desertification of the temperate-climate region of southern Tibet is mentioned only by several non-Chinese participants.

Chinese scientists are moving to end their long isolation by sharing their findings with, and by learning from and collaborating with, scientists throughout the international community. These volumes place all of us interested in a unique part of the world much in the debt of the organizers of the symposium. It is to be hoped that expanded reports, to be released outside China, will present the detailed bases for conclusions summarized in the volumes.

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Dasyurids and Their Kin

Carnivorous Marsupials. MICHAEL ARCHER, Ed. Royal Zoological Society of New South Wales, Mosman, Australia, 1982. In two volumes. xvi, 804 pp., illus. $49.

Modern biology is perfused with the notion that research should not be organism-oriented. Rather, organisms serve researchers by providing vehicles for the testing of hypotheses of general interest. This two-volume work is ample testimony to the continuing power and utility of interdisciplinary focus on groups of organisms. It is based on a symposium organized by Michael Archer and held in Sydney in May 1980. Archer and the officers of the Royal Zoological Society of New South Wales, which sponsored the symposium, decided, after several discouraging approaches to commercial publishers, to find their own printer for the proceedings. This meant that Archer handled the editorial chores, the society tended to the business aspects, and the book is being sold at cost. I find the volumes impressive not only because of the generally high quality and current interest of their content but because of their luxurious quality and relatively low price. Both volumes have color frontispieces, and each paper is adorned with a small black-and-white drawing inset next to the abstract. An especially thoughtful feature is a summary in Spanish provided for each paper.

The scope of the volumes is not as extensive as the title implies. A very large fraction of the species of marsupials are carnivorous or at least omnivorous, and especially is this true for the Western Hemisphere forms. Yet these volumes deal almost exclusively with Australian species, even New Guinea representatives being only occasionally mentioned. Ostensibly, the symposium was to cover the families Dasyuridae, Thylacinidae, Thylacoleonidae, Myrmecobiidae, and Notoryctidae. In fact it is largely a treatise on the diverse and fascinating members of the Dasyuridae (over 50 species ranging in size from a 3-gram *Planigale* to the 9-kilogram Tasmanian devil, *Sarcophilus*). Of the 63 papers following the introduction, one is a philosophical essay on building phylogenies (by J. A. W. Kirsch), four treat marsupials generally, five concern the extinct marsupial lion *Thylacoleo*, six are on the Tasmanian wolf or thylacine, and 47 are on dasyurids. None of the papers focuses on the numbat (Myrmecophagidae) or the marsupial mole (Notoryctidae). In spite of these biases, the volumes are amply justified. It affirms one's faith in science to read a multidisciplinary and synthetic treatment given to a group of organisms about which almost nothing was known just 20 years ago. In this sense, *Carnivorous Marsupials* is a tribute to Australian mammalogists.

Aside from bringing together available information on a large group of mammals, the book has much of interest for the evolutionist, ecologist, ethologist, physiologist, paleontologist, and even conservationist. A foreword by John Calaby, mammalogist and leading historian of Australian biology, gives an absorbing history of the study of Australian carnivorous marsupials beginning in 1770 with the voyage of the *Endeavour*. Did you know that Errol Flynn's father (T. T. Flynn) was a professor of biology in Tasmania and did pioneering research on reproduction in the Tasmanian devil? Archer in his introduction writes informally and enthusiastically about the symposium, its publication in these volumes, and the "beasts" that are its heroes. A total of 69 papers were submitted for publication. All were reviewed by two referees and 63 were accepted. A few of the papers I found to be weak, but in general the quality is excellent. The papers are arranged in six sections: Reproduction, Ecology, Physiology, Behaviour, Palaeontology, and a miscellaneous collection on Morphology, Cytology, Genetics, Electrophoresis and Phylogenetic Relationships. These are followed by an index to taxonomic names and a list of errata.

