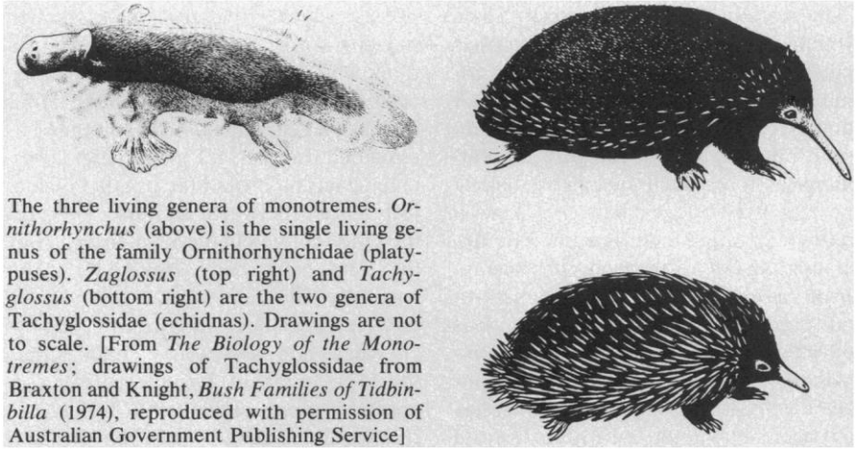
Prototheria

The Biology of the Monotremes. MERVYN GRIFFITHS. Academic Press, New York, 1978. x, 368 pp., illus. $31.

Although the unusual nature of the monotremes was recognized well before they were known to be oviparous, real knowledge of their biology languished until the last decade, largely because of the dismissive assumption that they were aberrant and primitive. The renewed interest in monotremes was largely stimulated by Mervyn Griffiths's book *Echidnas*, published in 1968, and much of the work he reviews in *The Biology of the Monotremes* has resulted from that stimulus. Indeed, almost half the 500 references cited in the book have been published in the last ten years.



The three living genera of monotremes. *Ornithorhynchus* (above) is the single living genus of the family Ornithorhynchidae (platypuses). *Zaglossus* (top right) and *Tachyglossus* (bottom right) are the two genera of Tachyglossidae (echidnas). Drawings are not to scale. [From *The Biology of the Monotremes*; drawings of Tachyglossidae from Braxton and Knight, *Bush Families of Tidbinbilla* (1974), reproduced with permission of Australian Government Publishing Service]

This is still a field of zoology where one person with the mind to do it can command the whole subject, and Griffiths is such a person. He has written a book that considers everything of importance that has been written on monotremes from their discovery in 1782 until late last year, and an appendix includes notes on still more recent studies. The review of published work is informed by the author's own wide knowledge of and research on echidnas, platypuses, and zaglossids in many parts of Australia and New Guinea and is enlivened by his direct, uncomplicated style of writing.

All students of comparative zoology are aware of the extraordinary mixture of mammalian and sauropsidan features possessed by the monotremes, and in this book we learn that the mélange, as Griffiths calls it, extends from gross anatomy to the microscopic and molecular levels of organization. Thus the sclera of the monotreme eye consists in part of a cartilaginous cup unknown in any marsupial or eutherian; the partially coiled cochlea is intermediate between those of Jurassic and living mammals but contains an expanded lagena and macula acustica unknown in mammals and similar to that of birds and reptiles; the sperm are sauropsidan but the mammary glands wholly mammalian; and the keratin of hair and the crural spur is composed wholly of the α species, as is the keratin in all other mammals.

In their thermoregulatory adaptations, however, both echidna and platypus fall well within the ranges of comparable eutherian and marsupial species. Griffiths challenges the notion that the standard metabolic rates of monotremes are more primitive than those of other orders of mammals. He refers to unpublished work by Grant that shows that the platypus has a capacity to withstand low water temperature unequalled by diving mammals such as muskrat, beaver, and polar bear. Similarly, the echidna can cope very effectively with low ambient temperature and when fasted can hibernate and become hypothermic in association with adrenocortical responses. In both species these adaptations are reflected in enzyme kinetics and isolated tissue metabolism similar to those of eutherian mammals rather than to those of poikilothermic animals.

Griffiths compares monotreme and marsupial modes of reproduction in detail and emphasizes the important facts, which have escaped some recent reviewers, that although monotremes lay eggs these are very much smaller and less yolky than sauropsidan eggs and that intrauterine development in monotremes depends, as it does in marsupials, to a considerable extent on uterine secretions, probably controlled by an active corpus luteum. The hatchling monotreme and neonatal marsupial are remarkably similar. The post-hatching development of echidna and platypus and the mode of milk synthesis and secretion are described. The milk changes markedly in composition during the course of lactation in a way similar to that of marsupials, and the changes in both are related to the changing requirements of the dependent young.

In the final chapter the relationships of monotremes to other mammals, living and extinct, are discussed. The most important feature of the chapter is Griffiths's reexamination of the homologies of the monotreme braincase, especially the identity of the alisphenoid, a matter long disputed and crucial to understanding the relationship of monotremes to fossil mammals. With a fine series of specially prepared skulls Griffiths provides the best evidence yet for the structural homologies of the side wall of the skull in echidna and platypus. This evidence and that from dental anlage in the platypus dentary strengthens considerably the old view of Cope that the monotremes are living descendants of the multituberculates. With the new finds of multituberculates in Mongolia and elsewhere Griffiths's studies are timely.

This is undoubtedly the most important book that has been written on the monotremes. It will be necessary reading for anyone interested in the evolution of mammals and their mode of reproduction, and for others it will be a source of enlightenment about these very fine beasts.

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Quantum Chemistry

Excited States in Quantum Chemistry. Theoretical and Experimental Aspects of the Electronic Structure and Properties of the Excited States in Atoms, Molecules and Solids. Proceedings of a NATO Advanced Study Institute, Kos, Greece, June 1978. CLEANTHES A. NICOLAIDES and DONALD R. BECK, Eds. Reidel, Boston, 1979 (distributor, Kluwer Boston, Hingham, Mass.). x, 572 pp., illus. $59. NATO Advanced Study Institutes series C, vol. 46.

The contributors to this book of symposium proceedings include several scientists such as Peyerimhoff and Buenker who have contributed much to developing variational techniques for studying excited states as well as scientists such