"Nest of a harvest mouse in an oat field. An oat stem nearby has been bent and incorporated into the nest for extra support." The nest "is a breeding nest made by a pregnant female for her young . . . Sleeping nests are simpler and less dense." [From *Animal Architecture*]

"apparently they do not like the smell of fox." Whatever critics may justifiably say about the pitfalls of anthropomorphism in the study of animal behavior, being able to identify with an animal—to imagine oneself in its different perceptual, and possibly even emotional, world—is undoubtedly a common and valuable trait among working ethologists.

Von Frisch expresses a humble, almost pessimistic attitude about the efficacy of science. Biologists who believe that "the key to life in all its manifestations" can ultimately be found through research "are to be pitied," he says, "for they have never experienced that sense of profound awe in the face of the workings of nature, some of which will forever elude comprehension, even by the mind of man" (p. 287). But such philosophizing is rare in the book. It is clearly intended mainly for entertainment, and as such can be recommended to both amateur and professional students of biology and behavior. It does a good job of immersing the reader, even if only momentarily, in the lives of other animals (the section on birds is particularly vivid). With this book von Frisch seems to be saying: "Here are some of the most striking true animal stories I know. Look at how beautiful and amazing these creatures are. Think of how they must feel, and be kind to them."

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Bioacoustics

Ultrasonic Communication by Animals. GILLIAN SALES and DAVID PYE. Chapman and Hall, London, and Halsted (Wiley), New York, 1974. xii, 282 pp. + plates. $15.75.

Important discoveries in biology have often arisen from the application to biological problems of new techniques or instrumentation developed in other disciplines. It was, for example, the invention of the crystal-controlled oscillator in the physics laboratory of G. W. Pierce that enabled Pierce and D. R. Griffin to first detect the ultrasonic vocalizations of bats in 1938 and subsequently led to the discovery of echolocation. Instruments for studying ultrasound have undergone vast improvements since those early days, and there is now a rapidly growing body of research in ultrasonic bioacoustics. It is now realized that many groups of organisms use sound frequencies above our hearing range for social communication or acoustic orientation.

This book provides a welcome, relatively compact survey of the rapidly growing literature in ultrasonic bioacoustics. It should be of interest to the layman as well as to the scientist. A brief introduction on the properties of sound and methods for studying ultrasound is followed by one chapter on bats, three on insects, one on rodents, and one covering birds, marine mammals, and insectivores. There is also a short appendix in which some of the equations from radar theory are applied to echolocation.

The authors discuss, in so far as is possible, the characteristics and biological functions of ultrasounds emitted by each group of animals, the mechanism of sound production, the nature of the auditory organs, and, to varying extents, the neural processing of auditory information. The distinction between sonic and ultrasonic frequencies is biologically arbitrary, and many of the organisms discussed emit sounds containing frequencies in both of these categories. In at least one case a group of organisms (mole crickets) that has not been demonstrated to produce ultrasound is included for the sake of completeness.

The assets of the book include the application of fundamentals of information theory to illuminate the possible functional significance of different types of sonar pulses used in echolocation, a worthwhile discussion of the physics and mechanisms of insect strigilation, and the first comprehensive review of the literature (most of which has appeared in the last ten years) on ultrasonic communication in rodents. It

is too bad that none of the Russian literature on echolocation is included, and it would seem appropriate to elaborate more on some topics such as the ultrasonic communication and ontogeny of echolocative pulses in infant bats. The brief appendix might also be profitably expanded to further assist those unfamiliar with the application of information theory to animal sonar systems. Nevertheless, Sales and Pye have achieved a reasonably balanced and complete coverage of their subject within the restrictions of a limited space. Their authoritative and readable book will be much appreciated by all who are interested in bioacoustics.

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The New Paleoprimatology

Approaches to Primate Paleobiology. F. S. SZALAY, Ed. Karger, Basel, 1975. x, 326 pp., illus. Paper, $60.25.

Paleobiology and its glamorous sister group paleoanthropology are essentially empirical sciences. Recently, however, their practitioners have applied a veritable battery of new and refurbished techniques, methods, and inferential strategies to the stock-in-trade of their realms, the fossils. "Approaches" is indeed appropriate in the title of this nine-chapter volume. It exemplifies the new paleoprimatology.

Savage (p. 15) looks forward to a halcyon period in which sophisticated geochemical-geophysical methods will permit paleontologists to withdraw their fossils from a central position in geochronological dating and to concentrate instead on paleobiological puzzles. He provides many clearheaded caveats for orthodox practice during the interim.