Four of the six major sections are introduced by significant review papers. Initiating the section on reproduction is a review of life history strategies in dasyurids by A. K. Lee, P. Woolley, and R. W. Braithwaite. Their story begins with the pioneering research of Woolley, who in 1966 described her discovery of a monestrous strategy in *Antechinus stuartii*. This pattern, now known for nine species in the family, involves all of the adult males' dying shortly after a brief annual breeding season. Moreover, only a few females manage to breed in more than one season. Enough is known of 30 species for the authors to assign them to six general life history categories. The ecology section is launched with a review of dasyurid ecology by B. J. Fox. He concludes that the general arthropod diet of this group leads to a low number of species living microsympatrically. This plus a generally significant sexual dimorphism leads to expanded niche widths. Hence sympatric species are markedly different in size (differences exceed the theoretical minimum limiting similarities), and there is marked habitat segregation of species in the same general area. An excellent review of communication in the dasyurids by D. B. Croft introduces the behavior section. Social behavior in this family seems limited to mating and maternal care. The repertoire of communication signals is comparable in size, however, to that of similar eutherians. Finally, Archer's review of the dasyurid fossil record includes a model effort to synthesize paleontological and neontological data into a classification of the family (nine groups at the subfamily level are recognized).

For those interested in the increasingly prevalent phenomenon of extinction, two papers are recommended. One (by Smith) is a good general review of the probably extinct thylacine and offers some comments regarding causes of its extinction. The second (by K. A. Johnson and A. D. Roff) is a fascinating and comprehensive account of the extinction of the western quoll (*Dasyurus geoffroii*) in the Northern Territory. Some of their evidence comes from interviews with old aboriginal men who remembered the quoll from their youth. The authors postulate that extinction was caused by a combination of competition with European foxes and feral cats, the movement of aborigines to missions, resulting in a cessation of the practice of patchy burning of the countryside in favor of less frequent but larger-scale fires, and invasion of European rabbits, who destroyed the vegetation during drought periods, causing loss of native prey for the quoll.

The final paper to be mentioned is that by F. S. Szalay giving a new appraisal of marsupial phylogeny. Although Szalay's conclusions are based largely on tarsal morphology, other kinds of characters

are incorporated, and the results seem well supported. He proposes four orders of marsupials arranged in two cohorts: the Ameridelphia, which includes all Western Hemisphere forms with the exception of the small opossum *Dromiciops*, and the Australidelphia. This arrangement of *Dromiciops* is also supported by karyotypic evidence (Sharman) and has obvious zoogeographic significance.

Naturally, there are things to criticize in such a large and complex undertaking. There are too many typographical errors and too many of the figures were poorly designed for the required reductions in size. I find it unacceptable to include, as some authors have, the distinctive dasyurid *Antechinomys* within the genus *Sminthopsis*. Except for dental morphology, all other aspects of anatomy and the isozyme data support separate generic status for *Antechinomys*. Rather than list deficiencies and disagreements, however, I prefer to emphasize the major contributions made in these two volumes, their welcome synthesis of various viewpoints and approaches, and the genuine effort that was apparently made to keep the authors in communication with each other. This seems to have been a symposium true to the literal sense of the word, and the volumes are ones any biologist would be pleased to own. They are clearly essential for any mammalogical library and are to be recommended for any scientist or research group concerned with the comparative approach to ecology, physiology, behavior, paleontology, or evolution.

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Biochemistry

Structure and Function Relationships in Biochemical Systems. Proceedings of a symposium, Rome, Sept. 1981. FRANCESCO BOSSA, EMILIA CHIANCONE, ALESSANDRO FINAZZI-AGRÒ, and ROBERTO STROM, Eds. Plenum, New York, 1982, x., 386 pp., illus. $49.50. Advances in Experimental Medicine and Biology, vol. 148.

The work of Alessandro Rossi Fanelli provides the focus in this proceedings of a symposium organized to celebrate his 75th birthday. A concise and vivid profile of Rossi Fanelli from both a personal and a scientific perspective is provided by N. Siliprandi in the opening paper. This is followed by a unique statistical analysis by W. E. Blumberg of the honoree's publications and collaborations.

