aegyptius which he states is "A close relative of *Jaculus* . . .," is indeed—it is the same animal! The usage of *Dipus aegyptius* for the small North African jerboa has long been passé. To the best of my knowledge, the author has created a new name, *"Pachuromys steatomys,"* for the fat-tailed sand rat *Pachuromys duprasi.*

It is true that the slipshod use of scientific names does not detract markedly from the value of the compilation and original research presented in this volume, but their proper use would have enhanced the book.

As a whole this work will be invaluable to persons interested in deserts and desert animals. The book answers, at least in part, some of the questions raised about peculiarities in behavior of desert-adapted animals.

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Symposium on Acarology

Advances in Acarology. vol. 1. John A. Naegele, Ed. Cornell University Press, Ithaca, N.Y., 1963. xii + 480 pp. Illus. $9.75.

This volume is a compilation of the papers presented at the first National Acarological Symposium, which was held at Cornell University in 1962. It is therefore not, as the title might suggest, part of the series of comprehensive surveys of rather selected topics, which are published in other fields. The papers are grouped under six general headings: Bionomics and control of acarine pests; Techniques for the rearing, mounting, and testing of the Acarina; Physiology, biochemistry, and genetics of the Acarina; Disease transmission in the Acarina; Current trends in acarine systematics; and Acarine behavior. These categories bring some arrangement into the great diversity of subjects.

The papers on the distribution, abundance, and control of acarines are concerned with spider mites or eriophyid mites on citrus, cotton, and apple foliage and on woody ornamentals, and with mites in stored products and on poultry, cattle, and sheep. The studies on bionomics deal with predaceous mites that feed on housefly eggs and scale insects, and with the effects of low temperatures on a species of *Tyrophagus*. Many observations and experimental data on nutrition and biology, including new findings, are brought together in a very interesting report on food relationships in free-living Acaridiae and Oribatei.

In the second category, techniques for rearing, mounting, and testing spider mites and oribatids are described. One paper, which deals with a useful technique for studying light response in spider mites and other small arthropods, shows how a permanent record of the pathway followed by an animal can be obtained by photographic means.

Two papers in the section on physiology are concerned with the water balance of mites: The concept of "equilibrium humidities" is developed, and the role of the digestive system in the water balance of a spider mite is treated. Biochemical investigations deal with the demonstration of the different components of the cholinergic system and with various esterases in spider mites, along with some aspects of the carbohydrate metabolism of these mites. Other papers are concerned with problems of resistance to miticides in spider mites in relation to the genetics, selection pressure, and cross resistance.

A comprehensive review of tick-borne diseases and a study of transmission of plant viruses by Eriophyidae are given in the treatment of disease transmission.

The part on systematics contains an interesting paper on the reproductive isolation and taxonomy of some spider mites and another on the reevaluation of the names of some common mites of this family. There is a survey of mites endoparasitic in vertebrates, and the application of numerical taxonomy to acarology is discussed. Phylogenetic considerations on Oribatei and Phytoseiidae and taxonomic characters of Trombiculidae are discussed. These papers, of course, cannot represent the current trends in acarine systematics as a whole.

In the section on acarine behavior a valuable paper, which is based on experimental research, deals with the relations between host-finding behavior and life histories in ectoparasitic Acarina. Studies of reactions to light show that two types of response within populations of *Tetranychus urticae* can be distinguished. These are probably caused by transient physiological factors. One paper is concerned with the relationship between humidity and the behavior of some species of ticks.

Although the papers in this volume represent only a small sample of the current advances in acarology, they nevertheless indicate the diversity of recent work. Thus, this book should interest workers in basic and applied disciplines allied to acarology as well as acarologists.

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Metazoan Evolution

The Lower Metazoa: Comparative Biology and Phylogeny. Ellsworth C. Dougherty, Zoe Norwood Brown, Earl D. Hanson, and Willard D. Hartman, Eds. University of California Press, Berkeley, 1963. xii + 478 pp. Illus. $17.50.

The Evolution of the Metazoa. Jovan Hadži. Pergamon, London; Macmillan, New York, 1963. xii + 499 pp. Illus. $14.

A rather small, quiet, and hardy band of zoologists is studying the more primitive groups and lesser lights of the animal kingdom in an effort to increase our understanding of evolution in general and of the phylogenetic basis of animal classification in particular. Diversity of nationality and language characterizes this group, and its research results have been scattered and sometimes inaccessible, even to its members. These two complementary volumes, the first in English on the subject, should direct attention to these studies.

The Lower Metazoa is a well-produced symposium volume that offers extensive and intensive coverage of its subject. About two-thirds of the 34 chapters deal directly with phylogeny and provide a forum for both sides of several polemics; the debate is often lively. The main arguments concern the type of Protozoa that gave rise to multicellular animals, the most primitive group of the latter, the nature of the process by which this immensely important evolutionary change occurred, and the origin and early evolution of body cavities. The controversies are fundamental but frustrating for, as T. Komai states, "Discussion based on the scanty, outdated information now available to us will contribute very little to the advancement of animal phylogeny."

