that was to follow, including the work outlined in this volume. Once TRH had been discovered, the race was on to find other hypothalamic releasing factors—the discovery of which soon followed.

Not wholly appreciated in 1969 at the birth of TRH was the fact that hypothalamic releasing factors were present throughout the brain, where they subserved a role as neurotransmitters or neuromodulators, quite unrelated to the regulation of pituitary or endocrine function. Later these same peptides were found distributed throughout the gastrointestinal system and pancreas. Other peptides were soon isolated from these and other organs in tissue cells or neurons, so that the idea of a diffuse neuroendocrine system was proposed by Pearse as a third division of the nervous system after the somatic and autonomic branches. The number of neural peptides isolated has since burgeoned, but for many of these substances a clear physiologic role has not been determined. This book touches upon close to 60, but even this number is far from being comprehensive.

Julia Polak, the editor, has made significant contributions to our appreciation of the potential roles of neural peptides, especially through her immunohistochemical studies. She has recruited a group of experts predominantly from Europe. This volume is especially strong in contributions related to histochemistry, both immunocytochemistry and in situ hybridization. Certainly the chapters on autoradiography and axonal transport tracing for peptide mapping will be of value to all workers involved in the investigation of peptide function. The sections on molecular biology do not fully reflect the current extensive studies addressing the mechanism of peptide regulation at a transcriptional level. The discussions of the versatility of the functional role of peptides in different organs are valuable, showing for example that deficiency of vasoactive intestinal polypeptide, or VIP, may in the chest play a role in causing asthma and in the pelvis be involved in male impotence.

As members of the "peptide generation," we have already benefited from important advances in the diagnosis and treatment of disorders of both brain and bowel directly arising from discovery of these substances; further contributions to our welfare from regulatory peptides, their analogues, or both are anticipated. Polak's book can be recommended as a useful source of information to all who have an interest in peptides.

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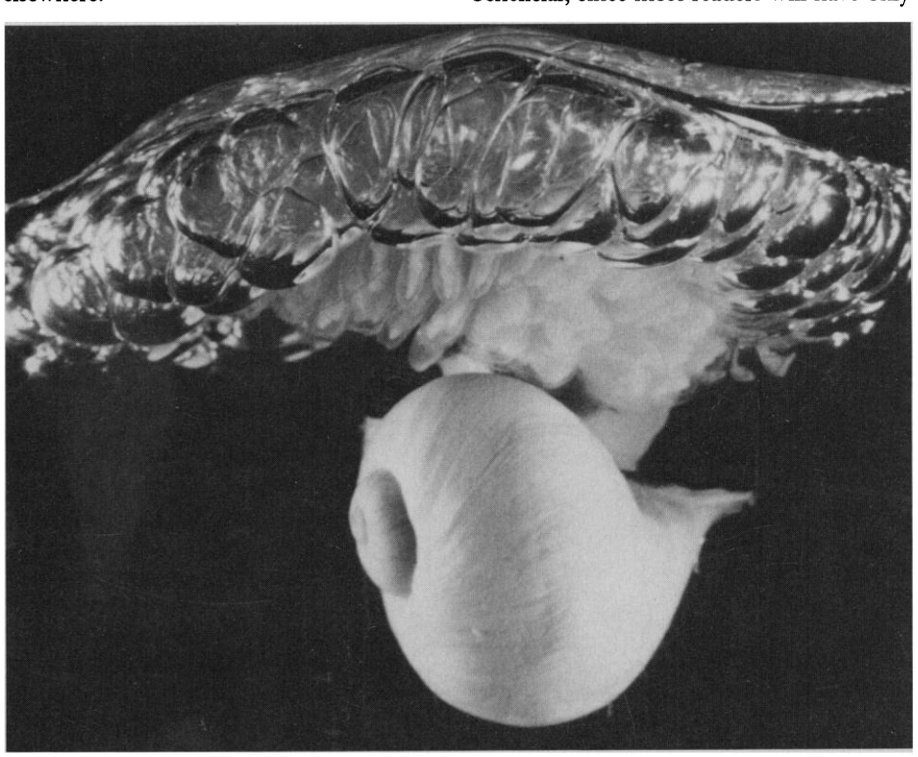
Oceangoing Mollusks

Pelagic Snails. The Biology of Holoplanktonic Gastropod Mollusks. CAROL M. LALLI and RONALD W. GILMER. Stanford University Press, Stanford, CA, 1989. xvi, 259 pp., illus., + plates. $49.50.

