"self" and "nonself," for it has been proposed that histocompatibility genes direct the synthesis of odorants as well as of olfactory receptors. Understanding of the presumed olfactory-receptor proteins, of central importance to olfactory biochemistry, is at a primitive stage, as is shown in a paper by Price. Taste membrane-receptors, too, are not yet well understood at the molecular level, although the specificity of some receptors, particularly those for sweet taste, to sugars and other compounds is being characterized electrophysiologically. In chapter 10 Cagan describes an interesting experiment in which the isolation of an amino-acid taste receptor from catfish is attempted by the use of a covalent probe.

The third section (six chapters), Physicochemistry and Transduction, is somewhat vague in content as well as in title. The studies presented in this section deal largely with correlations between electrophysiological responses and models for gustatory and olfactory function. Hirsch and Margolis contribute a provocative paper on the isolation of olfactory epithelial cells, a technique that opens the way to meaningful biochemical work on olfactory mechanisms at the level of the sense cell. Also, Brand, Kron, and Senseman provide a coherent account of how intracellular calcium probably acts in taste-cell transduction.

A section on neurotransmitters (four chapters) deals mainly with the olfactory bulb and tubercle (Margolis, Quinn and Cagan, Krieger), with some mention of the efferent cholinergic enzymes of the taste receptors and olfactory bulb (Matschinsky, Godfrey, Ross, and Norfleet). It is disappointing that the problem of the identity of the presumed afferent neurotransmitter of the taste receptor cell is hardly addressed. However, the recent status of the dipeptide carnosine as a primary, afferent olfactory neurotransmitter is concisely reviewed by Margolis. In elucidating histochemically the cholinergic enzymes in taste buds and olfactory bulb, Matschinsky and colleagues establish further biochemical correlates of cholinergic early processing, which may characterize all higher sensory systems.

The book concludes with four short papers on "analogous chemoreceptors." These papers come from the laboratories of investigators who research simple biochemical systems: bacterial chemical sensing by Paoni, Maderis, and Koshland, glutathione-activated feeding response of hydra by Lenhoff, acetylcholine receptor vesicles by Hartig, Moore, and Raftery, and brain receptors by Pert and Herkenham. Although these papers introduce a certain discontinuity to the book's theme of chemoreceptor function of higher systems, they do increase the value of the book to the biochemist.

As a whole, the book is well worth reading. Discussions by the symposium participants at the end of each section are particularly helpful, and attempts that are made to relate chapters add a sense of continuity. Although a brief summary of relevant gustatory and olfactory morphology at the beginning of the book would have been useful, such information is available in individual papers. In all, the book is interesting, suggests new experiments to investigators initiated to the field, and will undoubtedly help draw young biochemists into the study of taste and olfaction.

DENNIS G. DRESCHER
*Departments of Otolaryngology and Biochemistry, Wayne State University School of Medicine, Detroit, Michigan 48201*

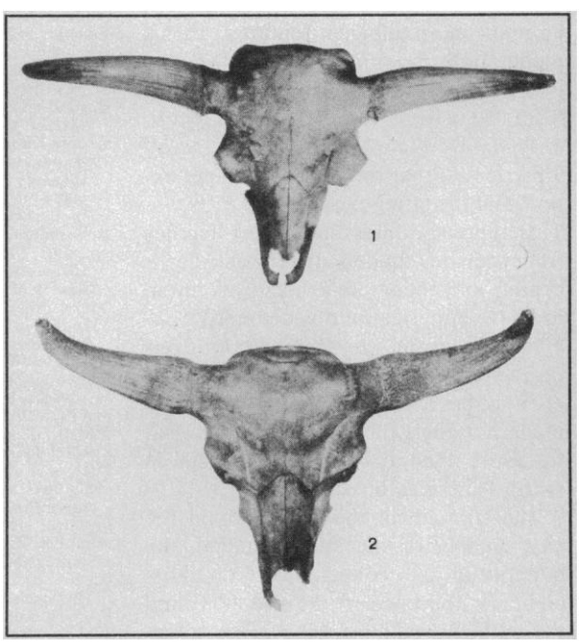
## Evolution of a Mammal

**North American Bison.** Their Classification and Evolution. JERRY N. MCDONALD. University of California Press, Berkeley, 1981. viii, 316 pp., illus., + plates. $35.

