oka tool inventory included notched spear and dart points, heavy ground stone adzes, and equipment for fishing with hook and line and by netting. The Lamoka culture was replaced by about 2000 B.C. by another group, the Laurentian culture, which was carried into New York by a biologically distinguishable group of people with weapons and tools relating them to culturally similar groups from Lake Superior to Quebec. The Laurentian invasion seems to have been the last major incursion of people. The subsequent story is one of gradual transformation, principally through the addition of elements from the outside: pottery, the bow and arrow, smoking pipes, and, most importantly, maize and other domesticated plants. Although agriculture may have appeared several hundred years earlier, it is not until after A.D. 1000 that sizable villages of gardeners appeared. Village development culminated in the palisaded towns of the historic Iroquois.

Despite Ritchie's best efforts, detailed explanation of the sequences in technological-environmental terms is not possible. We lack anthropologically satisfying explanations for such phenomena as the domination of the Lamoka people by the Laurentian invaders and the slow progress of the pottery-using people during the 2000-year period between 1000 B.C. and A.D. 1000. This unsatisfactory situation is surely not the fault of Ritchie; it is a general condition, and it can be improved only by the development of more adequate anthropological theory.

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Techniques of Biological Chemistry

The Structure of Lipids, by Spectroscopic and X-Ray Techniques (Wiley, New York, 1965. 335 pp., $10.50), by D. Chapman, considers selected topics relating to physical properties and to determinations of structure of lipids and their simpler units. The book consists of the following chapters: "Introduction," "Separation techniques," "Ultraviolet spectroscopy," "Infrared and Raman spectroscopy," "Mass spectroscopy," "Nuclear magnetic resonance spectroscopy," "Electron spin resonance spectroscopy," "X-ray diffraction studies," and "Future developments and other techniques." Most of these subjects, which are treated in an authoritative manner and are well documented, are new and powerful means of characterizing lipids. The theoretical bases of the methods employed in modern lipid chemistry are explained, and examples from recent literature are given in most instances. Therefore, the book will provide a very useful orientation in physical methods applicable to study of lipid structures and will be particularly useful to students and to investigators in the field of lipids.

The most valuable chapters are those on infrared spectroscopy, mass spectroscopy, nuclear and electron spin resonance spectroscopy, and x-ray diffraction studies. These subjects, which lie closest to the author's research interest, are better organized and are treated more thoroughly than separation methods and ultraviolet spectroscopy. However, separation methods are less germane to the study of structure of lipids, and ultraviolet spectroscopy is currently a less active field than the remaining subjects.

The grammatical errors scattered throughout the book suggest either hasty writing or uncritical editing. Some of the illustrations in the section on infrared spectroscopy indicate poor art work in copying published figures. With the exception of these features which detract from its overall appearance, the book is well printed and bound and it is pleasing to read.

The title is perhaps a bit misleading, for the book deals largely with the methods of determining structure of lipids, and then with rather simple lipids or their derivatives. Only in the latter part of the eighth chapter is the structure of complex lipids in biological systems treated briefly. Perhaps it is premature to expect a longer treatment of structure of complex lipids. However, two facts—the author is an acknowledged authority on that subject and the title of his book—led me to hope for a more thorough treatment of structure of lipids in biological systems that was given here.

Nevertheless, *The Structure of Lipids* is a valuable and useful book that should be read by all who wish to do serious work with lipids.

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Entomology

In 1953 Melville Hatch published the first volume of a series, "The Beetles of the Pacific Northwest," in which he proposed to treat all of the estimated 4000 species of beetles that inhabit the states of Washington, Oregon, Idaho, and the province of British Columbia. This ambitious project has resulted in four volumes, or parts, treating more than 3000 species in 78 families, but so far several of the large phytophagous families have not been treated.

In this new volume, part 4, **Macrodactyles, Palpicornes, and Heteromera** (University of Washington Press, Seattle, 1965. 278 pp., $10), the suborder Diversicornia, begun in part 3, is completed with the series Macrodactyles, which corresponds nearly to the Dryopoidea of other authors. This group embraces several small and fascinating aquatic or semiaquatic families including Limnichidae, Psephenidae, and the Heteroceridae. Included in the suborder Palpicornes are the obscure family Hydraenidae and the familiar Hydrophilidae. Eighteen families are placed in the Heteromera, and most of these are of interest only to the specialist. However, the Meloidae are of some medical importance because of their vesicant powers, and it is probable that more of the beetles which infest stored products belong to the Tenebrionidae than to any other beetle family.

Specialists in the various taxonomic groups may disagree with the composition and disposition of different levels of taxa in this work, which is to be expected in any faunal treatment of this scope. The average person will find the contents of these volumes dull reading, but for the coleopterist, a wealth of information is assembled and presented in concise form. Every effort is made to include as much information as possible about each species, and much biological data as well as old and new distributional records are made available. Bibliographical notations are also given for each species, and an extensive list of pertinent references is provided at the end of each volume.

Keys are included for families, genera, and species, and a generous number of excellent halftone habitus illustrations and line drawings of genitalia contribute to the accuracy of identifications. A notable feature is that the caption of each illustration in-

cludes the page number of the description. To date the format of treatment has been kept fairly consistent, despite the fact that several collaborators have contributed to the work.

