interesting fauna and environment of Australia's limited and often ephemeral inland waters. It has three main divisions covering environment, faunal surveys, and some of the consequences of man's presence.

There still remains a paucity of limnological data on Australia, and the first two chapters summarize physical and chemical information concerning this exceedingly dry land. As might be expected on the world's driest continent, many lakes have very high salinity. W. D. Williams has summarized the varied chemical characteristics by region in very useful fashion. In Queensland, for example, sodium is the dominant cation instead of calcium or magnesium. In northern and southern Australia at salinities over 4000 parts per million sodium also dominates. A general classification of aquatic environments is proposed by I. A. E. Bayly which is based on the calanoid copepods, whose representatives cover the whole range of salinity encountered. A useful new term, "athallassic," is proposed for lakes whose waters are not derived in any direct fashion from the sea yet which show a biological unity despite their variable chemical nature.

The faunal survey includes Australian decapod Crustacea, Mollusca, Amphibia including anurans, and the principal fish of the major river system in New South Wales. J. A. Bishop provides interesting zoogeographic speculation as to probable origin and dispersal. D. F. McMichael presents simple keys to bivalves and gastropods, with useful illustrations. M. J. Littlejohn deals with patterns of speciation at two levels which may be considered as divergence following a postglacial fragmentation of amphibian ranges and differentiation in earlier glacial phases. In search of distinct regional faunas he reviews 51 forms of southeastern Australian anuran amphibians. This chapter is complemented by one on life histories, evolution, and ecology of anurans by A. A. Martin.

The faunal survey section concludes with a review of principal fish of the Murray-Darling River system. This system, despite the length of the rivers (2600 and 2700 kilometers, respectively), has the smallest runoff of any large river system in the world. The fish fauna is characterized by few species and remarkable resilience in extremes of drought and flood.

The first chapter of the final section of the book, by the editor and J. Slake, deals with the nine introduced species which are "at liberty" in Australia. Introductions of exotic species are often criticized by biologists, and Australia has had some particularly unfortunate examples. Fish introductions appear to have met with more welcome. The trout, which are confined by temperature to the eastern highlands, have probably been the most successful. The suggestion that any future introduction be examined carefully by "authorities" rather than "authoritative administrators" is well taken in the chapter by W. D. Williams.

The concluding chapter, a particularly interesting example of applied limnology, deals with zinc pollution of the Molonglo River, which supplies Lake Burley Griffin in the city of Canberra. The zinc, which originates from abandoned mining operations upstream, is in "ionic" and "nonionic" form. In the river there is a depression of the number and variety of invertebrates. The suggestion of indirect effects on the primary producers would lend itself to useful additional study, and further work is certainly necessary on toxicity in fish.

In summary, although the book would be somewhat disappointing to limnologists seeking information on the physical and chemical aspects of inland waters of Australia or some study of the productivity or population structure of the plankton, the taxonomist and zoogeographer will find the book to be of considerable interest.

W. D. Williams in *Australian Freshwater Life* provides a useful guide to the invertebrates found there. The author intended the volume for readers with little biological knowledge, and it is written in a popular style. For such an audience the grouping of animals included in chapters 2, 3, and 4 seems unfortunate, since the basis for this classification is not clearly explained. Williams' primary subdivision separates "the Lowest Groups," namely, Protozoa, Porifera, and Coelentera (chapter 2) from the other animals on the basis of their "lacking bilateral symmetry," without mentioning that the last two groups are predominantly radially symmetrical. The higher Metazoa (with bilateral symmetry) are then subdivided on the basis of presence or absence of a coelom, which the author defines in the strict sense as "an internal body cavity developing within embryonic mesoderm." No mention is made of another internal body cavity which is only partly enclosed by mesoderm (and not lined by peritoneum), namely the pseudocoel. This should be noted because four of the six major groups dealt with in chapter 3, "The Bilateral groups without a coelom," do have a pseudocoel (Nematoda, Nematomorpha, Rotifera, and Gastrotricha). The other two, Platyhelminthes and Nemertea, of course lack a body cavity within the mesodermal packing and hence may properly be called acoelomate. The reader may be confused to find acoelomate and pseudocoelomate groups thus combined in the same chapter.

References are included at the end of each chapter and a short glossary and a well-developed index are included.

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Chemical Systems

Radical Ions. E. T. KAISER and L. KEVAN, Eds. Interscience (Wiley), New York, 1968. x + 800 pp., illus. $30. Reactive Intermediates in Organic Chemistry.

This is a collection of 13 papers that deal with the recent developments in the chemistry of radical ions. The first eight chapters cover the theoretical and experimental aspects of organic radicals in solution. Although there is no apparent attempt to present these chapters from a systematic point of view, the topics chosen do seem to give a fairly good, up-to-date, overall perspective of the radicals. Since electron paramagnetic resonance (EPR) is uniquely suited for investigation of these systems, most of the discussions are based on the interpretation of the EPR spectra. Recent important developments such as theoretical calculation of spin densities, electronic structure of anion and cation radicals, ion-ion-pair equilibria, and molecular conformation studies are treated in considerable detail. The other five chapters are devoted to the chemistry of inorganic radical ions as well as ions produced in rigid media by high energy irradiation. Here again the reader will find that EPR is the dominant experimental tool, although optical methods are also discussed.

