

receptors of the insect retina is a particularly effective review of recent work.

The theories of image formation for the two major anatomical types of compound eyes, which were advanced by Exner in the early 1890's, have provided the basis for textbook accounts of how compound eyes work. Chapters by Horridge and P. Caricaburu, however, draw attention to the great anatomical diversity present among insects, the functioning of several alternative mechanisms of image formation, and the difficulties in making appropriate measurements for an understanding of how light is distributed within the eye. A recent development in physiological optics has been the application of dielectric waveguide theory to the functional properties of photoreceptor organelles. The contribution of A. W. Snyder, who has been one of the leaders in this enterprise, describes some of the consequences for spectral and polarization sensitivity. J. Palka and R. B. Pinter present an excellent account of how measurements of visual acuity are beset with artifacts unless exquisite attention is paid to the design of the stimulus. And R. Wehner's chapter on behavioral analysis of pattern recognition can be profitably read in conjunction with the chapters by R. B. Northrop, L. Kien, K. Mimura, and T. Collett and A. J. King dealing with various response properties of visual interneurons.

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## Transition Zones

**The Geology of Continental Margins.** CREIGHTON A. BURK and CHARLES L. DRAKE, Eds. Springer-Verlag, New York, 1974. xiv, 1010 pp., illus., + plates. \$34.80.

This book aims at presenting a summary and synthesis of all that is known of the transition zones separating the exposed continents from the deep oceans, that is, the continental margins. The volume succeeds to an extent beyond what most scientists would regard as admirable for a subject so controversial and covered by so many diverse studies and types of measurement.

A major factor influencing this outcome is the partnership of the editors, who have been leaders in the conduct both of individual research dealing with continental margins and of national and international projects bearing on the problem of the transition zone.

Burk and Drake presided at the Penrose

Conference of the Geological Society of America that provided the stimulus for this book. It is evident that the overview of the subject they thus obtained has to a significant degree governed their selection of authors. The geographic areas covered by the various contributors are indicated in a useful map printed on the inside covers of the book. It is apparent from the map that geographic coverage of margins of the Americas and Europe is complete. To varying degrees gaps exist for the remaining continents.

The organization of the volume is a logical outgrowth of the editors' aim to offer a broad inventory and synthesis of knowledge pertaining to continental margins. Modern margins are classed as Atlantic or Pacific types depending on the absence or presence of associated earthquake seismicity. Seismically passive margins are characterized by broad shelves and relatively smooth topography. Seismically active margins are typically narrow with rough topography and tend to be bounded on their basinward sides by deep trenches. One-third of the book is devoted to area-by-area descriptions of modern margins. Rabinowitz's paper dealing with the western North Atlantic is exemplary among a number of important contributions. It gives a comprehensive account of the available data for the area and sets forth the meaning of the data with respect to the ocean-to-continent transition.

Rabinowitz points out that the compositional change from basic oceanic crust to granitic continental basement does not occur along a specific contour of the slope break of the continental shelves. The paper describes the numerous geological and geophysical lineaments that border the margin of the northwest Atlantic. Rabinowitz shows that the continuous free-air gravity high located near the shelf break is associated with a subsurface ridge defined by refraction seismic measurements. Ridge topography alone is insufficient to explain the gravity anomaly, and it follows that the ridge is related to an intrabasement density high.

It is inferred that the East Coast magnetic anomaly reflects basic intrusions into subsided continental crust. North of the New England seamounts the magnetic anomaly is associated with another subsurface ridge system the presence of which is confirmed by reflection seismic profiles. South of the seamount chain, this outer ridge is indiscernible, and the East Coast magnetic anomaly is in close agreement with the continuous gravity high and the associated subsurface ridge system. The gravity and magnetic anomalies diverge at a point east of southeastern Georgia,

where the magnetic anomaly bears westward, intersecting the coastline.

Rabinowitz identifies an anomaly E within the magnetic quiet zone. Landward of this anomaly the inner quiet zone is believed to overlie subsided continental crust. Seaward of E, low-amplitude magnetic anomalies within the outer quiet zone are believed to be situated above oceanic crust formed during the Newark interval of predominantly normal geomagnetic polarity. The explanation of quiet zones as reflecting the presence of subsided continental crust has the advantage that it avoids the contrivance of calling for quiet zone formations at different geologic times all during periods of constant magnetic polarity.

In addition to areal studies such as that of Rabinowitz, the volume contains series of papers treating a number of special problems. Various aspects of sedimentation in the transition are analyzed, interactions of small ocean basins with margins are examined, and ancient margins reconstructed from the geologic record are described and discussed. Several papers contain descriptions augmented by figures presenting stacked multichannel reflection seismic profiles that make possible elimination of obstruction of primary reflections by long-path multiple reflections.

