

behavior; this is an important contribution. Fourth, the extensive analyses of attitudes toward homosexuals provides insight into the nature of antihomosexual sentiment. An important unanswered question is whether these analyses are still valid in 1989.

The weaknesses of the research are serious. First, there is virtually no discussion of the quality of the data. The only discussion of reliability reports data from reinterviews of 16 pretest respondents. This is inadequate. There is no discussion of validity of measures. The investigators appear to assume that questions measure the variables of interest, for example, that answers to the question "Have you always felt this way?" are a valid measure of moral change. The only exceptions are those instances where scaling techniques are employed with attitude items. There is no mention of rates of refusal or termination by selected respondents. There is no discussion of the incidence of missing data, a special concern with regard to measures of sexual activity. Finally, there is no mention of possible interviewer effects. Most of the interviewers were white middle-class women; one wonders whether respondents' answers, particularly those of males and black females, were influenced by this.

A major limitation is that the key questions regarding sexual behavior were imprecise. The questions about premarital, extramarital, and homosexual experience ask whether "you had sexual activity with someone . . . when either you or your partner came to a sexual climax?" Thus a "yes" answer could reflect masturbation, oral-genital contact, vaginal intercourse, or anal intercourse. It is likely that this phrasing was used to maximize response rate. This may be another reflection of the anachronistic character of the research; though such delicacy may have been necessary in 1970, it creates a serious ambiguity. Contemporary surveys of sexual behavior use much more detailed questions. Some reviews and media reports suggest that *Sex and Morality* provides information that will be invaluable in understanding or predicting the spread of HIV infection. This claim, unfortunately, is not true. HIV infection is probably transmitted by anal intercourse, may be transmitted by vaginal intercourse and oral-genital contact, and is unlikely to be transmitted by masturbation. Since the behavioral measure used in this research does not differentiate these behaviors, its usefulness in this context is greatly reduced.

A weakness of the book is the lack of integration. Some of the chapters, for example 6 and 9, are not related to those that precede or follow. Further, the analytic strategy is not systematic. In some instances,

indices are constructed and discussed but not included in subsequent analyses. The final chapter does not systematically summarize the results of the various analyses.

Despite its weaknesses, this is an important book. It should be read by serious students of sex and morality in the United States. It provides a wealth of data about the attitudes of adults in 1970 and some information about their sexual experience. As the editor suggests, these data can serve as a benchmark; if future research employs the same questions with comparable samples, we will be able to assess the changes in sexual morality and behavior that will inevitably occur.

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## Colonial Adaptations

**Bryozoan Evolution.** F. K. MCKINNEY and J. B. C. JACKSON. Unwin Hyman, Winchester, MA, 1989. xiv, 238 pp., illus. \$45. Special Topics in Palaeontology, vol. 2.

The phylum Bryozoa, a diverse assemblage of colonial coelomate organisms, has attracted the interest and piqued the curiosity of biologists and paleontologists for more than two centuries. In *Bryozoan Evolution*, a paleobiologist (McKinney) and a biologist (Jackson) merge their expertise to analyze trends in the evolution of colonial morphology within the marine bryozoans over geologic time.

The authors note that despite the seemingly endless ways in which the diverse modules (zooids) could be organized into colonies, only a few such patterns were developed. The "repeated evolution and stability of [these few] growth forms, the improvement of design within them, and their distribution in space and time are the major subjects of this book." Readers may well benefit from reading first the four-page concluding chapter. There, eight trends in the evolution of bryozoan colony design are summarized. In large measure, these patterns may justify the adaptational interpretations used throughout the volume: the trends identified are clearly ones of parallel evolution correlated with specific ecological niches and are not reflections of the phylogenetic history of a given clade.

In the first two chapters, the reader is introduced to general features of bryozoan zooids and their integration into colonies, major taxonomic divisions including extinct groups, and difficulties of determining micro- or macroevolutionary patterns in the phylum.

Details of the astogenetic development of the major growth forms (encrusting, erect, free-living, and rooted) known for the phylum, including mathematical models for the generation of such colonies, are provided in chapter 3. In essence, this chapter serves as an introduction to the remainder of the book, in which the ecological and evolutionary corollaries of these variants are documented. In the latter chapters, McKinney and Jackson have relied heavily on a "growth form model" "to deduce the adaptive significance of different growth forms as strategies to reduce risk of mortality due to known ecological processes." That dependence is perhaps most pervasive in the chapters on growth forms as adaptive strategies and life histories.

A chapter on feeding provides insight into the impacts of biomechanical constraints, zooidal and colonial morphologies, and colonial integration on food, feeding patterns, and feeding efficiency.

In the three chapters on specific growth forms, the authors usually emphasize one of the multitude of biotic and abiotic attributes of the environment as a backdrop against which to evaluate in detail the advantages and shortcomings of the specific colony architecture. For example, chapter 8 deals extensively with the biomechanics of engineering an erect colony that can survive water flow of differing velocities, but only briefly notes the advantages of such a growth form (avoidance of crowded substrata, exposure to a richer food resource, and isolation from competitors and predators). Although chapter 7 is entitled "Encrusting growth: the importance of biological interactions," virtually all the correlations are made apropos the relative permanence of the substrata. Similarly, the rare bryozoans with free-living, rooted, or interstitial growth forms are largely interpreted with reference to the instability of the sediments in which they reside (chapter 9). Although the scope of some chapters is narrow, it must be appreciated that extensive original research was necessary to make the book as comprehensive as it is.

*Bryozoan Evolution* is profusely illustrated and has a bibliography of over 400 titles. It will find an appreciative audience of paleontologists, invertebrate zoologists, and ecologists thanks to its innovative and detailed evaluations of the roles of ecology, adaptive and functional morphology, life histories, biomechanics, developmental constraints, and chance on the evolution of the marine taxa of this speciose group.

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