ity, variety, and depth. These "readings" were culled, classified, and collated by Slotkin during several years of intensive study. They provide equally impressive testimony of his scholarship and of his deep concern with the historical foundations of anthropology in Western Europe. His untimely death prevented Slotkin from undertaking the history of social anthropology in which he planned to use these materials. In such a work, these excerpts and their themes could have been presented in their culture-historical and idealogical contexts, thereby revealing their dialectical relationships. In the present volume, the editor's terse comments and signposts often presuppose that the reader is well versed in the general history and context of Western social and philosophical thought during these centuries, and especially in its competing views of man, his origin, development, status, society, language, and culture.

Although this is an extremely handy and useful source book for students of anthropological history, and a most welcome addition to the growing literature in that field, it needs to be handled with care, for several reasons. First, the citations are, as Slotkin points out, removed from their intellectual and cultural context. Second, for reasons unknown, the Romans and Greeks are ignored. Slotkin restricts his selections to Christian writers, ignoring Herodotus, Plato, and Ibn Khaldun alike. Consequently the book documents the struggles of West Europeans to break free of the crippling mould that medieval Christian theology imposed on thought about the human condition, but, by omitting the Greeks and Roman, Slotkin cuts off the Renaissance and the Enlightenment from their inspiration and source. The history of anthropology is part of the history of Western Europe, and in compilations of extracts much is inevitably lost because of lack of context. To get the most out of these readings, it is necessary to make the imaginative effort required to replace them in their contexts. Finally, anthropology is one of the youngest "sciences," and its development has always been conditioned by the state and progress of other older, and more advanced, sciences. Though many excerpts reflect and indicate this, these relations require special attention in tracing the evolution of the study of man.

The first two sections of excerpts—17 percent of the volume—deal mainly with the protoanthropological thought current from the 12th to the 16th century. These passages are almost wholly theological in their mode and terms, in contrast with the naturalism and rationalism that gradually dominate the contributions of the 17th and 18th centuries, which form 83 percent of the whole. It is particularly in its presentation of anthropological thought during the 17th and 18th centuries that this volume is of greatest value.

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Birth and Death of a Theory

Galaxies, Nuclei, and Quasars. Fred Hoyle. Harper and Row, New York, 1965. x + 160 pp. $3.95.

During July 1948, H. Bondi and T. Gold sent a manuscript entitled "The steady-state theory of the expanding universe" to the *Monthly Notices* of the Royal Astronomical Society. One month later, an independent formulation (which arose, however, from a discussion with Gold) was communicated to the same journal by Fred Hoyle. In the years that followed, Hoyle became the leading spokesman for what he termed the "New Cosmology," spreading the gospel of continuous creation through lectures, articles, and books (*The Nature of the Universe*, 1950; *Frontiers of Astronomy*, 1955; *Astronomy*, 1962). Considerable interest was therefore generated by press reports of an "Evening Discourse" delivered by Hoyle on 6 September 1965, in which he announced to the British Association for the Advancement of Science that the steady-state theory would "have to be discarded." As seen by most astronomers, the crushing blow to the theory was the number versus flux-density relation for extragalactic radio sources, determined by Martin Ryle who (like Bondi, Gold, and Hoyle) did his work at Cambridge University.

In *Galaxies, Nuclei, and Quasars*, Hoyle traces the developments in physics, astronomy, and cosmology that have so profoundly affected his view of the universe in recent years. The chapters "Galaxies" and "Radio sources," for example, call attention to the increasing body of evidence that identifies the giant elliptical systems as the sites of catastrophic celestial events. Hoyle now believes that these galaxies result from a process of expansion, while he retains the view that the flattened systems (spiral galaxies) are formed by condensation. The relevance to cosmology of high energy physics and nuclear physics is shown, respectively, in chapters called "X-rays, γ-rays, and cosmic rays" and "An outline of the history of matter." Of greatest interest, however, are the chapters entitled "The steady-state cosmology" and "A radical departure from the steady-state concept," in which the author develops his presently preferred model, a variation on the oscillating universe theory.

The book, which is based on lectures delivered at various universities, contains many stimulating ideas that will be of considerable philosophical interest to scientists. Its chief flaw is the failure to point out to the reader that the theories presented are generally not the prevailing ones. Further, the use of such terms as "very likely" (p. 146) and "inevitable" (p. 147) in speculative discussions is regrettable, especially on the part of the author who, as recently as 1962, rejected the oscillating universe model (*Astronomy*, pp. 299 and 300).

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Human Ecological Adjustments

Man, Culture, and Animals. The role of animals in human ecological adjustments. A symposium. AAAS Publ. No. 78. Anthony Leeds and Andrew P. Vayda, Eds. AAAS, Washington, D.C., 1965. viii + 304 pp. Illus. Prepaid to members, $7; others, $8.

The papers in this volume, some from a 1961 symposium and some added later, were not intended to test predetermined hypotheses but were an attempt to discover what regularities, if any, could be determined in the pattern of behavior of peoples who keep or use animals in various capacities, or depend on them for survival. Of the descriptive essays, eight are concerned with societies that possess

truly domestic animals: the Apache and Navaho with cattle and sheep, respectively (P. Kunstadter); the Chukchi and reindeer (A. Leeds); Bedouins and their dromedaries (L. E. Sweet); the Dodo of northern Uganda and their cattle (W. W. Deshler); the Tibetans and a variety of ungulates (J. F. Downs and R. B. Ekvall); Inca and pre-Inca Indians and the llama (J. V. Murra); Hindu Indians and the zebu (M. Harris); and our modern industrial society with range cattle and sheep (A. Strickon). One essay is concerned with the relationship of the native Australians to their half-feral dingos (M. J. Meggitt), while two deal with groups that depend completely on hunted animals (the northeastern Algonkian Indians today; R. Knight) or used them as a major nutritional source (Chippewa and Sioux in the upper Mississippian valley into the 19th century; H. Hickerson). All of these authors are professional anthropologists except Deshler, who is a geographer.

