firm enough to promise permanency. The institute would, it is expected, soon become in part self-supporting.

The writer has often been asked what relation this proposed bibliographical institute would have to the other institutes of this kind, notably the Institut International de Bibliographie at Brussels, and the Internationales Institut für Sozialbibliographie, and allied institutions, at Berlin. The answer is that it would supplement them and, as far as possible, utilize their material. The Brussels institute collects titles of all kinds, from all sources and of all dates, the Berlin institutes collect titles from the current year on a limited number of sciences. The institute which the writer proposes would have for its object to collect titles from all sources and of all dates on a definite number of subjects, concerning which information is actually wanted.

If anybody who reads the above should be willing to assist in any way in furthering the interest of bibliographical research along the lines suggested, he should communicate with the undersigned.

AKSEL G. S. JOSEPHSON, *Chairman, Committee on Research Institute*
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SCIENTIFIC BOOKS

Elements of Physics. By E. H. HALL. Henry Holt & Co. Pp. 570.

A First Course in Physics. By MILLIKAN and GALE. Revised version. Ginn & Co. Pp. 430.

Applied Physics for Secondary Schools. By V. D. HAWKINS. Longmans, Green & Co. Pp. 196.

In a new text which may be looked on as a successor to Hall and Bergen's "Textbook of Physics," Professor Hall has incorporated many changes which have been suggested by discussions carried on in SCIENCE and in meetings of the American Association for the Advancement of Science. These changes are seen in the arrangement and treatment of mechanics and they tend toward the simplification of that subject. Mechanics is treated more fully in this text than in other elementary texts. The author has attempted to make the subject of the text deal with the experiences of the every-day life of the student. He has done this without introducing material and illustrations intended to make the book self-advertising, material which now figures in a number of texts. For this the text is to be commended.

The criticisms which many teachers will make are: that the text is much too full of details, that general principles do not stand out, and that the treatment is at times too didactic. How many students beginning physics are apt to understand or become enthused over this sentence on page 401, "Two conductors are said to be at the same electrical potential when the potential energy of a quantity of electricity on one is just as great as the potential energy of an equal quantity of electricity on the other, so that there is no flow of electricity from one to the other when they are connected by a conductor"? This is an unnecessarily heavy statement.

In attempting to bring in matter connected with the every-day life of the student the text has been burdened with detail. Its five hundred and seventy pages (seventy of which deal with laboratory exercises) may be regarded as encyclopedic for an elementary student.

The well-known and widely-used elementary text by Millikan and Gale has been revised, shortened by sixty pages, and improved in treatment. It is still, in its numerous details, a comprehensive text for elementary students, but it is interesting, original and up to date in subject matter. The authors aim to do away with the didactic method, yet in some of their abbreviated statements of general principles they do not accomplish this aim. To give only one example; in the deduction of the formula giving the object distance and image distance from a lens, they are content to state that a lens changes the curvature of a wave-front always by the same amount. This statement must appear an arbitrary one to a student, but had it been led up to by a geometrical construction, as has been done by numerous teachers, it would appear more reasonable.

The two-thousand-year-old physics of Archimedes is a part of every text. That many developments in the domain of physics have been made in recent years is also generally recorded. But what physicist of ten years ago would have prophesied that the path of a helium atom could and would be photographed? And what must be the astonishment of even Mr. Wilson—whose patience and skill achieved this brilliant result—when he sees in the frontispiece of this elementary text published a few months after he did his work a reproduction of the photographs he obtained.

It is an extraordinary thing that some of the great facts of science, so difficult to obtain in the first case, are so easily understood after they have been obtained. The authors have eclipsed all others, as far as the reviewer knows, in their inclusion of new and striking developments in physics.

There is one general criticism which applies to this text and to several others. They introduce the student to the subject of physics by a study of liquids. The argument is that this study is fascinating. If that argument were to apply throughout the subject we would begin electricity with the discharge of electricity through gases, we would come to light through spectrum analyses and soap-bubble colors. The fascination which these phenomena have for students would be none the less if they were introduced in their logical place. The custom of placing the study of liquids first implies that a boy knows more about rowing or sailing a boat than he does about pulling an express-wagon or coasting on a sled; in general, that he is more at home in water or on water than on land. It may be that high-school laboratories are better equipped to show experiments setting forth the properties of liquids than experiments demonstrating motions and forces. But that does not alter the fact that force is a more elemental thing than pressure. Nor does it alter the fact that boys have a great fund of knowledge—unclassified, of course—in regard to motion and force, which knowledge can at once be made use of by a capable teacher.

