tant secondary and explanatory literature.

Since the 17th century was the time in which the concepts of classical physics were clearly formulated, Dugas' excellent book has a strategic importance for our understanding of physics itself. It deals with the work of great intellectual giants —Kepler, Stevin, Galileo, Descartes, Huygens, Newton, Hooke, Leibniz—and enough information is supplied about the mechanical theories in antiquity and the Middle Ages to enable the reader to set the theories of the 17th century in proper perspective. Although Dugas uses the excellent method of allowing his main participants to speak for themselves, he manages to convey the spirit of invention that characterizes creative work in science, and he shows the delicate connections between brute experience, contrived experiments, logical formalism and mathematics, hypothesis and intuition, and even metaphysics.

I. Bernard Cohen
*Department of the History of Science, Harvard University*

**Traité de Zoologie: Anatomie, Systématique, Biologie.** vol. XII, **Vertébrés:** Généralités, embryologie topographique, anatomie comparée, caractéristiques biochimiques. Pierre P. Grassé, Ed. Masson, Paris, 1954. 1145 pp. Illus. Paper, F. 9800; cloth, F. 10550.

Although it is primarily devoted to vertebrate morphology, this volume departs from the usual treatment in two obvious respects. Novel inclusions are represented by the two short concluding chapters, one on vertebrate chromosomes (Matthey), the other on biochemical features of vertebrates (Florkin). On the other hand, several missing topics such as adult digestive and respiratory systems, endocrines, and musculature (to be treated in five subsequent volumes devoted to the various vertebrate classes), prevent this volume from serving as a complete comparative morphology textbook.

*Vertébrés* consists of a series of authoritative chapters contributed by Belgian, French, and Swiss authors. A short introductory chapter by Brien and Dalcq stresses the need for understanding the dynamic developmental processes resulting in adult form, since viable inherited changes in patterns of development represent "amendments to the laws of development" underlying evolutionary change. The authors then proceed to brief considerations of general features of early vertebrate development, adult morphology, and general aspects of vertebrate evolution. A well-illustrated section on comparative vertebrate embryology by Dalcq and Pasteels follows, and, where possible, the descriptive details are based on the dynamic relationships, such as relative movements and inductive interactions, among embryonic parts.

Most of the remaining chapters in this volume are devoted to detailed comparative accounts of the morphology and evolution of vertebrate organs and systems. They include the central and peripheral nervous systems (Cordier), the eye (Rochon-Duvigneaud), statoacoustical (Cordier and Dalcq) and olfactory (Gérard) organs. Moreover, the skeletal system is considered in several chapters, one on the cranium (Piveteau) and several by Devillers on the vertebral column, ribs, sternum, and paired appendages. The histochemist, Lison, contributes a chapter on the teeth, in which he considers their comparative histogenesis and histology and gives a short discourse on their evolution. This is followed by detailed chapters on the circulatory (Stephan) and urogenital (Gérard) systems.

Literature citations following each chapter vary in completeness; a detailed appendix facilitates the search for specific topics.

*Vertébrés,* although it is well written, illustrated, and indexed, may not find its way into many private libraries because of its high price and because its complete usefulness depends on its supplementation by the remaining volumes of the series.

Morris Foster
*Osborn Zoological Laboratory, Yale University*

**Geology in Engineering.** John R. Schultz and Arthur B. Cleaves. Wiley, New York; Chapman and Hall, London, 1955. ix + 592 pp. Illus. $8.75.

There has been a notable shortage of books that treat the application of geology to civil engineering. As a consequence *Geology and Engineering* should be popular as a textbook for introducing engineers to the aspects of geology that are indispensable to sound engineering and as a reference for engineering geologists and practicing engineers.

The wide experience of the authors in the fields of teaching and practicing geology is reflected both in the comprehensive quality of the subject matter and illustrations and in the judicious selection of topic sequences and reference material. There are 22 chapters, the first of which introduces the engineer to the development of the science of geology and its relationship in more recent time to civil engineering.

