by natural selection and a tendency toward diversification which have parallels (not merely analogies) in the biological realm. However, the biological notion of the population and Meggers's concept of "culture" or "cultural configuration" are not equivalent. The latter are catchall labels that cover an unsystematic assortment of beliefs, practices, and objects "that characterize a particular group and distinguish it from similar groups" (p. 42). A culture thus consists of *traits* which are each assumed to be separately "adaptive" in a particular ecological situation. Natural selection is reduced to a functional adjustment of miscellaneous traits to environmental pressures, and evolution as applied to culture remains an analogy, despite the author's insistence to the contrary.

More successful are the descriptive sections of the book, in which Meggers analyzes the selective pressures in two distinct geographical zones, the *terra firme* or unflooded land, and the *várzea* or periodically inundated floodplain. In my opinion, however, the ethnographic illustrations do not adequately demonstrate the significance of these pressures for the *terra firme*. It is surprising that Meggers does not refer to published sources (including the work of Goldman, Carneiro, Murphy, and Wagley and Galvão) which contain considerably more ecological information than some of those upon which she relies, whose data are fragmentary.

Despite these shortcomings, *Amazonia* provides the most comprehensive anthropological discussion so far of the Amazon basin as a human habitat. For this reason, and because it does indeed pose some critical questions about modern man's attempts to exploit the tropical rain forest, this book will stimulate interest in what is most obviously needed: a program of intense, multidisciplinary research in the Amazon basin.

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Evolutionary Anthropology

The Brain in Hominid Evolution. PHILLIP V. TOBIAS. Columbia University Press, New York, 1971. xviii, 170 pp., illus. $10.

Tobias has written, as we have come to expect, a solid and scholarly book that will be of great interest to paleoanthropologists. Tobias concentrates his efforts mainly on brain size, since that is the parameter most easily measurable, although he cautions that studies of brain size and external shape have to be approached with great care. The primary brain data with which paleontologists generally deal are endocranial casts, and these differ from actual brain casts to a greater or lesser extent because of the presence of the meninges, blood vessels, cranial nerves, and so forth between brain and bone.

Nonetheless, Tobias's useful review of volume measurements, including many new ones, indicates that the hominid brain was expanding steadily from at least 2 million to around 40,000 years ago. When adjustments are made for new dates and other stratigraphic details, this expansion is seen as being steady and fairly regular. The chapters dealing with volume measurements are exhaustively detailed, and are marred only by the fact that the author constructs confidence limits on both means and populations incorrectly.

Tobias emphasizes that paleoanthropologists concentrate on brain size only because that is all they can measure. In fact, increasing brain volume of itself tells us little, since it merely reflects changes in internal brain organization at a variety of levels. The interrelationships are represented by Tobias thus:

Increasing brain size ⇌ Increasing complexity of internal organization ⇌ Changing functional patterns ⇌ Changing behavior patterns.

For the first time, a distinguished physical anthropologist has shifted away, however tentatively, from an excessive concentration on brain size alone. For this shift in emphasis, we must thank most of all the work of Ralph Holloway, Jr., on whom Tobias relies quite heavily for much of chapter 7.

In the final chapters, Tobias discusses the reasons for the brain expansion during hominid evolution. Here he gives what has come to be the "traditional" or "consensus" view, that tool-making was the most important factor, or one of the most important ones, in molding man's evolution. This idea can be traced back at least to Darwin's *The Descent of Man*. Recently, however, a variety of lines of evidence are beginning to suggest that tool- or weapon-oriented theories may not be telling the whole story of human origins and evolution.

There is more to human cultural behavior than the ability simply to learn, or to chip flint. Our behavior differs from the learned behavior of all other animals, including chimpanzees, in such important ways as to render descriptions of nonhuman primate learned behavior as examples of "crude and primitive culture" potentially highly misleading. Human cultural behavior involves a very special form of learning, depending upon learned rules, norms, and values which vary arbitrarily from one culture group to another; our behavior is highly context-dependent, contexts being defined or delimited by the arbitrary learned rules. Tools can be detected in the fossil record; this helps explain, at least in part, the emphasis that anthropology has placed on them. Context-dependent cultural behavior is much harder to detect in the fossil record. One of the great challenges for anthropologists with evolutionary interests in future will be to propose plausible model schemes of behavioral evolution based on what we know of behavior, at all levels, in living primates, including man. There are a few brave souls working in these areas already, but evolutionary anthropology will not come of age until such problems are tackled in a much more sophisticated way.

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Paleoecological Methodology

Introduction to Quantitative Paleoecology. R. A. REYMENT. Elsevier, New York, 1971. xiv, 226 pp., illus. $16.75.

This relatively small book, a first in its field, is well written, lucid, and a delight to read. Potential readers should not be put off by the somewhat austere title, which does little to encourage would-be readers with scanty mathematical knowledge. In fact the book presents a clear account of how one mathematically inclined paleoecologist tackles his subject, and it requires of the reader little more than high school mathematics. The highly personal style will not suit all tastes, but it does result in a very readable account of subject matter which easily could become heavy going.

