tedious and lacks perspective. One is likely, however, to come away with the awareness that a variety of complementary techniques are used to investigate ionic interactions and that much progress has been made, even recently, in their interpretation.

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Interdisciplinary Approach

Annual Review of Materials Science. Vol. 1. ROBERT A. HUGGINS, RICHARD H. BUBE, and RICHARD W. ROBERTS, Eds. Annual Reviews, Palo Alto, Calif., 1971. x, 420 pp., illus. $10.

To those among us who were trained in traditional disciplines but who have grown to appreciate the advantages of an inherently interdisciplinary approach to the study of materials, the birth of this new series is indeed welcome. The excellence and breadth of the coverage in the first volume have set a high standard for future issues, both for the contributors and for the editorial staff.

The editors have deliberately not organized this first volume, or the next "early" volumes, into sections that could have been described in terms of the traditional academic fields—chemistry, metallurgy, physics, and so on—nor have they fallen into the trap of basing their organization on specific and seemingly representative classes of materials, such as insulators, metals, and semiconductors. Rather, they have placed the emphasis on the broader and more unifying aspects of materials science relating to preparation, structural and chemical characterization, and scientifically interesting and technologically important properties. This reviewer hopes that the editors retain this approach not only in the first and "early" volumes but in all subsequent ones.

The series should be of considerable interest and value to researchers, both engineers and scientists, in industrial and academic environments, as well as to graduate students in science and engineering. In particular physicists and chemists working on materials studies who have taken a parochial view of their disciplines can benefit from it. The articles are critical and in-depth appraisals of different aspects of materials science rather than research papers and as such serve a pedagogical function by introducing the reader to the spirit and philosophy of the materials science approach. The editors point out that there is a question as to whether or not materials science is indeed a discipline in the same sense that physics or metallurgy is. I prefer to view it as an approach to the study of materials. In any event, this annual review series will give its readers a clearer indication of just what materials science really means to those who have identified themselves with its label.

There is one short but significant paper that I have chosen to single out for comment: that by J. C. Phillips on the "Development and application of theoretical techniques to problems in materials science." I would hope that this paper, as well as the many other recent papers by Phillips and his coworkers, demonstrates that significant theoretical progress can be made in reconciling the seemingly different approaches taken by physicists and chemists to problems in chemical bonding and structure in solids. It clearly identifies opportunities for creative theoretical inputs to this new field.

In closing, I can only give this volume high praise and hope that the series will provide increasing numbers of scientists with the benefits of a broad interdisciplinary approach to materials problems.

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Physiological Adaptation

Endocrines and Osmoregulation. A Comparative Account of the Regulation of Water and Salt in Vertebrates. P. J. BENTLEY. Springer-Verlag, New York, 1971. xvi, 300 pp., illus $16.80. Zoophysiology and Ecology, vol. 1.

This volume is a highly promising start to a series of monographs edited by Donald S. Farner and a distinguished group of coeditors and intended primarily for advanced graduate students.

Bentley manages to cover a broad and complicated subject in a manner not previously attempted. The exact endocrine mechanisms involved in osmotic regulation among most vertebrates remain poorly defined. The author first presents a brief survey of the problems, physiological principles, and organs involved in vertebrate osmoregulation, then reviews vertebrate endocrine organs, their secretions, and their actions, and finally presents chapters on each major vertebrate group, starting with mammals and descending the phylogenetic tree to end with the fishes. The text is informative and readable, and the organization should allow readers to pick out what they may need for review before delving into the more detailed chapters on specific vertebrate groups.

The author uses many tables to present data, mercifully selected and not inclusive. Unfortunately some of these were carelessly set in type, and though this is usually more annoying than confusing some of the data might have been presented more effectively as illustrations. The few figures used are well chosen. The author's antipodal origin may explain why one of the few figures that appear to be original is a map of Australia. This may also account for the fact that monotremes and marsupials are dealt with at more length than are the placental mammals, although they have not exploited a comparable range of osmotic environments. It is legitimate for the author to emphasize those aspects of this vast subject in which he has the most interest and knowledge, however.

