Book Reviews

Paleontologist's Memoir

Concession to the Improbable. An Unconventional Autobiography. GEORGE GAYLORD SIMPSON. Yale University Press, New Haven, Conn., 1978. xii, 292 pp. + plates. $15.

Motivations and other complex factors that underlie and influence the activities of scientists are currently of interest to historians and sociologists of science. George Simpson, noted paleontologist and evolutionary biologist, describes his own motivation as "an uncontrollable drive to know and understand the world in which I live." His autobiography, "unconventional" in that its organization is mainly topical rather than chronological, relates the development of diverse aspects of his career to particular interests: the history of life, causes and patterns of evolution, the effects of the history of continents on the distribution of animals, the nature of the human species, ethics and gods. Questions about these matters Simpson terms basic problems of science and philosophy. Beyond such serious topics he provides a liberal sample of interesting experiences from his extensive travels and of observations on nature, language, music, art, and architecture.

Nearly half the book is devoted to highlights of travels Simpson has undertaken, largely in connection with his research. It opens with an account of an adventurous flight with a Venezuelan bush pilot and touches every continent. Unforgettable first impressions of various lands and cities, spectacular mountains and deserts, opportunities to observe rare and unusual animals, assorted traveling companions, and people of many lands are mentioned with obvious pleasure and frequent humor. Scattered through these chapters are frank expressions of Simpson's own likes and dislikes and even sharply critical remarks about certain social systems and customs. In spite of not a few hardships, travel has been one of his major pleasures.

Family antecedents, youth and education, family and friends, and other nonprofessional interests are touched upon in several brief chapters, and information on these matters is also interspersed through the partly topical and partly chronological account of Simpson's scientific career. Some youthful escapades were hilarious, at least in retrospect, and humorous anecdotes about noted paleontologists are sprinkled through most chapters. Religious beliefs and the nature of the Mysterious Ultimate are soberly expounded.

Simpson's work in vertebrate paleontology began with a comprehensive survey of the most ancient mammals, contemporaries of the better-known dinosaurs of the Age of Reptiles. His position at the American Museum of Natural History afforded the opportunity to study ancient mammals of Mongolia collected by the Central Asiatic Expeditions led by Roy Chapman Andrews. Numerous studies of early Tertiary mammals of North America and many years of fieldwork in the San Juan Basin of New Mexico (where he had his home for some years) made him an authority on the earlier phases of mammalian history and evolution. Fieldwork in Patagonia and the opportunity to study collections in the museums of Argentina provided a second major area of paleontological research. In a chapter entitled "The importance of South America" Simpson summarizes his work on neotropical mammals and takes the opportunity to survey the most important ideas about South American biogeography. A long-continued program of studies of fossil and living penguins forms a final descriptive and systematic endeavor.

This work alone would ensure Simpson a prominent place among the paleontologists of this century, but his reputation rests even more upon his theoretical treatment of the principles of systematics, evolution, biogeography, and aspects of the philosophy of science, to which his time became increasingly devoted after 1945. The genesis and sometimes details of the gestation of his major books are described, and Simpson presents his estimate of their success and influence. Likewise his role in the formation of the Society for the Study of Evolution and the Society of Vertebrate Paleontology and in several important symposia that influenced biological thought is recorded. These varied activities are successively brought into focus, and always in relation to the author's overall interests.

Simpson played a leading role in changing paleontological systematics from static typological description and comparison to the analysis of variable and evolving populations consonant with the theory of organic evolution. He applied techniques of statistical inference from the fossil sample to the species population whence the sample came and extended the biological species concept to fossil material in various publications on fossil mammals from the mid 1930's onward. The principles underlying these contributions were explained in *Quantitative Zoology* (1939) and *Principles of Classification and a Classification of Mammals* (1945) and were reviewed in *Principles of Animal Taxonomy* (1961) as well as in numerous short papers. *Tempo and Mode in Evolution* (1944) provided a new way of looking at the mechanisms of evolutionary change that hastened the development of the "synthetic theory" of evolution soon after the end of World War II. In biogeography Simpson applied quantitative measures of faunal resemblance to data on the relationship and origin of South American Tertiary mammalian faunas. Through support of W. D. Matthew's arguments (in *Climate and Evolution*, 1915) for the holarctic origin of South American mammals he became known as an opponent of Wegener's theory of continental drift. He changed his views on this theory during the 1960's, like many other geologists; his analysis of the data remains sound and can be adjusted rather easily to current ideas of paleogeography.

Simpson explicitly states his preference for the written word over talking as a means of communication. He further admits his fondness for footnotes, and he liberally uses notes throughout this book, although they are relegated to the ends of the chapters. These notes (as in other writings of Simpson's) include a wide range of erudite linguistic, etymological, historical, and scientific observations.

Little is said of Simpson's teaching at Columbia, Harvard, or the University of Arizona, nothing of individual students, and very little of his colleagues at these institutions. This contrasts with the lively vignettes of many foreign paleontologists and associates met on his travels. A few unpleasant incidents that affected the course of his life are briefly mentioned. Further details of some of these would be desirable for a full historical

record, but Simpson's reluctance to dwell upon them is understandable and in good taste. Students of the causation of scientific achievement may ponder his great productivity both under the stress of personal difficulties and under far more agreeable circumstances, as in his various collaborative efforts with his wife, the psychologist Anne Roe.

