thor analyzes had a beneficial side, in promoting efficiency, productivity, and economies of scale, which are not given their due. Second, in light of Noble's own insistence upon the importance of human choice and the wider framework within which his findings can be fitted, it is arguable that corporate capitalism is not the crucial underlying variable that the title and general tenor of the book would suggest it to be. In the final analysis, people, not machines or economic systems, harbor the motives and make the decisions that affect the course of history. The human urge to manipulate, exploit, dominate, and control can assume many poses and wear many masks. No system or ideology, however compelling the rhetoric enlisted in its behalf, can in itself bring about a better future.

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Nonverbal Communication

Face-to-Face Interaction. Research, Methods, and Theory. STARKEY DUNCAN, JR., and DONALD W. FISKE. Erlbaum, Hillsdale, N.J., 1977 (distributor, Halsted [Wiley], New York). xvi, 362 pp. $18.50.

Past research on nonverbal communication, or face-to-face interaction, the term these authors prefer, has been notably lacking in conceptual models. Some investigators have even resisted theoretical formulations or the derivation of hypotheses as being prematurely restrictive given the shortage of careful descriptive work on nonverbal behavior. Duncan and Fiske are identified with this conservative position, as is exemplified by their insistence on beginning with exhaustive descriptions of face-to-face interactions before attempting a conceptual model of the structure or grammar of such interactions.

This book, which is aimed primarily at researchers, is divided into four sections. Initially, the area of investigation and the research strategies deemed appropriate to it are outlined. The authors reject experimental methods, such as the use of programmed confederates, in favor of careful observation of interactions that are "as close as possible to natural conditions." The second part of the book describes correlational patterns emerging from such observations of seven-minute videotaped conversations between pairs of 88 graduate students. Thirty thousand acts were coded and correlated with other acts of the same participant, with acts of the partner, and with several self-report measures of personality. Little relation was found between nonverbal acts and self-descriptive scores. The sex differences that emerged led the authors to recommend that future research take the sex of the interactants into account because it appears that men and women do different things in social interactions and that these behaviors differ whether conversations are with a member of the same or the opposite sex.

The third section of the book reports the fine-grained analysis of eight conversations (four of them from the first study). The focus is on the patterned organization of interactions, and the expressed goal of the investigation is to discover the "manner of segmentation" of the interaction into units. The transcription of speech into segmental phonemes provided an anchor for further analyses of paralanguage and body motion. These analyses in turn led to the identification of a unit called the "speaking turn" and its six constituent cues. This section of the book dramatically illustrates both the arduous nature of fine-grained analysis and its considerable rewards. Many researchers will react with dismay to the seemingly tedious nature of these procedures, but the authors make a compelling case that such an approach provides more interpretable data than does the pursuit of arbitrarily derived hypotheses.

Finally, the authors offer a conceptual model with which to organize this wealth of detailed description. The model gives considerable weight to the coordination of mutual expectations in structuring conversations and to the importance of observed conventions in guiding the smooth flow of interactions. The primacy of organized sequences is restated in the model, making the model more descriptive than predictive, which is as the authors would have it.

Overall, this is a difficult and valuable book for those interested in nonverbal communication. Of the three components offered by the title (research, methods, and theory), the book delivers more on the first two than on the third. The model makes good sense of the research findings, but theory it is not; it neither yields testable hypotheses nor connects conventions with any broader interactional framework.

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Mammalian Behavior

African Ungulates. A Comparative Review of Their Ethology and Behaviorial Ecology. WALTER LEUTHOLD. Springer-Verlag, New York, 1977. xiv, 308 pp., illus. $31.70. Zoophysiology and Ecology, vol. 8.

Birds and primates have been the focus of most of the recent hypotheses relating vertebrate behavior and social organization to ecological variables. This book, a scholarly compendium of findings from recent descriptive and quantitative field research, particularly in East Africa, recognizes that the burgeoning number of studies on ungulates provides a corpus of data on another taxon against which the general validity of such hypotheses can be tested.

The arrangement of the subject matter is along classical ethological lines, thus permitting ready access to comparative summaries of maintenance behavior (for example, feeding, drinking), use of space (for example, migratory movements and ranging), agonism, sexual behavior, and social organization (that is, mating systems in relation to territoriality, group size, and hierarchies).

Although such compartmentalization is time-honored and is appropriate for many purposes, it precludes the kind of synthesis that many field workers today see as the goal of behavioral ecology. A list of communication signals, for example, is presented (in chapter 8) without reference either to the social organization of the species using them or to the environments in which they are employed. The treatment thus discourages consideration of such questions as which ungulates use predominantly vocal, which visual, and which olfactory signals for, say, agonistic encounters as a function of habitat structure and interindividual spacing. Deficiencies of this sort, however, do not detract from the usefulness of having such a thorough catalog, supported by a comprehensive bibliography, of ungulate behavior.

The treatment of concepts underlying classes of behavior is uneven in quality; however, it never rises to creative peaks or sinks into troughs of error. There is an excellent discussion of territory, home range, and dominance, concepts that are frequently confounded. On the other hand, similar care is not taken to disentangle the concepts of aggression, threat, agonism, antagonism, and combat, these being as frequently misused in the literature as those in the preceding list, although Leuthold himself is always carefully correct in his use of them.