Almost as many pages are devoted to fishes as to mammals, birds, and reptiles combined. This is fitting. Fishes comprise the vast majority of living vertebrate species, they have a complicated evolutionary history relating to osmoregulation, and they face more dramatic osmotic stresses and show a greater variety of adaptations than do tetrapods.

In general the author has done a skillful job in dealing with the subject matter. One may find some instances in which he seems to generalize from inadequate data or to oversimplify on the basis of information derived from a limited number of species, but these are few. The author points out the dangers of attempting to interpret nonmammalian endocrine processes as if they must somehow conform to the mammalian patterns. He is also quite careful to point out just how rare facts are in many areas. This serves a useful purpose in suggesting some of the areas that hold promise for future investigation.

There are about 900 references. Although this bibliography is far from complete the works listed appear to be well selected, with particular emphasis on recent studies and including many papers published in 1970. The bibliography should be an adequate starting place for one new to the field.

This volume should be very well suited for the graduate student audience to whom it is directed. It should also serve a much larger group, physiologists, endo-

crinologists, and physicians interested in problems related to salt and water balances. Nonmammalian vertebrates, and particularly the amphibians, have provided materials for many investigations fundamental to our present understanding of renal functions, ion transport, and membrane actions of adrenocortical and neurohypophyseal hormones. We can predict that as osmoregulatory physiology and endocrinology become better understood further information derived from nonmammalian vertebrates will contribute substantially toward our fundamental understanding of osmoregulatory mechanisms in man and other mammals.

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Technology of Holography

Optical Holography. ROBERT J. COLLIER, CHRISTOPH B. BURCKHARDT, and LAWRENCE H. LIN. Academic Press, New York, 1971. xviii, 606 pp., illus. $22.

A subject can be said to have come of age when a significant book about it appears on the market that is readable and usable by people not as expert in the subject as the authors. On that premise, holography has finally reached that estate. (It took 24 years rather than the statutory 21.) *Optical Holography* is a first-rate technical book that the authors and publishers can take pride in—pride that cannot often be honestly felt these days. The authors set the level and the tone of the book in their preface: "Our book is addressed to those who will learn for themselves whether holographic techniques can solve technical problems. Our intention is to provide a ground from which innovation can spring. The reader need have no more than an undergraduate training in science and engineering. An elementary introduction to optics, an acceptance of Maxwell's equations, and a sometime acquaintance with the Fourier transform should suffice."

The fundamentals are reviewed briefly, as is the early history of holography. It is pleasant to see that the significant work of the numerous talented people that came in the era between Gabor and Leith is not ignored and forgotten. That work was extremely important for the future development of holography.

After a short discussion of point source holograms more of the important fundamentals are dealt with in detail—the Fourier transform, propagation and diffraction, and optical systems with spherical lenses. Holography proper starts in chapter 7 with a discussion of light sources and optical techniques followed by an analysis of plane and volume holograms. Separate chapters are devoted to hologram recording materials, pulsed laser holography, and nonlinear recording.

The second half of the book quite correctly is devoted to applications—image forming methods, spatial filters, interferometry, information storage, color holography, computer generated holograms, and so on. All have adequate discussion. Each topic is also very well illustrated with diagrams and photographs.

The authors have taken considerable pains to give credit where credit is due. I am sure that everyone who feels he has made a significant contribution to the subject will find reference to his work. The preface points out, however, that the work is not "a catalog of contributions to holography. We therefore have selected from the substantial amount of literature on holography that which seemed suited to the purpose."

It is hard to find any serious fault with the book—even typographical errors seem few and far between. I do wish, however, that the "coherent transfer function" and the "optical transfer function" had not been plotted on the same graph (figure 6.12, p. 136).

Optical Holography will become a standard work on the subject and from my own biased point of view will be an excellent text on which to base a special topic graduate level course.

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Books Received

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