Following this introduction are 12 chapters dealing rather generally with the engineering significance of minerals, rocks, geologic structure, subsurface water, weathering, erosion, desert land forms, shore lines and beaches, frost action, landslides, volcanoes, and earthquakes. Among these the chapter on frost action is the first good discussion in a textbook of this type of the engineering problems related to perennially frozen ground. Such features as permafrost, active layer, talik, thermal regime, pingo, frost blister, slud and zero curtain should arouse the curiosity of students and practitioners alike and should be studied carefully for their importance in arctic engineering projects.

Chapter 14, "Historical geology," a convenient division mark between the earlier and subsequent topics, might be regarded by some readers as superfluous to the book. However, in the second paragraph the authors make this statement, which might well have been placed in Chapter 1, and which budding engineering geologists should heed if they covet the respect of engineers: "the lengthy elaboration of paleontological and historical data in geologic reports intended primarily for civil engineers has perhaps done more than anything else to discourage the application of geology to civil engineering." The word *perhaps* in the foregoing quotation could be deleted safely.

Chapters 15 and 16 discuss the indispensability of geologic maps and sections and aerial photography as implements for obtaining complete predesign information. Chapter 17, "Soil mechanics," by E. J. Yoder, is a commendable discussion of the engineering classifications and properties of soils and their behavior under various conditions of engineering use. Chapter 18, "Subsurface exploration," may be criticized for devoting only one-fourth of its pages to the conventional and more reliable methods of exploring foundations by small- and large-diameter core borings, while three-fourths of the discussion is given to geophysical methods which, although useful, are limited in their reliability.

The last four chapters conclude the book with discussions on dams and reservoirs, tunnels, highways and airfields, and concrete aggregates; from the viewpoint of the engineering geologist these chapters constitute the main structure supported by the foundation of the preceding chapters of the book.

Weaknesses that are unavoidable in a work of this magnitude are limited chiefly to certain generalizations that should be modified in the interest of students. An example is the statement on page 91 that "Joints oriented approximately at right angles to the working face present the most unfavorable condition." Although this observation is correct insofar as it applies to quarrying or tunneling, the exact opposite is true with respect to a

preferred orientation for joints when sealing dam foundations against leakage is involved.

Should engineering geologists be inclined to consider the authors stingy in their development of the heavier subjects such as soil mechanics, subsurface explorations, and dams and reservoirs, they are reminded that the purpose of the book as expressed in the preface is that it should meet the needs of engineering students primarily, and that "an even greater need for a book acquainting geologists employed in engineering work" continues. With the impressive array of geologists who are qualified to contribute a treatise on engineering geology, it is to be hoped that such a contribution will appear at an early date as a supplement to Schultz and Cleaves' good work.

ROBERT H. NESBITT
*Office, Chief of Army Engineers*

**Mathematics for the Chemist.** Mathematical analysis for chemists, physicists, and chemical engineers. G. J. Kynch. Academic Press, New York; Butterworths, London, 1955. vii + 356 pp. Illus. $4.80.

The author states a threefold purpose for the book: to meet the needs of students taking Honours Courses in English universities; to provide a textbook on the applications of mathematics to chemical problems; and to serve as a reference book of mathematical information.

The subject matter covered includes approximate solution of equations; sequences and limits; differentiation; rational, circular, exponential, logarithmic, and hyperbolic functions; elementary analytic geometry; integration; series; complex numbers; differential equations; determinants; vectors; partial differential equations. Illustrative material in the text and numerous problems at the end of each chapter are largely from the field of chemistry. It is regrettable that the author found it necessary, because of space considerations, to omit chapters on numerical integration and on probability and error theory.

With such a wide range of subject matter to cover, the book could hardly be considered as a primary source of information. However, it should serve excellently as a textbook for a refresher course in mathematical techniques, for which purpose it is highly recommended. It should be especially valuable as a handy reference book for chemists, chemical engineers, physicists, and others who apply mathematics to physicochemical problems.

JOHN K. TAYLOR
*Division of Chemistry,*
*National Bureau of Standards*

**Transform Calculus with an Introduction to Complex Variables.** E. J. Scott. Harper, New York, 1955. ix + 330 pp. Illus. $7.50.

