# Book Reviews

## Phylogenetic Studies

**Interrelationships of Fishes.** Papers from a symposium, London, June 1972. P. H. GREENWOOD, R. S. MILES, and COLIN PATTERSON, Eds. Published for the Linnean Society of London by Academic Press, New York, 1974. xvi, 536 pp., illus. + plates. $31. Zoological Journal of the Linnean Society, vol. 53, suppl. 1.

In phylogenetic studies of vertebrates, the fishes have long proved the most intractable of subjects. Despite countless explorations of the primary relationships between the major groups and of the course of evolution within such complex groups as the Agnathans or Osteichthyes, progress "from the gradal to the clade," as one of the editors of the volume reviewed here once jocularly put it, has been difficult and slow. It has been hampered by a paucity of genuinely early and primitive forms and a surfeit of highly evolved forms in both the fossil and Recent records. That the situation has suddenly changed is due to four principal factors. First in importance is the paper by Greenwood, Rosen, Weitzman, and Myers (*Bull. Am. Mus. Nat. Hist.* **131**, No. 4 [1966]) in which the outline of a totally new classification of teleosts was presented. This stimulated enormous interest in the subject as a whole. Second is the paper by Patterson (*Philos. Trans. Roy. Soc. Lond. Ser. B* **247**, No. 739 [1964]) on fossil acanthopterygians from the English Chalk which, together with his later papers, has set a new standard for the study of fossil actinopterygians. Third, a large number of workers in this field have taken up the ideas of Hennig (*Phylogenetic Systematics,* University of Illinois Press, 1966) and thereby begun the attempt to develop a conceptual framework for the study of phylogenies based on as complex and incomplete a record as that of fishes. Fourth is the influence on a group of younger paleontologists of the technical accomplishments of the "Swedish School" led by E. A. Stensiö. Recent progress and interest in this field has been so marked that already Greenwood, Miles, and Patterson have judged it timely to produce the present work, the result of a symposium to which speakers were invited specifically to provide a "comprehensive review" of the interrelationships of fishes. Not surprisingly, definitive statements are still not possible in some cases, but the book is the distillation of a remarkable effort and will set standards for years to come.

The agnathans and placoderms are not covered, and progress here has been slowest of all. On the early chondrichthyans there is only a tantalizing essay by Zangerl that awaits full description of his new Paleozoic materials. Compagno, however, presents the sort of comprehensive overview of elasmobranch relationships that has been urgently needed for a long time. The contribution by Miles on acanthodians is exemplary as an exposition of rigorous argumentation. The paper by Andrews on crossopterygians is also interesting for its methodology, but this reviewer cannot accept without reservation her premises that the choana is primitive and that the rhipidistian dermal skull roof pattern is nonadaptive. Gardiner (dealing with the paleoniscid braincase and primitive osteichthyan characteristics), Schaeffer (in a concise review of chondrostean relationships), Bjerring (with his elaborate reconstructions of putative embryological components in the coelacanth endocranium), Miles, and Andrews all deal to a greater or lesser extent with the problems of the interrelationships of the major osteichthyan groups and it is evident that further trips around this particular mulberry bush will be unrevealing without the addition of entirely new material. In the meantime, the consensus view remains that Crossopterygii are most closely related to Dipnoi, that the Osteichthyes are a monophyletic group, and that the Osteichthyes and Acanthodii might be linked together (as the confusingly named Teleostomi). It is within the Actinopterygii that the most dramatic progress has been made. There are excellent reviews by Schaeffer, Jessen, Patterson, Greenwood, Nelson, Forey, Nybelin, and Roberts on chondrosteans, holosteans, osteoglossomorphs, clupeomorphs, elopomorphs, and ostariophysans together with more broad studies by Nybelin and by Rosen, who presents a long and detailed examination of the relationships of the "higher euteleosteans." All of these are individually excellent but perhaps one may single out as a major result of the opus the final demise of the grade in consideration of actinopterygian relationships. In this respect the contribution of Patterson on holosteans is extremely significant even though there is still a great deal that is unknown about this group.

Apart from the value of the individual papers, the work as a whole results from and reflects a concern with fundamental principles in the study of phylogeny and particularly with questions of methodology. Therefore in many cases the differences of approach and conclusions between authors (for example Gardiner and Bjerring or Jessen and Patterson) are as interesting as the results per se. The more general reader may find these differences and also the inevitable proliferation of new terms bewildering. It is therefore somewhat disappointing that the editors, who have thought more about these problems than almost anyone else, did not contribute an introductory or concluding essay in which the fascinating general questions in the development of a scientific methodology for phylogeny were discussed with particular reference to this immensely productive set of studies.

KEITH STEWART THOMSON
*Department of Biology,*
*Yale University,*
*New Haven, Connecticut*

## Cyanophytes

**The Blue-Green Algae.** G. E. FOGG, W. D. P. STEWART, P. FAY, and A. E. WALSBY. Academic Press, New York, 1973. viii, 460 pp., illus. + plates. $24.

The authorship of a balanced biological monograph of a genus, family, or phylum is a challenge frequently beyond the competence of a single author. The common refuge is the multiauthored review volume, often originating from a symposium and lacking comprehensiveness, unity, or insight. When a monograph does appear that is prepared by a small group of collaborators who have worked together and have been masters of the subject for years, the result is a joy. Such an achievement is this happy overview of the blue-green algae.

Blue-green algae have been on Earth