Kawai's inside stories show very clearly why many of our officials thought the Japanese were often stupid or cussed; and they show equally well why the Japanese often regarded even our highest echelon as bush-leaguers who, by accident, happened to be playing in the majors.

A dozen chapters give the author's ideas on a dozen phases of the occupation: Japanese attitudes; the character of the occupation; the Japanese background for democratization; the Constitution; the Emperor; political reorganization; the location of political power; economic reforms; labor, agriculture, and economic recovery; new basic education; higher education and mass education; and social change.

Kawai is critically analytic, but sympathetic. He believes that the occupation was benevolent, constructive, and sound, and that General MacArthur was brilliant, sincere, and intensely idealistic. He feels that the occupation was three steps forward and two steps backward in the direction of democracy, and that is tremendous progress for a brief moment in the history of a nation. He tempers his optimism with the wise caution that there is no assurance that democracy in Japan will always prevail. No nation can be master of its own destiny, particularly if it is surrounded as a democratic island in a communistic sea. But Kawai believes that Japan would not willingly go back to its chauvinistic past; thus, Japan's future is not a national but a world problem.

This is a book that will please a discriminating reader. The subject matter is vital; the author is competent. And he tells his story in a forceful, entertaining and human way.

CLAUDE A. BUSS
Department of History,
Stanford University

Physical Sciences

The Sea off Southern California. A modern habitat of petroleum. K. O. Emery. Wiley, New York, 1960. xi + 366 pp. Illus. $12.50.

Between the mainland coast and the continental slope off southern California lies a tract of deep marine basins and bold submerged ridges twice the size of Switzerland. Because of its unusual sedimentary, structural, and hydrographic features; its parallelisms with bordering oil-saturated basins ashore; and the high density of nearby population centers and research institutions, this area has become one of the world's most intensively studied offshore reaches.

In *The Sea off Southern California*, a leading student of this province successfully extracts and interrelates the essential elements from a formidable mass of published and previously unpublished data relating to this province. He does this in seven well-coordinated, conveniently subtitled, and profusely illustrated chapters on physiography, lithology, structure, water, life, sediments, and economic aspects. Special emphasis is placed on sediments, but one of the notable features of this book is the facility with which Emery moves about among the various subjects whose exposition comprises a general synthesis of the area treated. Outstanding for their thoughtfulness and balance are the sections on basins and troughs, phosphorite, currents, waves, slope sediments, interstitial water, the organic constituents, the origin of petroleum, and pollution. Emery's summation of the characteristics of sediment from various environments (Table 12, page 181) fills a serious and prospectively fruitful reference need. Moreover, Emery squarely confronts the problem of nuclear waste disposal at sea (pages 302–304), and presents data that indicate rapid turnover of the California basin waters (page 110).

With all its virtues, this book is not easy reading. It is an unremittingly serious, unabridged, technical treatise. The illustrations are closely related to the text and require careful study. By and large, they are well chosen and well executed, but some are cluttered and difficult to interpret. Related Figures 144 and 178 are so oriented that direct comparison within a single copy of the book is impossible.

An outstanding feature of the book is its ample documentation. With characteristic energy and command of detail, Emery has made effective use of a bibliography of some 850 titles, among which the principal contributors are himself and F. P. Shepard. Despite the labor of assembling and publishing such a quantity of data covering such a broad range of knowledge, it was done with few errors of typography or judgment. The name of the French mathematician Coriolis, is misspelled, the frequent use of "doubtlessly" (where there is doubt) is distracting, and Mohorovičić is written both with and without diacritical marks. To me, Emery's dismissal of A. O. Woodford's thoughtful discussion of submarine canyons seems too categorical, his espousal of the thesis that "many" Paleozoic black shales are marsh deposits uncritical, and his reasoning about the temperature requirements of organisms without sufficient rigor. Variations in calcium computed from the chloride ratio (page 239) are not quantitatively significant, inasmuch as this ratio can remain constant only in the absence of solution or precipitation of $CaCO_3$.

The good features of this work, however, far outweigh these minor objections. It is a scholarly and thoughtful compendium that at once gives perspective to the continental borderland off southern California and illuminates the general principles of marine science by applying them to a large scale natural model. It should be at the hand of all serious students of marine geology, sedimentation, oceanography, oil, or southern California.

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Advances in Spectroscopy. vol. 1. H. W. Thompson, Ed. Interscience, New York, 1959. ix + 363 pp. Illus. $12.50.