*The Geology of Continental Margins* is a mine of valuable information for students and researchers interested in the problems of the crustal transition zone. Most earth scientists will want to own a copy.

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## Useful Magnetic Reversals

**Magnetic Bubbles.** T. H. O'DELL. Halsted (Wiley), New York, 1974. x, 160 pp., illus. \$24.50.

In magnetic bubbles we have a technology based on the realization that "particles" can provide storage and logic in structures viable in today's computer world. O'Dell treats magnetic bubbles—highly mobile, minute magnetic reversals in an otherwise saturated magnetic film—in a fresh and interesting manner. He discusses bubble statics, bubble dynamics, materials (only briefly), bubble devices, and bubble systems. His presentation is strong in novel mathematical approaches, often drawing upon equivalences between magnetic and electric systems.

That stable cylindrical magnetic do-

mains do exist is probably surprising to many even today, though the stability of these domains was reported in 1960 by Kooy and Enz of Philips Research Laboratories in Eindhoven. It was not until it was realized that magnetic bubbles could operate competitively at speeds between those of magnetic tape and disk systems on the one hand and core or semiconductor memories on the other that a memory technology based on them emerged. Many interesting physics problems surfaced as this technology advanced, "hard bubbles" being one example.

Magnetic bubble domains can be readily observed in orthoferrite and garnet platelets and in epitaxial garnet films. In fact, observation of bubbles in controlled motion performing logic and storage functions is one of the fascinations of this technology. As a result of this ease of observation, the understanding of bubble circuits has progressed rapidly. The physics of bubble manipulation is adequately covered by O'Dell.

Tens of thousands of magnetic bubbles a fraction of a micrometer to several micrometers in diameter are entered as binary storage patterns in chips several millimeters on a side. These chips, singly or in combinations, are packaged to provide memory in many systems. *Magnetic Bubbles* will provide the casual reader with an overview of the subject and permit him better to compare magnetic bubble storage with other contenders. It is written in sufficient depth to satisfy the more serious student of bubble behavior.

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## Solid State Spectra

**Optical Properties of Ions in Solids.** Papers from a NATO Advanced Study Institute, Erice, Italy, June 1974. BALDASSARE DI BARTOLO and DENNIS PACHECO, Eds. Plenum, New York, 1975. xvi, 494 pp., illus. \$39. NATO Advanced Study Institutes Series B, vol. 8.

The electronic energy states of ionic defects in solids have long been of immediate practical interest in the technology of artificial light sources: phosphors, fluorescent materials, and most recently lasers. The development of narrow, intense light sources has in turn accelerated the study of the defects themselves by, for example, enhancing their sensitivity as probes of the vibrational states of the host material. With their relatively simple structures, ionic defects have served as a rich microscopic

"laboratory" for the imaginative application of quantum mechanics to their vibronic states and to mechanisms such as cooperative absorption and transfer. The present volume gives a clear picture of the current status of this aspect of the field.

Well-done physics summer school proceedings serve to fill the gap between what is learned in general quantum mechanics courses and the detailed knowledge needed today for research in the subspecialties of physics. This gap has become virtually unbridgeable by specialty graduate courses such as those in solid state or nuclear physics, unless they are much too narrowly focused. The Erice volume is suitable as a basis either for a subspecialty course or for self-study by a graduate or advanced undergraduate student.

The optical properties of ions are discussed in many approximations, as appropriate, from the simplest configuration-coordinate picture to a full treatment of phonon sidebands. Chapters on magnetic insulators, the Jahn-Teller effect, and ion-pair spectra are included. The important related subjects of stepwise up-conversion and cooperative absorption phenomena are covered, and this reviewer is especially enthusiastic about the clarity of the treatments of energy transfer by Watts and Orbach. All the lectures are concerned primarily with theory, but illustrative spectra are included and the balance is more than adequate. The value of the book is enhanced by the inclusion of just the right proportion of relevant more general topics such as semiclassical radiation theory, phonon theory, and group theory.

The authors of the lectures published in full are B. Di Bartolo, D. Curie, T. L. Estle, D. S. McClure, L. Mehrkam, R. Orbach, R. K. Watts, and F. Williams. Many of them have contributed more than one lecture. The authors and editors have produced a uniformly well-done volume that should have a place in many programs of study in the field.

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## Books Received

**Advanced Applications for Pocket Calculators.** Jack Gilbert. Tab Books, Blue Ridge Summit, Pa., 1975. 304 pp., illus. Cloth, \$8.95; paper, \$5.95.