If Leuthold had been equally careful

about evaluating the quality of the information he presents, the usefulness of the book would have been much enhanced. The data on home-range size of 25 African ungulates given in table 3, for example, are taken from studies that ranged in duration from a few weeks (as in the case of the bushbuck) to full annual cycles. The accompanying text warns of potential problems in the comparability of the data, but it would have been appropriate to include information on the duration of the studies as well as an assessment of the reliability of the data. Leuthold's firsthand knowledge of many of the studies he cites and his command of the literature clearly place him in a better position than the average reader to make such an assessment. This lack of interpretation is the book's only substantial weakness as a source of information.

In the chapter in which Leuthold attempts to deal with relationships between morphology, ecology, and social organization, and in occasional statements elsewhere that attempt to impose an evolutionary interpretation on the data, other shortcomings appear. The explanations presented for observed correlations are usually tautological, and alternative explanations are not offered for comparison. For example, the section on weapons and fighting techniques (pp. 111–116) considers the morphology of male horns and tusks in terms of their effectiveness as antipredator defenses and in fights with other males and ignores another major likely influence in their evolution, namely sexual selection. Another example (from p. 250) illustrates the nature of the arguments advanced:

> An important adaptation . . . is mobility, enabling animals to take advantage of irregularly distributed rainfall and associated grass growth. Mobility, in turn, requires relatively large body size, partly related to morphology (length of legs, etc.) and to energetics, partly to possibly increased risk of predation associated with high mobility and thus conspicuousness. In the latter context, gregariousness is also of advantage, particularly in open habitats, and as intragroup competition over food is less likely to be serious in grazers than in browsers, herd-formation will be favored. We may, therefore, expect the most pronounced grazers to be large, gregarious, and relatively mobile. This is indeed the case; examples are wildebeest, oryx and buffalo.

If this relationship illustrated an underlying principle, it could reasonably be expected to hold for ungulates other than bovids (which it does not) as well as for distant taxa.

The reader is cautioned to beware of other such explanations of adaptations. The more reasonable the argument appears the more one should be careful to consider whether new insights have actually been generated and what tests are proposed. Phrasing explanations of behavioral adaptations to ecological variables in the form of testable predictive hypotheses is rare among practitioners of behavioral ecology, and the author is no more to be faulted in this regard than are most advocates of this kind of socioecology and sociobiology.

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Regional Primatology

Primates of South Asia. Ecology, Sociobiology, and Behavior. M. L. ROONWAL and S. M. MOHNOT. Harvard University Press, Cambridge, Mass., 1977. xx, 422 pp., illus. $22.50.

The nonhuman primates of the Indian subcontinent have long occupied a prominent position in human affairs. The monkey god Hanuman is a major figure in the pantheon of Hindu gods and in the great works of Hindu religious literature. Much of our knowledge of human reproductive physiology came initially from studies of the rhesus macaque. This same Indian primate subsequently became important in the development of the polio vaccine in the early 1950's and has been the mainstay of biomedical and behavioral laboratory research ever since. More recently, field studies of the behavior of another Indian primate, the Hanuman langur, have provided the most elegant support for sociobiological interpretations of primate behavior. This volume by Roonwal and Mohnot is a compendium of published information about the 25 species of nonhuman primates that inhabit some parts of South Asia.

In organization and spirit the book resembles a mammalian field guide, giving information on distribution, vernacular names, external characters, and systematics for each species. It is set apart from other handbooks, however, by the extensive summaries it includes of the ecology, sociobiology, and behavior of the individual species. The authors, a distinguished mammalogist and a primate ethologist, have reviewed and faithfully recount the results of hundreds of laboratory and field studies. The strength of the book lies in these summaries. The coverage of such topics as anatomy and physiology is much less thorough. At the end of the book the authors provide a bibliography of nearly 1350 entries. Unfortunately, the bibliography is complete only through 1972 and includes only occasional papers from later years.

A stated purpose of the book is to provide a "consolidated picture" of research on South Asian primates that will also highlight the lacunae in our knowledge. In a summary book such as this it is the lacunae that are most conspicuous. While the rhesus macaque occupies more of the text than any other species, only two of the nearly 500 references cited for this animal describe long-term observations of forest populations in India. Likewise, despite a number of studies that have been carried out in recent years, our knowledge of the varied leaf-eating monkeys of Asia is still dominated by studies of the sacred hanuman langur of the Indian subcontinent, a species that is more terrestrial and omnivorous than most other colobines. Indeed, one species, *Rhinopithecus roxellanae*, the snub-nosed langur of China, is so poorly known that the authors could not even confirm its distribution in South Asia.

As a reference work and summary of earlier studies, this book should be a valuable addition to anthropology and zoology libraries throughout the world. One hopes that it will also serve a greater purpose by inspiring and facilitating more indigenous research on the many primates of this region.

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Estuaries

Estuarine Processes. Papers from a conference, Galveston, Texas, Oct. 1975. MARTIN WILEY, Ed. In two volumes. Vol. 1, Uses, Stresses, and Adaptation to the Estuary. xviii, 542 pp., illus. $22. Vol. 2, Circulation, Sediments, and Transfer of Material in the Estuary. xviii, 428 pp., illus. $19.50. Academic Press, New York, 1966–67.

These papers from the third International Estuarine Research Conference are representative of current research on estuaries in that they emphasize dynamic features. Estuarine research has in the past been concerned primarily with such structural features of estuaries as physical and chemical properties, standing crops, and the temporal and spatial dis-