This book is the first volume in a series having as its goal "to present, interpret, and evaluate significant accomplishments in spectroscopy, and to indicate the most promising lines of advance." Thompson states in the introduction that he hopes "to cover in this series all important aspects of spectroscopy, pure and applied, atomic and molecular, emission and absorption, relating to physics, chemistry, biology, astrophysics, meteorology and general technique." These quotations indicate that the editor has in mind a gigantic undertaking which will run into many volumes, if the selected fields of research are properly covered.

Volume 1 contains eight articles by seven authors, each well qualified in his field of discussion. The titles are: "The spectra of polyatomic free radicals," "Spectroscopy in the vacuum ultra-violet," "The index of refraction of air," "Determination of the velocity of light," "High resolution Raman spectroscopy," "Modern infra-red detectors," "The infra-red spectra of polymers," and "Rotational isomerism about C-C bonds in saturated molecules

as studied by vibrational spectroscopy." Each section is well written and gives most of the recent advances in the subject treated; but there is no correlation between the separate articles, and the amount of detail presented varies greatly from article to article. The book would have been more valuable if articles on more closely related subjects had been selected.

Several minor improvements could have been made in some of the sections: for example, the spectra of diatomic free radicals should have been included in the discussion of polyatomic free radicals rather than in another volume; in the discussion of the index of refraction of air, no reference is given to tables that correct for nonstandard temperatures and pressures; lists of some of the manufacturers of semiconductors and of thermocouples are given, but several companies that make excellent detectors are not included.

The book contains a subject index and an author index. However, the author index is not complete; a glaring omission is the name of P. G. Wilkinson, which appears often in the text but is not included in the author index.

In conclusion, volume 1 contains an excellent set of articles on separate subjects which are well worth reading by spectroscopists interested in these fields of research. It is hoped that future volumes in the series will be more unified in subject matter.

EARLE K. PLYLER
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Turbulence. An introduction to its mechanism and theory. J. O. Hinze. McGraw-Hill, New York, 1959. ix + 586 pp. Illus. $15.

Scientists and engineers interested in an up-to-date account of the status of knowledge, both theoretical and empirical, on the long-standing problems of turbulence will find much to recommend this book. It presents a very readable account of available knowledge and correlations for most of the types of flows of interest; both theory and data correlations are amply discussed. The book is readable throughout and contains appendixes covering the necessary mathematics for beginners in the field.

Unlike the previously available specialized monographs on this subject (by Townsend and Batchelor) this volume was written for the interested but nonspecialist worker. Readers without extensive background will probably find *Turbulence* easier to follow and more fitted to their needs than previous works; the specialist will find the book of interest for its discussions of a previously scattered literature and for its more comprehensive coverage.

The topics covered are well indicated by the chapter headings: (i) "General introduction and concepts," (ii) "Principles of methods and techniques in the measurement of turbulent flows," (iii) "Isotropic turbulence," (iv) "Non-isotropic turbulence," (v) "Trans-turbulence," (vi) "Non-isotropic wall turbulence."

S. J. KLINE
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Treatise on Analytical Chemistry. vol. 1, part 1, *Theory and Practice*. I. M. Kolthoff and Philip J. Elving, Eds. Interscience, New York, 1959. xxvi + 809 pp. Illus. $17.50.

The appearance of the first volume of a work that promises to have a profound and enduring influence on the development of analytical chemistry as a science is an event of more than ordinary interest. Volume 1 of the *Treatise on Analytical Chemistry*, a work that will comprise some 25 volumes when completed, sets a standard of achievement that will be difficult to maintain.

The *Treatise* aims to be concise, critical, comprehensive, and systematic at a level that will serve to inform and guide the advanced and experienced chemist. The completed work will consist of three parts, the aims of which are, respectively, to present in a comprehensive way the theoretical and practical fundamentals of modern analytical chemistry, to discuss systematically and critically the classical and modern methods for all the elements and their compounds, and to describe industrial and commercial analytical procedures in some detail. Kolthoff and Elving are participating actively in the formulation of the text and are thereby achieving a high degree of integration and coordination among chapters. For the preparation of Parts 1 and 2 they have enlisted the aid of E. B. Sandell.

