

rise to it, could be persuaded by what Macphail sees as "prima facie evidence" (p. 133). Experiments with other invertebrates offer Macphail some reason to hope that "Aplysia may indeed be capable of greater feats" of learning than have already been demonstrated (p. 139), but for now there is only his hope. As to whether the neural changes produced in *Aplysia* and *Hermisenda* by paired stimulation are pre- or postsynaptic, the results for the two animals are at odds, and it is difficult to disagree with Macphail's advice that we "approach work on mammals with an open mind on this issue" (p. 156).

The greater part of the book is devoted to the role of the hippocampus in learning, various theories of which are generously (sometimes ludicrously) given the benefit of every doubt. If recognition is the function of the hippocampus, why should hippocampal injury reduce the rat's initial wariness of novel tastes? The answer is that "all stimuli appear relatively novel, and genuinely novel stimuli may therefore not be effectively classified as novel" (p. 243). If the "place" cells of a rat register spatial location, why should they not fire when the rat is wrapped in a towel? Perhaps the cells become active only when the rat is "processing information concerned with anticipated movement from one place to another" (p. 267), which, wrapped in a towel, it would not be. If a lesion is assumed to disrupt "declarative" memory ("knowing that") as distinct from "procedural" memory ("knowing how"), why should the performance of monkeys in an easy (object) discrimination be impaired while their performance in a difficult (pattern) discrimination is not? The difficult discrimination must have an important procedural component, as must eyelid conditioning, which also is unimpaired.

In the end Macphail is bound to admit that none of the competing theories of hippocampal function comes off very well. The highly touted mapping theory is clouded by such facts as that there are many fewer "place" cells than originally imagined, that their fields are variable, and that hippocampal injury fails to impair performance in some spatial tasks while it does impair performance in some nonspatial tasks. The difficulty for the selective-attention theory, backed by the absence of latent inhibition in lesioned animals, is that they show overshadowing and blocking as well as impaired performance in some tasks that make no obvious demands on selective attention. The theory that the hippocampus is responsible for "working" or short-term memory, as distinct from "reference" or long-term memory, is faced with the same sort of difficulty; performance in some tasks that do not seem to require working memory is disrupted by

hippocampal damage while performance in some tasks that do seem to require it is not. (None of the theories makes contact with an interesting body of data on reward-schedule effects that Macphail unaccountably ignores.) Macphail takes comfort in the reflection that, at the very least, "all the major theories of hippocampal function appeal to concepts . . . derived from cognitive psychology," while acknowledging that "it has proved difficult to specify exactly which learning tasks engage 'cognitive' processes" (pp. 335-36). The consensus may be no more, of course, than a product of common anthropomorphic predilections. Whether physiological or other techniques are employed, "doing psychology" fruitfully first of all requires a disciplined grasp of the subject that the investigators whose work on a diversity of neural tissues Macphail considers do not often seem to possess.

For all that, *The Neuroscience of Animal Intelligence* does put us much in Macphail's debt. The innumerable experiments cataloged so conveniently are on the whole worth knowing about, and the questions posed worth thinking about, despite the fact that the promised contributions to our psychological understanding have failed thus far to materialize.

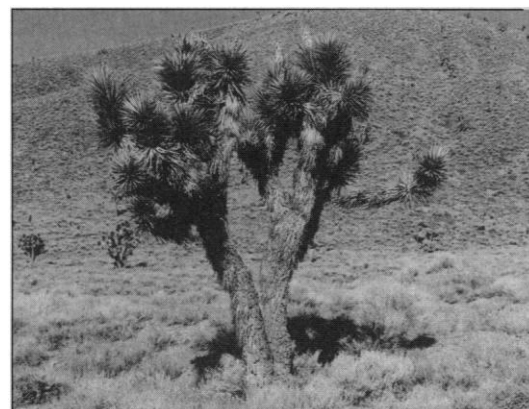
M. E. Bitterman
Békésy Laboratory of Neurobiology,
University of Hawaii,
Honolulu, HI 96822, USA

Living Landscapes

The Desert's Past. A Natural Prehistory of the Great Basin. DONALD K. GRAYSON. Smithsonian Institution Press, Washington, DC, 1993. xx, 356 pp., illus. \$44.95 or £34.95.

The Great Basin, a region covering some 165,000 square miles in Nevada and California that has no river outlet to the ocean, has long fascinated explorers and scientists alike. It is a place where climate and climatic changes have directly and visibly affected the landscape and its inhabitants in many ways, in some cases quite brutally and in others rather subtly.