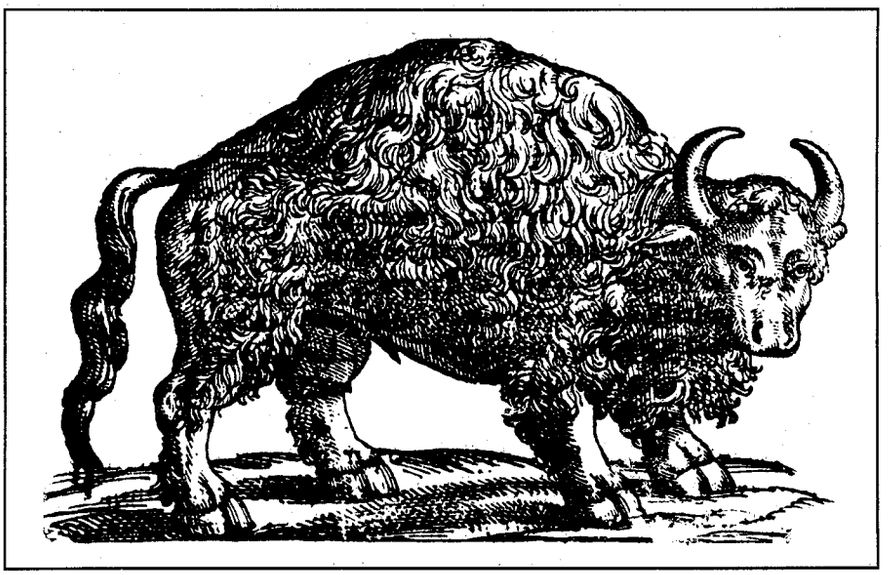
Until fairly recently, most studies of extinct bison of North America have dealt with typological rather than biological species. The result has been proliferation in the literature of extinct species; the diagnostic characteristics of these species are usually the size, curvature, and roundness of the horn-cores. Horn-cores are the most variable element of the bison skeleton, and, though species-specific horn-core characters certainly did exist, most investigators have tended to ignore individual variation when describing new species. The problems have also been compounded by the fact that there is amazingly little variation in postcranial skeletal elements. New taxa have been established on the basis of supposed differences in these elements; however, they have not been taken seriously by most investigators.

McDonald treats extinct bison as biological species, attempts to explain morphological differences from a functional viewpoint, accounts for individual variation, and brings the evidence and techniques from many allied fields to bear on the problem. In short, he departs from the classical treatment of fossil bison.

After an introductory chapter, McDonald discusses the classification of North American bison. He recognizes five species as having been present in North America: *Bison priscus, Bison alaskensis, Bison latifrons, Bison antiquus,* and *Bison bison,* the first two being Eurasian autochthons and the last three North American. He then attempts to explain the morphological differences in the North American forms as features representing adaptation to the three dominant habitats of the Late Pleistocene (forest-woodland, savanna–wooded-steppe, and grassland). He sees *B. latifrons* (the largest form) as having been adapted to the forest-woodland habitat. He concludes that this species had the lowest biological potential and




"Locating and identifying the *Bison priscus* lectotype has been a . . . complicated process. . . . Most bison taxonomists accept Cuvier's 1825 figure as the type illustration for the taxon. Cuvier indicated that the figured specimen was in the University of Pavia. Vialli attempted to identify [it] among the Pavia bison and selected the top specimen. . . . The bottom skull, however, in the University of Turin, more strongly resembles Cuvier's figure and is here considered more likely the lectotype if, in fact, Cuvier's figure was based on a single specimen." [From *North American Bison*]



"The Mexican bull, '*Taurus Mexicanus*,' as pictured in Dr. Francisco Hernandez's natural history of Mexico (1651). Linnaeus used Hernandez's description as the type description for *Bos bison*, now *Bison bison. Bison bison* is the type species for the genus." [From *North American Bison*]

was composed of individuals that were browser-grazers, more or less solitary in their habits. *B. antiquus* (the intermediate-sized form) is considered to have been a grazer-browser, occupying the savanna–wooded-steppe habitat. These forms are presumed to have been more gregarious than *B. latifrons* and to have possessed many of the other adaptive features characteristic of the living form, *B. bison*. The living species is pictured as having the greatest biological potential, as being extremely gregarious, smaller in size, and dependent almost entirely upon grazing.