The chapters are highly specialized and tend to reflect the interests of the authors, and a sound knowledge of EPR is essential for understanding most of the discussions. The presentations are clear and well organized, and the mate-

rial on the whole is well documented. The chapter by Kuska and Rogers on EPR of first-row transition metals gives extensive compilations of experimental data and over 1000 references.

The excellent choice of topics and the comprehensive treatments should make this book very valuable as a reference to experts in EPR and radiation chemistry as well as to nonspecialists. However, the price is unfortunately high for a book that can be useful for only the next few years.

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The Sun's Atmosphere

Solar Physics. Proceedings of a NATO Advanced Study Institute, Lagonissi, Athens, Greece, 1965. JOHN N. XANTHAKIS, Ed. Interscience (Wiley), New York, 1967. xvi + 536 pp., illus. $16.50.

The Structure of the Quiet Photosphere and the Low Chromosphere. Proceedings of the "Bilderberg" Conference held near Arnhem, Holland, 1967. C. DE JAGER, Ed. Springer-Verlag, New York; Reidel, Dordrecht, 1968. iv + 240 pp., illus. $9. Reprinted from *Solar Physics,* Vol. 3, No. 1, 1968.

Modern astrophysics was born with the first attempts to understand the physical nature of the sun's atmosphere, and solar physics continues to occupy a central place in modern astronomy. The reasons for this are clear. The sun is the only star near enough to be observed with high spatial and spectral resolution. The bewildering variety of phenomena that take place in its atmosphere hint at what must occur in the atmospheres of less stable stars, or in objects with stronger or more complex magnetic fields and with larger fluxes of mechanical and radiant energy. Theories of basic astrophysical processes, such as the acceleration of energetic particles, the production and dissipation of hydromagnetic or acoustic waves, and the variety of ways in which a hot plasma in a magnetic field can absorb or emit radiation —all these can be developed and tested in the sun's atmosphere. Further, most activity in the interplanetary medium and in the planetary magnetospheres is driven by solar activity.

The first of the two books under review attempts to give an overview of the physics of the sun's atmosphere. It is a collection of 19 lectures, by as many authors, presented to post-university students at a two-week NATO Advanced Study Institute. The intent of the organizing committee was that the lectures should present an up-to-date general outline of the field. Most of the lectures are thus reviews, but some are original research papers on specialized topics. As might be expected, the individual lectures vary greatly in breadth, depth, and completeness, but all are written by experts, and all are interesting. The lectures will be useful to graduate students, astronomers, and space scientists interested in solar activity, but they will be read with special interest by solar physicists because even the review articles contain much that is new.

The second set of proceedings under review reflects a very different kind of conference. The purpose of the Bilderberg Study Week was to construct a new and "internationally acceptable model of the solar photosphere and low chromosphere." About half of the 29 observational and theoretical papers presented at the meeting appear in this volume and make up the bulk of its 17 papers. It was found that a generally acceptable model, based primarily on the continuum data, could be outlined. The final version of the atmosphere—called the Bilderberg continuum atmosphere (BCA)—is presented in a paper by O. Gingerich and C. de Jager that opens this volume.

The model assumes a homogeneous atmosphere in hydrostatic equilibrium and neglects fluctuations of temperature and velocity with depth. It has a broad, flat temperature minimum at 4600°K inferred from the ultraviolet and infrared limb-darkening observations. The model—whose calculations are presented in detail in a very useful form—is a valuable one, in part because of the difficulties it exposes. Indeed, detailed criticism of it may be found within this volume. It is not consistent with present interpretations of the absorption-line data—particularly the H and K lines of Ca II—as several papers in the volume show. The book is an important one for students of the photosphere and chromosphere, and of value to anyone concerned with stellar atmospheres.

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Definitions and Explanations

A Glossary of Genetics and Cytogenetics. Classical and Molecular. RIGOMAR RIEGER, ARND MICHAELIS, and MELVIN M. GREEN. Third edition (first English edition). Springer-Verlag, New York, 1968. 508 pp., illus. $16.50.

This book was originally published in German in 1954 and 1958. This third edition is in English and, coming after ten of the most prolific years of molecular biology, is a new book. It is broad in scope, including not only genetics and cytogenetics but also the related fields of evolution, biosystematics, embryology, and nonchromosomal cytology. Terms such as "coenospecies," "deme," and "Golgi apparatus" are not strictly genetic terms, but their inclusion adds much to the usefulness of the book.

About 2500 terms are treated; the papers in which over 1200 of them were first used are listed in the bibliography. Cross references are abundant. Many entries are not merely defined but are explained and enlarged upon, sometimes with the aid of figures and tables. There are 90 figures and 6 tables, and some diagrams and tabular material that are not numbered.

Definitions and descriptions are thorough, and the choice of material to be illustrated is good. Molecular genetics is rightly emphasized, and terms such as "operon," "repressor," and "paramutation," to point out but a few, are excellently handled; the "operon concept" is illustrated by an elaborate diagram. The most modern usage is given; for example, the sense in which Fincham has used "cistron" is included. Many older and obsolete terms are explained, although a few, such as Bateson's "reduplication hypothesis," are omitted; for most terms that have been used with widely differing meanings, as have, for example, "accessory chromosome" and "conversion," all the meanings are given. Only a few terms have been neglected; "self-sterility" is scarcely mentioned, although once used exclusively for the later "self-incompatibility," and "coupling" and "repulsion" have a wider significance than just in relation to the *cis* and *trans* configurations.

Students with some background could learn a lot of genetics from this book. I highly recommend it.

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