is taking place. This global level of information flow and comprehension is simply not possible for a single scholar to command, and herein lies the second major problem with MacNeish's book. He has tried to incorporate recent data from all world regions but inevitably falls far short of being able to do so. My own expertise is restricted to parts of eastern North America and of the Near East, so I cannot assess MacNeish's accounts for other world areas in any detail. But I can see that he has not been able to integrate the fast-breaking information for the two regions I do know something about, with consequent serious implications for his presentation. As regards the Near East, for example, he makes no reference to Don Henry's recent volume (*From Foraging to Agriculture: The Levant at the End of the Ice Age*, University of Pennsylvania Press, 1989). In fact, he makes no overt reference at all to the Levantine primacy syndrome ably advocated by Ofer Bar-Yosef, Henry, Gordon Hillman, Andrew Moore, and others in a series of publications in the 1980s. That is, MacNeish seems unaware of the current focus on the Levant as the region where legumes and grains were first domesticated but instead discusses the Zagros and Taurus highlands as a primary developmental region, with initial plant domestication taking place there, and the Levant as secondary, receiving domesticated plants from the highlands.

For eastern North America, MacNeish has not integrated such crucial developments as Bruce Smith's demonstration—in a series of papers published during the 1980s—of morphological characteristics that define an early, indigenous domesticated *Chenopodium*, dated by accelerator mass spectrometry to the second millennium B.C. Nor does he refer to recent and continuing discussions about wild north-of-the-Mexican-border ancestors for the earliest (accelerator mass spectrometry dates indicate, at the latest, 4000 to 5000 years ago) domestic cucurbits in eastern North America. If cucurbits and *Chenopodium* were both taken into cultivation north of (and independently of) Mexico, then the center/non-center status of eastern North America vis-à-vis Mexico obviously needs reassessment. Another relevant issue missing from MacNeish's discussion is the increasing evidence for significant dependence on pre-maize, indigenous agricultural systems during the Early and Middle Woodland periods in some portions of eastern North America.

MacNeish's book is noteworthy because of his standing in the field, but archeologists venturing into its 300-plus closely written pages should be prepared to read with reservation the data summaries for areas they do not know at first hand and be prepared to reevaluate the summaries for areas they do know well.

Patty Jo Watson
Department of Anthropology, Washington University, St. Louis, MO 63130

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Plasma Astrophysics

Extragalactic Radio Sources. From Beams to Jets. J. ROLAND, H. SOL, and G. PELLETIER, Eds. Cambridge University Press, New York, 1992. xvi, 372 pp., illus. $69.96. From a meeting, Paris, July 1991.

It is well accepted among astrophysicists that the nuclei of some galaxies eject highly collimated jets of plasma, often with speeds very close to that of light. The traces of these jets on the sky are readily visible to observers with radio telescopes, and their signatures are also read in the intense, flickering gamma-rays that have recently been discovered to come from some quasars and radio galaxies. But the mechanisms responsible for powering, accelerating, and collimating cosmic jets remain the subject of intense speculation among theorists. Although it has its share of observational papers, this proceedings volume has a decidedly theoretical bent. The focus of the theoretical contributions is somewhat unorthodox, with an unusual emphasis on plasma physical processes. This is not too surprising, since the conference organizers (and editors of the volume) are among the few to have approached the study of jets from a plasma physicist's viewpoint.

Over the years it has proven notoriously difficult to make progress in the subdiscipline that has become known as "plasma astrophysics." The physical effects that one needs to study are quite subtle and complex, even in the most idealized of models, and sound observational diagnostics are often elusive. All of these difficulties are evident in the theory papers in this book, which treat such topics as beam instabilities of electron-positron plasmas, relativistic magnetohydrodynamics, and mechanisms for accelerating particles to relativistic energies. The speculative and exploratory tone of the theory papers contrasts with some solid observational contributions. Perhaps the most interesting new result is the discovery of "intraday radio variability," which is summarized crisply by Wagner and Witzel. The rapid flickering of radio flux, if interpreted naively, indicates enormous intensities at the source, posing a serious problem for existing theories of radio emission. A radical solution is suggested in the theory papers by Benford and Lesch, who suggest that the radio waves arise from coherent plasma processes rather than the incoherent synchrotron emission that is usually invoked.

By virtue of its timing, the book misses out on reporting other, equally exciting observational developments of the past two years. There is some discussion of early results from the French-Soviet SIGMA/GRANAT gamma-ray experiment, but the conference was held shortly before the announcement of dramatic observations of jet emission by Gamma Ray Observatory. Likewise, Brinkmann's report on results from the ROSAT x-ray satellite is very preliminary and has been superseded by more recent reports at conferences.

Some conference proceedings serve as useful references for students or other novices who wish to get up to speed in a field, because of the careful balance or breadth of topics covered. Some are distinguished by the high pedagogical quality of their review papers. This volume has none of those distinctions. Most of the contributions are terse summaries of work in progress or recent publications. It is just another conference proceedings and should mainly be of interest to specialists who want to know what was discussed at the Institut d'Astrophysique in July 1991.

