Astrophysics

The proceedings of the 13th conference on physics at the University of Brussels (1964 Solvay Conference) have been published in **The Structure and Evolution of Galaxies** [Interscience (Wiley), New York, 1965. 184 pp., illus. $9].

The contributors include the most eminent researchers in the field of astrophysics, and they address themselves to the problem of how knowledge of the laws of physics can be advanced by considering phenomena on a galactic and cosmic scale. Although the general problem of the nature of the galaxies is considered, most attention is concentrated on the more or less recently discovered subjects of radio sources, supernovae, and quasars—all phenomena which indicate release of great amounts of energy or extreme physical conditions. It is apparent that the approach of the conference oscillates between explaining such events as the result of collapse or condensation and explaining them as the result of explosions or ejections.

Differences in the style of the participants are also marked. Some give complex detailed observational pictures; some give intricate theoretical discussions. But Ambartsumian's introductory report, on the nuclei of galaxies and their activity, is outstanding. It courageously deals with the most important subject of all—the assumptions which underlie the description and attempted explanations of the phenomena. It is my opinion that what appear to be brilliant intuitions about ejection in galaxies, the role of nuclei, associations of spiral arms, blue objects, and quasars are really the result of Ambartsumian's considering the problem in great generality and, above all, of his careful reasoning coupled with the visual inspection and study of a very large number of actual galaxy forms.

The book is valuable for those interested in the important and difficult problems in cosmic physics today, the pertinent information available in 1964, and the attitudes of the most knowledgeable scientists toward these problems and data.

The papers in the volume include, in addition to Ambartsumian's, "Some topics concerning the structure and evolution of galaxies," by J. H. Oort; "The role of magnetic fields and cosmic rays," by L. Woltjer; "Formation of stars," by L. Spitzer; "Stellar evolution," by E. E. Salpeter; "Supernovae," by R. Minkowski; "Supernovae and supernovae remnants," by F. Hoyle; "Extra-galactic radio-sources," by J. G. Bolton; "Spectroscopic observations of extra-galactic radio-sources," by M. Schmidt; and "The mechanisms of extra-galactic radio sources," by G. and M. Burbidge. The recorded discussions that followed each paper, and the general discussion, introduced by R. Oppenheimer, are also included.

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Biochemical Symposium

Mechanisms of Release of Biogenic Amines (U. S. von Euler, S. Rosell, and B. Uvnas, Eds. Pergamon, New York, 1966. 490 pp., illus. $20) contains the proceedings of a symposium, the fifth in a series sponsored by the International Wenner-Gren Center, held in Stockholm in February 1965. This symposium was characterized by an impressive interdisciplinary representation of pharmacologists, physiologists, biochemists, and morphologists, who contributed in all about 40 papers.

As is often the case with such symposiums, by and large it is more interesting to read the discussions, which often uncover many of the basic problems in the field, than the actual papers, which are frequently warmed-over versions of material already in the literature. For example, it was refreshing to read in the general discussion how a concern has arisen over whether the extragranular compartment of catecholamines may not be "free" in a physicochemical sense, but may be, rather, bound to a macromolecule, perhaps soluble in the cytoplasm.

This is not to say that valuable and incisive papers are not included in the volume. One needs only to read Whittaker's paper on acetylcholine-binding by brain particles, Kopin's report on biochemical aspects of storage and release of biogenic amines, and Douglas' lucid account of calcium-dependent links in stimulus-secretion coupling in the adrenal medulla to realize that the volume is a success. Perhaps these three papers were preeminent to me because in each case the investigator made a commendable effort to present a working model to explain the release of the appropriate biogenic amine, thereby fulfilling the seductive title of the volume. These models are remarkable for their encompassing of most of the known, and sometimes divergent, facts in the fields involved.

Another impression which reading the volume left was that the accumulated information about histamine does not seem to fit into the same context as that concerning acetylcholine, serotonin, and catecholamines, perhaps because mast cells, on which so much of the work on histamine has been done, are not neurones. The attempt by Brodie and his colleagues to ascribe a transmitter role to histamine on the basis of the submaxillary gland's secreting labeled histamine, which had been injected prior to stimulation of the chorda tympani, seems rather premature, if not strained. As a matter of fact, the attempt on the part of some of the Swedish investigators to ascribe a transmitter role to serotonin in the central nervous system on the basis of the presence of this amine in neurones demonstrated by fluorescence microscopy is equally unwarranted. The microbiologists have to satisfy Koch's postulates to identify a microorganism as the etiologic agent in an infection; perhaps the "transmitterologists" should feel compelled to satisfy equally rigorous criteria before happily conferring the title of transmitter on biogenic amines and other metabolites.

These criticisms are minor, however, and do not detract from the overall excellence of this volume. The book should prove of value to student and investigator alike.

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Oceanography Textbook

Principles of Physical Oceanography by Gerhard Neumann and Willard J. Pierson, Jr. (Prentice-Hall, Englewood Cliffs, N.J. 557 pp., illus. $30) is the first really complete and reasonably proportioned book for the *teaching* of physical oceanography in an advanced formal course. Although several valuable reference compendia enjoy honored places in the rather limited library of volumes in oceanography, this is the first book of a comprehensive nature that is organized primarily as a teaching medium. The book begins with a concise historical summary

and an up-to-date discussion of the ocean bottom. The following 13 chapters are arranged to cover instrumentation and the statics and dynamics of the sea, and a final chapter on probability statistics and time series is included in order to provide the working knowledge necessary for full understanding of the mathematics of ocean waves as presented by the authors.