**Advances in Fruit Breeding.** Jules Janick and James N. Moore, Eds. Purdue University Press, West Lafayette, 1975. xvi, 624 pp., illus. \$25.

**Advances in Organometallic Chemistry.** Vol. 13. F. G. A. Stone and Robert West, Eds. Academic Press, New York, 1975. x, 562 pp., illus. \$44.50.

**Advances in Polymer Science.** Fortschritte der Hochpolymeren-Forschung. Vol. 17. H.-J. Cantow and twelve others, Eds. Springer-Verlag, New York, 1975. iv, 110 pp., illus. \$24.10.

**The Aldine Crime and Justice Annual, 1974.** Seymour L. Halleck and five others, Eds. Aldine, Chicago, 1975. xxii, 542 pp. \$18.50; to institutions, \$27.50.

**Aldosterone and Aldosteronism.** E. J. Ross. Lloyd-Luke, London, 1975. x, 502 pp., illus. £8.

**Analysis and Presentation of Experimental Results.** R. H. Leaver and T. R. Thomas. Halsted (Wiley), New York, 1975. xiv, 128 pp., illus. Paper, \$7.75.

**Analysis of Tall Buildings by the Force-Displacement Method.** M. Smolira. Halsted (Wiley), New York, 1975. xii, 300 pp., illus. \$39.50.

**Applications of Behavior Modification.** Proceedings of a conference, Minneapolis, Oct. 1972. Travis Thompson and William S. Dockens III, Eds. Academic Press, New York, 1975. xviii, 540 pp., illus. \$28.50.

**The Archaeology of Missouri.** Vol. 1. Carl H. Chapman. Illustrations by Eleanor F. Chapman. University of Missouri Press, Columbia, 1975. xiv, 288 pp. \$20. University of Missouri Studies, 62.

**An Autocorrelation Theory of Form Detection.** William R. Uttal. Erlbaum, Hillsdale, N.J., 1975 (distributor, Halsted [Wiley], New York). x, 158 pp., illus. \$12.95.

**Basic and Therapeutic Aspects of Perinatal Pharmacology.** Papers from a symposium, Milan, Italy, June 1974. P. L. Morselli, S. Garattini, and F. Sereni, Eds. Raven Press, New York, 1975. xvi, 440 pp., illus. \$18.95. Monographs of the Mario Negri Institute for Pharmacological Research, Milan.

**Beta-Adrenergic Blocking Agents in the Management of Hypertension and Angina Pectoris.** Proceedings of a symposium, Florence, Italy, Apr. 1974. Bruno Magnani, Ed. Raven Press, New York, 1975. xii, 190 pp., illus. \$10.

**Biology of Cancer.** E. J. Ambrose and F. J. C. Roe, Eds. Horwood, Chichester, England, and Halsted (Wiley), New York, ed. 2, 1975. viii, 316 pp., illus. \$45.

**Biomechanics.** R. McNeill Alexander. Chapman and Hall, London, and Halsted (Wiley), New York, 1975. 62 pp., illus. Paper, \$3.45.

**Breeding Endangered Species in Captivity.** Papers from a conference, Trinity, Jersey, Channel Islands, May 1972. R. D. Martin, Ed. Academic Press, New York, 1975. xxvi, 420 pp., illus. \$33.75.

**Cancer Therapy.** Prognostic Factors and Criteria of Response. Maurice J. Staquet, Ed. Raven Press, New York, 1975. xii, 394 pp., illus. \$19.75. A Monograph of the European Organization for Research on Treatment of Cancer.

**Cell Biology.** E. D. P. DeRobertis, Francisco A. Saez, and E. M. F. DeRobertis, Jr. Saunders, Philadelphia, ed. 6, 1975. xvi, 616 pp., illus. \$14.95.

**Cerebral Circulation and Metabolism.** Papers from a symposium, Philadelphia, June 1973. Thomas W. Langfitt, Lawrence C. McHenry, Jr., Martin Reivich, and Harry Wollman, Eds. Springer-Verlag, New York, 1975. xxviii, 566 pp., illus. \$76.80.

**Cerebral Vascular Diseases.** Transactions of a conference, Princeton, N.J., Jan. 1974. Jack P. Whisnant and Burton A. Sandok, Eds. Grune and Stratton, New York, 1975. xvi, 334 pp., illus. \$13.50. Princeton Conferences on Cerebrovascular Diseases, 9.

**The Chief Abstractions of Biology.** W. M. El-sasser. North-Holland, Amsterdam, and Else-

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