This book is written strictly for the engineer, physicist, and chemist. Its purpose is to show how problems are solved by the use of transforms. Although a fair amount of theory is included, it is there only because it is necessary for expounding the technique. The preface explains that the book is an outgrowth of lectures given at the University of Illinois to advanced undergraduates, mostly from the fields of engineering, physics, and chemistry.

The first chapter of 46 pages, including five pages of problems, is devoted to complex variables, with limits and analyticity, the Cauchy theorem, Taylor and Laurent series, singularities, residues, and contour integration. The next two chapters (34 pages) discuss the Laplace transform and its inverse. The succeeding eight chapters consider, in turn, ordinary differential equations, partial differential equations, integral equations and some special functions, partial differential equations again, and finite transforms. In appendixes are given a list of references and tables of operations, of Laplace transforms, of finite sine transforms, and of finite cosine transforms. Finally there is a short index of just over a page.

The exposition rests primarily upon the discussion of special problems: deflection of beams, motion of a particle, small oscillations, vibrations, networks, heat flow, radiation, diffusion, and others. There is a brief discussion of stability in the chapter on matrix algebra. Each chapter is followed by three or four pages of problems for solution.

Mention might be made of an unfortunate phraseology on page 256, second paragraph. The first sentence reads: "Now the series in the bracket is *divergent* for all values of $x$, since by the Cauchy ratio test . . ."; the italics are Scott's and the dots signify an assertion. Presumably the following is meant: "Since . . . therefore by the Cauchy ratio test the series in the bracket is *divergent.*" On page 51, second line before the end of the section, there appears to be a superfluous "and."

On the whole the book seems well suited to its purpose. A considerable amount of material is presented in a readily comprehensible manner. Thus the engineering student who is interested in gaining facility with a particular tool can get some experience in using it, some feeling for the variety of possible transforms, and some appreciation for the principles upon which the method is based.

However, it appears to me at least that the utility of this particular tool is decidedly on the wane. This makes no judgment of the importance of operator theory as a branch of mathematics, which is, in any case, not the concern of the book. But with the increasing use of high-speed computing machinery, and the use is increasing at a phenomenal rate, the notion of what constitutes a "solution" to a problem is undergoing a radical change. To be able to express a function, say the solution of a differential equation, in terms of tabulated functions, even elementary functions, is not *ipso facto* advantageous. If numbers are required it may be much easier to apply standard numerical procedures to the differential equation itself than to attempt to evaluate the "closed form" expression for the solution. And if one is interested in the qualitative properties of the solution, then again one may be better off to go back to the differential equation and apply principles of the qualitative theory of differential equations. In either case the attempt to apply transform theory or any other device for obtaining the solution in some kind of closed form may turn out to be wasted effort even when it is formally successful.

One may object that not every physicist or engineer will have a UNIVAC or 701 at his fingertips, and this is certainly true. But many do and many more will have, or if not one of these, then a 650 or other more modest, but still fairly adequate, computing equipment. There is an ILLIAC at Scott's own university.

ALSTON S. HOUSEHOLDER
*Mathematics Panel,*
*Oak Ridge National Laboratory*

**Medical Uses of Cortisone.** Including hydrocortisone and corticotropin. Francis D. W. Lukens, Ed. Blakiston–McGraw-Hill, New York, 1954. xiii + 534 pp. Illus. $7.50.

"Five years have passed since the anti-inflammatory effect of cortisone was announced and since this hormone was made available to physicians. During this period extensive investigations have been made of the action and uses of cortisone, hydrocortisone, and corticotropin. . . . Accordingly, the judgment of a group of physicians with wide experience in the use of adrenal hormone therapy has been assembled in one volume. The authors not only cite the ample literature in their several fields, but present their own conclusions as to the place of these hormones in various diseases."

The 15 chapters, representing the work of 29 contributors, are "Physiology of the adrenal cortex," "Pharmacologic aspects of adrenocortical hormones in man, and their effects in adrenal insufficiency," "Rheumatoid arthritis and