The Yugoslav biologist Jovan Hadži, whose controversial and provocative views have stimulated a reexamination of the evidence concerning modes of early metazoan evolution, began his career 60 years ago. His first publication (in 1906) has been followed by 60 others, about half in Serbo-Croatian and half in German. *The Evolution of the Metazoa* summarizes the views he has developed, and those of earlier workers he cites extensively, rather than contributing new information or a balanced, heuristic synthesis. Hadži states at the outset that his main concern is the origin and position of the Cnidaria in animal classification, and the exposition and defense of his concept occupy more than half the book. The rest of animal evolution follows necessarily, and the remaining groups are more concisely treated. Despite its general title, the book's emphasis is thus also on lower Metazoa.

Hadži's main and most controversial points are (i) that Cnidaria evolved from turbellarian ancestors, the Anthozoa being primitive and fundamentally bilaterally symmetrical; radial symmetry developed as a consequence of a sessile mode of life, and the other classes evolved in turn from Anthozoa; and (ii) that bilateral symmetry is primitive in Metazoa, the acoel Turbellaria are the most primitive Metazoa, and their ancestors were very primitive ciliates. The latter shared characters with their flagellate ancestors, enabling Hadži to consider the Flagellata "direct antecedents of the Eumetazoa."

Much fruitful discussion in *The Lower Metazoa* was stimulated by some of Adolf Remane's equally provocative and controversial ideas, which are made easily accessible to American students in three valuable chapters of this book. Remane's view of metazoan origin is classical, flagellate colonization, and variations of the classical view are stoutly defended by P. Ax and V. N. Beklemishev, while Hadži's allies are O. Steinböck and E. D. Hanson. Hanson applies Remane's criteria of homology to evidence for the second point of Hadži's theory. The major criterion is not met; Hanson offers the striking evolutionary changes between ancestral ciliates and descendant acoels as the reason. The chapter in which Remane argues for the primitive nature of the coelum in the Bilateria and its origin only once and in an enterocoelous manner is next to "A critique of the enterocele theory," in which W. D. Hartman concludes that Remane's theory is supported by insufficient evidence to meet his own criteria of homology.

There are also several important chapters on relationships and evolution of sponges, turbellarians, and pseudocoelomates and on comparative biology of Cnidaria and Platyhelminthes. Half the chapters in *The Lower Metazoa* are by authors whose native tongue is not English, and the clarity of presentation places American readers much in debt to the authors and the editors, who translated several chapters and coped successfully with formidable differences in terminology and classification. The language problem is not so happily solved in Hadži's book. It is translated from German and has many rough and a few unintelligible passages. The editing is marred by many typographical errors and by disconcerting bibliographic mispellings.

Hadži, Komai, and E. Baldwin call for observations and experiments to provide new factual evidence relevant to animal phylogeny, especially from biochemistry, where modern analytical methods are largely untried but promise results of great interest. Hopefully, these volumes will stimulate the search for new evidence at all levels of organization.

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Paleoecology

Late Eocene Zoogeography of the Eastern Gulf Coast Region. Alan H. Cheetham. Geological Society of America, New York, 1963. xii + 113 pp. Illus. $3.75.

This work, a valuable contribution in the field of paleoecology, is on the whole an exposition of method rather than a solution to problems. In a region where it is difficult to offer an interpretation that has not been made before, this article superimposes the systematics and ecology of the Cheilostomata (order of Bryozoa) on the known geology, and constructs a model that might be used interpretively in other regions.

In the introductory chapter, Cheetham reviews the regional relationships of the lithologic units and the faunal zones. Aside from renaming as bryozoan zones two faunal zones in the Ocala Limestone that were formerly distinguished by Foraminifera and Ostracoda, no new terms are introduced.

The distribution of species and the ecologic associations of species are shown on maps and in lists. Diagrams that contrast the relative abundance of the different colonial morphs of cheilostomes with the abundance of other organisms in three different areal biofacies, and vertically within each biofacies, are skillfully presented.

Probably the point of greatest interest to geologists is the confirmation of the Ocala Uplift as a submerged Bahamas-like bank (Biofacies 4) in Jackson (late Eocene) time. A depth of 50 meters is postulated for the top of the Ocala Bank in early Jackson time. By late Jackson time the bank was tilted so that its north end was nearly awash and its south end was more deeply submerged. The Ocala Bank was separated from the continental shelf by the Suwannee Strait (Biofacies 3), which, although much shallower, is compared with the present Florida Straits. Sediments in the Suwannee Strait (the Gadsden Limestone of Moore) contain only buliminid and lagenid Foraminifera. Because the strait sediments include dolomite, it is inferred (after Fairbridge) that the depth of these sediments could not have exceeded 200 meters; 180 meters is accepted as the probable depth. A shallow carbonate facies is present on the shelf in western Florida and southeastern Alabama (Biofacies 2), but it passes into terrigenous clastic sediments in western Alabama (Biofacies 1).

The uppermost faunal zone studied is termed the *Spondylus dumosus* zone and is assigned to the Oligocene. It includes the Bumpnose Member of the Crystal River Formation (of Moore) and the Red Bluff Clay, both of which contain *S. dumosus*, and the Shubuta Member of the Yazoo Clay, which does not. The following statement is unsupported: "In central Alabama the Bumpnose grades into the Shubuta Clay and the Red Bluff Marl." I know of no surface continuation with either. That the cheilostome bryozoans of the Bumpnose, Red Bluff, and Shubuta "are more closely akin to those of the Vicksburgian than to those of the Jacksonian" and thereby establish an Oligocene age for all of these beds is no more justified than would be the assumption that the Vicksburg fauna is foreshadowed in late Eocene and early