and American Association of Petroleum Geologists, besides being a member of the National Committee engaged in the scientific classification of North American coals.

The study of the structure of the mountains and subsidiary folds of the region will be planned by a group including Dr. Thom; Professor Walter H. Bucher, of the University of Cincinnati; Professor Chester R. Longwell, of Yale, and Professor Rollin T. Chamberlin, of the University of Chicago.

The fossil plants associated with the volcanic deposits lying east of the Yellowstone Park, or included in the river-laid clays of the Big Horn Basin badlands, will be collected and studied by Dr. Erling Dorf, with the advice of Dr. R. W. Chaney, of the Carnegie Institution, and Dr. David White, of the U. S. Geological Survey. Dr. Dorf has been assisting Dr. Chaney for several years in the study of the Pliocene floras of the Pacific Coast sponsored by the Carnegie Institution of Washington, and the doctor's thesis recently submitted by Mr. Dorf to the University of Chicago covered a part of these paleobotanic studies and is being published by the Carnegie Institution.

Study of the processes of marine and continental sedimentation as illustrated by the sedimentary forms of the Big Horn Basin region will be developed by Professor R. M. Field, of Princeton, as a continuation of his studies of sedimentation now taking place in the Bahamas and Florida east coast areas. Dr. Field, together with the other members of the International Summer School of Geology and Natural Resources, will visit the Yellowstone and Big Horn Basin regions this summer. Foreign guests of this year's summer school include: Dr. Frank Debenham, head of the department of geography of Caius College, Cambridge University; Dr. H. Schneiderhöhn, professor of economic geology and director of the Mineralogical Institute of the University of Freiburg; Dr. P. Ramdohr, professor of mineralogy of the Mineralogical Institute of Aachen; Dr. Otakar Matousek, associate professor of methods of geology, Charles IV. University, Prague, Czechoslovakia.

Administrative direction of the field research work is under the direction of Dr. Thom, acting with the advice of Professor J. P. Rowe, chairman of the department of geology at the University of Montana, and of Professor Field as director of the International Summer School. Doctors Dorf and Perry will participate as executive assistants as well as scientific investigators.

A cabin colony will probably be established in 1931 at some strategic point along the eastern or northeastern foot of the Yellowstone Park Plateau. This colony will serve as headquarters both for the students who are receiving practical training and for the experienced geologists who may wish to spend their summers in group study and research in the Yellowstone-Big Horn Basin province.

Through the prosecution of plans laid out by such a group of scientists, it seems certain that geology will be advanced as a science and that a popular understanding of geology and an appreciation of the work of the federal and state surveys will both be promoted to an appreciable degree.

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SCIENTIFIC BOOKS

Mathematical and Physical Papers. SIR JOSEPH LARMOR. In two volumes. Vol. I, pp. xii + 679; Vol. II, pp. xxxii + 811. Cambridge University Press, 1929.

THESE two large beautifully printed volumes contain one hundred and four papers on mathematics and mathematical physics as well as nearly fifty additional notes or papers in the form of appendices, a few of which follow the papers to which they refer but most of which are collected at the end of each volume. Nine papers relating to physical relativity have been omitted from the collection, since the author felt that their significance has been vitiated by more recent developments of the subject. The following rough classification of the one hundred and four numbered papers gives an idea of the range of Professor Larmor's interest. In mathematics without direct physical applications there are nine papers of which six are predominantly in the field of geometry. Twelve papers fall in the domain of dynamics, several of them having to do with celestial mechanics or geophysics; the theory of elasticity claims three, and hydro and aerodynamics seven. Relating to thermodynamics, statistics and atomic theory there are eight papers. The largest categories, however, are electromagnetism, including the ether, and optics. Although it is not possible to distinguish sharply between these two, we may classify thirty-seven as belonging to the former and twenty-two to the latter. Then there are three obituaries or appreciations (Gibbs, Kelvin, John Michell), a paper on the periodicity in sun-spots, an address before the British Association in 1900 on the "Methods of Mathematical Physics" and the presiden-

tial address delivered before the London Mathematical Society in 1916.

