illustrated with reproductions of his fine landscape sketches and block diagrams, give the book something of the character of an anthology. The bibliography itself is a contribution that will be appreciated by collectors and scholars. Undoubtedly the book will become an indispensable source of reference for geomorphologists.

In his generally favorable review of the first volume (*Science* **146**, 1665 [1964]), J. Hoover Mackin expressed reservations regarding the great length of the book, due partly to the inclusion of topics not directly related to geomorphology. He estimated that the entire work of three volumes would run to around 2000 pages. This estimate will surely prove too small; for now, with 1568 pages behind them, the authors announce that there will be not one but two more volumes. Size, however, is no longer the only problem for the aspiring reader; the second volume is so expensive that many students will not be able to buy it, and the publishers have announced that the first volume is out of print.

Mackin also took exception to certain judgments of Davis's work which he considered unduly harsh, but he withheld free use of his cudgel until the authors could have their full say in volume 2. As it has turned out, Chorley and company have treated Davis with a respect bordering on affection. To be sure they are critical of the Davisian system of geomorphology, mainly on the grounds that it was qualitative and all too little concerned with the dynamics of landscape modification. But the net effect of the book is to magnify rather than detract from Davis's accomplishments.

As a person, Davis emerges as "a Victorian gentleman—proud, disciplined and aloof." As a scientist he is given full credit for demonstrating the dominant role of fluvial processes in arid regions, and more generally for stimulating advancements in most branches of geomorphology. As an educator he is credited with establishing geography as a respected academic discipline in the United States. His major biographical essays on John Wesley Powell and Grove Karl Gilbert are praised as substantial contributions to the history of geological thought.

Members of the Davis Protective Society may now lay down their cudgels.

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Problematic Creatures

Bigfoot. The Yeti and Sasquatch in Myth and Reality. JOHN NAPIER. Dutton, New York, 1973. 240 pp. + plates. $8.95.

Supposed sightings of Yeti and Sasquatch are disappointing evidence in favor of large manlike creatures' living in the mountains of Asia and the Pacific Northwest or anywhere else. The eyewitness always turns out to be a victim of a hoax, commercially implicated, inept at keeping live specimens from getting away, tardy about seeking medical corroboration of rape, or otherwise less than credible. Then, too, honest men make honest taxonomic mistakes about real creatures glimpsed at a distance, or in poor light, or among bushes. Real creatures, however, keep leaving marks behind them in snow or mud, thereby providing tangible evidence for the skeptical and the credulous to throw at one another.

In the Himalayas eight different mammals have played a part in keeping alive the Yeti legend, which, alas for its zoological respectability, seems to depend on a selection of tracks produced by some quadruped moving with a particular gait under the right conditions of snow crust, melting, sublimation, or other processes. A ninth mammal—man himself—adds further confusion: accidentally in the Himalayas by treading barefoot or shod in the tracks of a fellow pilgrim (or perhaps of a snow leopard), deliberately on the Pacific coast by using footprinting devices of various degrees of sophistication. Not all tracks are fakes, according to the author, himself an authority on human walking patterns; indeed, he is impressed by how genuine some tracks seem to be, and how sad it is that at Bossburgh, Washington, the local Sasquatch has a club foot. No hoaxer, the author believes, would be sick enough to create a deformed Sasquatch, strong enough to trundle heavy footprinting equipment through the coastal forests, or smart enough to cover up a conspiracy of counterfeiters operating between California and British Columbia. On the other hand, living off the edible resources of the western mountains would be tough going even for isolated individuals of a large manlike animal, let alone for the populations needed to keep it off the list of endangered species. Also, its waste-disposal habits would have to be a good deal tidier than those for which man himself is noted.

The author's fence-sitting is unlikely to satisfy the extremists; but in a twilight zone of fact and fiction, who cares about scientific realism? Attributing survival value to a belief in the abominable snowman may be going a bit far, but the author has obviously had a wonderful time on his excursion into the art of the insoluble.

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The Study of Amphibia

Evolutionary Biology of the Anurans. Contemporary Research on Major Problems. Proceedings of a symposium, Kansas City, Mo., Aug. 1970. JAMES L. VIAL, Ed. University of Missouri Press, Columbia, 1973. xiv, 470 pp., illus. $20.

It is a fact about the study of the modern Amphibia in the second half of the 20th century that it has still been possible to recommend Noble's *Biology of the Amphibia*, first published in 1931, as a better-written overview and a more intellectually satisfying introduction to this group than anything done since. The book here reviewed does not provide grounds for altering that recommendation.

The title of the volume is itself a misnomer. The phrase "evolutionary biology" currently has much wider implications than these papers would indicate. "The Evolution and Classification of Frogs" would have been a better title. In this regard, the tenor of the book is set by the first chapter, by Frank Blair, which purports to identify "the salient problems in Anuran evolution and those areas of investigation likely to produce significant resolution."

The symposium from which the book results was held in 1970, but the editor advises us that "the contributors have allowed me to revise and elaborate upon their manuscripts until press time in 1972. Thus the papers published here have a recency and a greater body of evidence than the original publications."

The succeeding chapters do provide an impressive fund of information, but the resolution of salient problems that Blair hoped for is not achieved.