It is interesting to compare the text written by Mr. Hawkins for technical high schools with the other texts arranged for general students of physics. In this text the student meets in the first chapter the difficult topics: machines, horse-power, and the Prony-brake. Later he begins the subject of electricity by the study of the dynamo. He continues this study to the performance of transformers, multiple generators, induction motors, etc. Evidently the technical high-school student must be prepared to assimilate strong food. Evidently, too, where facts of value to the commercial world are given large prominence, there is not much room for the discussion of scientific principles. For example, the experiment on the mechanical equivalent of heat is not described. Ohm's law is based on the definition of a volt! These but illustrate the criticisms which a physicist would make on the text. It does not give enough space to the presentation of the scientific method. But it does present in brief compass the main points at which physics touches commerce.

A Textbook of Physics. By HURST and LATTEY. Van Nostrand Co. In three volumes. Vol. I., Dynamics and Heat; Vol. II., Sound and Light; Vol. III., Heat, Magnetism and Electricity; a total of 640 pages.

This text is characteristic in places by its very elaborate and detailed explanations—the discussion of the passage of a beam of light through a prism takes up five pages—carried out into all the geometrical and arithmetical details. The problems are very numerous and are always identified as having been set in a certain examination. An American student may wonder why it is necessary to identify so highly original a question as this: "Describe shortly how a mercury thermometer is made. (Camb. Loc. June, '07.)" One sees that it is not the question, but the examination that is the principal thing. This text would be a very complete guide to a student going up for the army or university examinations.

Laboratory Problems in Physics. By JONES and TATNALL. Macmillan Co. Pp. 81.

Physical Laboratory Guide. By FREDERICK C. REEVES. American Book Co. Pp. 183.

A Course of Elementary Practical Physics. By H. V. S. SHORTER. Clarendon Press, Oxford. Part I., Mensuration, Mechanics, Hydrostatics. Pp. 110. Part II., Heat and Light. Pp. 216.

Jones and Tatnall's text contains outlines of about seventy-five experiments in general physics of secondary school grade. Some of the experiments are qualitative, such as are usually given in demonstrations in the classroom. Their inclusion would tend to make a laboratory course more interesting and less an exercise in following directions than most laboratory courses in physics are apt to be. The experiments are very briefly but clearly outlined and are well proportioned among the various parts of the subject. The text is named "Laboratory Problems," rather than "Laboratory Manual," probably on account of the fact that emphasis is placed upon the experimental problem, the principle or fact involved. In keeping with this idea, the outline of an exercise after giving a few brief directions (in very short sentences) consists of a series of questions tending to sharpen the student's powers of observation and reasoning. This is a most commendable feature of the text.

Mr. Reeves, an electrical engineer who is also a teacher of physics, has written a manual which places larger emphasis upon some experiments bearing upon engineering than do most manuals in physics. One evidence of this influence is seen in the fact that electricity (and magnetism) is given considerable space (from pages 23 to 59) almost at the opening of the text. Thirteen pages, an unusual amount of space, is given to Archimedes's principle with its application to the measurement of density and specific gravity. The chapter on the mechanics of *solids* opens with an experiment on the bending of beams and closes with the verification of Boyle's law!

The course which has been given by Mr. Shorter for several years at King Edward VIII. School, Sheffield, differs from that given in similar American schools in the larger space given there to mensuration. The volumes outlining the course consist of questions or directions with large blank spaces between —a cross between a series of report sheets and a laboratory manual. The spaces are rather small for the report sheets and the questions and directions rather attenuated for a manual. The heuristic method is rather overdone.

An Introduction to Mathematical Physics. By R. A. HOUSTOUN. Longmans, Green & Co. Pp. 197.

In less than two hundred pages Dr. Houstoun presents those ancient and honorable theorems in mathematical physics which English university men look upon as essential to the training of a physicist, but which look rather formidable to most students of physics in American colleges. The text starts in with the theory of attraction and potential, Gauss's theorem, Laplace's and Poisson's equations, and electrical images. It continues through hydrodynamics, Green's theorem, irrotational motion, Stokes's and Kelvin's theorems, Fourier's series with application to the conduction of heat, wave motion with application to acoustics and tidal waves, electromagnetic theory with application to the reflection and refraction of radiation, and lastly, thermodynamics with applications to reversible cells. It is a matter of wonder that a text so small can contain so much. Most physicists will feel that the experimental point of view should have had a larger place—for example, that descriptions should have been given of harmonic analyzers and synthesizers, of sound analyzers, of wave meters, and that it should have included the telegrapher's equation. The problems, too, might have been chosen with more thought of the actual and less of the geometric and ideal. But we can not have everything in two hundred pages.

DARTMOUTH COLLEGE G. F. HULL

Die Steinzeitliche Technick und Ihre Beziehungen zur Gegenwart. Ein Beitrag zur Geschichte der Arbeit von DR. LUDWIG