Part 1 will consist of 124 chapters; 19 of these, prepared by 17 authorities from this country and abroad, appear in volume 1. Each chapter illustrates how analytical chemistry draws on the fundamentals of chemistry and how the theory of analysis draws on a remarkably wide cross section of modern physical chemistry. The chapters are all capably written, and many are outstanding in their originality. In my opinion, the following chapters are particularly praiseworthy: chapter 5, "Elements and compounds" (J. I. Watters); chapter 7, "Chemical equilibrium and the thermodynamics of reactions" (T. S. Lee); chapter 13, "Acid-base equilibria in nonaqueous solutions" (I. M. Kolthoff and S. Bruckenstein); and chapter 19, "Equilibria in precipitation reactions, and precipitation lines" (J. F. Coetzee).

It is regrettable that the *Treatise*, in its entirety, will be beyond the means of many potential users. Nevertheless, a large proportion of analytical chemists will want to purchase volume 1 and other selected volumes; eventually, it is likely that nearly all chemists will come to regard the *Treatise* as an indispensable reference work. The editors have embarked on an ambitious project, but they are performing a monumental service to analytical chemistry.

ROGER G. BATES
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Geografia Fizyczna Polski (Physical Geography of Poland). Stanislav Lencewicz. Third edition revised and expanded by Jerzy Kondracki. Translated into Russian by Yu. V. Ilinich, K. A. Radvillovich, and Yu. N. Tsesel'chuk. L. G. Kamanin, Ed. Foreign Literature Press, Moscow, 1959. (order from Telberg Book Co., New York 11). 401 pp. Illus. + maps. $7.50.

This volume, written by a famous Polish geographer, is a reasonably complete and up-to-date analysis of Polish terrains; the original third edition was published in Warsaw in 1955, 17 years after publication of the second edition. The chapters on soils and on the utilization of natural resources were written by Kondracki, a student and colleague of Lencewicz; the Russian editors supplied minor revisions of some data.

The regional physical geography of

Poland is introduced by chapters covering the history of geographical knowledge and cartography of the country, geographical names, and the elements of geographical environment (165 pages). The 15 natural regions of Poland are treated in detail in the remainder of the book (202 pages).

The text, maps, and diagrams are excellent in their clarity and organization. The photographs are appropriately chosen and skillfully distributed in the text; however, many of them are foggy in their detail, a fairly common defect of publications by the Foreign Literature Press in Moscow.

Philosophically, the geographical regionalism of Lencewicz is based on the same premises as the American one, but with a greater emphasis on the biosphere (including man) as one of the regional determinants and on the "European background of Poland," in the geographic sense, inasmuch as Polish terrains grade into the neighboring ones, in the virtual absence of natural boundaries on the east and on the west of the country.

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Physics and Chemistry of the Earth. vol. 3. L. H. Ahrens, Frank Press, Kalervo Rankama, and S. K. Runcorn. Pergamon Press, New York, 1959. 453 pp. Illus. $15.

This volume is the third of an annual series designed, in part, to assist in integrating knowledge in the field of the earth sciences and to review for the specialist and nonspecialist advances in the more physical and chemical divisions of the subject. Parts of the present volume may fall short of achieving these commendable objectives, for careful presentation of a subject is necessary if the nonspecialist is to benefit.

Almost 180 pages are devoted to a review of existing data and a presentation of new data concerned with geophysical studies of the structure of continental margins and the ocean floor (Drake, Ewing, Hennion, Harkrider, Miller, Officer, and Sutton). This review is concerned with one of the most recent and revealing areas of geological study. For the student, the methods involved in seismic and other areas of study are briefly reviewed. In particular, the results of 20 years' study of a large part of the eastern margin of the North American continent are summarized, and new data obtained on recent cruises in the eastern Caribbean, pertaining to the structure of an island arc and deep sea trench, are presented. Some 90 pages are devoted to documentation of these new data.

Three chapters are devoted to geochemical and cosmochemical subjects. Cameron presents a much needed review of modern ideas concerning the origin of the elements, emphasizing the environments and mechanism involved in their synthesis. The two older theories of equilibrium and nonequilibrium synthesis are extensively modified and to some extent unified. It is clear that more than one type of process of formation is required by cosmic abundance data. Roedder summarizes results from the more important experimental studies of silicate melts; such data have had an enormous influence on the study of igneous rocks. Little of the data presented will be unfamiliar to the petrologist or mineralogist, but the introductory discussion of methods and difficulties will be valuable to all concerned with application of these data. Adams, Osmond, and Rogers review the geochemistry of thorium and uranium. The discussion covers the geochemical behavior of the elements through all major geological processes and the fundamental atomic properties responsible for the general similarities and occasional important differences in behavior are emphasized throughout the review.

