regulation of secretion, and modes and types of action of the pituitary and placental gonadotropins. Because direct research on human gonadotropins is still rather limited, much of the book deals with reproductive studies of other mammals, and these provide a valuable framework for the more recent research on human hormones. Despite the broad title of the symposium, there is no comparative information for any nonmammalian species. Also surprising, in view of the special interest in fertility control expressed in the preface, is the dearth of information on current contraceptive research in relation to gonadotropins.

Within these limitations, the breadth of topics covered is still impressive. Both theoretical and applied approaches are represented. For example, a large section is devoted to the practical problems of measuring hormone levels. Emphasis is given to discrepancies obtained when different types of techniques or standards are used, and especially when attempts are made to compare classical bioassay data with results obtained from radioimmunoassay. The detailed presentation of methodology for the radioimmunoassay of gonadotropins and gonadal steroids should prove valuable to anyone wishing to undertake the use of this new and sensitive technique. After examining this section, however, one may wonder whether radioimmunoassay is indeed the panacea it is sometimes claimed to be.

The consideration of the physiological relationships between gonadotropins and the gonads tends to be largely clinical but illustrates how human studies can benefit from general physiological studies and vice versa. Details of the effects of the two pituitary gonadotropins on various testicular and ovarian functions in humans may cast some doubt on the classical dogmas regarding the specific actions of follicle-stimulating hormone (FSH) and luteinizing hormone (LH).

The interdisciplinary approach of the symposium provides interesting insights into some of the broader problems in reproductive physiology. For example, the question of how pituitary gonadotropins are regulated is highlighted by recent chemical findings of a single hypothalamic releasing factor that appears to be nonspecific for FSH and LH, and by the indication from immunostaining techniques that both gonadotropins may also be produced in a single cell type within the gland. These phenomena appear to be general for all mammals studied. In other sections, it is emphasized that estrogens and other sex steroids may have positive, as well as the classical negative-feedback, control on gonadotropin secretion. How the secretion of two gonadotropins is independently regulated, if in fact it is, remains unresolved.

Unfortunately, the potential value of the interdisciplinary approach is limited by several shortcomings in the organization of the volume. Contrary to the publisher's assertion on the dust jacket, each section is not introduced by a critical review of current knowledge in the area. Rather, all the reports tend to be highly technical and relatively narrow in scope. Furthermore, there is no real attempt to integrate or synthesize the diverse material presented within or between sections. In several cases, papers covering virtually identical subjects reveal marked discrepancies in results. But aside from brief comments by participants in the discussions following each section, there is little effort to clarify or resolve these differences or to evaluate their importance. The lack of summaries in most papers and a poor indexing system make it difficult for the reader to glean the details necessary to derive any generalizations, and this compilation of papers may thus prove most useful to specialists already working in the field of reproductive physiology.

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Ecology of Nutrition

Malnutrition. Its Causation and Control. (With Special Reference to Protein Calorie Malnutrition.) JOHN R. K. ROBSON in collaboration with Frances A. Larkin, Anita M. Sandretto, and Bahram Tadayyon. Gordon and Breach, New York, 1972. Two vols. Vol. 1, xii pp. + pp. 1–312, illus. Vol. 2, x pp. + pp. 313–612, illus. Each vol., $14.95; the set, $24.50.

This two-volume work grows out of the authors' 18 years of experience "in every continent of the world. . . . [which has included] the planning of nutrition programs at national and local levels and the delivery of nutrition services in the richest and the poorest countries of the world. . . . laboratory and field research, and teaching nutrition in a variety of settings from graduate and undergraduate programs in nutrition in the United States and elsewhere, to the training of local auxiliaries in the field." They present an environmental approach to the study and practice of nutrition. "Malnutrition is an ecological problem; . . . nutritional science cannot be effectively applied unless it is related to physiology, pathology, human behavior, and the many factors that constitute the ecology of food and nutrition." The "many factors" delineated as a part of the ecology of food and nutrition include concepts from the pure, the applied, and the social sciences—chemistry, biology, physiology, medicine, agriculture, education, sociology, economics, anthropology, and politics.

Ecology is defined as concern with relationships between the environment and the organism (in this case, the community). From this point of view discussions of both malnutrition and normal nutrition are presented for students and professionals in nutrition, medicine, nursing, public health, and related sciences. A major goal in these volumes is providing definitions of terms used in public health nutrition.

The first volume offers a fairly comprehensive overview of contemporary public health nutrition problems on a global scale, grouped for discussion purposes into the clinical states of overnutrition, undernutrition, and malnutrition. Malnutrition is defined as the result of an imbalance of nutrient intake. Some of its etiology is hinged to such identifiable (but difficult-to-measure) factors as food availability, cultural influences, effects of food processing and storage, and nutrient utilization, as well as some of the more immediate and measurable causes such as infant feeding practices, infections, and the sources of nutrients available within the community. The focus on ecological considerations in relation to malnutrition is enhanced by descriptions of real-life situations which provide insight into the causal relationships of worldwide community nutrition problems.

Normal nutrition is the theme of the last half of volume 1, in which concise but quite basic explanations of nutrient physiology, chemistry, absorption and metabolism, functions, deficiency states, sources, and recommended intakes of all the known factors essential to normal nutrition are discussed. Normal nutrition per se is not defined, but there is reiteration of disturbances in function which occur when nutrient intake is inadequate, in excess, or imbalanced.

