a thinly documented subject. Either of us may be right in our view of the descent of man, or we may both be as wrong as some of our predecessors who fumbled brilliantly in even deeper gloom.

In any case, I still consider *Mankind in the Making* the soundest exposition of its subject yet in print. It will be widely read (particularly at $4.95), and its influence should be wide. Some professionals will wish that the publishers had wanted more documentation in footnotes and bibliography and a few more technical terms. Students and fellow-scientists need this book more than other people, and with Howells' style to float these didactic aids, the book-club crowd could have stomached them painlessly. Anyhow it is a much needed and courageous book, and a graceful monument to a great teacher's memory.

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The Study of Rocks in Thin Section. W. W. Moorhouse. Harper, New York, 1959. xvii + 514 pp. Illus. $8.

This book is described accurately in its preface as "a brief review of the methods of optical mineralogy (with a minimum of optical theory), descriptions of the rock-forming minerals encountered in the more common rocks, identification tables to assist in the identification of these minerals, and descriptions of the common rock types." Although the book often rises considerably above the level of this rather reserved prospectus, many sections lack the data and critical discussions needed by the graduate student, and its greatest value will be for students and geologists who are concerned mainly with naming common rocks.

The book begins with a 36-page chapter on methods of petrographic mineralogy; with the exception of the parts on dispersion and the universal stage, it is reasonably complete. The user of the book will, however, require additional reading or course work in optical mineralogy. The next chapter consists of brief descriptions of 149 minerals. Many of the descriptions contain orientation diagrams and graphs of optical data. Chemical formulas have been omitted from some of the more complex silicates, for example, biotite and hornblende. Each mineral is given a consecutive number which keys it to several determinative tables, and these tables should be very useful to beginners.

The remaining 70 percent of the book consists of systematic descriptions of rocks, beginning with those of the volcanic and hypabyssal realms, proceeding to plutonic, sedimentary, and metamorphic rocks, and concluding with a brief chapter on ores. Each of the four main groups receives about equal space, but the chapters on igneous rocks seem considerably more complete, probably because it is easier to treat these rocks systematically. In any case, the preliminary discussions and classifications of the sedimentary and metamorphic rocks need amplification. For example, the beginner will sorely miss a summary of the sedimentation cycle, a table showing Wentworth's size scale and classes, and a definition and discussion of grain-sorting. In the chapters on metamorphic rocks, the reader is introduced to concepts and names of metamorphic grades and facies, but he is not told how to interpret them from thin sections; furthermore, several triangular facies diagrams are given, but without instructions for their use.

The descriptions of altered rocks and the chapters on metasomatism and ores are rather new in concept and should prove worth while. The 90 photographs of rocks and minerals and the 350 drawings of rocks are excellent, and they combine with a select format to make this an unusually handsome book.

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Handbuch der Physik. vol. 53, *Astrophysics IV: Stellar Systems.* S. Flügge, Ed. Springer, Berlin, 1959. viii + 565 pp. Illus. DM. 142.

This work, the fourth of five volumes devoted to astrophysics, or the art of applying terrestrially formulated laws of physics to the universe as observed by both optical and radio means, is concerned with the manner in which stars occur in systems—our own Milky Way galactic system and its subsystems of open and globular clusters (to which more than one-third of the volume is devoted), the myriad galaxies, and in turn, the systems of galaxies. The three earlier volumes in this subseries of the *Handbuch* treated stellar surfaces and binary stars, stellar structure, and the solar system, respectively.

The dynamics of the galaxy, the classical topic on which so many "astronomer-lives" have been spent, is discussed from both observational and theoretical viewpoints in two masterful chapters by Edmondson and Lindblad; despite the very great progress made, it appears that our understanding of the dynamics of our own galaxy-in-rotation is still imperfect.

In the field of galactic structures and dynamics, progress is being materially accelerated by the rapidly growing contributions of the relatively new techniques of radio astronomy. Oort gives, in his chapter, a learned résumé of these contributions, but any summary of this exploding field of research must necessarily be considered a progress report. This also applies to the discussion of the swiftly mounting contributions made by radio techniques to the study of exterior galactic systems, which are treated in the chapters by Hanbury Brown and Mills.

The structure of galaxies is intimately linked with the evolution of stars from dust and gas clouds, and the unique and signal place held by star clusters in this study is ably and comprehensively treated by Helen Sawyer Hogg. A valuable catalog of open and globular star clusters is included.

A large measure of the value of this volume lies in its presentation of a greatly needed, encyclopedic treatment of external galaxies (it is gratifying to note that the old, ambiguous term nebulae applied to galaxies has at last been discarded). A systematic treatment of the classification, morphology, and general physical properties of external galaxies, which includes many excellent photographs, is given by de Vaucouleurs, while Zwicky, in his inimitable style (almost one-half of the references in his ample bibliography are to his own papers), treats the organization of galaxies in multiple and cluster systems, for on a lower level of organization stars often exist in multiple groupings and in star clusters. Zwicky's photographs present impressive examples of physical linkage between galaxies.

The large-scale organization of galaxies is discussed statistically by Neyman and Scott, and the difficult and controversial cosmological aspects of the wealth of observational data are well treated in chapters by McVittie and Heckmann.