Russell epitomizes the faunas and environments of four Paleocene localities and more numerous (over 50) early Eocene sites in Europe. Very few European Paleocene forms persisted into the early Eocene, which was characterized by many new types of animals. Russell concludes that only a "mass migration" via a land connection with North America reasonably explains this faunal transition. Europe and North America had more than 50 percent of genera in common during the early Eocene whereas only 20 percent were identical in the late Paleocene (p. 43).

Andrews and Van Couvering's open-minded essay on paleoenvironments and pongid distributions in the East African Miocene is a provocative contribution to paleoanthropology. Around 16 million years ago Africa rejoined Eurasia, great faunal interchange occurred, volcanic activity produced prominent altitudinal relief in East Africa, and lakes formed in the Eastern Rift (pp. 69–70). Montane forests developed on the upper slopes of the volcanoes (p. 77) and inter-rift evergreen forests gave way to a greater complexity of vegetation types.

Andrews and Van Couvering disagree with hypotheses directly linking *Dryopithecus africanus* and *Dryopithecus major* with modern chimpanzees and gorillas, respectively. They speculate that the East African Miocene apes represent adaptive radiations into ecological niches now occupied by monkeys (pp. 92–93). The validity of Andrews's two "new" species of *Dryopithecus* (*D. gordoni*, represented by 24 individuals, and *D. vancouveringi*, represented by seven) remains to be substantiated by detailed morphological treatises (perhaps à la Ramaekers, Delson, and Eldredge and Tattersall, this volume). If they are in fact referable to established species of *Dryopithecus* (and perhaps *Limnopithecus*) then, *pace* Andrews and Van Couvering (p. 97), *D. africanus* might be safely returned to the forest.

Delson's handsomely illustrated paper on the evolutionary history of the Old World monkeys clarifies the positions of many species. It is based on a study of numerous fossils, interpreted by a cladistic approach emphasizing shared derived characters. Delson concludes that the adaptive radiations of the Colobinae and Cercopithecinae were geochronologically relatively late events (beginning about 12 million years ago). He also constructs hypothetical craniodental morphotypes for each major ancestral population.

Three chapters (Eldredge and Tattersall, Gould, and Every) contain applications of novel approaches to aspects of hominid evolution. For instance, at the conclusion of a lengthy discussion on allometry and brain evolution in primates and the types of scaling that might provide information on evolutionary mechanisms, Gould resurrects the pedomorphic theory of human origins, swaddled in the concept that ontogenetic scaling reasonably explains the outsized human brain.

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Do Ecosystems Converge?

Mediterranean Type Ecosystems. Origin and Structure. FRANCESCO DI CASTRI and HAROLD A. MOONEY, Eds. Springer-Verlag, New York, 1974. xii, 406 pp., illus. $30.10. Ecological Studies, vol. 7.

Five fairly localized regions of the earth's surface share an unusual unimodal annual precipitation regime with moderate winter rainfall but a pronounced and prolonged summer drought. These areas lie mostly between latitudes 30° and 40° on the western sides of continents. They are widely separated geographically, not only being scattered all around the Mediterranean Sea but also occurring along the southern edges of both Africa and Australia and in central Chile and parts of California. Unimodal annual marches of precipitation occur elsewhere, but with the wet season invariably during the warmer months. A result of the unique "mediterranean" climate is that the seasonal difference between winter and summer is accentuated. As might be expected, these extraordinary spots typically support a drought-resistant, evergreen, and tough-leafed vegetation, often termed chaparral. Although they tend to have basically similar life forms, the actual species of plants differ between regions.

The present compendium is an outgrowth of a symposium held in Chile in 1971. It is mainly an attempt to discern whether these various mediterranean systems originated and evolved independently of one another, and, if so, to assess the extent to which their structure and function might have converged over evolutionary time. If present, such a convergence in ecosystem structure and function would indicate the degree to which evolutionary pathways are predictable and determinate. Ecosystem convergence is an attractive prospect in that convergent responses to similar selective pressures would encourage ecologists in their continuing quest for general principles of community organization.

Natural selection does not act upon entire ecosystems but operates through differential reproductive success of individual organisms within communities. Organisms living in an ecosystem often evolve in response to antagonistic counteradaptations of other organisms, such as their predators and competitors. Coupled with accidents of history, such biotic interactions must of-