

spindle tuber viroid, published recently by West German scientists, has given credence to the idea of the small infectious RNA molecule. Interest in viroids is now directed toward unraveling the mechanism of their replication and determining how they cause disease. They apparently do not code for proteins, and thus their synthesis must be completely dependent upon host enzymes. The only proven viroid-coded product is a complementary RNA, suggesting that viroids have an RNA-directed replication, although there is some evidence that indicates possible DNA involvement.

In this book, the descriptions of the techniques used in viroid studies, the investigations concerning the nature of the agent, and so on are drawn from studies in Diener's laboratory, with work in other laboratories used largely as confirmation. The literature coverage is therefore not altogether evenhanded, but the book does collate useful information on the host ranges of several viroids, and it gives detailed procedures for the experimental transmission, bioassay, isolation, and purification of viroids.

In the final chapter, "Nature of viroids," Diener presents the interesting speculation that "viroid diseases of cultivated plants are of recent origin." He stresses that the diseases have only come to notice over the last 60 years, with one recognized as recently as 1974. It is probable that the spread of viroids is a consequence of human cultural practices; viroids, unlike conventional plant viruses, have no known insect vectors. Humans are the vectors. Thus viroid RNA's, which conceivably could derive from normal host-cell RNA, probably exist in many plant species without causing disease, but when they are inadvertently transferred by humans to particular cultivated plants a disease may develop.

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Porifera

Sponges. PATRICIA R. BERGQUIST. University of California Press, Berkeley, 1978. 268 pp., illus. + plates. \$25.

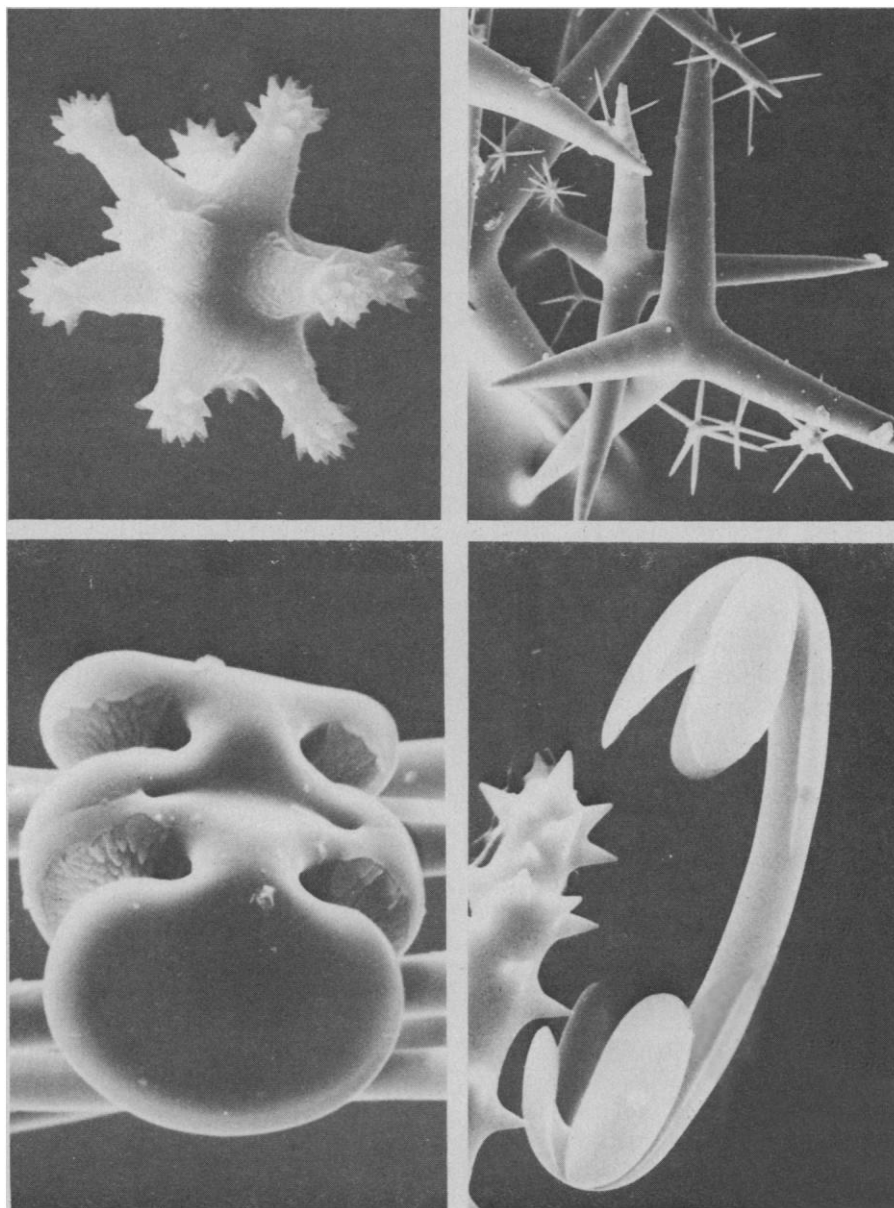
Research interest in the Porifera has been growing steadily in both depth and breadth in the last two decades. Basic new information of many sorts has been brought to light by several active groups of workers in Europe, North America,

