Another impressive evolution is seen in Krebs and R. Dawkins's lively chapter on communication. In the first edition of the book they argued that because the reproductive interests of signalers and receivers usually differ, the entire concept of communication is antiquated since "if information is shared at all it is likely to be false information." In the new version the authors still believe that they are dealing with a "coevolutionary arms race" between "manipulators" (signalers) and "mind readers" (receivers), but now they clearly distinguish signals among genetic competitors from communication between cooperators. In the former case, Krebs and Dawkins hypothesize the evolution of exaggerated, conspicuous, repetitive (for example, ritualized) signals that are basically "dishonest." On the other hand, when individuals' reproductive interests coincide, so that manipulators benefit from having their minds read, more "honest" communication will occur. In this situation the signals will be muted and inconspicuous ("conspiratorial whispers," the authors call them), both to minimize signaling costs and to prevent eavesdropping.

Overall this volume is a clearly written, well-produced, and reasonably priced guide to the hot topics in behavioral ecology. It will make for informative reading and spirited discussion among practitioners, graduate students, and others hoping to keep up with this exciting, fast-moving field. On the other hand, the book's long-term value hinges largely on whether parameters of the various models can be measured in nature and, if so, on the correspondence between theoretical predictions and reality.

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The Invertebrate Integument

Biology of the Integument. Vol. 1, Invertebrates. J. BEREITER-HAHN, A. G. MATOLTSY, and K. SYLVIA RICHARDS, Eds. Springer-Verlag, New York, 1984. xvi, 841 pp., illus. $111.

This volume provides a comprehensive examination of the integumentary features of the major invertebrate phyla, with some review of the more limited information available on the minor phyla. For many invertebrate phyla (for example, Cnidaria, Turbellaria), the dominant feature of the integument is its transporting function. For other invertebrates, especially the Arthropoda, its salient feature is its barrier function. The integument of insects is skeleton as well as skin and serves very well in protecting the terrestrial insect from desiccation while limiting the respiratory surface (the tracheal system).

The great variety of integumental innovations among the various invertebrate phyla is covered by 45 chapters organized into 12 sections including Acoelomata (Turbellaria, Trematoda, Nemertea), Pseudocoelomata (Nematoda, Acanthocephala), Annelida, Mollusca, Arthropoda, Echinodermata, and Protochordata. The sections on the Annelida and the Mollusca are about 100 pages each; that on the Arthropoda is over 200 pages. A scientist with a special interest in one of these groups would find a detailed treatment in *Biology of the Integument*. (Porifera are omitted.)

The exclusive use of ciliated surfaces by certain invertebrate groups justifies an introductory chapter on cilia. Cilia are found at specialized sites on the external epithelium of the Ctenophora. On the other hand, the Turbellaria are characterized by an extensive ciliated epithelium. Similarly, the reader is prepared for later reference to epithelial cell interactions by an introductory chapter on intercellular junctions. Both sealing functions and gap junctions between epithelial cells appear in the Coelenterata and provide both the necessary restrictions on "leakage" and the basis for an integument that is both environmental barrier and selective transporter. These cellular interactive features are missing in the Porifera.

I found the discussions of cuticle in the various phyla to be of considerable interest. The primitive origin of cuticular coverings is emphasized by Rieger, who states that "cuticles are likely to be as old as flagellated epithelia in the Eumetazoa and are likely to be a primitive feature of the adult organization of Eumetazoa." The primitive cuticle was probably a simple surface coat of mucoproteins or mucopolysaccharides. The collagenous cuticle of the Annelida is considered in detail by Richards. There is also a careful treatment of Nematoda cuticle by Bird. The most extensive discussion of cuticle occurs in five chapters in the section on the Arthropoda. These cover the biochemistry (Hackman), structure (Neville), mechanical properties (Hillerton), molting (Gnatry and Romer), and ecological significance (Hadley) of cuticles. An additional chapter (Gilby) treats insect cuticle in relation to penetration by insecticides but does not consider the pesticides that are thought to inhibit chitin synthesis. All of this is introduced by an excellent overview of the cell biology of cuticle formation in a chapter by Locke.

Although the organization of the book is phylogenetic, the subchapter headings are detailed enough that a reader interested in such topics as sensory cells and structures on the integument or permeability and transport functions can quickly find the appropriate sections for review and comparison. Readers will be aided by a substantial list of references that covers the literature through at least 1982 as well as a detailed index of genera covered in the book.

Throughout the work there are numerous drawings, histological photos, and electron micrographs. There are few tables, and few data *per se* are provided. Nevertheless, scientists with an interest in a specific phylum or in physiological, biochemical, or structural features of invertebrate integument will find that the book is an excellent resource.

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Primordial Germ Cells

Current Problems in Germ Cell Differentiation. A. MCLAREN and C. C. WYLIE, Eds. Cambridge University Press, New York, 1983. x, 401 pp., illus. $79.50. From a symposium, London, Sept. 1982.

This book emerges from the seventh international symposium of the British Society for Developmental Biology. It contains 19 contributions that evaluate some of the major research involving primordial germ cells and animal eggs; the species covered include representatives of amphibians, insects, birds, and mammals.

The book is divided into six parts. In the first part, Mahowald and Boswell, Smith *et al.*, and Eddy and Hahnel analyze the nature of the evidence that primordial germ cells are determined through the action of cytoplasmic molecules. The authors go back and wrestle with dogma from the older literature. The papers are lucid and scholarly reviews of a fascinating subject that has not been critically assessed in recent years.