composition of marine organisms, and of the fundamental changes in elementary composition of marine organisms during geological time. Based on the most extensive bibliography of analyses of marine organisms so far assembled, this study also includes much unpublished work from the files of the Vernadsky Laboratory for Geochemical Problems. A work of such scope is of inestimable value to marine biologists, geochemists, sedimentary geologists, comparative physiologists, and students in many other fields, and especially so since it can be assumed that Vinogradov summarized the basic assumptions and the theoretical approaches common to workers at the Vernadsky Laboratory, certainly the major world center of biogeochemical research.

In making this material available to non-Russian-speaking scientists, the translators, bibliographers, and editors have performed a heroic task. The entire text has been brought up to date as of about 1946 and much later material has been added, the bibliography has been thoroughly corrected, all text references have been made specific, and in many sections the taxonomy has been unified and revised. A comparison with some of the author's earlier publications in English indicates that his style has been treated with full justice throughout and that his ideas come through unscathed. One suspects that this volume is now as essential to the Russian workers as to any others.

Considering the enormous amount of effort that it represents, this monograph leaves a regrettably unsatisfactory impression. In a work of such scope it must be expected that specialists will be conscious of neglects of emphasis and of superficialities in discussion; an editorial note points out many cases of conclusions not generally accepted by specialists in the appropriate fields or not borne out by more modern investigations. I feel that too much caution was exercised in retaining in the various tables analyses either obviously untrustworthy or certainly superseded by modern techniques. The occurrences in the discussion of conclusions directly contradicted by the pertinent tables of data may perhaps be blamed on the greater ease of revising tabular material; in any case, such contradictions occur frequently.

As evidence of the theoretical approach of the Russian school of biochemists, one can only deplore the general lack of emphasis on the biology of the organisms being analyzed. Especially striking is the omission of mention of the variability of symbiont populations of sponges and corals. Unfortunate, too, is the lack of any thoroughgoing attempt to correlate variations in trace-element content with the available data on enzyme activation. The chemical discussion loses force by omitting any consideration of the physical-chemical states of the trace elements in sea water and of the correlated activities of organisms as ion exchangers or colloid adsorbers. It seems unlikely, for instance, that the uptake, as opposed to the metabolism, of arsenate and vanadate can ever be profitably considered apart from that of phosphate.

Regardless of what appear as its many deficiencies in laying the theoretical groundwork, which was one of its aims, there is a factual basis here for virtually all future investigations into the elementary chemistry of marine organisms and sediments, and we may be sure that the volume will be the major bibliographic starting point for decades to come. As a stimulus to interest, this volume promises to be a success, although the sheer mass of the work may be a major drawback. Gratitude for the elegance and substantiality of the book conflicts in one's mind with horror at the price. Special efforts must be made by librarians to make copies available to the students who should feel and most easily respond to its stimulation.

VAUGHAN T. BOWEN
Woods Hole Oceanographic Institution

Qualitative Inorganic Analysis. A new physico-chemical approach. G. Charlot. Trans. by R. C. Murray. Methuen, London and Wiley, New York, ed. 4, 1954. xi + 354 pp. Illus. $7.

Like many other textbooks on qualitative analysis, this one is suitable for work on a semimicro scale; it is divided into three parts: "Theory," "Chemical properties and the characterization of ions," and "Technique and methods of qualitative analysis." From this point on, however, the differences are more numerous than the resemblances. Few precipitations are made, and the precipitates seldom require washing. The tests are independent of one another and generally do not require separations of ions as a prerequisite. The author believes that a complete analysis can be made in 2 hr or less. The theory studied in part I is required if the procedures for making tests are to be understood.

About 190 pages in part II are devoted to the properties of, and the tests for, more than 100 substances, mostly ions, about equally divided between cationic and anionic groups. About five pages are devoted to directions for analysis. References are made in part III to descriptions of tests in part II. Tests for 27 cations (37 if multiple valences of some ions are counted) are made on separate samples taken from one solution with only occasional removal of interfering ions as prescribed in special cases. Many tests are by, or are similar to, the spot test. For some tests catalysis or controlled *p*H and/or redox are prescribed.

The theory is fully as difficult as that presented in the ordinary textbooks on qualitative analysis. The procedures are simpler in that there are fewer procedures before the final test for an ion is made. In fact, many final tests can be made on a 1-drop sample taken from the original solution. All the theory should be mastered; it is necessary to know it before the reasons for the procedures can be understood. However, with an open book one might make a successful analysis without knowing any of the theory. The introduction states that no special knowledge of physical chemistry is necessary since everything that

is required is given in a directly usable form. The equations necessary for expressing relationships are given, but when one meets *p*H, *p*K, activity, ionic strength, free energy and redox, formal potentials, buffer solutions, Flood's diagram, overvoltage, distribution coefficient, indicator theory, redox indicators, and pages of equations connecting free energies with various concentrations of oxidants, ions, and complexes, the thought that some knowledge of physical chemistry would be desirable is sure to arise.