The past few decades have witnessed intensive exploration of the environmental history of the Great Basin, with new technologies and techniques being used to build upon earlier work. With this book Grayson has brought together the results of a wide variety of investigations in archeology, geology, paleohydrology, climatology, meteorology, biogeography, dendrochronology, and history (among other fields) to create an engrossing description of the region's



"Joshua trees in Joshua Flats, eastern Inyo Mountains, California; sagebrush and rabbit-brush dominate the understory." [From *The Desert's Past*]

changing environment during the past 25,000 years.

Grayson begins by identifying several "Great Basins," viewed in terms of hydrography, physiography, flora, and ethnography, respectively. An introduction to the interactions of the Laurentide Ice Sheet and the Bering Land Bridge sets the stage for a discussion of Pleistocene mammals, extinctions, and early peoples, which is followed by chapters on the Late Pleistocene lakes, vegetation, and vertebrates of the Great Basin. The Holocene, or last 10,000 years, is described first climatically and then archeologically. An intriguing chapter is included on the demographics, social dynamics, and archeology of the ill-fated Donner Party of 1846-47.

The book provides a particularly useful overview of the insights gained through analysis of packrat middens and accelerator-mass-spectrometer radiocarbon dating over the past two decades. The remarkably late appearance of single-leaf piñon pine during the Holocene, for example, is now understood far better than it was only a few decades ago. The spotty nature of the packrat midden record has given rise to a number of conflicting interpretations, and Grayson has taken pains to present varying points of view. He does not, however, refer to Owen Davis's model of differential elevational changes in plant distributions as a result of orbitally induced insolation changes (*Science* 225, 617 [1984]), which seems highly relevant to his analysis of Early Holocene biogeography.

The illustrations include many well-reproduced black-and-white photographs that enhance the text nicely. The maps, however, are another matter. Latitudes and longitudes are missing, as are some localities referred to in the text. Reading the maps often requires simultaneous use of a table. Some use of color, or a more effective use of

patterns, would have helped readers unfamiliar with the geographic details of the Great Basin. Also, inclusion of a few satellite photos would have been appropriate. It would be helpful for the reader to have at hand some of the new computer-generated landform maps and images—for example, those of Edwards and Batson (*U.S. Geol. Surv. Misc. Inv.*, Map I-1850 [1990]) and Thelin and Pike (*ibid.*, Map I-2206 [1991]).

Its geographic approach and many tables of data make *The Desert's Past* an attractive candidate for release in CD-ROM form. Indeed, putting the many types of digital data being generated by Great Basin researchers into a common format would do a great deal to enhance the kind of sharing between disciplines that is so well exemplified by this book.

Grayson clearly has a great love for and deep understanding of his subject, and throughout the book he manages to convey a sense of excitement through the inclusion of odd bits of information about topics ranging from compelling coprolites to a lost Manx farthing and the unlikely immortality of Danny King's dog. Stylistically, the book is an interesting (and successful) hybrid. The informality and readability of the main text will satisfy the needs of a general audience. On the other hand, even active researchers are likely to find new sources of information in the more than 1000 references that are packed into narrative "Notes" sections at the ends of the chapters. This book will appeal to

all those interested in the natural history of the Great Basin and might be useful as the basis of a course in historical environmental science.

David P. Adam
U.S. Geological Survey,
Menlo Park, CA 94025, USA

Books Received

All Was Light. An Introduction to Newton's *Opticks*. A. Rupert Hall. Clarendon (Oxford University Press), New York, 1993. viii, 252 pp., illus. \$52.50.

ANCA-Associated Vasculitides. Immunological and Clinical Aspects. Wolfgang L. Gross, Ed. Plenum, New York, 1993. xx, 552 pp., illus. \$135. Advances in Experimental Medicine and Biology, vol. 336. From a workshop, Lübeck, Germany, May 1992.

Biotechnology of Antibiotics and Other Bioactive Microbial Metabolites. Giancarlo Lancini and Rolando Lorenzetti. Plenum, New York, 1993. viii, 236 pp., illus. \$59.50.

Cellular and Molecular Physiology of Cell Volume Regulation. Kevin Strange, Ed. CRC Press, Boca Raton, FL, 1993. xiv, 400 pp., illus. \$95.

Chaos and Order. The Complex Structure of Living Systems. F. Cramer. VCH, New York, 1993. xvi, 249 pp., illus. \$30 or £19.50. Translated from the German by D. I. Loewus.

