have a strong mathematical background, this book provides a means of becoming acquainted with some applications of the theory to their respective fields.

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The Lipids. Their chemistry and biochemistry. vol. II, **Biochemistry.** Digestion, absorption, transport and storage. Harry J. Deuel, Jr. Interscience, New York, 1955. xxvi + 919 pp. $25.

This comprehensive treatise on *The Lipids* was originally planned to be published in two volumes but has been expanded to three. Volume I, *Chemistry,* appeared in 1951. Volume III, which will include biosynthesis, metabolism, and nutritional value, is yet to come.

Volume II covers digestion, absorption, transport, and storage of lipids with literature citations up to and including 1953. Its seven chapters are "Introduction," "The digestion and absorption of fats in the gastrointestinal tract," "The digestibility of fats," "The digestion, absorption, and digestibility of lipids other than fats," "Blood lipids," "The occurrence of lipids in the animal as a whole," and "Lipid distribution in specific tissues and in their secretions."

The chapter on digestion and absorption of fats in the digestive tract includes very complete discussions of the various fat-splitting enzymes and the chemistry of the bile acids and their role in fat digestion and absorption. The pathways of fat absorption in animals are thoroughly discussed, along with the physiological and chemical factors that affect them. Chapter III reviews the important concept of "digestibility of fats." The numerous experimental methods of investigating this concept are described, and there is an excellent résumé of published data on digestibility. An unusual feature, Chapter IV, is a 97-page review of digestion, absorption, and digestibility of *lipids other than fats,* including such diverse types of compounds as phospholipids, sterols, and the several fat-soluble vitamins—subject matter that is covered only briefly in the usual textbook. Even to one who is familiar with this field, it was astonishing to see more than 600 references cited in this chapter alone.

Chapter V on blood lipids, 170 pages, is by far the most exhaustive treatment of this subject to date. It should be of great value to those who are conducting investigations related to this subject. Subjects covered include chemical nature, qualitative and quantitative relationships, factors affecting blood levels, and pathological considerations, including the currently important subject of arteriosclerosis.

Total body lipids are considered, in Chapter VI, as originating from the diet and from synthesis from protein and carbohydrate. Methods are described for determining total lipids of human and other animal bodies. Fatty livers and the lipidoses are included in the discussion of abnormal lipid deposits. Chapter VII includes a vast fund of information on specific tissue lipids, a coverage somewhat similar to that in Bloor's monograph published in 1943 but, of course, including data published since that time.

After reading the first two volumes of *The Lipids,* one is deeply impressed by the comprehensive treatment of the subject matter. In volume II alone nearly 4000 authors are cited with about an equal number of literature references. One is, in fact, amazed that so many investigators have contributed to this field. Indeed, the citation of so many references may be confusing. On the other hand, no author could be expected to evaluate critically and justly all that has been published. The graduate student entering the field will be impressed with the confusion of data and ideas on these several subjects, and yet, no doubt, if he will study the old and the new citations on any given subject, he will learn much from the experimental methods that are covered in this volume in more detail than usual and will certainly be in a position to profit by the mistakes of those who have gone before.

The author is to be congratulated on his audacity in having attempted such a comprehensive treatise on this subject and for the general excellence of his results. This work will undoubtedly be an important milestone in this branch of science and will serve as an invaluable reference book.

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Theories Relativistes de la Gravitation et de l'Electromagnetisme. Relativite Generale et Theories Unitaires. A. Lichnerowicz. Masson, Paris, 1955. xii + 298 pp. Illus. F. 2800.

A. Lichnerowicz is, while still young, a recognized leader in the difficult mathematical theories that have blossomed out of the classical tensor calculus of Ricci and Levi-Civita. In the present volume, which embodies his lectures of the last 2 years at the Collège de France, he applies these theories to what is called the unitary problem. The treatment of the electromagnetic field in tensor form, on the one hand, and the relativistic solution of the two-body problem, on the other, are quite generally known, but it is probably not recognized outside the circle of the specialists that there exists as yet no final "unitary" theory leading to the equation of a gravitational and electromagnetic field.

The first part of this volume is an advanced treatment of the mathematics of general relativity, including some new results obtained by the author and his research students. The second part is devoted to two major movements in the contemporary advance toward a unitary field theory: one, labeled the Jordan-Thiry theory, calls to aid the greater potentialities of a five-dimensional space; the other, the Einstein-Schrödinger theory, introduces an affine connection that forsakes the symmetry of the classical "gammas." Generalizations of the wave-propagation theory contained in Hadamard's famous lectures on the Cauchy problem are made throughout the book and contribute clarity and elegance.

This book, needless to say, is not meant for the general public; it is a scholarly presentation of some of the most recent gropings toward a unitary theory, which every worker in the field will wish to ponder. The printing is excellent; the index may be (we are not sure) a product of the tongue-in-cheek humor of the French mathematical school.

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La Mécanique au XVII^{e} Siècle (des Antécédents Scolastiques à la Pensée Classique). René Dugas. Bibliothèque Scientifique 26, Philosophie et Histoire. Dunod Editeur, Paris 6, 1954. 620 pp. Illus.

The author of this book published in 1950 an *Histoire de la mécanique,* in which the major ideas of the science of mechanics, both statics and dynamics, were traced historically from antiquity to the present; that book had the unique virtue of combining into a single study a history of the ideas of both classical and quantum mechanics. It might, therefore, seem as if the present book were merely an expansion of the section of the former work dealing with the 17th century, but this is not the case at all. Great as the merits of the former work were, it suffered from the fact that the author had not made much use of the scholarly efforts in the history of science in the last three-quarters of a century, much of which has been devoted to elucidating the historical development of mechanics. The present study shows the same familiarity with the primary material as the previous one, but the whole book is enriched by the fact that the author does now take into consideration the impor-

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.

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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.

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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