McDonald's evolutionary model is based upon his conclusions regarding behavior and habitat preference as well as upon morphological features. In his model, both *B. latifrons* and *B. antiquus* evolved from *B. sivalensis*, an Old World form. He believes that *B. latifrons* and *B. antiquus* were contemporaneous and allopatric and that the former became extinct and the latter evolved into *B. bison*. This approach differs in varying degrees from previous models. It refutes Allen's century-old theory that bison evolution in North America involved simply a decrease in horn size from *B. latifrons* through *B. antiquus* to *B. bison*. However, it differs less significantly from more modern models, nearly all of which call for more than one line of descent in North American bison.

The strength of this work lies in the vast number of specimens studied, the quantity of data collected, the multidisciplinary approach to the problem, and the author's willingness to draw sometimes bold conclusions from the available information. As McDonald points out, the study of bison taxonomy and evolution is controversial. This book will heighten that controversy; like all good works, it will raise more questions than it will answer.

JESSE S. ROBERTSON, JR.
*Department of Biology,*
*Jacksonville University,*
*Jacksonville, Florida 32211*

## Books Received

**Adhesion and Microorganism Pathogenicity**. Papers from a symposium, London, May 1980. Pitman, London, 1981 (U.S. distributor, Medical Education Administration, Ciba Pharmaceutical Company, Summit, N.J.). x, 346 pp., illus. $35. Ciba Foundation Symposium 80.

**The Adolescent**. A Psychological Self-Portrait. Daniel Offer, Eric Ostrov, and Kenneth I. Howard. Basic Books, New York, 1981. x, 196 pp. $14.95.

**Adrenoceptors and Catecholamine Action**. Part A. George Kunos, Ed. Wiley-Interscience, New York, 1981. viii, 344 pp., illus. $50.

**Advances in Cyclic Nucleotide Research**. Vol. 14. Papers from a conference, Brussels, July 1980. Jacques E. Dumont, Paul Greengard, and G. Alan Robison, Eds. Raven, New York, 1981. xxxii, 724 pp., illus. $79.

**Advances in High Voltage Insulation and Arc Interruption in $SF_6$ and Vacuum**. V. N. Maller and M. S. Naidu. Pergamon, New York, 1981. x, 282 pp., illus. $35.

**Advances in Infancy Research**. Vol. 1. Lewis P. Lipsitt and Carolyn K. Rovee-Collier, Eds. Ablex, Norwood, N.J., 1981. xxiv, 268 pp., illus. $30.

**Advances in Nuclear Physics**. Vol. 12. J. W. Negele and Erich Vogt, Eds. Plenum, New York, 1981. xiv, 258 pp., illus. $35.

**Affine Planes with Transitive Collineation Groups**. Michael J. Kallaher. North-Holland, New York, 1982. xiv, 156 pp. $34.95.

**Aggression und Frustration als psychologisches Problem**. Hans-Joachim Kornadt, Ed. Wissenschaftliche Buchgesellschaft, Darmstadt, 1981. Two volumes. xii, 536 pp., and xii, 536 pp. cloth. Wege der Forschung, Band 274.

**The Alkaloids**. Chemistry and Physiology. Vol. 18. R. G. A. Rodrigo, Ed. Academic Press, New York, 1981. xvi, 412 pp., illus. $65.

**Alluvial Fans**. An Attempt at an Empirical Approach. Andrezej Rachocki. Wiley-Interscience, New York, 1981. x, 162 pp., illus. $35.

**Analytical Profiles of Drug Substances**. Vol. 10. Klaus Florey, Ed. Academic Press, New York, 1981. xii, 736 pp., illus. $41.

**Annual Reports in Organic Synthesis—1980**. L. G. Wade, Jr., and Martin J. O'Donnell, Eds. Academic Press, New York, 1981. xvi, 456 pp., illus. Paper, $24.

**Annual Review of Astronomy and Astrophysics**. Vol. 19. Geoffrey Burbidge, David Layzer, and John G. Phillips, Eds. Annual Reviews, Palo Alto, Calif., 1981. x, 480 pp., illus. $20.

**Anorectic Agents**. Mechanisms of Action and Tolerance. Silvio Garattini and Rosario Samanin, Eds. Raven, New York, 1981. x, 246 pp., illus. $28. Monographs of the Mario Negri Institute for Pharmacological Research, Milan.

**Approaching Disarmament Education**. Magnus Haavelsrud, Ed. Westbury House, Guildford, England, 1981 (U.S. distributor, Butterworths, Woburn, Mass.). viii, 280 pp. $37.95.