In the preface the authors write that the book is intended to meet the needs of three different groups: senior undergraduate students, beginning graduate students, and geophysicists requiring a reference text in physical oceanography. They are correct in noting that certain portions of the book will require abridgement for use in college. Unfortunately this would require considerable reworking on the parts of the instructor and students in the cases of the chapters on hydrodynamic equations, on wind waves, swell, and so forth, on turbulence and mixing, and on probability, time series, and statistics.

Since most of the oceanographic dynamics is included in these chapters, the book would be suitable as it stands for graduate students and geophysicists with advanced training. For the most part, serious oceanographic training is at present a graduate program; if the book is evaluated primarily from this viewpoint, it is outstanding among existing works, in the balance between complete coverage of physical oceanography and the necessary omission of reference data.

Chapters 10 and 12, on wave motion, will be considered either very useful or very useless depending on the skill and training of the reader. Since this is the subject of the authors' special study in recent years, it is understandable that these chapters might be the most penetrating and specialized. Neumann and Pierson appear to have realized this, but their attempt in chapter 10 to develop waves from the most elementary principles does not diminish the weightiness of the treatment as a whole.

In summary, Neumann and Pierson's book is a very good professional textbook on physical oceanography, which becomes rather difficult in the sections on dynamics, but which will probably become a standard graduate text in the subject.

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Séminaire Bourbaki

Research workers in mathematics will be pleased with the announcement of a hardbound edition of **Séminaire Bourbaki, 1948–1965** (Twelve volumes. Benjamin, New York, 1966. Individual volumes, $12.25; set, $129).

Mathematical research in the past 25 years has been greatly enriched by the publications of the international group of mathematicians who have written under the pseudonym of Nicholas Bourbaki. In addition to their universally respected series of monographs on advanced mathematics, this group has conducted a series of three seminars each year. Initially the seminars were held at the Ecole Normale Supérieure in Paris; more recently they have taken place at the Institut Henri Poincaré. At each seminar six mathematicians are invited to report on a particular paper or papers from the literature, or, in some cases, on their own work. These lectures stress the main ideas in the papers rather than the technical details. Since 1948 mimeographed notes containing a bibliography of related work have been prepared in advance and distributed at each seminar.

Copies of these notes (which are almost entirely in French) have been available for limited distribution in 17 paperbound volumes. The Benjamin edition reprints these in 12 clothbound volumes (*1*). The reprinting is by photo-offset from the second edition of the original notes. The table of contents has been enlarged to show both the name of the speaker and the name of the author of the paper under discussion. Each volume contains an index of persons referred to in the bibliographies of the exposés.

These exposés are introductions to much of the most important mathematical research of the past 20 years and are indispensable reference materials for an active research worker. Since copies of the original version were limited in their distribution and fragile in their format, they have not been generally available to mathematicians outside of major centers. The publisher is to be congratulated for his enterprise in reprinting these in permanent bindings at a reasonable price. Every institution that fosters mathematical research should have a complete copy of these in its library.

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Bibliographic Note

1. Vol. 1948/49–1949/50, exposés 1–32; vol. 1950/51–1951/52, exposés 33–67; vol. 1952/53–1953/54, exposés 68–100; vol. 1954/55–1955/56, exposés 101–136; vol. 1956/57–1957/58, exposés 137–168; vol. 1958/59, exposés 169–186; vol. 1959/60, exposés 187–204; vol. 1960/61, exposés 205–222; vol. 1961/62, exposés 223–240; vol. 1962/63, exposés 241–258; vol. 1963/64, exposés 259–276; vol. 1964/65, exposés 277–294. Benjamin plans to continue publication of annual volumes.

The Nyssoninae

In **The Comparative Ethology and Evolution of the Sand Wasps**, by Howard E. Evans (Harvard University Press, Cambridge, Mass., 1966. 544 pp., illus. $15), we have a comprehensive synthesis of widely scattered, often fragmented information. By necessity the treatment is limited to one subfamily, the Nyssoninae, which contains nearly 1000 species, but the coverage is worldwide and extends in time from the Eocene to the present. According to the author, only about 5 percent of the species have been studied in the field in any detail and for another 10 percent there are only fragmentary records. In spite of this difficulty a great deal of information, both old and new, from representative sections of the entire subfamily, has been assimilated to form a total ethological picture. This information is presented in detail for selected species. These in turn are summarized for each genus and finally into a chapter on the comparative ethology of the subfamily.

Within the relatively broad confines of ethology, Evans discusses and compares the habitats, population densities, aggression among females, feeding, sleeping, reproductive behavior, nesting behavior, orientation, hunting and provisioning, oviposition, cleptoparasitism, cocoon spinning, and natural enemies. In each chapter that deals with the specifics of one or more genera the ethological information is preceded by a brief morphological description. This in turn is summarized and assimilated for the reader in chapter 13, which includes the fossil history, distribution, and comparative morphology of the Nyssoninae. Within this chapter is a discussion of the major trends in structural modification, including a tentative phylogenetic arrangement based on morphology. When this information was correlated with ethology it was found that the morphological classification required no major revision. Chapter 15, on the evolution of the behavior of sand