In this volume, as in volume 1, Tomkeieff does immense service to geology with an extensive review of the Russian geochemical literature, stressing the impressive increase in the Soviet effort. The bibliography (over 1200 references) indicates the diverse attack on geochemical problems, but it is noteworthy that there is still little effort in the field of experimental geochemistry.

Other chapters include a concise account of present views on climate variation (particularly since the Cretaceous) as deduced from fossil and isotope evidence. Durham is careful to indicate the limitations of such data and the care with which they must be used. Continental drift and polar wandering are considered to have been slight, at least since the Tertiary. In the final chapter, Tozer discusses our meager knowledge of the electrical properties of the interior of the earth. Analysis of most geophysical data on the interior of the earth basically rests on fitting observations to the best model, and an essential step toward progress in this field must involve experimental studies of the electrical, optical, and structural properties of matter under extreme conditions of pressure and temperature.

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Anorganische Chemie. vol. 1. István Náray-Szabó. Translated into German by András Beliczay. Hungarian Academy of Sciences, Budapest, 1959. 664 pp. Illus.

In his foreword, the author states that his purpose was to produce a text on inorganic chemistry which would be intermediate between the usual one- and two-volume works and the extensive ones such as those of Gmelin, Mellor, Friend, and Pascal, or, more recently, the five-volume work by Sneed, Maynard, and Brasted. To do this, much of the material had to be compressed. In this way the author compiled what amounts to a small handbook, suitable for daily use by many workers in various branches of science.

This, the first volume of the contemplated three-volume set, is divided into two parts: general and special. The general part (152 pages) discusses the atom and the combining of atoms, and constitutes the introductory and theoretical portion of the book. The remaining portion of the book is devoted to the nonmetallic elements: hydrogen, fluorine, chlorine, bromine, iodine, astatine, oxygen, sulfur, selenium, tellurium, polonium, nitrogen, phosphorus, arsenic, antimony, bismuth, carbon, silicon, germanium, tin, lead, and boron.

In the part of the book entitled "special," the elements and many of their compounds are discussed according to a standard format that covers the following topics: history, occurrence, preparation, physical properties, chemical properties, uses, physiological action, detection, and determination. One very valuable feature is the listing of the physical constants of each of the elements, as well as those of its compounds for which data exist. A formula index enables the reader to find information quickly.

RALEIGH GILCHRIST
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Elements of Cartography. Arthur H. Robinson. Wiley, New York, ed. 2, 1960. 343 pp. Illus. $8.75.

Profound technological change has all but revolutionized many phases of cartography in the 7-year span between the first and second editions of Robinson's book [see *Scientific Monthly* **77**, 217 (1953)]. New developments take place so rapidly that it is easy to become completely fascinated with gadgetry—so fascinated in fact, that the thought processes and reasoning behind good maps are often neglected. Robinson has skillfully avoided entrapment of this type, for he continually emphasizes the intellectual and not the manipulative aspects of the subject.

As might be expected, the new edition is expanded and improved in numerous ways. Larger type makes the text, and especially the tables, much easier to read. The subject matter has been reorganized; expanded sections on map projections, drafting, and reproduction incorporate recent research and reflect the maturing status of the subject. The enlarged bibliography and the additional appendixes are welcome changes.

More fundamental, however, are the new and revised sections dealing with the intellectual phases of cartography. Robinson's discussion of symbolizing and processing map data, map design, mapping three-dimensional data, and statistics in cartography are his most important contributions. No serious cartographer can ignore this book, for it is the leading cartographic text in the English language.

GEORGE F. JENKS
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Open-Channel Hydraulics. Ven Te Chow. McGraw-Hill, New York, 1959. xviii + 680 pp. Illus. $17.

In this day of scientific achievement, the feasibility of many projects still depends on an adequate supply of water. The hydraulic engineers and hydrologists, whose responsibility it is to deliver water (and deal with floods), are especially interested in open-channel flow. Chow, who is in charge of hydraulic engineering at the University of Illinois, has written an amazingly complete new textbook that will be useful to working engineers as well as to students; in fact, it is almost a reference book on current American practice in open-channel engineering.