The subject matter is logically presented. Binding, printing, paper, and the arrangement of tables, graphs, and illustrations are good. There are minor errors but I saw none worthy of mention. Both the scheme for analysis and the theory necessary for understanding it differ much from those found in the textbooks commonly used in the United States.

F. E. BROWN

Department of Chemistry,
Iowa State College

An Introduction to Human Biochemical Genetics. H. Harris. Eugenics Laboratory Memoirs, XXXVII. Cambridge Univ. Press, New York, 1953. 96 pp. Illus. $2.75.

Because of the difficulties inherent in the study of genetics in humans, knowledge in this area is somewhat less precise than that accumulated through observation of other organisms. On the other hand, in some aspects of genetics, the study of humans has suggested fruitful approaches to be applied to other organisms. This is particularly true of biochemical genetics, since Garrod, studying some diseases which appeared to be "inborn errors of metabolism," was one of the first to see that genes might act through their control over biochemical functions. Since his time, the advent of ever more refined and precise methods for studying the chemical aspects of bacteria, fungi, tissues, and body fluids in humans and animals have made biochemical genetics of considerable scientific importance.

In this book Harris has provided an excellent introduction to this field, which is useful to physicians and medical investigators who would understand genetics, and to geneticists who would see how genetic principles might apply in the biochemistry of health and disease. The book is not long and is certainly readable. Chapters II, III, and IX are especially valuable to the nongeneticist, since they review with great clarity the principles of genetics as they apply to human populations. In Chapter II is a discussion of gene frequencies, the significance of consanguinity, and some of the methods for the analysis of data. In Chapter III Harris discusses the difficult question of heterogeneity of apparently homogenous and simple characters, and in Chapter IX he takes up the problem of variability in manifestation of inherited characteristics. Under this heading are mentioned differences in manifestation in the two sexes, and quantitative differences and variations within and between families. If one understood what modified the expression of a characteristic in one individual as opposed to another, therapeutic approaches might suggest themselves. The other chapters present well-chosen illustrative material and avoid the use of conditions that are not reasonably well understood.

The format of the book and the diagrams and other illustrations are all well done. This is an important book, illustrating the conception that gene action, in order to be understood with maximum precision, will have to be expressed in biochemical terms.

BARTON CHILDS

Department of Pediatrics,
The Johns Hopkins Hospital

General Theory of High Speed Aerodynamics. vol. VI. *High Speed Aerodynamics and Jet Propulsion.* W. R. Sears, Ed. Princeton Univ. Press, Princeton, N. J., 1954. xiv+758 pp. Illus.+plates. $15.

This large volume presents discussions of a great variety of problems in high-speed aerodynamics by a number of different authors, each of whom has himself made important original contributions to one or more aspects of the field. This has inevitably resulted in a certain lack of logical structure for the volume considered as a whole. However this defect, if it be one, is more than compensated by the fact that the same subject is frequently considered by several of the authors; the resulting differences in approach and viewpoint are extremely illuminating and helpful to the understanding of the phenomena treated in this multiple fashion. The editorial task of cross-referencing must have been a formidable one, but it has been excellently and very completely accomplished.

The material covered is somewhat less broad than the title would imply since, with very few exceptions, the diffusion of both shear and heat are neglected, and the flows considered are treated as adiabatic. Many of the topics are, for the first time, presented in a unified and comprehensive manner, and there is a considerable amount of new material that has not before appeared at all. Accordingly the volume should be of great interest and value to the rapidly growing group of workers, teachers, and students in the field. The extensive bibliographies at the end of each section should also prove very useful.

Titles and authors of the various sections of *General Theory of High Speed Aerodynamics* are (A) "On the foundation of high speed aerodynamics" by Th. von Karman, (B) "Mathematical aspects of flow problems of hyperbolic type" by K. O. Friedrichs, (C) "Small perturbation theory" by W. R. Sears, (D) "Supersonic and transonic small perturbation theory" by Max Heaslet and Harvard Lomax, (E) "Higher approximations" by M. J. Lighthill, (F) "Plane subsonic and transonic potential flows" by Y. H. Kuo and W. R. Sears, (G) "The method of characteristics" by Antonio Ferri, (H) "Supersonic flows with shock waves" by Antonio Ferri.

CLARK B. MILLIKAN

Aeronautical Department,
California Institute of Technology