purpose *can* be exhibited by a physical mechanism. In pursuit of this goal Boden gives detailed and illuminating expositions of McDougall's views on purpose, instinct, sentiments, emotions, temperament, the organization of behavior by the self-image and "master sentiment of self-regard," and various other topics. In the case of each she offers stimulating suggestions for computer simulation. The book is also generously larded with references, by way of parallel and contrast, to the views of many other psychologists and philosophers. The author may not have succeeded in reviving McDougall as a major force in contemporary psychology (nor indeed was it her purpose to do so), but she has succeeded in providing a fresh context, and some fresh perspectives, for the age-old controversy between mechanism and purpose.

WILLIAM P. ALSTON
Douglass College,
Rutgers University,
New Brunswick, New Jersey

Hominids and Their Relatives

The Functional and Evolutionary Biology of Primates. Papers from a symposium, Burg Wartenstein, Austria, July 1970. RUSSELL TUTTLE, Ed. Aldine-Atherton, Chicago, 1972. xii, 488 pp. + plates. $15.

One of the most widely known contributions of the Wenner-Gren Foundation, and often an important one, to the field of anthropology has been the support and stimulus given to a series of conferences on current anthropological topics from which valuable books have been derived. The system works in this way: a conference organizer is invited to attract participants, who submit drafts of their contributions for private circulation which are then debated by the participants and modified, prior to publication, in the light of the discussion. In effect, the academic wash is put through the machine in private, in contrast to the treatment meted out to those who brave the *Current Anthropology* technique. The conference from which the volume under review stems was held at a castle in Austria, according to Tuttle in an "enriched environment," whatever that means in human ecological terms.

The think-tank situation has a lot to offer in interactions among those who participate and in the topics that are under discussion; but inherent in the use of the system are several questions that must be raised. Clearly, whoever acts as convenor, whom he selects to participate and what is to be discussed are crucial to the success of the conference and therefore to the published volume that results. Scientific elitism of this kind can succeed only in the presence of an elite whose areas of expertise are so closely related that in the process of debate the refinement can operate effectively. It is not for a reviewer to comment on the choice of the participants, but it seems open to question that a conference as broadly based as that covered by the title of this book can produce debate of the quality that has been reported in some earlier publications of this series. The decision to exclude the transcript of discussions from publication is disappointing, for the reader is denied the pleasure of following the arguments that led to new conclusions, and more particularly those that led nowhere.

The papers are grouped into five sections, on fossil primates, on skull structure, on brain and endocasts, on limb morphology, and on behavior, any one of which is worthy of a conference on its own account.

In the fossil primate section Szalay gives a useful review of the earliest primates, with a personal flavor, and Simons and Pilbeam review the current state of hominoid paleontology and explore the global prospects for new excavations. In the same section Tobias provides an updated catalog of early man in sub-Saharan Africa and touches on sexual dimorphism, posing again the question of its relevance in australopithecine studies.

The section on skull morphology exemplifies the broad approach in that it contains a most stimulating and provocative essay by Cartmill questioning the arboreal explanation of primate skull features. Much of his evidence is negative, in that it exemplifies other arboreal mammals that are without the primate specializations usually said to be due to tree life, but his case is closely argued and of great interest. Howells's new analysis of modern human cranial dimensions shows that interpopulation differences involve the same morphological pattern as individual variation within populations.

Stephan, Radinsky, and Holloway all wrestle with an intractable field of research. The study of cranial endocasts seems like an assault on Everest, necessary because this material exists to be conquered, even though it appears biologically almost unassailable.

The postcranial morphology section is uneven, the matters included ranging from a simple investigation of the vertebral anatomy of primates to the world of Fourier optics, lasers, stressed plastic cut-outs, and "multivariate morphometric" analyses, all exemplified by the remark, "This is comparative anatomy at the flick of a switch" (Oxnard, p. 345). Perhaps the peak of the distribution is the meticulous work reported by Tuttle on catarrhine hand muscles.

The section on behavior is rounded off by an amusing and informative piece on mathematical modeling by Cohen. His astringent style and realistic approach to research revived your reviewer and restored his faith in behaviorists.

This is a book for specialists, each of whom will find something of importance. It is a volume of loosely grouped papers and not the outcome of a concerted scientific attack on a specific problem with the big guns deployed. If the emphasis was intended to be on "research strategies," the outcome was results; but then results are far more interesting anyway.

M. H. DAY
Department of Anatomy,
St. Thomas's Hospital Medical School,
London, England

Problems in vitro

Invertebrate Tissue Culture. Vol. 1. C. VAGO, Ed. Academic Press, New York, 1971. xiv, 442 pp., illus. $25.

Choose almost any review on invertebrate (or insect) tissue culture written during the past 15 years and the first paragraph will contain a sentence stating how unexpectedly difficult it has been to obtain actively proliferating cells in vitro. After reading J. L. Vaughn's introductory chapter on culture media one might justifiably wonder that we have had any success at all.

Optimally, a culture medium should provide the nutritional and physical factors to insure that the metabolism of the cells in vitro closely approaches that of their counterparts in vivo. One means of determining such factors is simple empirical testing; another is quantitative analyses. That the latter means has been woefully neglected is made apparent in Vaughn's review: ". . . very little investigation of the anion requirements of invertebrate cells *in vitro*"; ". . . few studies . . . on the amino acids requirements"; ". . . use of carbohydrates . . . has been investigated only