and the Antipodes: findings concerning basic physiology and cellular recognition systems, identification of unique bioactive products, paleontological discoveries, and recognition of new major taxa. Bergquist has successfully integrated most of these advances in this first comprehensive review of sponge biology to appear in English since Hyman's now-outdated 1940 classic in volume 1 of *The Invertebrates*.

Bergquist develops two important themes. The first is the unique organizational characteristics of sponges, their morphological plasticity as individuals, and the persistence of cellular mobility and differentiation potential through

adult stages. She maintains appreciation of this dynamism in outlining the special problems encountered in attempting to use research approaches that have been successful with other metazoans in research on sponges. Lack of understanding of the special features of the group on the part of many early workers has been the single most important cause of erroneous or worthless research results, and Bergquist's cautions for prospective research workers cannot be overemphasized.

Bergquist's second theme is the importance of taxonomists in studies of sponges—both in planning of comparative research projects and in developing



Scanning electron micrographs of some representative sponge spicules. (Top left) An asterose microsclere from a species of *Tethya*. This spicule has a pronounced core or centrum and many short rays each with a terminal cap of spines. (Top right) Tetraxon megascleres (calthrops) and asterose microscleres of an undescribed genus of the Choristida (Calthropellidae). The calthrops megasclere is typical of this order. (Bottom left) A bizarre type of cheloid microsclere as seen in *Tetrapocillon*. (Bottom right) A typical arcuate isochela as seen in *Ectyomyxilla*. Portion of a spiny (acanthose) megasclere, an acanthostyle is also shown. [From *Sponges*]

an urgently needed stable natural higher classification for the group. Her assessment of these problems is certainly valid, but perhaps a stronger argument should be developed, on behalf of ecologists, geologists, and biochemists, for a stable, practical guide for identification of sponge genera. Bergquist's optimistic outlook for resolution of taxonomic confusion in the near future cannot be shared by this reviewer.

Though the book presents a very valuable synthesis of recent research results and thus provides a much-needed entry to the literature, it should not be expected to provide species or generic identifications. The reader is directed to the *Traité de Zoologie* (1973) for coverage of sponge distributions and their relationships to physical and chemical parameters.

The organization of the text and the quality of illustrations are excellent, but most of the figures lack magnification scales and many lack identification of the species shown. The placement of the illustrations with respect to references to them in the text is awkward, with page references included haphazardly.

The book is a necessity for all workers interested in sponge research and will be an excellent reference for general invertebrate zoology courses and a definitive textbook for advanced courses. Bergquist has pinpointed a number of persistent research problems which, through her stimulation, may now be addressed.

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Mesonic Nuclear Physics

Mesons in Nuclei. MANNQUE RHO and DENYS WILKINSON, Eds. North-Holland, Amsterdam, 1979 (U.S. distributor, Elsevier, New York). In three volumes, illus. Vol. 1. xviii pp. + pp. 1-434 + index. \$73.25. Vol. 2. x pp. + pp. 435-788 + index. \$66.75. Vol. 3. x pp. + pp. 789-1156 + index. \$66.75. The set, \$186.25.