Although this series of volumes will be of the greatest utility to Coleoptera specialists and amateurs and will be a classic in future years, it should also be widely used by identifiers, ecologists, and zoogeographers.

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Modern Lunar Research

A Fundamental Survey of the Moon (McGraw-Hill, New York, 1965. 157 pp., $4.95), by R. B. Baldwin, is the second volume of the McGraw-Hill series in astronomy; the series is intended to supply new material to undergraduate majors in astronomy, physics, and space science. The volume is also Baldwin's third book on the moon.

His first book, *Face of the Moon* (1949), made a deep and lasting impression on our thinking about the origin of the lunar craters and dark maria, establishing for the first time satisfactory qualitative and quantitative correlations between these features and their postulated terrestrial counterparts. Baldwin did not originate the meteoritic impact theory, but he certainly made it very respectable. His *Measure of the Moon* (1963) is an updated and amplified version of the earlier book.

The two earlier works are mentioned to make clear Baldwin's position in lunar research and because he has drawn on them for materials and mode of exposition. The latter is perhaps a little unfortunate, since the propagandist tendencies, appropriate enough in these earlier works, are rather out of place in a text for undergraduates.

The book includes well-organized chapters on the lunar orbit, the tides, tidal friction and the shape of the moon, the major surface features, the origin of the lunar craters, the origin of the maria, the birth of a meteoritic crater, the surface temperatures, the optical characteristics of the surface, changes on the moon, the lunar atmosphere, and the Ranger photographs. I could find no discussion of the moon's thermal history, a topic that certainly belongs in a book of this kind. The bias mentioned above appears only in those chapters that bear on the mode of origin of the surface features. Because the author's principal tenets are generally accepted, I do not consider this occasional subjectiveness a real drawback.

The chapter on the moon's origin is excellent even if, as dictated by the present state of our knowledge, it does not lead to a definite conclusion. I wish that the discussion of the moon's figure had been written in the same vein, since contrary to Baldwin's ideas, we still do not know how the moon acquired its shape. Baldwin's identification of the earthward elongation of the moon as a fossil tide will not do, since the known ratio of the differences of the moments of inertia is not consistent with the solidification of the moon as a synchronous satellite of the earth.

Each chapter closes with a short list of problems for the reader. There is a useful eight-page glossary which, however, is not flawless. The definition of *maria* may be correct but is needlessly subjective. The *limb* of a celestial object is the edge of its image, rather than the edge of the object itself. The index is adequate for a book of this scope. The line diagrams are clear and relevant. There are eight photographic views of the lunar surface, and one of these is a Ranger VII picture.

Despite the above criticisms, this book comes close to its stated purpose, for it presents the student with a very readable account of modern lunar research.

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Stars and Stellar Systems

Galactic Structure, edited by A. Blaauw and M. Schmidt (University of Chicago Press, Chicago, 1965. 626 pp., $15), is volume 5 (and the sixth volume published) in the nine-volume compendium of astronomy and astrophysics, "Stars and Stellar Systems," which is being published under the general editorship of Gerard P. Kuiper and Barbara M. Middlehurst. The editors have felt, and rightly so, that this volume more than others of the compendium, should help to fill the gap caused by the lack of a good textbook on this most important domain of modern astronomy. The price is so low, thanks to the National Science Foundation, that all graduate students in astronomy can afford the book, and it should be closely and carefully studied by them. Volume 7, *Nebulae and Interstellar Matter*, is now in the galley proof stage; it too should be of special importance, and for the same reason.

Our present picture of the structure of the galaxy is remarkably different from the picture that we had only 15 years ago. Spiral arms have been identified and traced, still in rather hazy fashion, out to distances far beyond the galactic center. This hidden center has been observed and pinpointed by radio observations to within a few minutes of arc, and its remarkable nature has been investigated in a preliminary sort of way. A very thin disk of neutral hydrogen is amazingly flat to distances of 200 million billion kilometers from the center and, at greater distances, is systematically distorted from the galactic plane—which it defines—along a line in the direction of the Magellanic Clouds.

Remnants of many old supernova explosions have been located close to the galactic equator; but recently a number of high-velocity, neutral, hydrogen clouds have been discovered far from the plane, and there undoubtedly are many more such. The interstellar gas, magnetic fields, and cosmic rays are dynamically coupled in ways that are still little understood. A gigantic corona of radio radiation and faint blue stars surrounds the galaxy and may extend to nearby galaxies. We have discovered a few dozen nearby subdwarf stars which have orbits "plunging" into the galactic nuclear bulge. The number of stellar population types has grown from Baade's original two to five—or perhaps more. Stars that were once thought to be all of one chemical composition are now known to be widely different in their chemistry, and those differences are correlated with their kinematics and their ages.

Most of the 23 chapters in this volume are significant contributions to the literature; I will comment on only two of them. In chapter 6 Olin Eggen reviews the evidence for a number of moving groups of stars, a subject that he has made peculiarly his own. A moving group of stars, like a moving cluster, presumably has a common origin in time and place and nearly identical space velocities. In a moving group, however, there is a non-negligible dispersion of the velocity components perpendicular to the galactic plane. Identification of group membership is made from the identical velocity components *in* the plane (within observa-