Professor Larmor's most valuable contributions to science were made in the golden age of classical physics, and his papers abound in references to Faraday, Ampère, Helmholtz, Carnot, Clausius, Kelvin, Maxwell, Stokes, Kirchhoff, Boltzmann, Gibbs and Rayleigh. The last half of the nineteenth century and the early years of the present century was a period in which the ether held sway as the most controversial and devastating subject with which theoretical physics had to deal. For this reason the most interesting papers in this collection are those dealing with the properties of this suppositious medium. These papers appeared during the years from 1894 to 1897 under the title "A Dynamical Theory of the Electric and Luminiferous Medium." Part I outlined the broad underlying principles of the theory; Part II developed the theory of electrons, and Part III, relations with material media. Impressed by Kelvin's remarks, in connection with Stokes' suggested explanation of the aberration of light, that the motion of the ether outside of matter must be of an absolutely irrotational character, Larmor took for his dynamical model of the ether a medium with rotational elasticity such as that which had been proposed by MacCullagh in 1839 in the effort to give a rational basis to Fresnel's discoveries in optics. On this theory electric fields are explained as strains in the medium, magnetic fields as velocities. MacCullagh's ether, like Kelvin's quasi-labile ether, yields equations of motion identical in form with the electromagnetic equations. Therefore the proper dynamical application of either of these ether models must lead to the same results as Maxwell's equations. Larmor, however, introduced a new element in his hypothesis of 1895 that electricity exists in the form of discrete charges—electrons. In this series of monographs he deals not only with those phenomena—such as propagation of light in isotropic and anisotropic materials—which depend only on the macroscopic properties of the medium, but also with phenomena such as dispersion which involve its microscopic structure. Finally he does not ignore the optics of moving media.

Among other important contributions, that numbered fifty-one has perhaps proved of the greatest significance in connection with modern atomic theory. This paper, entitled "On the Theory of the Magnetic Influence on Spectra; and on the Radiation from Moving Ions," was published in December, 1897. It is the one in which Larmor's Theorem, familiar to every student of the theory of the Zeeman effect, is developed. This theorem is vital on account of its generality, for it enables us to assert that the dynamics of the electrons in an atom—no matter how complicated the structure may be—is the same relative to rotating axes in the presence of a magnetic field as relative to fixed axes in its absence, provided only that second order terms are negligible.

These collected papers of a great mathematical physicist of the age when classical physics was at the height of its power constitute an important addition to the library of every student of the subject, and should have a place on the shelves of every departmental library.

LEIGH PAGE

A Chemical Dictionary, containing the words generally used in chemistry, and many of the terms used in the related sciences of physics, astrophysics, mineralogy, pharmacy and biology, with their pronunciations, based on recent chemical literature. By INGO W. D. HACKH, Professor of Chemistry, College of Physicians and Surgeons, School of Dentistry of San Francisco, California. Pp. 790. P. Blakiston's Sons & Co. Inc. Philadelphia, 1929.

THAT an individual should have undertaken, apparently singlehanded, to produce a book containing thirty to fifty thousand concise definitions of chemical and other scientific terms, portraits and a brief statement about the work of a considerable number of chemists and a short discussion of many of the most fundamental principles of chemistry seems almost incredible. The result is a book which is sure to prove very useful to chemists and to physicists, biologists, physicians and many others who make use of the facts of chemistry. No similar book has been attempted for more than a century.

The following illustrations of the varied and detailed information found in the book will give some indication of its value:

A table of alchemical and chemical symbols in parallel columns; a list of a dozen substances used in drying gases with accurate statements of the efficiency of each; the structural formulas of camphor, morphine, brucine, cocaine, nicotine, strychnine and dozens of other natural and synthetic alkaloids; list of the minerals containing nickel; table giving the composition of ten kinds of milk; a half-column about vitamins; diagram of the radioactive disintegrations.

Professor Hackh has long been known as a chemist with fresh and original ideas of his own, not always in accord with orthodox chemistry. These ideas are worthy of consideration and study and they are not obtruded in such a manner as to interfere seriously with the usefulness of the book.

In the opinion of the writer "univalent" and "bivalent" are more common American usage than "monovalent" and "divalent." There are some differ-