Early Supplementary Feeding and Cognition. Effects Over Two Decades. Ernesto Pollitt *et al.* University of Chicago Press, Chicago, 1993. vi, 122 pp., illus. Paper, \$14. Monographs of the Society for Research in Child Development, serial no. 235, vol. 58, no. 7.

Ecology for Environmental Professionals. Dorothy J. Howell. Quorum (Greenwood), Westport, CT, 1993. xiv, 215 pp., illus. \$59.95.

Ecophysiology of Fungi. R. C. Cooke and J. M. Whipps. Blackwell Scientific, Cambridge, MA, 1993. x, 337 pp., illus. \$99.95.

Foundations for Social and Biological Evolution. Progress Toward a Physical Theory of Civilization and of Speciation. A. Iberall, D. Wilkinson, and D. White. Cri-de-Coeur, Laguna Hills, CA, 1993. viii, 312 pp. Paper, \$14. Cri-de-Coeur Series of Physical-Philosophical Publications, vol. 3.

Fractals for the Macintosh. Jesse Jones. Waite Group, Corte Madera, CA, 1993. xxiv, 207 pp., illus., + diskette. Paper, \$24.95.

Gravitational Force of the Sun. Pari Spolter. Orb, Granada Hills, CA, 1994. x, 260 pp., illus. \$29.95.

Guardians of Science. Fairness and Reliability of Peer Review. H.-D. Daniel. VCH, New York, 1993. xiv, 118 pp., illus. DM 78.

Handbook of Semiconductor Wafer Cleaning Technology. Science, Technology, and Applications. Werner Kern, Ed. Noyes, Park Ridge, NJ, 1993. xxii, 623 pp., illus. \$96. Materials Science and Process Technology Series.

Human Population Genetics. A Centennial Tribute to J. B. S. Haldane. Partha P. Majumder, Ed. Plenum, New York, 1993. x, 349 pp., illus. \$85. From a conference, Calcutta, Dec. 1992.

Immunopharmacology of the Renal System. C. Tetta, Ed. Academic Press, San Diego, CA, 1993. xvi, 218 pp., illus. \$45. Handbook of Immunopharmacology.

Information, Sensation, and Perception. Kenneth H. Norwich. Academic Press, San Diego, CA, 1993. xx, 326 pp., illus. \$59.95.

An Introduction to Astronomical Photometry. Edwin Budding. Cambridge University Press, New York, 1993. xiv, 272 pp., illus. \$39.95.

The Less Noble Sex. Scientific, Religious, and Philosophical Conceptions of Woman's Nature. Nancy Tuana. Indiana University Press, Bloomington, 1993. xiv, 224 pp., illus. \$29.95; paper, \$12.95. Race, Gender, and Science.

Mathematical Analysis of Spectral Orthogonality. John H. Kalivas and Patrick M. Lang. Dek-

ker, New York, 1993. xvi, 324 pp., illus. \$145. Practical Spectroscopy, vol. 17.

Mechanical Intelligence. A. M. Turing. D. C. Ince, Ed. North-Holland, New York, 1992. xx, 227 pp., illus. \$82 or Dfl. 160. Collected Works of A. M. Turing.

Medical Cost Crisis! A Solution Before It's Too Late. Donald G. Lindsay. Tonal, Ventura, CA, 1993. xii, 291 pp., illus. Paper, \$15.95.

Morphogenesis in Plants. Molecular Approaches. Kalliopi A. Roubelakis-Angelakis and Kiem Tran Thanh Van, Eds. Plenum, New York, 1993. viii, 283 pp., illus. \$89.50. NATO Advanced Science Institutes Series A, vol. 253. From an institute, Crete, Sept. 1992.

Morphological Change in Quaternary Mammals of North America. Robert A. Martin and Anthony D. Barnosky, Eds. Cambridge University Press, New York, 1993. x, 415 pp., illus. \$74.95.

Mössbauer Spectroscopy Applied to Magnetism and Materials Science. Vol. 1. Gary J. Long and Fernande Grandjean, Eds. Plenum, New York, 1993. xvi, 479 pp., illus. \$95. Modern Inorganic Chemistry.

Mucosal Immunology. Intraepithelial Lymphocytes. Hiroshi Kiyono and Jerry R. McGhee, Eds. Raven, New York, 1993. xx, 204 pp., illus., + plate. \$90. Advances in Host Defense Mechanisms, vol. 9.

The Neurotic Personality of Our Time. Karen Horney. Norton, New York, 1994. xii, 299 pp. Paper, \$7.95. Reprint, 1937 ed.