The second volume takes up what can possibly be dubbed the "control"

aspect of the topic of malnutrition, and it is the portion of greater value. At this point, the work becomes a handbook for action through its discussion of nutrient requirements and of the assessment of nutritional status, a description of nutrition programs and services, and a discussion of the determinants of food habits.

The authors have attempted to gain recognition for the breadth of the problem of malnutrition, and in doing so have directed attention to several questions which they state thus: "What are the manifestations of malnutrition, what is the setting? What is normal nutrition and what nutrients does the body require to maintain health? How do we know if adequate nutrition has been achieved? How do we promote better nutrition and relieve existing malnutrition?" A mere casual reading of these volumes will not be sufficient to discern whether or not the goals have been achieved. The authors have avoided following a systematic approach to the study of individual nutritional diseases, in order to further illustrate interrelationships. The casual reader may not grasp this purpose, either.

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Animal Biosystematics

Evolution in the Genus Bufo. W. FRANK BLAIR, Ed. University of Texas Press, Austin, 1972. viii, 460 pp. + plates. $17.50.

To many people toads (genus *Bufo*) are grotesque or ugly creatures of the night that bespeak witches, hobgoblins, black cats, and the imperfect dark side of man, especially revealed in warts. To Shakespeare they were nocturnal creatures of wonder, containing in their heads a jewel, which scientists identify as eyes reflecting back light from lantern or flashlight at night, but which in medieval symbolism represented the hidden beauty of life visible to those who see beyond appearances through the ugliness of day-to-day "reality." In this book, the last theme reappears as the editor and contributors regard the genus as an evolutionary treasure to be mined for new insights into life processes.

The book itself is based upon an intensive though somewhat uneven analysis of the biological characteristics, distribution, relationship, and probable evolutionary history of toads. The work is a major effort to bring together the diverse approaches of morphology, karyology, comparative biochemistry, bioacoustics, experimental hybridization studies, and biogeography to elucidate the evolution of a speciose and complex biological group. Although this approach, especially correlating karyology and hybridization experiments with morphologic data, has become almost standard practice in studies of higher plants (the "biosystematics" of most authors), *Evolution in the Genus Bufo* represents the first major attempt at a biosystematic analysis of a genus of vertebrates, if not the first for any animal group. The book is the culmination of 15 years of effort by Blair, who provided the initial impetus and the leadership for the study, who combed the world for living materials, and who assembled a battery of students and colleagues to work on the project. Blair's previous achievements include the virtual invention, in the early 1950's, of discriminant sonographic analysis of the breeding calls of frogs and toads as a basic technique for study of their systematic, ecologic, and evolutionary relationships and the use of refined experimental hybridization techniques, once used only by a few experimental embryologists, for genetic evaluation of the evolutionary status of related anuran species. These approaches set the stage for the investigation summarized in the present book.

The objectives of the study were essentially to establish the geographic and evolutionary origin of toads, the relationships among the approximately 200 recognized species, and the most probable evolutionary history explaining distribution patterns. Some 16 papers deal with various approaches and interpretations of data pertaining to these matters. Particularly outstanding is the paper by Tandy and Keith on African *Bufo*, including a wealth of biological and bioacoustical data, and the study of the mechanisms of vocalization by W. F. Martin, although Martin's evolutionary interpretations seem questionable. Only somewhat less excellent are the accounts of karyology by J. P. Bogart and the data from paper chromatographic analysis of the toxic parotoid gland secretions by Low. A wealth of data on hybridization experiments is provided in a paper by Blair himself, but I found the paper difficult to follow and many of its statements arguable.

Unfortunately almost all the authors attempt to relate their data to the morphology-based groupings of broad-skulled and narrow-skulled toads established in R. F. Martin's contribution on osteology. This paper is rather weak and does not seem to take full advantage of the evidence of osteology. Review of the osteological data seriously weakens the argument for the recognition of two major divisions on the basis of skull form, since of the 20 defined species groups, 2 in the broad-headed division have intermediate- or narrow-skulled species and 6 in the narrow-headed division have intermediate- to broad-headed representatives. A more interesting approach might have been to construct separate evolutionary interpretations based on each line of evidence and to compare these phylogenies for congruence.

One regrets that no account of the features of the eggs and larvae is included, since these must have been available in numbers during the hybridization studies and are known to provide useful data for systematic studies.

There can be no question but that the work stands as a first major effort toward understanding the genus as a biological and evolutionary entity. Any such effort requires refinement. As a herpetologist who knows something about *Bufo*, I find many points on which reevaluation is in order. From the viewpoint of an evolutionist, I find the objectives of the study still unfulfilled. The explanations in the summary by Blair fail to be convincing because of conflict among the various data used and because of his difficulty in relating present patterns to chronology and paleogeography. Nevertheless, the attempt should stimulate others to utilize the data in this book for the construction of alternative hypotheses.

The book is best regarded as a prototype of what can be done through this kind of multidisciplinary approach to problems of animal evolution. For this reason, if for no other, it will have an influence on future studies far out of proportion to the intrinsic value of any knowledge of *Bufo* per se. Anyone interested in evolutionary theory and the potential for biosystematic study of other vertebrates will find this book the best available prospector's guide.

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