The rest of the volume consists of 26 scientific papers that are divided into five sections. The first is titled Hemoglobin, Myoglobin, and Other Respiratory Proteins and is composed of a theoretical paper by Wyman, discussions of mammalian, fish, and invertebrate hemoglobins by Perutz, Gibson and Carey, and Antonini *et al.*, and a paper on the effects of heavy metals on respiratory proteins of marine organisms by Bonaventura *et al.* Perutz's paper incorporates the extensive literature on this subject in a concise, up-to-date view of hemoglobin structure and function. The papers by Gibson and Carey and Antonini *et al.* serve to emphasize the utility of studies of hemoglobins from fish and invertebrates and their contribution to our understanding of mammalian hemoglobin structure and function.

The second section, Mechanism of Action of Metal-Containing Enzymes, deals extensively with present knowledge of the structure and function of cytochrome *c* oxidase. Papers by Malmström, Chance *et al.*, and Brunori *et al.* discuss current views regarding the participation of the Cu and heme centers in the reduction of O_2 to H_2O as well as structural alterations involved that may be relevant to the role of this redox protein in energy coupling. An excellent paper by Beinert discusses the influence of conformational alterations on function for a number of enzymes containing iron-sulfur centers in addition to cytochrome *c* oxidase. The role of Cu in enzyme-catalyzed reactions is also treated in papers on the well-studied Cu-Zn superoxide dismutase and the less understood amine oxidases.

The third section, Bioenergetics, Membrane Structure, and Multienzyme Complexes, serves to remind us of the role of supramolecular organization in the functional control of biological processes. Topics addressed range from protein-membrane interactions to enzyme-enzyme interactions, with excellent papers by Lehninger on mitochondrial energy transduction and by Reed and Oliver on the pyruvate and α-ketoglutarate dehydrogenase complexes.

Modulation of the chemical function of the bound coenzyme by the environment provided by the host apoenzyme is discussed in the fourth section, Cofactor-Dependent Enzymes. Excellent papers by Snell and by Massey deal respectively with the comparative aspects of pyridoxal phosphate and pyruvoyl-dependent amino acid decarboxylases and with the correlation of flavin environment with function in a number of flavoenzymes.

The final section, Sulfur Metabolism, consists of a review of the chemistry and biological occurrence of persulfide groups by Wood and one of the biological utilization of selenium- and sulfur-containing amino acids by De Marco and Di Girolamo and a paper on some interesting observations of chemical reactions of selected sulfur-containing amino acids subsequent to enzyme-catalyzed oxidative deamination by Cavallini *et al.*

The volume is readable and informative. The papers are, in general, well written and provide concise, current treatments of their respective topics.

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An Era in Classical Physics

Energy, Force, and Matter. The Conceptual Development of Nineteenth-Century Physics. P. M. HARMAN. Cambridge University Press, New York, 1982. x, 182 pp., illus. Cloth, $27.50; paper, $8.95. Cambridge History of Science.

To laypersons classical physics has long been epitomized by Newtonian mechanics, in contraposition to the relativistic mechanics and quantum mechanics of our century. Peter Harman seeks to reform that consciousness by displaying for a non-mathematical audience the great subtlety and variety in the mechanical worldview of 19th-century physicists. The reader will see that energy physics, thermodynamics, electromagnetic field theory, and statistical mechanics were a long way from Newton. They were also a long way from Einstein and Bohr, but not so far as we imagine when we think of mechanics only in terms of forces acting between atoms in conformity with the laws of motion. During the second half of the 19th century "classical" physics posed for itself puzzles that still haunt those who wish to understand nature. What is an electromagnetic field? What is the meaning of the second law of thermodynamics? How are we to conceive that randomness in nature which seems to require a probabilistic description at the most fundamental level? Such are the questions to which Maxwell, Wilhelm Weber, Helmholtz, Boltzmann, William Thomson, Hertz, and others equally renowned sought answers. Their subjects did not exist in 1840, but by 1900 these men had upset the foundations of mechanical philosophy in their attempts to elaborate it.