Apart from a brief, but nonetheless useful, introduction to statistical ideas, the book consists of 28 examples of common paleoecological problems, which are grouped according to the broad topics of orientation dynamics; environ-

mental effects; predators, prey, and population dynamics; spatial paleoecology; and analysis of fossil populations. As well as covering a wide variety of commonly occurring problems, the examples embrace a good selection of the simpler statistical techniques that are in current use. The fact that the examples rely heavily on mollusks and ostracods from the upper part of the geological column is of little consequence. Each example is broken down into logical steps; the problem is discussed, a model is proposed, and a statistical method and accompanying calculations are given, followed by a discussion of the results and, in some cases, suggestions of further possible investigations. A fuller discussion of why a particular method is proposed would, however, have been a welcome addition in many instances. The reader searching for details of a particular technique may be slightly irritated by the fact that differing versions of some techniques are spread throughout the book. This is not a serious drawback, however, and it is largely overcome by the accurate and comprehensive index.

The techniques and worked examples are supplemented by a selection of useful statistical tables and simple Fortran IV programs, which, together with the index and list of references, occupy the last 40 pages of the book. The choice of tables for inclusion is a little curious, some tables referred to in the examples being included while for others the reader is referred to various other texts.

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Early Vertebrates

Palaeozoic Fishes. J. A. MOY-THOMAS. Second edition, revised by R. S. Miles. Saunders, Philadelphia, 1971. xii, 260 pp., illus. $12.75.

It happens all too rarely that someone puts into a very small book such a feeling for the subject and such a concise synthesis of information that the book becomes a classic, having influence far out of proportion to its size. Such a gem was Moy-Thomas's *Palaeozoic Fishes* (1939), as indeed were many of its sister Methuen Monographs on Biological Subjects. But the book ceased to fulfill its function, being overwhelmed by the mass of material described or redescribed since 1950. A new overview has been needed. Specifically, at a time when it is clear that many important questions of general vertebrate morphology and phylogeny can be answered only through consideration of early fishes, and when new information has been accumulating at a high rate, the need is not so much for an encyclopedia (an excellent *Traité* exists, in any case) but for a critical analysis. Even Moy-Thomas, had he lived, might have had a little trouble in trying to revise his monograph to deal with the present state of affairs, but now R. S. Miles of the British Museum (Natural History) has attempted the seemingly impossible revision and has succeeded. By following Moy-Thomas's basic formula, by prolific use of excellent illustrations, and by showing a fine sense for what is important and what can be left out, he presents us with a valuable, unified approach to an all too diverse subject.

Miles has made a few improvements in the organization, putting the appropriate classification at the start of each of the sections and a brief but select bibliography at the end of each. (One wonders why the lists of genera in the classification are not more complete. Presumably they include only those genera mentioned in the text, but a complete listing would have been even more useful.) An excellent feature of the illustrations is a clear scale, notably lacking in other such works. The illustrations have all been drawn (usually redrawn from recent research works) to a common style, and what they occasionally lack in detail they make up in clarity and number. The book has grown in size, but it is not in the slightest unwieldy.

Not surprisingly, Miles has had to produce new classifications in order to bring order where there has been confusion. Whether these particular systems will prevail is not something to discuss here, but they allow a very reasonable organization of the material and cause us to think about it differently. Thus a classification of the Acanthodii with the Osteichthyes has been hinted at for several years, but Miles sets it out and we must now face it on his terms. (But why did he resurrect that unfortunate and confusing term Teleostomi for this new group? Surely a completely new name is needed.) Another idea that Miles outlines to the general reader for the first time is a revised theory of the segmentation of the head that this reader found most convincing.

An excellent feature of the book is the detailed treatment of fine structure of hard tissues. Perhaps the only disappointment is that Miles has not been able to develop more thoroughly the sections of each chapter dealing with "tendencies in evolution." In the cases of the lobe-finned fishes and the actinopterygians, more discussion of the origin of tetrapods and of higher rayfins, respectively, would have been welcome. The treatment of evolution within the Placodermi, however, on which Miles has done a lot of his own research, is excellent and guides us around most of the pitfalls that await him who would do battle with the voluminous works on these fishes.

In short, this is an excellent book and a worthy successor to Moy-Thomas's original.

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Books Received

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Adjustment by Least Squares in Geodesy and Photogrammetry. R. A. Hirvonen. Translated from the Finnish edition (1965) by the author. Ungar, New York, 1971. x, 262 pp., illus. $9.50.

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Advances in Applied Mechanics. Vol. 11. Chia-Shun Yih, Ed. Academic Press, New York, 1971. xii, 370 pp., illus. $18.50.

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Biological Aspects of Alcohol. Mary K. Roach, William M. McIsaac, and Patrick J. Creaven, Eds. Published for the Faculty for Advanced Studies of the Texas Research Institute of Mental Sciences by the University of Texas Press, Austin, 1971. xii, 477 pp., illus. $12.50.

Biological Rhythms and Human Performance. W. P. Colquhoun, Ed. Aca-

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