valuable discussions of relevant chemical and biological topics. Some of his interpretations in these sections are unreasonably harsh, personal, and injudicious. The book is marred also by numerous minor errors of presentation and technical substance.

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Primate Socioecology

The St. Kitts Vervet. MICHAEL T. MCGUIRE and members of the Behavioral Sciences Foundation, University of California at Los Angeles. Karger, Basel, 1974. xii, 202 pp., illus. Paper, $20.50. Contributions to Primatology, vol. 1.

The relative accessibility of the large free-ranging population of vervet monkeys (*Cercopithecus aethiops*) on St. Kitts, introduced to the island over 300 years ago, provides unusually good opportunities for observation and experimentation. The main value of this book lies in the efforts of its authors to bridge the gap between the traditional qualitative descriptions of the behavior of free-ranging primates and the more sophisticated experimental techniques used in the study of laboratory animals. The admittedly limited success of their study in terms of results should be assessed against this background; the study may have a considerable influence on the direction of subsequent research.

The approach of the book is to describe the universe of possible behaviors for the vervet and to relate them to environmental variables through a summative reasoning equation (SRE). The starting point is a discussion of the ecology-influences-behavior and innate-repertoire hypotheses.

Food and water, range use, sleeping locations, and day plans are examined in terms of the SRE. Then there is a similar treatment of ranging behavior, group cohesion and dispersion, age and sex differences in behavior, play, grooming, hierarchy, sexual behavior, and group fission. The SRE is used to relate such conditions as population density, sources of disturbance, and birth and mating seasons to such behaviors as cohesion, coalitions, consort, aggression, play, and grooming.

The comparison of calls and gestures of vervets on St. Kitts and at Amboseli, which concentrates on variety (there is less on St. Kitts) rather than frequency, provides material for the subsequent discussion of elicited behavior and multiple social systems hypotheses and for a revision of the SRE.

Finally, the results are used in the discussion of some theoretical matters: population genetics of the vervet, including comparison between the island populations of St. Kitts and Lolui; the likely decreased genetic variability of the St. Kitts vervet; the concept of adaptation and its relevance to field studies; and the basis of socialization in terms of drive, sequential, reciprocal interaction, and drive consummation theories.

The authors bring refreshingly new ideas into the discussion of the behavior of free-ranging primates; these ideas may have an important part to play in the development of our understanding of, for example, the relations between environment and behavior. There is, however, a paucity of relevant data for the numerous hypotheses and formulas. Although the authors apparently recognize the complexity of relationships, such quantitative analyses as they provide are often insufficiently refined and detailed.

There is an emphasis on relatively crude measures of human and nonhuman disturbance and of population size and the tension of monkeys, but neglect of quantification of component behaviors in day plans, cohesion and dispersion, ranging patterns in relation to different biotic divisions within a group range (or territory), and the distribution therein of foods and feeding time. In the absence of such data the authors' conclusion that nutrients have no obvious effect on behavior can be of little value.

Qualitative data and involved theoretical discussion might have been portrayed graphically to greater effect, and the absence of photographs of monkeys and habitats is disappointing. So far there have been no experiments. The reader is told that there are important differences in behavior between the monkeys inhabiting forested ravines and those inhabiting the savanna-bush peninsula, but the nature, degree, and possible significance of these differences are not clear. The transposition of social groups from different biomes might help resolve the authors' speculations concerning the effects of habitat on behavior. There are several other instances of convoluted discussion, obscure conclusions, and arguments weakened by the lack of important evidence.

The authors' grasp of and ability to manipulate theoretical behavioral concepts are impressive. The theoretical framework they have built may be a major step forward in the quantitative description and interpretation of primate populations and social structure, yielding a fuller understanding of primate socioecology. The authors might, however, have paid more attention to recent advances in data collection and analysis in the field. Their perplexity on completion of their task is understandable; the problems facing primatologists are frustrating in their complexity, and solutions to many of them are possible only after detailed long-term studies. Continued efforts in the unusual situation on St. Kitts have clearly an important part to play in the resolution of these problems.

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Neotropical Biogeography

Avian Speciation in Tropical South America. With a Systematic Survey of the Toucans (Ramphastidae) and Jacamars (Galbulidae). JÜRGEN HAFFER. Nuttall Ornithological Club (% Museum of Comparative Zoology, Harvard University), Cambridge, Mass., 1974. viii, 390 pp., illus. $19. Publications of the Nuttall Ornithological Club, No. 14.

An airplane flight over tropical South America vividly confronts evolutionary biologists with a paradox. In the Amazonian rain forests below lives the most species-rich avifauna on earth. From horizon to horizon stretches the forest, homogeneous in appearance and, except for rivers, which can be circumvented at their headwaters, lacking in obvious barriers to bird dispersal. Yet the work of Mayr and others has shown that isolation of populations by geographic barriers is a prerequisite to speciation. Where are the barriers that permitted all those bird species to diverge?

For a long time the very richness of the neotropical fauna and flora and the size of South America kept neotropical biogeography in an information-gathering stage. Ecologists and evolutionary biologists who sought general principles were warned to turn their attention to the supposedly simpler and clearer problems of the temperate zones. Within