Many will regret, with me, that this excellent treatment of the universe of galaxies does not have a word from the dean of galaxy observers, Walter Baade.

The volume is largely in English, but the index is bilingual. The press work is excellent, and I found only a few typographical errors.

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Roman Construction in Italy from Tiberius through the Flavians. Marion Elizabeth Blake. Carnegie Institution of Washington, Washington, D.C., 1959. xvii + 195 pp. Illus. $9.

The present volume is the second part of a basic, three-volume work which will present in considerable detail the history and development of Roman building methods in Italy. The first volume (1947) takes us through the reign of Augustus; now this one guides us through the confusing history of building in the first century A.D.—a period in which builders seem to be striking out in all directions, but without arriving at any truly major discoveries, and only rarely contributing a great architectural monument.

The old saw would have it that Augustus "found Rome of brick and left it of marble." Just how wrong headed this notion is is amply illustrated by Marion Blake's book; for working with marble (except as a veneer) was never greatly interesting to the Romans, nor was their contribution to stone construction ever of major importance. The great Roman advances in building technique were in the use of brick and concrete, and their continued experiments with these combined media prepared the way for the great architectural masterpieces of Trajan and Hadrian, Diocletian and Constantine—masterpieces which remain to be dealt with in the final volume of the series.

The present volume, like its predecessor, is sumptuously published. The footnotes are set along the edges of the pages, opposite the passages to which they refer; there are five separate indexes; and the plates contain over 100 photographs, beautifully reproduced. Yet it is just in these points where cause for complaint can be found. Anyone likely to read this book will expect to find the footnotes at the bottom of the page, and the present method not only wastes paper when the footnotes are sparse, but, when they come thick and fast, there is really not enough room for them. This leaves the impression that footnote information is crowded back into the text, and confuses material which is already hard enough to read. As to the five indexes, I should much prefer them combined. Finally, it seems to me that for illustrating architecture (and thus building) *drawings* are far superior to photographs and should be used even though some photographs must be left out. Let us hope that in the final volume Miss Blake will append a generous portfolio of drawings to illustrate not only that volume but this entire work.

The text itself deserves only praise. The completed work will force us to reassess both the history of Roman architecture and its contribution to architecture in general. This work is fundamental for classicists and medievalists alike and is recommended to anyone interested in architecture and engineering.

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Elementary Astronomy. Otto Struve, Beverly Lynds, Helen Pillans. Oxford University Press, New York, 1959. viii + 396 pp. Illus. $7.

Otto Struve, one of our most distinguished and lucid astronomers, has produced an unusual, interesting, and very useful book. Struve was assisted by Beverly Lynds and Helen Pillans. Although the title is *Elementary Astronomy*, the preface as well as the text clearly indicates that this is not another general, descriptive, astronomical text. Instead the book stresses the physics involved in astronomy, especially dynamical and spectroscopic lines of evidence and analysis. It might have been titled "Elementary Astrophysics." This book will be received with pleasure by many instructors and serious students of astronomy and physics.

The student or general reader usually has a difficult time finding how astronomers proceed from their various types of observation to models of the interior of stars, or to general pictures of the structure and history of the galaxy. Of necessity most introductory texts, like a considerable number of popular books, are mainly descriptive. Books at the next level have generally consisted of specialized, and usually rather technical, discussions. For most readers the gap is too great to jump; but this volume will provide a useful bridge. The volume may also be of value to physics students who explore some of the interesting astronomical contexts in which physics is applied. Problems, but not references for further study, are provided at the end of each chapter.

Although the book jacket contends correctly that the volume is "written in readable, non-technical style, the text assumes no previous training in mathematics or physics; calculus and trigonometry have been omitted entirely," a reader who lacks a knowledge of introductory physics will proceed slowly in many sections. In many instances the discussion is more detailed and mathematical, as well as more modern, than that in the well-known *Astronomy* by Russell, Dugan, and Stewart.

The topics discussed range from coordinate systems and fundamental units, through planetary motions and physical conditions, to the sun and its structure, the origin of stellar radiation, the origin of the solar system, the arrangement and motion of stars in space, stellar spectra, clusters, nebulae, binaries, variable stars, galaxies, and relativity, and the book ends with a chapter on telescopes and their accessories. In every instance, as in the discussion of radio astronomical instruments and observations, emphasis is upon the physical principles used by astronomers in constructing their equipment and interpreting their observations.

The 110 halftone illustrations, all closely related to the text, are most attractive despite the use of nonglossy paper for the book. In addition, 181 diagrams and a four-color frontispiece clarify the discussion. Many of the illustrations are especially interesting because they deal with technical points not commonly discussed or illustrated in descriptive texts.

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On the Pectoral Fin and Shoulder Girdle of the Arthrodires. Erik Stensiö. *Kungliga Svenska Vetenskapsakademiens Handlingar*, vol. 8, No. 1. Almquist and Wiksell, Stockholm, Sweden, 1959. 229 pp. + plates. Kr. 114.

This is another of the important and beautifully illustrated works by a man who has greatly influenced the study of fossil fishes over the past 3½ decades. As the latest in a series of recent studies on the anatomy and classification of the