Jack Corliss. Nisbet's articulate exposition shows why this idea must be taken seriously.

All in all, *The Young Earth* is a rich book, intelligently written and displaying a clear feel for Archean terrains. It is also a very personal book. Nisbet draws again and again on his own experience in the Belingwe greenstone belt of Zimbabwe; he presents provocative opinions on controversial issues; and he weaves his personal as well as scientific philosophy throughout the text. This will undoubtedly strike individual readers differently, but I found it refreshing—reminiscent of an earlier era when the term "scientific literature" was more than oxymoron. *The Young Earth* can be read with pleasure and profit by anyone with a serious interest in our planet's early development.

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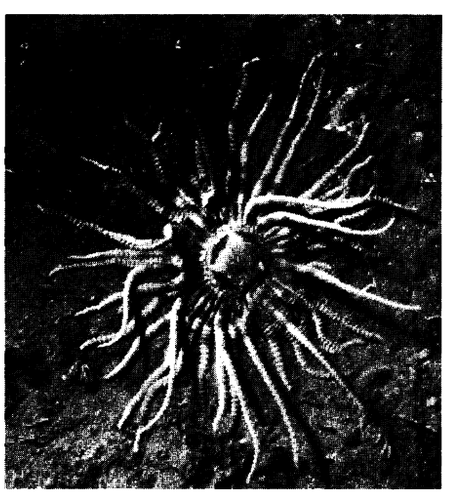
Marine Strategists

A Functional Biology of Echinoderms. JOHN LAWRENCE. Johns Hopkins University Press, Baltimore, MD, 1987. xii, 340 pp., illus. $56.50.

In "functional biology," organisms are seen as units that maximize the two components of fitness, survival and reproduction. There are trade-offs among different "strategies" of acquiring nutrients and allocating them to growth, maintenance, and reproduction. Workers in this field calculate the "costs" of these trade-offs and attempt to identify conditions that lead to maximal return. John Lawrence points out that although this approach may be carried out in theory without considering particular morphological characteristics, every group of organisms has an intrinsic functional morphology that provides particular opportunities and constraints for maximizing fitness. Echinoderms, with their bizarre pentamerous symmetry, internal skeleton, and hydraulic system of coelomic tubes, may be especially suitable for examining how the functional morphology of real organisms can be integrated with theoretical functional biology.



"*Labidiaster annulatus* with arms elevated in the feeding posture." [*Eltanin* sixth cruise photograph, Smithsonian Oceanographic Sorting Center for the National Science Foundation; from *A Functional Biology of Echinoderms*]

After briefly characterizing the phylum and the five main extant classes, Lawrence selectively reviews feeding, maintenance, and reproduction, largely along taxonomic lines. Comparative analyses of the functional morphology of feeding draw from a rich literature on the uses of flagellar currents, tube feet, spines, and Aristotle's lantern. Irregular echinoids are shown to be a functional morphologist's dream, and recent analyses of feeding, respiration, and locomotion in these animals compare in elegance to C. M. Yonge's analyses of bivalve molluscs. I also particularly recommend Lawrence's treatments of circulation, including the perplexing perihemal-hemal systems, and of brooding, even though brooding is uncommon in echinoderms. However, the book does not directly relate such information to theory in functional biology, except for briefly noting when particular processes or features might be costly and merit further study.

A comprehensive treatment of echinoderms would have required a much thicker book than Lawrence's. Some allusion to the rich and diverse fossil record is squeezed in, but there is little or no mention of such topics as digestion and assimilation, endocrine and nervous functions, the perplexing axial complex, photoperiodism, the remarkable catch connective tissue, development, or the diversity of feeding and nonfeeding larvae. Growth, usually a major component in analyses of functional biology, also is treated only in passing, and intriguing examples of asexual reproduction by fission and autotomy are considered without discussion of how such growth increases sexual fecundity of an individual genome.

Lawrence has selected an impressive array of illustrations, including some delightful, near-forgotten drawings from the last century and original synthetic figures and tables of his own. It is a shame that his excellent selection of photographs did not reproduce better. The book will be a valuable resource for well-informed biologists who need selected up-to-date information on echinoderms. It may also serve to reinforce the idea that organisms, here exemplified by echinoderms, do not necessarily maximize their fitness but survive any way they can with history-laden, just-functional morphologies.

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Neuronal Mechanisms

Synaptic Function. GERALD M. EDELMAN, W. EINAR GALL, and W. MAXWELL COWAN, Eds. Wiley, New York, 1987. x, 789 pp., illus. $149.95; paper, $39.95. A Neurosciences Institute Publication. Based on a symposium, San Diego, CA, 1984.

Our classical understanding of synaptic function largely derived from studies of the process mediating the control of muscle function by motor nerves, which involves the release of acetylcholine at the neuromuscular junction. Now, however, new knowledge of the rich variety of synaptic transmission in the central nervous system has made it apparent that some of the classical concepts need to be revised. The 25 chapters in the present volume provide an excellent, up-to-date survey of this large and flourishing area of research. Modern knowledge of synaptic transmission in the mammalian CNS from the viewpoint of the neurophysiologist and those who study ion channels as well as from the perspective of the neurochemist and neuropharmacologist is well reviewed. The first six chapters deal mainly with the electrophysiological analysis of presynaptic mechanisms regulating neurotransmitter storage and release and with properties of voltage-gated ion channels in postsynaptic cells. A second group of six chapters covers the biochemical study of neurotransmitters and their receptors, with focus on such topical areas as the coexistence of neurotransmitters and neuropeptides, synergism between multiple chemical messengers, the role of protein phosphorylation in slow postsynaptic responses, and the molecular analysis of the GABA/benzodiazepine receptor.

A major emphasis of the volume is the attempt to use this new knowledge to improve our understanding of the highest functions of the CNS. Three chapters deal with the special features of connections in neuronal networks, and two of them use the cerebral cortex as their example. The role of synaptic plasticity in memory and learning is well reviewed in a further six chapters that cover hippocampus, cerebellum, and brainstem, *Aplysia*, and the hypothetical roles of

calcium-activated proteases and allosteric receptors. It is perhaps humbling to realize that the best progress to date has been made in studies of simple reflex learning in mammals or in invertebrates; the neural mechanisms involved in learning and memory at a cortical level are still largely obscure. A concluding section of four chapters reviews theoretical and mathematical models of synaptic function. In the past, theoretical modeling of brain function has often relied too heavily on the computer analogy and has ignored or failed to understand the cellular reality of what neuroscience has revealed about the nature of communication in the nervous system. This criticism cannot be leveled against these authors. The book will undoubtedly appeal to a wide readership and will give much pause for thought.

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