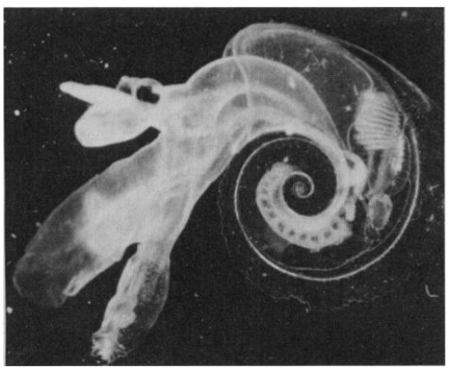
The gastropods are the largest class of mollusks (comprising over 40,000 species). They have been remarkably successful and occur in a variety of marine, fresh-water, and terrestrial habitats. The vast majority of marine gastropods are benthic as adults, living in association with the sea bottom. Though the larvae of many benthic species are planktonic for varied lengths of time, only a small number of species (about 140) are pelagic as adults and live out their entire life histories in the water column. A primary focus of this book is the description of the unique and varied ways in which these animals have adapted to the pelagic environment. The authors have done an excellent job of reviewing the literature (which is scattered among journal articles and expedition reports) and organizing it into a readable and informative text. An important feature of the book is that it goes beyond a synthesis of the published literature on these animals by incorporating unpublished observations and data of the authors. Thus, this book is a source of information that is not available elsewhere.

The text is divided into chapters dealing with each of the five major groups of pelagic gastropods: janthinids, heteropods, thecosomes (shelled pteropods), gymnosomes (shell-less pteropods), and nudibranchs. The major topics discussed for each group are external anatomy, mechanisms of locomotion and buoyancy, feeding mechanisms, diet and trophic relationships, metabolism and energetics, reproduction and development, parasites and epifauna, growth and reproduction, and evolutionary relationships. Topics such as internal anatomy, taxonomy, and geographical distribution are not discussed to any extent. Despite the low number of species of pelagic snails, the species composition of most of the groups is incompletely known or controversial. Thus, those who work with these groups will undoubtedly disagree with the inclusion or exclusion of particular species from the lists of "recognized species" provided at the ends of the chapters. However, by referring readers interested in taxonomy to the relevant literature, the authors sidestep an area of minimal concern to most readers of the book.

The beauty of the pelagic snails in their natural environment is portrayed by a series of 16 color photographs. Descriptive sections of the text are supported by in-situ photographs of the animals printed in black and white. The inclusion of a glossary is beneficial, since most readers will have only



Janthina prolongata with egg capsules. The "adaptation [of the janthinid snails] for an open-ocean existence has occurred largely through behavioral change, the major modification being the ability of the animal to construct a raft of air bubbles, from which they hang suspended, upside-down, from the water surface." [Magnification about 2½; from *Pelagic Snails*]



The heteropod *Atlanta peroni*, lateral view. "Heteropods are highly modified for life in the open ocean, the major morphological adaptations including a reduction in the size and weight of the aragonite shell or a loss of the shell associated with an increase in body size; the development of a single swimming fin derived from the gastropod foot; and a tendency for the body and shell to be transparent." [Magnification about 5; from *Pelagic Snails*]

limited familiarity with these animals. The book will be of interest to a wide range of readers. It is unique in being the first book devoted exclusively to the fascinating and little-known groups that comprise the pelagic snails.

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Uncertainties about Mammals

Evolution of Life Histories of Mammals. Theory and Pattern. MARK S. BOYCE, Ed. Yale University Press, New Haven, CT, 1988. xvi, 373 pp., illus. $45. Based on a symposium, Edmonton, Alberta, Aug. 1985.