**Aquaculture of Grey Mullets**. O. H. Oren, Ed. Cambridge University Press, New York, 1981. xxii, 508 pp., illus. $120. International Biological Programme 26.

**The Archives of Ebla**. An Empire Inscribed in Clay. Giovanni Pettinato. Translated from the Italian edition (Torino, 1979). Doubleday, Garden City, N.Y., 1981. xx, 348 pp., illus. $15.95.

**Arctic Air Chemistry**. Proceedings of a symposium, Narragansett, R. I., May 1980. K. A. Rahn, Ed. Pergamon, New York, 1981. iv + pp. 1345–1516, illus. Paper, $30. *Atmospheric Environment*, vol. 15, No. 8.

**Aspects of Mid-Cretaceous Regional Geology**. R. A. Reyment and P. Bengston, Eds. Academic Press, New York, 1981. x, 328 pp., illus., + plates. $72. IGCP Project 58 Mid-Cretaceous Events.

**Auditing in the Electronic Environment**. Theory, Practice and Literature. Delroy L. Cornick. Lomond, Mt. Airy, Md., 1981. xvi, 316 pp. $19.75.

**The Aztecs, Maya, and Their Predecessors**. Archaeology of Mesoamerica. Muriel Porter Weaver. Academic Press, New York, ed. 2, 1981. xxiv, 598 pp., illus. $19.50. Studies in Archaeology.

**Bacteriophage Assembly**. Proceedings of a conference, Asilomar, Calif., Sept. 1980. Michael S. DuBow, Ed. Liss, New York, 1981. xx, 554 pp., illus. $52. Progress in Clinical and Biological Research, vol. 64.

**Les Bases Scientifiques de l'Amélioration des Ressources Alimentaires**. Papers from a conference, Amiens, Sept. 1980. Palais de la Découverte, Paris, 1981. 352 pp., illus. Paper, 45 F. Revue du Palais de la Découverte, Numero Spécial 21.

**Basic Botany**. Arthur Cronquist. Harper and Row, New York, ed. 2, 1981. x, 662 pp., illus. $18.

**Behavior Modification**. Contributions to Education. Papers from a symposium, Caracas, Venezuela, Feb. 1978. Sidney W. Bijou and Roberto Ruiz, Eds. Erlbaum, Hillsdale, N.J., 1981. viii, 312 pp., illus. $29.95.

**Behavioral Approaches to Neurology**. Joel F. Lubar and William M. Deering. Academic Press, New York, 1981. xii, 210 pp. $22. Behavioral Medicine.

**Benjamin Thompson, Count Rumford**. Sanborn C. Brown. MIT Press, Cambridge, Mass., 1981. xiv, 362 pp., illus. Paper, $9.95. Reprint of the 1979 edition.

**Bibliometrics**. A Bibliography and Index. Vol. 1, 1874–1959. Alan Pritchard in collaboration with Glenn R. Wittig, ALLM Books, Watford, Herts, England, 1981. Variously paged. Paper, $15.

**Biological Clocks in Seasonal Reproductive Cycles**. Proceedings of a symposium, Bristol, England, Mar. 1980. B. K. Follett and D. E. Follett, Eds. Halsted (Wiley), New York, 1981. xii, 292 pp., illus. $49.95. Colston Papers, vol. 32.

**Biological Magnetic Resonance**. Vol. 3. Lawrence J. Berliner and Jacques Reuben, Eds. Plenum, New York, 1981. xx, 268 pp., illus. $35.

**The Biology of Centipedes**. J. G. E. Lewis. Cambridge University Press, New York, 1981. viii, 476 pp., illus. $69.95.

**The Biology of Normal Human Growth**. Papers from a conference, Stockholm, Aug. 1980. Martin Ritzén and five others, Eds. Raven, New York, 1981. xvi, 334 pp., illus. $38.50.

**Biology Reviews**. Vol. 2. V. P. Skulachev, Ed. Translated from the Russian. Harwood, New York, 1981. x, 394 pp., illus. $84.50. Soviet Scientific Reviews, Section D.

**The Birds of Sable Island, Nova Scotia**. Ian A. McLaren. Nova Scotian Institute of Science, Halifax, Canada, 1981. 84 pp., illus. Paper, C$7.50. Proceedings of the Nova Scotian Institute of Science, vol. 31, part 1.

**Bone and Bone Seeking Radionuclides**. Physiology, Dosimetry and Effects. Papers from a symposium, Rotterdam, Aug. 1980. V. Volf, Ed. Published for

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