they explain at a glance what many pages of description could not make clear.

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ELEMENTS OF GEOLOGY

By ELIOT BLACKWELDER, Associate Professor of Geology, University of Wisconsin, and HARLAN H. BARROWS, Associate Professor of General Geology and Geography, University of Chicago.

\$1.40

AN introductory course in geology, complete enough for college classes, yet simple enough for high school pupils. The text is explanatory, seldom merely descriptive, and the student gains a knowledge not only of the salient facts in the history of the earth, but also of the methods by which those facts have been determined. The style is simple and direct. Few technical terms are used. The book is exceedingly teachable.

¶ The volume is divided into two parts, physical geology and historical geology. It differs more or less from its predecessors in the emphasis on different topics and in the arrangement of its material. Factors of minor importance in the development of the earth, such as earthquakes, volcanoes, and geysers, are treated much more briefly than is customary. This has given space for the extended discussion of matters of greater significance. For the first time an adequate discussion of the leading modern conceptions concerning the origin and early development of the earth is presented in an elementary textbook.

¶ The illustrations and maps, which are unusually numerous, really illustrate the text and are referred to definitely in the discussion. They are admirably adapted to serve as the basis for classroom discussion and quizzes, and as such constitute one of the most important features of the book. The questions at the end of the chapters are distinctive in that the answers are in general not to be found in the text. They may, however, be reasoned out by the student, provided he has read the text with understanding.

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MAYNE & HATCH'S HIGH SCHOOL AGRICULTURE

By D. D. MAYNE, Principal of School of Agriculture and Professor of Agricultural Pedagogics, University of Minnesota; and K. L. HATCH, Professor of Agricultural Education, University of Wisconsin.

\$1.00

THIS course has a double value for pupils in the first years of the high school. On the one hand, it puts the study of agriculture on a serious basis and teaches the young beginner how he can carry on the work of a farm most profitably. On the other hand, it affords an interesting introduction to all the natural sciences, enabling the student to master certain definite principles of chemistry, botany, and zoölogy, and to understand their applications. A few experiments are included, which may be performed by the student or by the teacher before the class. But the subject is not made ultrascientific, forcing the student through the long process of laboratory method to rediscover what scientists have fully established.

¶ The topics are taken up in the text in their logical order. The treatment begins with an elementary agricultural chemistry, in which are discussed the elements that are of chief importance in plant and animal life. Following in turn are sections on soils and fertilizers; agricultural botany; economic plants, including field and forage crops, fruits and vegetables; plant diseases; insect enemies; animal husbandry; and farm management.

¶ The chapter on plant diseases, by Dr. E. M. Freeman, Professor of Botany and Vegetable Pathology, College of Agriculture, University of Minnesota, describes the various fungus growths that injure crops, and suggests methods of fighting them. The section on farm management treats farming from the modern standpoint as a business proposition.

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CLARK'S THE GOVERNMENT WHAT IT IS, WHAT IT DOES

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THIS text-book furnishes a unique presentation of the subject, treating of the principles of general government before considering those of local government. Its method of treatment encourages independent thought and personal research. This appears, not only in the supplementary work at the end of each chapter, but also in the problems of government given at intervals. Maps and diagrams are used, besides suggestive illustrations to reinforce the text.

¶ Following an account of the government in general the book treats of the chief functions of government in a definite and logical manner. It then explains the American system of central government and the local government by the people; it discusses voting, State and national constitutions, and the relation of nation, State, county, township, and city to each other. The principal officials of the various governmental systems are taken up, and their duties, qualifications, etc., properly considered.

¶ The latter part of the book presents important chapters on certain practical operations of government, such as: Trials, law-making, party nominations, political issues, and political corruption. A short summary of the principles of international law and of the commoner laws pertaining to business and property is also included.

¶ The author lays emphasis on the importance of State governments, and enriches the text with illuminating comparisons with foreign governments. He presents the subject as a science, a complete and sensible system of interdependent parts and defined limits, with a single object—the good of the people.

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