Useful compilations or syntheses usually tell us one of two things: we know a lot more about something than we suspected; or we know a lot less about something we thought we had just about got right. Boyce's compilation on mammalian life histories does more the latter. Mammals have occupied a disproportionate share of the literature on life history evolution, and much of that literature reflects an overconfidence that the theoretical and empirical foundations of the subject are well settled. The 16 diverse contributions in this volume leave me even more convinced that this self-satisfaction is unjustified.

Boyce himself points out that there is an ever-increasing gap between the analysis of life history evolution from a theoretical perspective and attempts to test theory empirically. In particular, far too little is known about fluctuating environments. Unfortunately, the empirical contributions to this book (for example, Negus and Berger's) stress the inadequacy of simple theoretical models with only a few parameters, while a theoretician berates empiricists for underestimating the complexity hidden in simple models (Schaffer). Because the conspicuous geographic variation in life history traits that prompted the interest in the first place is often not obviously dependent on tradeoffs (Cameron and McClure; Dobson), the implicit or explicit assumption of most theory may not be applicable to many of the trends we seek to explain. Even where tradeoffs seem to occur, the currency may be obscure, as indicated by Bujalska's claim that the high mortality of female voles during reproduction has little to do with the energetic costs of lactation and gestation but is rather dependent on sex-specific territoriality.

We do suspect that quantitative genetics would tell us a lot about the opportunity for, and response to, selection regimes in fluctuating environments. However, our capacity to measure the appropriate parameters in the field (Boonstra and Boag) is quite rudimentary. Although great sophistication can be achieved in laboratory studies (Leamy and Bradley), the evolutionary significance of tradeoffs observed in the laboratory needs to be treated with caution, as any phenotypic correlations may be dominated by the unusual and often benign environment.

Allometric and phylogenetic conservatism in the distribution of life history traits among higher taxa leads some authors to suggest that life history evolution is dictated largely by selection on body size (Lindstedt and Swain) or that interesting variation is often confined to higher taxonomic levels (Harvey and Read). These increasingly common claims sit uneasily with the substantial interspecific and intraspecific variability reported elsewhere in the volume, particularly in Smith's elegant review of research on pikas. In any case, allometric analysis remains a field dominated by a plethora of correlations yet lack of mechanistic explanations. As Harvey and Read comment, "Comparative life-history studies of mammals have so far done little more than describe patterns. Now that a general picture is beginning to emerge, attention must inevitably turn to explaining it."

The book has few errors, though the literature citations are often poorly checked. Its best feature is the papers that draw together large quantities of data and grope toward synthesis or that show special dedication. Some of these studies are certainly heroic in their breadth or implementation. Harvey and Read manage to cover the methods and results of interspecific comparisons of mammalian life histories with extraordinary clarity and admirable brevity. Dobson provided four tonnes of high-protein horse feed to show that ground squirrels have plastic life history traits! A surprising number of people have devoted large parts of their lives to measuring litter sizes of the cotton rat. Perhaps the central problems are the omissions and balance. Two topics I was surprised to find scarcely addressed are the currently exciting interface between behavioral and population ecology and the growing body of long-term field studies where lifetime consequences of life history variation can be assessed. Despite a token chapter on didelphid marsupials (Eisenberg), there is a strong bias toward herbivores in general, and rodents in particular. Even among herbivores, with the exception of Harvey and Read's contribution, the book follows the tendency of mammalogists to ignore primates or treat them as a group belonging to someone else. Although the most widely cited advantages of studies of rodents are their short lifespans and complex demography, facilitating measures of reproductive effort in a changing selective milieu, almost all the empirical studies deal with single atomized traits, such as body size or litter size.

So where do we go from here? All students of mammalian life histories will benefit from at least some of the contributions, yet the rewards are more from syntheses of past research than from a clear guide to profitable future directions. There is a nice catalog of unanswered questions scattered through the volume, but I suspect we need better selection of species suited for addressing particular questions and more focus on what special attributes mammals have to offer to the understanding of life history evolution in general, rather than *a posteriori* attempts to force pet study species into a theoretical straightjacket. My own biases are toward exploitation of the tractable fecundity, the complexity of social evolution, and the diversity of diet and habitat structure revealed in this most fascinating of groups.

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