The simple description of nuclei as ensembles of neutrons and protons is adequate to characterize most nuclear properties. This collection of papers aims at the deeper level of understanding achieved by studying the mesonic substructure of the nucleons. When a large amount of momentum or energy is transferred to the nucleus, or when the nuclear medium is compressed to a much

higher density, the mesonic degrees of freedom become too important to be ignored. Even static properties of nuclei, such as magnetic moments, are significantly affected by the mesons.

The first paper, by Blin-Stoyle, is a primer on pi-nucleon interactions that presents the basic interactions and perturbation formulas in sufficient detail to make the whole collection of papers self-contained. Neophytes should also find helpful the following two papers, by Kim and Primakoff and by Delorme, which discuss the so-called elementary particle formalism. This formalism emphasizes the matrix elements of relativistic operators, whereas the conventional formalism utilizes the ordinary wave functions.

A basic goal of meson theory is to derive the force between nucleons; this is the subject of the remainder of the first volume. Vinh Mau's paper documents the substantial progress made in the last decade in understanding the mesonic interaction between two nucleons. The two-meson exchange can be calculated by making use of the smoothness of the scattering functions, once the scattering between the two mesons is known. Unfortunately, the exposition leaves out essential details. The reader who wishes to recalculate the interaction, or to apply it to some other physical situation, will need to refer to decades-old preprints and unpublished reports. Other aspects of the interaction discussed in the first volume include many-body forces, in a paper by McKellar and Rajaraman, and the charge dependence of the force, in a paper by Henley and Miller.

The subject of the second volume is the effect of the mesons on the electromagnetic and weak interaction properties of nuclei. It has been known for a long time that the presence of charged mesons increases dipole absorption strength by about 50 percent over the strength for independent nucleons. These renormalization effects are usually calculated in a Fermi gas model, but a more detailed treatment was necessary to reveal the surprisingly large effects in the deuteron. There has also been progress in the accumulation of systematic data on renormalization effects, aided by accurate shell model calculations. These are among the topics reviewed in this volume.

The last volume considers the interesting possibility that phase transitions occur in nuclear matter. The chiral Lagrangian, which is thoroughly described in several papers, leads to a high-density phase transition under certain assumptions. As proposed in a paper by Lee and

Wick, nuclei could be compressed to this new state, releasing energy in the process. However, it appears difficult to reconcile this hypothetical phase transition with the properties of ordinary nuclei. In particular, the smallness of many-body forces may contradict the chiral assumptions. This and other uncertainties are discussed in Nyman's paper. A milder phase transition, pion condensation, is predicted more firmly by meson theory. Migdal and other leading proponents of pion condensation contribute papers on the subject. The phase transition might occur at densities reached in the centers of neutron stars or in nuclear collisions at high energy. However, only a small energy change is involved with pion condensation, and its effects might be hard to observe.

Possibly, an even deeper understanding of nuclei might be achieved by considering the quark constituents of nucleons and mesons. Until that happens, this collection of papers, with its encyclopedic coverage of mesonic nuclear physics, should replace many years of journal articles on library shelves. The only major omission is a paper on the phenomenological meson field theory of nuclei, but this simple and successful model is referenced in several places.

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Density and Human Behavior

Residential Crowding in Urban America. MARK BALDASSARE. University of California Press, Berkeley, 1979. xiv, 250 pp. \$12.95.

Concern with the relationship of human crowding and behavior has stimulated an immense number of studies in the past few years. Serious interest in the subject was precipitated in the early 1960's by the work of John Calhoun, who found that social patterns among rats were significantly affected by densities within caged pens. Various types of "aberrant" behavior such as homosexuality, aggression, lack of maternal care, and physical illness were more prevalent in the high-density situations. Implications of the studies for humans were drawn, and social scientists quickly discovered a new area for research.

Calhoun's studies had a certain inherent credibility in the eyes of many who had been preaching the horrors of rapid urbanization and population growth in