A final chapter defends some of the theories and principles underlying his work that have been attacked by younger students. In summary he writes, "It is as if for each of these questions . . . I had entered the ring, fought my best, delivered and received many a hard blow, and achieved a tie." Most of his contemporaries would give him a higher score.

JOSEPH T. GREGORY
Department of Paleontology,
University of California,
Berkeley 94720

Plains Archeology

Prehistoric Hunters of the High Plains. GEORGE C. FRISON. Academic Press, New York, 1978. xiv, 458 pp., illus. $29.50. New World Archaeological Record.

Before the advent of the barbed wire fence and the steel plow the only way to make a living in the rigorous environment of the northwestern High Plains centering on Wyoming was by hunting and gathering. American Indian men and women cooperated in these endeavors for at least 12 millennia before the first Europeans hastily crossed the region on their way to more promising lands on the Pacific slopes. Eventually some of these newcomers adapted themselves to the region, mainly by cattle ranching, but only after the mainstay of the aboriginal economy—the bison—had been essentially exterminated by gunpowder and greed.

George Frison, the author of *Prehistoric Hunters of the High Plains*, is a member of one of the pioneer ranching families who learned to cope with the sometimes devastating, sometimes highly productive weather conditions that sweep through this land at regular intervals. Perhaps only a native of this often bitter region could fully appreciate the difficulties of surviving in it without the advantages of modern technology. Frison has gathered together in this volume a well-organized, clearly written, and beautifully illustrated set of insights into the subsistence systems of the aboriginal inhabitants. This constitutes a solid, down-to-earth attempt at an ethnography of the many human groups who successfully lived in this region from the Clovis mammoth hunters until the final heyday of the Plains buffalo.

The study paints a clear picture of human adaptation to this region by exploring how its inhabitants tackled the ever-present problem of how to obtain and process meat. Much of the time they had to resort to small mammals as well as plants gathered by the women to supplement their diet, but most of the known archeological sites are monuments to their prowess and ingenuity as hunters. Although methods for procuring antelope, sheep, deer, and elk, as well as mammoth, are discussed, most of the book concerns techniques for hunting bison, always the most abundant Plains herd animal. Especially valuable interpretations of the archeological evidence concerning butchering techniques are based upon Frison's experiments using replicated stone and bone tools made from local materials.

After an initial survey of the long cultural sequence of the Northwestern Plains, Frison interprets the field evidence he has accumulated over the last 20 years. After presenting the evidence that the Colby mammoth kill was used during winter as a deep freeze where butchered elephant cuts were stacked, he discusses the Hanson site, one of three known Folsom occupation sites on the Plains. As examples of later Paleo-Indian bison procurement methods he compares his recent reexcavation at the Agate Basin kill site with findings from the Casper site, a full account of which he has already published. The Early Plains Archaic is introduced by a discussion of the Hawken site, whose occupants still hunted giant bison (*Bison occidentalis*) with large, side-notched points in arroyo traps as late as 6400 years ago. About 4500 years ago, after a hiatus when the hunters evidently retreated to the mountains because the high Plains became too arid to support large bison herds, the Middle Archaic hunters readapted themselves to hunting bison in arroyo traps and bison pounds. Buffalo jumps with long drive lines became a major means of procurement during the Late Prehistoric Period, during which time, to judge from the abundance of sites, both the bison and their human hunters were most abundant.

Any Plains archeologist must have this book, and any professional or nonprofessional person interested in the history of man the hunter will find it fascinating reading. Any archeologist who teaches an introductory course in the field by stressing the scientific thinking processes that an archeologist should use in tackling a problem will find it invaluable as supplementary reading. As extra gems for the specialist there are appendixes by John Albanese on the archeology of the region, by Cary Madden on mammoth taxonomy, and by Frison on rock art and human osteology.

ALAN L. BRYAN
Department of Anthropology,
University of Alberta,
Edmonton T6G 2H4, Canada

Transport Physiology

Transport of Ions and Water in Animals. B. L. GUPTA, R. B. MORETON, J. L. OSCHMAN, and B. J. WALL, Eds. Academic Press, New York, 1977. xx, 818 pp., illus. $62.50.

Comparative Physiology. Water, Ions and Fluid Mechanics. Papers from a conference, Crans-sur-Sierre, Switzerland, Sept. 1976. K. SCHMIDT-NIELSEN, L. BOLIS, and S. H. P. MADDRELL, Eds. Cambridge University Press, New York, 1978. xii, 360 pp., illus. $42.50.

Since August Krogh wrote the first monograph on osmotic regulation in aquatic animals in 1939, the study of ion and water transport and regulation has expanded beyond the capacity of a single person. The two books under review help to overcome the resulting difficulties of communication.

The 30 essays in *Transport of Ions and Water in Animals* are dedicated to J. A. Ramsay, to commemorate his retirement from the chair of comparative physiology at the University of Cambridge. Ramsay has made fundamental contributions to the elucidation of osmoregulatory mechanisms in invertebrates, especially insects. To study the function of the excretory organs in these small animals he developed microtechniques that permitted analyses of nanoliter samples. Most appropriately, therefore, the introductory essays in the book review recent progress made in the use of microtechniques, from microperfusions of tubules of kidney and other excretory organs to electron probe x-ray analysis for the determination of ion concentrations in subcellular compartments. Several essays deal with general and theoretical aspects of transport mechanisms and transport models. The remaining 22 essays cover the subject at levels ranging from transport across cell membranes to osmoregulatory adaptations of whole organisms to their environments. All larger groups of animals are represented, but half the papers deal, exclusively or partly, with transport processes in insects,