# Book Reviews

## Wild Canids

**Coyotes**. Biology, Behavior, and Management. MARC BEKOFF, Ed. Academic Press, New York, 1978. xx, 384 pp., illus. $34.50.

**Wolf and Man**. Evolution in Parallel. ROBERTA L. HALL and HENRY S. SHARP, Eds. Academic Press, New York, 1978. xiv, 210 pp., illus. $19.50.

Despite popular interest and considerable research effort, much of the biology of both wolves and coyotes remains unknown. In particular, detailed information on the social dynamics of wild populations is not available. We are ignorant of such basic parameters as the role of males in raising pups, the degree to which females may cooperate in breeding, the genetic relationships between members of social groups, and whether sons are more likely than daughters to breed in or close to their parents' territory. The two books under review take different approaches to dealing with the limited information. The book on coyotes summarizes data that do exist, whereas *Wolf and Man* presents a collection of elegant theories without many data to substantiate them.

*Coyotes* is at its best in those chapters that draw together widely dispersed information; the reviews of parasites and diseases, reproduction, and livestock damage by coyotes, which include large summary tables, are excellent. There are good chapters covering taxonomy, communication, behavioral development, and research on other canids as well as recent ecological studies in the Southwest, Minnesota, Iowa, and New England. The contribution by Camenzind on the coyotes of the National Elk Refuge in Wyoming is of particular interest because it reports the results of the first study in which individual coyote groups were recognized and followed over time. The final three chapters cover, with scrupulous fairness, the emotive issue of coyote damage and control: one article is biased slightly toward a conservationist outlook; one reflects more of a stockman's approach; and the third, a review of computer simulations of coyote populations, can remain aloof. Both the authors and the editor can be complimented on the consistently high standards of clarity and thoroughness maintained in the book.

*Wolf and Man* is a volume edited by two anthropologists who emphasize the useful cross-fertilization that is possible between biology and anthropology. The book has three sections. The first gives the most extensive treatment to date of "the carnivore analogy." This is the idea that the forces molding human social organization may be illuminated as clearly by studying social carnivores such as wolves, which are ecologically similar to our ancestors, as by studying our phylogenetic relatives among the primates. The most interesting chapter compares the social organization of the Chipewyan people and that of wolves in an area of Alaska where the two populations extensively hunt the same population of caribou. Little is known about the wolves, but it is in dealing with those aspects of social behavior about which the least is known that biologists and anthropologists generally have the most to gain by cooperation.

The second section of the book deals with the evolution of communication and cognition. It includes data on wolf vocalizations and scent marking, together with some speculation that carnivory, which requires accurate knowledge of a larger home range than herbivory, may have prompted the initial increase in the mental capacities of our ancestors. The final portion is devoted to the interesting suggestion that there are valuable insights into human evolution to be gained by comparing the Pleistocene radiation of hominids of different sizes now being unearthed in East Africa with that of the canids that have inhabited North America over the last 500,000 years. The large, extinct dire wolf is compared to the robust australopithecines and coyotes to gracile forms.

With the exception of two chapters by Mech and his co-workers, the book contains few hard data; a 20-page review of coyote biology cites only three references, two of which were published before 1955. It is unfortunate that some of the interesting ideas are not supported even by the data that do exist, such as the known correlations between home range size and relative brain weight; for other ideas, such as the comparison of canid and hominid skulls, insufficient data are presented to allow accurate assessment. At a theoretical level, the book raises interesting questions about the role and meaning of culture in humans and animals, but naive assumptions concerning the nature-nurture dichotomy and group selection arguments flaw the discussion.

Both books serve to emphasize the need for long-term field studies of known individuals. One hopes that the considerable skills that have been acquired in locating both wolf and coyote dens in order to exterminate the occupants can be utilized to allow biologists simply to sit and watch how these two species run their lives.

JAMES MALCOLM
*Office of Zoological Research, National Zoological Park, Washington, D.C. 20008*

## The Meeting of a Mathematical Challenge

**The Four-Color Problem**. Assaults and Conquest. THOMAS L. SAATY and PAUL C. KAINEN. McGraw-Hill, New York, 1977. x, 218 pp., illus. $22. Advanced Book Program.

The four-color problem is to determine whether any map in the plane (or, equivalently, on a sphere) can be colored in four colors so that no two regions with a common boundary receive the same color. It was first posed by F. Guthrie, a student of A. de Morgan, in 1852. A proof that four colors do indeed suffice was published by A. B. Kempe in 1879, but 11 years later P. J. Heawood discovered a fundamental error in Kempe's reasoning. Since then, many attempts have been made to establish the four-color theorem and many false proofs have been proposed. It is not surprising, therefore, that the recent proof by K. I. Appel and W. Haken was greeted with much skepticism when it was announced in 1976. Although a majority of mathematicians are now willing to accept the Appel-Haken proof, an element of doubt remains because the proof relies heavily on the services of a high-speed computer and cannot be checked by hand.

The indispensable role played by the computer in the work of Appel and Ha-