One essay (A. P. Vayda) introduces the concepts and possible uses of ecological information and principles into social anthropological studies, and two terminal essays, one by the geographer H. Aschmann and the other by the philosopher P. W. Collins, are summary evaluations from their authors' respective points of view. There are many more interesting and provocative ideas presented, which are in major part more fully discussed in the two final chapters, than can be reviewed here.

Although study of the relation between an animal species or a fauna and the culture of the individual societies is as near to an announced aim as the book has, at least one persistent theme, even if seemingly not always recognized by each writer, was the functional correlation between the physical environment, the social environment, and the animal populations. Collins thoughtfully discusses this study of "functional analysis" and concludes that almost all cultural traits do probably have a functional meaning (in biology we would say "survival value") even when they may seem most absurd to the outsider. Harris's "Myth of the sacred cow" offers the best example; to the tourist and to many officials in India, the great numbers of half-starved but sanctified zebus are an economic drain and a cultural absurdity. Fewer cows of better stock and yielding more milk, so runs the argument, would be better for the individual peasant and, thus, for India. Harris shows that, with the present farming practices and economic situation, the abundant cows are vital to the survival of the peasant population. The taboo on the killing of cattle protects a major factor underlying what is at best a precarious subsistence economy. The same kind of conclusion is independently reached by Deshler, who finds that the Dodo tribe of northern Uganda keeps what seems at first glance to be a vast oversupply of scrub cattle on poor range land; actually, such cattle are a form of insurance, used in the emergency caused by the not-infrequent crop failures. In both India and Uganda the cattle are those that can survive under the present conditions, which will have to be drastically altered before cattle of higher productivity can be utilized by the native peoples.

Three authors agree that where life is harsh, as with the Bedouin, the Chukchi, and the northeastern Algonkian, people must have great freedom of movement to be able to survive times of stress in an environment that is essentially marginal. (The same is true of the native Australians, although this is not discussed in Meggitt's essay.) An attempt at governmental control of such human freedom, in the supposed interests of conservation of the furbearers, led to human starvation among the northeastern Algonkian. (What communization may have done to the Chukchi since 1920 is not mentioned.) Surprising parallels emerge in the comparison of the desert Bedouin with the Arctic Chukchi of the turn of the century. In each instance a sparse vegetation can be utilized, for the success of an organized human society, only by the manipulation of a single large ruminant, which can be kept in herds but which has to be moved frequently. Within this environmental framework, both societies have developed a masculine pattern of aggressive individuality, in which the "good" man is cast in the heroic mold of active leadership, individual stamina, physical prowess and courage, and personal generosity, a program rewarded by success in love and wealth of herds. At the same time, the exigencies of nature and tribal warfare being what they are, there are definite cultural channels through which a poor youth can win success and wealth, while simultaneously the man of many herds, stripped of all wealth by warfare or natural disaster, is expected to rebuild his family's fortune in his own lifetime. A man, a real man, lives so that sagas will be sung of him.

One finds here the essence of the pastoral nomad, whether Bedouin or Chukchi, Mongol or Scythian or Taureg, Gaucho or American cowboy—even though, as delineated in Strickon's essay, the latter two are merely paid servants of a commercial enterprise. There is an essential core of freedom and adventure in the life of such herd keepers which has appealed to all men (except possibly those being raided by the unruly nomad). This core is devoutly espoused by its own participants in their own lore and love of living, and is sufficient explanation for the success of this motif as expressed in film and television. The functional values of such behavior and attitude to the survival of the nomad society are obvious, but is the viewer's release from the stress or trivia of modern living a sufficient function to have survival value in western society?

Certainly to a biologist such as myself, the study of human social forms against a background of time, physical environment, and biota has fundamental meaning.

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Erratum: I find an error of fact in my book review, "Quaternary Geology Reviewed" (1 Oct., p. 49, paragraph 4, column 3). The review states that ". . . Pleistocene mollusks along the arctic coast of Alaska have Atlantic rather than Pacific Ocean affinities, suggesting that the bridge existed during much or all of Pleistocene time. . . ."

The mollusks referred to are late Tertiary, not Pleistocene. Pleistocene mollusks with Pacific Ocean affinities are known along the coast of Alaska north of Bering Strait. Hopkins, who has reported most fully on the geologic history of the land bridge [*Science* **129**, 1519 (1959)], referred to these occurrences. From this and other evidence he concluded that seaways connected the Arctic and Pacific Oceans during the interglaciations, that the bridge existed during the glaciations, and that its climate then was severely arctic.

The point of the paragraph remains unchanged; a glacial maximum is hardly a favorable time for migrations practically at the Arctic Circle.

—CHARLES B. HUNT

Erratum: I regret that I made an error in my book review of *The Native Americans* [*Science* **149**, 1364 (1965)], where I cite MacNeish for a date of 6500 B.C. as the earliest find of maize. This is incorrect. The earliest wild maize dates from about 80,000 B.C. and the earliest domesticated variety from about 5000 B.C. The earliest date given in *The Native Americans* is, therefore, correct for the earliest domesticated maize.

—HAROLD E. DRIVER