Between Noble's book and the present one there came into prominence (all at about the same period, in the late '50's and early '60's) four hypotheses or discoveries that looked especially promising for exactly the topics this book covers: the Orton classification of frogs by larval types (1953,

1957), the Darlingtonian hypothesis of competition and replacement of frog families (1957), the discoveries of Jurassic frogs (1957, 1961), and the Lissamphibia hypothesis (1962) that the three modern amphibian orders, despite their striking structural differences, are a unified phyletic group, most closely related *inter se*. The evidence of this symposium is that none of these have resulted in the advances they seemed to promise.

On the paleontological evidence, Estes and Reig say, "Only moderate progress has been made in the last few years." Of the Lissamphibia Reig says, "The test results are contradictory." Savage says, "Competitive dominance and replacement have little to do with the origin and replacement of frogs." Orton's classification receives a mixed report. Some (Savage, Starrett) accept it as the premise upon which all evolutionary thinking about frogs must be based; others (Lynch) regard it as an unparsimonious "alternative phylogeny" that should be considered more tenuous than a phylogeny that regards larval characters as of minor importance.

Starrett elaborates the Orton scheme, supplementing it with new internal muscular and skeletal larval characters. She does not, however, argue her case, and, though the reviewer's biases are on the side of Orton's viewpoint, I am disappointed to see no discussion of the crucial problem of the placement of the microhylids, no counterargument against those who would see these as close to the ranids and their larvae as secondarily simplified. Starrett provides an advance in information but not in understanding. Her one formal contribution to classification—the substitution of names of Greek derivation for Orton's Roman numerals for larval types—is not in the reviewer's judgment an advance at all. That she calls the microhylids the Scoptanura from "skoptos"—"mocking, scoffing, or jesting"—sets the tone of her action in this regard. The other proposed names have the same equivocal, tongue-in-cheek sound.

New techniques for interpreting the relationships of frogs—electrophoresis and immunology and karyotype studies—are here summarized. The results are not very illuminating. There is an effort to find more in the incomplete data thus far accumulated than the data can support. It seems likely also that both electrophoresis and karyotypes will be more often useful for species and species groups than at higher levels.

A thread running through many of the papers, and occurring in discussions also, is the new effort to formalize criteria for such categories as "primitive" and "derived." In another effort at more formal and objective classification, Lynch employs the now fashionable numerical coding of "character states." It is, however, as clear in the present papers as in other efforts using these devices that they have led to no demonstrable major advances or striking insights.

There are short and preliminary explorations on more ecological themes—Salthe and Duellman's discussions of egg size, Wassersug's report on the social aspects of tadpoles. These again have not got very far.

In the end a very distinct impression is left: there is much that is lively and vigorous, a great deal of information has been collected and reported, there is much effort and movement but little advance. This is the Realm of the Red Queen, where we must run as fast as we can to stay where we are. It is impossible not to be disappointed, but this is a phase *between advances* that does occur in science, and we cannot allow our disappointment to discourage the vigor and liveliness that we see here. The information we have deteriorates unless we rediscover and add to it. As textbook after textbook demonstrates, information only repeated at second hand distorts to outright error.

Let there be no mistake. This is a useful book, full of highly useful data and instructive figures. What is known and believed is better presented here than anywhere else. Richard Estes and Osvaldo Reig provide reconstructions and details on critical fossil frogs that are new and important. Linda Trueb reviews frog osteology in better fashion than any previous summary. John Lynch defines the families that he recognizes far more fully and adequately than anyone has before. Priscilla Starrett provides the material to raise discussion of tadpole anatomy to another level. There are many interesting and some rather sophisticated data on frog vocalization.

The most impressive paper is that by Jay Savage. It is a synthetic correlation of the morphological and paleontological data provided by others with current ideas on paleoclimates and continental drift which attempts to provide a historical biogeography of frogs. Savage counters the Darlingtonian hypothesis of family competition with an alternative that he calls "preemptive exclusion"—not a new idea, but a useful catch phrase. He does discuss the evolution of tadpole types in terms of adaptation and competition. His maps and diagrams are illuminating and valuable.

But when the justified compliments have been paid, there remains the sense of deficiency. The new techniques of electrophoresis and karyology apart, the questions and the data are traditional in the extreme. To mention a few topics that come casually to mind: Could not the evolution of modes of reproduction have been more fully explored? If anatomy was to be emphasized, are there no additional anatomical systems that might have added something to the fund of evidence? Is there nothing in the competitive relations of adult frog species that might be interesting? Frog diversity in the tropics is immense. Is there nothing to be learned from it? That old questions have been reexamined is not a bad thing, but such reexaminations are more likely to be fruitful when they are confronted with new approaches and new hypotheses. Here the wheels spin in old grooves, getting deeper but staying in the same place. There is more to be done with the evolutionary biology of frogs than appears here.

The discussions held after each of the three sessions of the symposium were judged to deserve the wide currency and intended immortality of print. Unhappily, the looseness of syntax and of thought characteristic of oral argument is all too apparent in the printed transcripts. These pages further detract from a book already disappointing despite many merits.

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The Field of Nutrition

Notes on the History of Nutrition Research. CLIVE M. MCCAY. F. Verzár, Ed. Huber, Bern, Switzerland, 1973 (U.S. distributor, Williams and Wilkins, Baltimore). 234 pp., illus. Paper, $22.25.

Leading scientists know the history of their own fields of research in considerable detail; they have to in order to plan their work well and to interpret their observations and results correctly. The need for a historical perspective is particularly great for scientists in a field such as nutrition, which is still