The main divisions of the book cover basic principles: uniform, gradually varied, rapidly varied, and unsteady flow of water. The level of the mathematical treatment is intentionally held down, and many lucid examples are worked out numerically, a feature that makes the book eminently suitable for the reader who wants to study the subject on his own. The numerous references to publications from many countries will be valuable to the research engineer.

Publishing an abridged edition might help bring the price down to a more reasonable level for a textbook.

BYRNE PERRY
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Space Technology. Howard S. Seifert, Ed. Wiley, New York; Chapman and Hall, London, 1959. xvi + 33 chapters. $22.50.

Space Handbook. Astronautics and its applications. Robert W. Buchheim *et al.* Random House, New York, 1959. xvi + 330 pp. Illus. $3.95.

Both of these books are from southern California; most of *Space Technology* was written by personnel of the Space Technology Laboratories or of the University of California, and the *Space Handbook* was produced by staff members of the RAND Corporation. Both discuss extensively the engineering aspects of space problems (especially the construction of rockets), the calculation of trajectories in space, the problem of communications, and problems of man in space.

Space Technology is largely devoted (28 out of 33 chapters) to the four problems listed above; among its contributions are rocket construction (described by the editor, Howard Seifert), rockets (from the Jet Propulsion Laboratory, Rocketdyne, and Los Alamos), astrodynamics (by Herrick), interplanetary trajectories (by Ehricke), communications (by Pickering and Rechtin), space medicine (by Haber and Strughold). These problems are discussed in very great detail; for example, the section on flight dynamics includes a 152-page chapter on the dynamics of interplanetary travel as well as chapters on lunar flights, low-thrust flights, and landing problems. On the other hand, the problems of payload construction and of conducting experiments in space receive only a single chapter of 27 pages.

The *Space Handbook* covers considerably more ground, as its name implies. The four main problems are discussed in much briefer form, but with considerable effectiveness. Pithy statements, in the tradition of engineering handbooks, graphs, and tables are used to summarize the extensive results of theory and experiment. In addition, the *Space Handbook* devotes 80 compactly written pages to the uses of space vehicles, with detailed consideration given to payloads, and 25 well-written pages to the space environment. A recurrent theme of the *Handbook* is the possibility of combining aeronautical with space techniques as in the glide rocket.

Neither book includes more than passing references to the information that can be obtained on the earth's gravitational field, the density and temperature of the atmosphere (and their changes) by observing the motions of satellites as a whole, or to the information on magnetic fields in space which can be derived from studies of the magnetic damping of satellite rotation. These observations can be made with the simplest satellites; thus, they have little engineering interest, but they are of considerable scientific value.

The *Space Handbook* will be useful to almost every worker in the field; *Space Technology* will be useful to those concerned with the engineering of space vehicles.

JOHN A. O'KEEFE
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General Crystallography. A brief compendium. W. F. de Jong (translated from the Dutch). Freeman, San Francisco, 1959. ix + 281 pp. Illus. $6.

This "brief compendium" of 265 pages contains a vast amount of information on geometrical, structural, chemical, and physical crystallography.

The section on geometrical crystallography describes the symmetries, considers mathematical and graphic solutions to the calculation of angles and elements, and contains a short section on the various methods of crystal drawing.

The section on structural crystallography treats, in a brief outline, the derivation of space groups from the

various possible lattices and the determination of structures (primarily by x-ray methods) and contains an explanation of the theory of diffraction by electrons, which shows how intensities may be calculated and used in locating atomic positions. The various methods of recording diffraction patterns are briefly treated.

The nature of the various chemical bonds and their effects on combinations of particles are explained in the section on chemical crystallography. A number of compounds are listed as examples of structures with one, two, or several kinds of atoms.

Under physical crystallography internal properties are contrasted with external properties. These include deformation, dielectric and piezoelectric phenomena, propagation of light, and other properties. Various imperfections of structures, on an atomic scale, are listed and explained.

The translation is remarkably good, typographical errors very few, and references to original sources are numerous. This book should be a valuable source of information for workers in various stages of crystallographic research.

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Harvard University

Physics of the Earth's Interior. Beno Gutenberg. Academic Press, New York, 1959. 240 pp. Illus. $8.50.

This volume, a well written, clear, concise, and authoritative summary of present knowledge and opinion on the nature of the earth's interior, is a work that every earth scientist will want to read cover to cover. It is the eloquent swan song of an eminent scientist who, over the past 50 years, contributed substantially to every phase of the "physics of the earth's interior."

