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

largely empirical in nature. Students of nutrition are fortunate in having the beautifully written historical works of Graham Lusk and E. V. McCollum to guide them, as well as various histories of medicine, physiology, and related sciences. With this book by the late Clive McCay the beginning student can now learn how to go about acquiring information on the historical development of his science. This information is outlined in the first chapter of the book, appropriately titled "Finding your way in the nutrition literature." In the remaining chapters the student will find hints and illustrations about acquiring a knowledge of the chronological developments of nutritional thought in the 18th and 19th centuries and up to about 1940, when much of the fundamental work had been done.

The scope of this book is broad, as might be expected from an author whose own experimental interests covered the relationship between diet and growth, physiological function, and longevity of animals from insects to man and whose writings concerned practical feeding problems of dairy cows and other farm animals, dogs, brook trout, industrial workers under wartime food restrictions, patients in mental hospitals, where cost is important, and men in the U.S. Navy during World War II, where questions of acceptability and ease of shipping demanded attention alongside questions of nutritional quality.

McCay devoted a lifetime of reading and study to the compilation of the notes which make up this volume. I remember his list of historical titles on iron in nutrition, which he showed me in 1926; I copied the references to the reviews by H. A. Christian, H. C. Sherman, and E. Meyer and obtained them from the Yale Library for study. These same references are to be found in the present book, with many more, in the section on iron in nutrition.

The approach McCay has taken is that of pursuing lines of thought, as affected by scientific studies, on what he calls the three great questions that stimulated nutritional research in its early days. These questions are: How is food transformed into body tissues? What are the relationships of the nitrogen of the air and that of soils, plants, and animal bodies? What are the sources of energy and how are they used for "operating" the body?

Except for vitamin D, there is no treatment of the remarkable contributions to our knowledge of the vitamins that were made during the 1930's and '40's. The title of this book is completely appropriate; the material consists of "notes" about experimental studies and the men who made them. This material hitherto has been available only in the form of mimeographed sheets which McCay distributed to students in the graduate course on the history of nutrition which he offered at Cornell. There are typographical errors, though nothing serious, and the grammar in a few places reflects what a man might write on a slip of paper as he reads. These defects, if they can be so called, seem to add to the vigor and freshness of the treatment.

Clive McCay died in 1967. His wife, Dr. Jeanette B. McCay, turned over her husband's collection of papers and old books to Cornell University. There, in the Mann Library of Agriculture and Home Economics, the books are being displayed in a reading room named in McCay's honor. L. A. Maynard of Cornell began the preparation of the material in this volume for publication, and, after his death, the task was completed by F. Verzár of Basel, Switzerland. Maynard's introductory essay states that among McCay's remaining unpublished notes is detailed material on 13 vitamins, completing the record to about 1953. There is also a chronology of about 150 pages on significant events in the history of nutrition from the year 470 B.C. to about 1953. Perhaps in time this unpublished material may be made available for wider use and enjoyment, in a book to take its place beside this present interesting and useful volume.

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