The New Alchemists. Breaking Through the Barriers of High Pressure. Robert M. Hazen. Times, New York, 1994. xvi, 286 pp., illus. \$25.

Nuclear Acoustic Resonance. Dan I. Bolef and Ronald K. Sundfors. Academic Press, San Diego, CA, 1993. xii, 432 pp., illus. \$79.95.

Path-Integral Methods and Their Applications. D. C. Khandekar, S. V. Lawande, and K. V. Bhagwat. World Scientific, River Edge, NJ, 1993. xiv, 343 pp., illus. \$38.

The Philosophy Behind Physics. Thomas Brody. Luis de la Peña and Peter E. Hodgson, Eds. Springer-Verlag, New York, 1993. xii, 355 pp., illus. \$59.

Physics and Chance. Philosophical Issues in the Foundations of Statistical Mechanics. Lawrence Sklar. Cambridge University Press, New York, 1993. xiv, 437 pp., illus. \$64.95.

Residue Currents and Bezout Identities. Carlos A. Berenstein *et al.* Birkhäuser Boston, Cambridge, MA, 1993. xii, 158 pp. \$49.50. Progress in Mathematics, vol. 114.

Retinal Degeneration. Clinical and Laboratory Applications. Joe G. Hollyfield, Robert E. Anderson, and Matthew M. LaVail, Eds. Plenum, New York, 1993. xiv, 365 pp., illus. \$95. From a symposium, Costa Smeralda, Sardinia, Sept. 1992.

Sea Loads on Ships and Offshore Structures. O. M. Faltinsen. Cambridge University Press, New York, 1993. viii, 328 pp., illus. Paper, \$37.95. Cambridge Ocean Technology Series. Reprint, 1990 ed.

Semiconductor Quantum Dots. L. Bányai and S. W. Koch. World Scientific, River Edge, NJ, 1993. x, 244 pp., illus. \$38. Series on Atomic, Molecular and Optical Physics, vol. 2.

Sensory Research. Multimodal Perspectives. Ronald T. Verrillo, Ed. Erlbaum, Hillsdale, NJ, 1993. xxviii, 321 pp., illus. \$69.95. From a conference, Syracuse, NY, Aug. 1992.

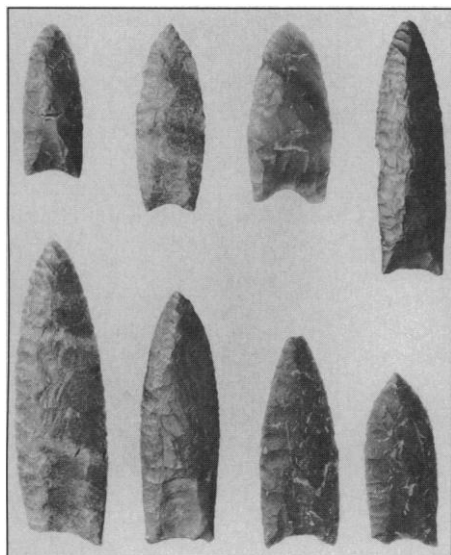
Structures. Sally and Adrian Morgan. Facts on File, New York, 1993. 48 pp., illus. \$14.95. Designs in Science.

Superantigens. A Pathogen's View of the Immune System. Brigitte T. Huber and Ed Palmer, Eds. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, 1993. x, 182 pp., illus. Paper, \$55. Current Communications in Cell and Molecular Biology, 7.

Symmetries in Science VI. From the Rotation Group to Quantum Algebras. Bruno Gruber, Ed. Plenum, New York, 1993. xviii, 770 pp., illus. \$149.50. From a symposium, Bregenz, Austria, Aug. 1992.

Taking the Naturalistic Turn. Or, How Real Philosophy of Science Is Done. Werner Callebaut, Organizer and Moderator. University of Chicago Press, Chicago, 1993. xxii, 553 pp., illus. \$85 or £67.95; paper, \$29.95 or £23.95. Science and Its Conceptual Foundations.

Theory of Reflectance and Emittance Spectroscopy. Bruce Hapke. Cambridge University Press, New York, 1993. xiv, 455 pp., illus. \$125. Topics in Remote Sensing, 3.



"Clovis points" from the Naco site, Arizona, found among the remains of a mammoth (the longest measures 4.6 inches). Approximately 11,000 years old, they take their name from the town of Clovis, New Mexico, where such projectile points were first found and recognized to be ancient. [From *The Desert's Past*, photograph by E. B. Sayles, courtesy of the Arizona State Museum]