Clearing the decks

Adrian Friday

Comparative Biology and Evolutionary Relationships of Tree Shrews. Edited by W.P. Luckett. Pp.314. (Plenum: 1980.) $39.50, £24.89.

TREE shrews are placental mammals of Southeast Asia. Although not rodents, they resemble squirrels and the Malay word "tupai" is used for both. Of all placental mammals, tree shrews are probably the most enigmatic and differences of opinion concerning their evolutionary relationships

From *Proc. Zool. Soc. Lond.* Vol. XVI, 1848

The pen-tailed tree shrew, *Ptilocerus lowii*, from the plate in the original description by J.E. Gray.

have caused some heated exchanges among mammalogists. Originally included in that ragbag of an order, Insectivora (within which they had been particularly allied with the elephant shrews of Africa), the tree shrews came to be widely regarded as the least-specialized grade of primate largely as a result of the work of Alberta Carlsson and W. E. Le Gros Clark. In this volume there are contributions on the tree shrew skeleton, dentition and cranial circulation, their meagre fossil record, their nervous and reproductive systems, and the molecular evidence for their relationships. Behavioural studies on tree shrews are not represented: distinguished work in this area has already been published, but Luckett implies that it has little to contribute to solving the problem of tree shrew relationships.

Contributors to the volume were asked to consider two questions in their accounts: first, do tree shrews and primates share unique derived characters suggesting an immediate common ancestry; second, are there reasons for supposing that tree shrews, primates, bats and colugos ("flying lemurs") together form a discrete evolutionary group (Archonta) amongst mammals?

It was part of the message from the work of Van Valen and of Martin in the late 1960s that progress in assessing the evolutionary affinities of the tree shrews and other problematic groups, collected together in the past as Insectivora, would be made only if comparisons were made between these animals and all other mammalian orders. However, if Luckett had insisted on such application from all his authors, several of them would have been consigned to a lifetime's work.

The fascination of tree shrews reaches beyond biologists interested in Insectivora (in the widest sense) to include those concerned with the principles of phylogenetic reconstruction. In his introductory chapter, Luckett succinctly summarizes the phylogenetic methods described by Hennig, and uses them to dispose of the early arguments for immediate common ancestry shared by tree shrews and elephant shrews. Particular emphasis is given to the reconstruction of the primitive state for various characters in the hypothetical eutherian common ancestor. In reviewing the evidence of all the contributors, Luckett reaffirms Butler's and McDowell's concept of the isolation of both the tree shrews and the elephant shrews, leaving other Insectivora as an assemblage of animals which may have some claim to monophyly.

It is hardly surprising that there are few firm conclusions concerning the relationships of the tree shrews, although Szalay and Drawhorn reassert the validity of Archonta, a tactic supported in varying degrees by the two chapters on molecular evidence. Inevitably, much recent work on tree shrews has been inconclusive, even destructive, but this might be viewed as a clearing of the decks. In any case, a volume that includes several chapters of thoroughly admirable compilation and evaluation of morphological data is very welcome for that alone. □

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Pedagogical overview of quantum fields

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Quantum Field Theory. By Claude Itzykson and Jean-Bernard Zuber. Pp.700. (McGraw-Hill: 1980.) £26.95, $55.50.

A NEW generation of textbooks on quantum field theory is appearing, and this monumental work of 700 pages promises to become the standard book to replace Schweber's *An Introduction to Relativistic Quantum Field Theory* (Harper & Row, 1961), or Bjorken and Drell's *Relativistic Quantum Mechanics* (McGraw Hill, 1964) and *Relativistic Quantum Fields* (McGraw Hill, 1965), both nearly 20 years old. The subject has moved a long way in that time, and a comprehensive, pedagogical book covering both the traditional material and modern developments is long overdue.

The authors have been lavish and ambitious in their approach. Starting with classical field theory, they build upon an extensive discussion of the Dirac equation towards a thorough treatment of conventional quantum electrodynamics. On the way, all the mathematical formalism needed for the more familiar applications is presented. Also included are some topics that are generally hard to find in textbooks: the Klein paradox, the Heisenberg–Euler effective action, the Fock–Schwinger proper time method, finite temperature states, massive vector fields and the Casimir vacuum force effect. Especially welcome are the treatments of symmetries, the PCT and spin-statistics theorems, and a section on Grassmann algebra.

All the routine machinery of interacting relativistic quantum fields then emerge via the S-matrix and Feynman rules, with extensive applications to quantum electrodynamic processes on the way. Then, on through dispersion relations and analyticity to an extensive section on radiative corrections and renormalization theory. Once again, one welcomes the inclusion of modern topics like Wick rotation, asymptotic behaviour and dimensional regularization.

But all this comprises only the first half of the book! The really attractive feature is the comprehensive treatment of recent functional methods, gauge theories and asymptotics which occupies the last 300 pages. An extensive discussion of non-Abelian gauge fields and spontaneous symmetry breaking opens the way to topics such as the Weinberg–Salam theory, anomalies, Fadeev–Popov ghosts and scaling behaviour in scattering theory.

This valuable survey is written with meticulous care and thoroughness. Although intended primarily for graduate students, there is such a wealth of material that undergraduates will find it useful for reference. Those learning relativistic quantum mechanics will also benefit from the chapter on the Dirac equation, hole theory and hydrogen-like atoms. Certainly, any student of quantum field theory will find everything necessary for a thorough grounding in this increasingly important subject. □

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