The work is divided into nine chapters: (i) "Fundamental problems and fundamental data"; (ii) "The structure of the earth"; (iii) "The crust"; (iv) "The mantle"; (v) "The core"; (vi) "Temperature and thermal processes"; (vii) "Density, pressure, gravity, and flattening"; (viii) "Elastic constants and processes"; (ix) "Non-elastic processes." Major recent works are listed in the bibliographies which follow each chapter.

The book is a summary monograph rather than an exhaustive treatise. Brief historical summaries are given, and techniques of investigation are sometimes reviewed, but the major emphasis of the book is the current status of knowledge of the earth's interior. The book contains valuable tables and is illustrated with many classical figures from the more recent literature.

The scientific community was shocked to learn of Beno Gutenberg's death on 25 January 1960. Earth science has lost one of its greatest research scientists. We are, indeed, fortunate to have, in this book, his final summing up of a lifetime of research.

BRUCE C. HEEZEN
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The Theory of Matrices. vol. 1 and vol. 2. F. R. Gantmacher. Chelsea Publishing Company, New York 68, 1959. vol. 1: x + 374 pp. vol. 2: x + 277 pp. $6 each.

Since we are living in an era of increasing abstraction, it is not surprising that most texts on matrix theory treat the subject almost as a minor illustration of the results of linear algebra. It is, therefore, a pleasant surprise for those of us of old-fashioned bent, to find an exposition of matrix theory which begins directly with the most elementary results and builds up to an exposition of the more refined points of the theory, never losing sight of the fact that most of the theory has developed from specific applied problems.

As an example of this point, the second chapter of volume 1 is devoted to an elegant exposition of Gauss' algorithm (the solution of linear equations by elimination) together with extensions and elementary applications. Much later in the book, these results are taken up again in a discussion of canonical forms of quadratic and Hermitian forms. In this latter chapter, Gantmacher discusses, in great detail, the problem of diagonalizing two positive, definite quadratic forms simultaneously; the results have been known for almost 150 years and are of great importance, but they appear in few texts on matrix theory.

Although the outstanding feature of Gantmacher's work is its concentration, first and foremost on matrix properties, there are several chapters on linear operators in vector spaces, which, following the more "elementary" algebraic results, will seem much better motivated than a purely axiomatic development. The theory of elementary divisors is presented from a purely algebraic point of view and then from the geometric point of view. Between these two expositions, the reader should have little difficulty in understanding this relatively complicated subject. Another feature of volume 1 is a careful treatment of functions of matrices (although some discussion of complex functions might have improved matters somewhat) and of matrix equations. Such matters as the equation $AX = XB$ the m'th roots of a matrix X, and polynomial equations in general are treated. Wisely, the author has refrained from a discussion of purely numerical techniques for matrices, a subject that deserves at least a volume of its own.

Finally we raise the matter of volume 2, of which the present translation is the second to be published [*Science* **131**, 405 (1960)]. The two translations are roughly comparable, with the present version, perhaps, enjoying a very slight edge. Since I cannot read Russian, I have only compared the two texts for clarity of exposition. There is, of course, no impropriety involved when two publishers bring out the same book, but it is probable that economic considerations induce some organizations to join the present translation derby. In this specific instance it is not difficult to recommend the Chelsea volumes, not only because of the additional material in volume 1, but also because of reasonable price.

In summary, I heartily recommend Gantmacher's treatise; it is easily the best now available.

GEORGE WEISS
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Physics in Your High School. A handbook for the improvement of physics courses. Prepared by the American Institute of Physics. McGraw-Hill, New York, 1960. 136 pp. $1.50.

Physics in Your High School is intended to serve as a handbook and guide for members of school boards and other interested lay persons concerned with improving or introducing

instruction in physics into their community's schools. It is exceptionally well and interestingly written and provides so broad a perspective on the teaching of high-school physics that it is certain to enjoy a much wider readership. Secondary school principals would profit greatly from reading this little volume, and the chapter, "Who should study physics," should be required reading for high-school counselors. Even experienced high-school physics teachers will find much in the book to help them improve their teaching, and inexperienced teachers can turn to it for guidance on many day-to-day problems that arise in teaching physics at the secondary-school level.

An interesting feature of the volume is a list of "things to do" at the end of each chapter. Although these are intended for school board members and lay members of school science committees, they will prove equally valuable as suggested steps that the physics teacher can take on his own or use to provide support for proposals made to the school administration.

So far as I know, there is no other published work similar to *Physics in Your High School.* It meets a need which has existed for a long time but which, until now, has apparently gone unrecognized.

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Geology of Saipan, Mariana Islands. Professional Paper No. 280, parts 1–4, U.S. Geological Survey, Washington, D.C., 1956–59 (order from Supt. of Documents, GPO, Washington 25). 445 pp. Illus. + plates. $12.50 (part 1, $3; part 2, $2; part 3, $5.50; part 4, $2).

Saipan is the second largest (after Guam) of the Mariana Islands, which form one of the many arc-shaped island chains in the Western Pacific Ocean. The geology of the island is relatively simple: Saipan consists of a core of volcanic material partly overlapped by nearly flat-lying sedimentary rocks, of which limestone is the dominant variety. Coral reefs surround the island at present, and a long history of earlier reefs is preserved in limestones terraced by marine erosion that occurred when the shoreline stood at higher levels. Because the Mariana chain is typical of the Pacific island arcs that have been a geologic puzzle for many years, and because Saipan is typical of the "high islands" of the tropical Pacific, it was selected by the Geological Survey for detailed study by a team of geologists, paleontologists, and soil scientists. Much of the team's work is brought together in this handsomely illustrated *Professional Paper.*

The paper is divided into four parts. General geology is treated in part 1 (by Preston E. Cloud, Jr., Robert G. Schmidt, and Harold W. Burke). Part 2 covers the petrology of the volcanic rocks (by Robert G. Schmidt), the petrography of the limestones (by J. Harlan Johnson), and a description of soils (by Ralph J. McCracken). Part 3, devoted to paleontology, includes sections on calcareous algae (by J. Harlan Johnson), on *Discoaster* and related microfossils (by M. N. Bramlette), on radiolaria (by William R. Riedel), on smaller foraminifera (by Ruth Todd), on larger foraminifera (by W. Storrs Cole), and on echinoids (by C. Wythe Cooke). Part 4 (by Preston E. Cloud, Jr.) describes the submarine topography and shoal-water ecology.

The authors have put together a comprehensive but very readable description of the rocks, landscapes, soils, and present-day reef complex, which should stand as an authoritative reference work for many years to come. For non-specialists, the work will also have enduring value, because each author has added to the descriptive material on his field a thoughtful discussion of the generalizations that may be drawn from his work on the relations of Saipan to problems of the Pacific basin as a whole.

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Aerial Photographic Interpretation. Principles and applications. Donald R. Lueder. McGraw-Hill, New York, 1959. xv + 452 pp. Illus. $17.50.

This book covers a lot of ground, and it does so, both literally and figuratively, in a highly effective manner. The science and the art of interpreting aerial photographs and the use of the interpretations as guides to every type of integrated terrain study are comprehensively treated. The theories, applications, and possibilities of this science presented here, should be an invaluable aid to engineers, geologists, geographers, planners, other scientists, and college students.

Easy reference is provided by division of the book into three parts: principles of theories of interpretation, geomorphology and landforms as seen by the aerial photograph, and applications of aerial-photographic techniques to the various fields of earth science. The lexicon of landforms and rock types is presented in such adequate and succinct detail that it vies with many college texts on geomorphology and physical geography (landforms). Photo analysis, photo reading, and photogrammetry are carefully described. The applications of these techniques are considered in solving problems of, to mention only a few, civil and water supply engineering, mineral exploration, forestry, coastal and harbor studies, agriculture, and urban and rural planning.

The book is rich in the quality and quantity of its illustrations; the bibliography is fat. Scholarly but, for the most part, blessedly unpedantic writing is notable throughout. The author emphasizes that "the imperfect state of our present knowledge necessitates the completion of some honest and valid interpretations that are heavily qualified and even merely educated guesses." He suggests with confidence, interprets with modesty.

In discussing the intellectual role of interpretation, the author makes a statement well worth quoting: "Jargon and specialized knowledge are increasing so rapidly that there is a definite danger of isolating each science in an intellectually autonomous area bounded by its own erudition. As a result, terrain studies . . . are leading to more and more specialized approaches. Overspecialization is . . . fatal to humanity . . . and a series of techniques for the logical integration of the earth sciences, as well as a system of semantics for their use, are the first steps toward combating this tendency. . . . Aerial-photographic interpretation is one such technique."

This is the first comprehensive study of aerial-photographic interpretation. It sets quite a precedent. Unfortunately, the price may be prohibitive for many college students.

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