Mitchell C. Begelman
Joint Institute for Laboratory Astrophysics, University of Colorado, Boulder, CO 80309–0440

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Adaptive Abilities

Insect Learning. Ecological and Evolutionary Perspectives. DANIEL R. PAPAJ and ALCINDA C. LEWIS, Eds. Chapman and Hall, New York, 1993. xiv, 398 pp., illus. $54.95.

From the data we have on major animal phyla, it seems that learning in the form of habituation appeared almost as soon as nerve nets arose. Associative learning is probably almost as ancient, and we can be reasonably sure that learning evolved almost as soon as did nervous tissue. In this volume issues of learning are addressed with respect to what is arguably one of the most highly evolved life forms on Earth. Learning is a requisite to the existence of many species, but at the same time there is much to be said for the adaptiveness of consistent behavior. Indeed, learning is often designed to *achieve* fixed behavior

(that is, behavior suited to a particular recurrent set of circumstances).

Consider a honeybee that remembers for life (no consciousness is implied) the association made between a flower scent or color and a food reward after just one or two trials. With but a few sightings at different times it interpolates (and learns) the sun's path through the heavens and uses it as a landmark. It also uses fixed landmarks to guide it back to its hive, after having committed them to memory after one orientation flight. Consider now a platylabine ichneumon wasp, a hymenopterous relative of the bee, that has no home base. One of its main missions in life is to track down a rare and highly camouflaged geometrid caterpillar mimicking a twig, in order to inject its egg into it. The bee requires elaborate mechanisms of learning, as are being elucidated by Randolf Menzel and associates, who contribute a paper to the volume. Many of these mechanisms may well be much like those we ourselves use. And though the wasp seems to rely on "instinctive" behavior, it may, like the bee, also be endowed with specific, or, in James L. Gould's term, "customized" learning predispositions. As Daniel R. Papaj points out in his contribution, an "instinct" could be generated either when the insect becomes so congenitally predisposed to a stimulus that response cannot be improved through learning or when it can learn so quickly that a single experience is sufficient for the expression of the appropriate behavior.

Insect Learning contains 14 chapters by 22 authors including physiologists, field ecologists, and theoreticians. The authors share an evolutionary perspective, but, as is typical of such community efforts, there is lack of consistency. Even definitions of learning and adaptation are not uniform, as each author has his or her own perspective on the issues. As the editors point out, however, "such incongruities form the core of academic debate" and "it is more in the collective interest for editors to foster debate than to feign consensus."

Most authors beat the drum for more studies in order to gain "better understanding." But it is generally not clear precisely what the biological puzzle is that is in need of a solution. We are all too often left with debate over semantics. On the other hand, attempts at hard generalizations are often futile and sometimes divisive, since adaptation to diverse environments is necessarily a matter of differences. As one example consider the debate over whether particular learning traits are recent adaptations or are traits retained from evolutionary ancestors. Legs and wings have not evolved *de novo* in each species, yet they are highly adaptive features because they enabled those organisms that evolved them to radiate profusely. Learning predispositions need not be viewed in a special light. To do so leads to chicken-versus-egg arguments. Surely specific morphological, physiological, and behavioral capacities such as learning ability, predispose animals to occupy specific ecological niches, and the occupation of these niches in turn promotes further evolution not only in the organisms themselves but sometimes also in others. For example, it is intriguing to note that the "cognitive" abilities of bees and other insects to distinguish colors, scents, and shapes and to learn and remember them are now reflected in the variety of flowers so pleasing to our senses. *Insect Learning* will be a valuable reference for anyone wishing an entree to the literature and to the ideas and research of many of the practitioners of a wide-ranging field.

Bernd Heinrich
Department of Zoology,
University of Vermont,
Burlington, VT 05405

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Books Received

Action Refinement in Process Algebras. Luca Aceto. Cambridge University Press, New York, 1992. x, 273 pp., illus. $49.95. Distinguished Dissertations in Computer Science.

Advances in Underwater Archaeology. J. Barto Arnold III, Ed. Society for Historical Archaeology, Tucson, AZ, 1992. iv, 131 pp., illus. Paper, $12.50. Based on a conference, Richmond, VA, 1991. *Historical Archaeology*, vol. 26, no. 4.

Biophysics of the Skeletal Muscle Extracellular Potentials. Alexander Gydikov. Publishing House of the Bulgarian Academy of Sciences, Sofia, and Kluwer, Norwell, MA, 1992. 278 pp., illus. $126. Translated from the Bulgarian.

The Book of Nature. Olaf Pedersen. Vatican Observatory, Vatican City State, 1992 (U.S. distributor, University of Notre Dame Press, Notre Dame, IN). vi, 92 pp. Paper, $9.95.

The Cambridge Encyclopedia of Human Evolution. Steve Jones *et al.*, Ed. Cambridge University Press, New York, 1992. xiv, 506 pp., illus. $95.

The Cambridge Guide to Astronomical Discovery. William Liller. Cambridge University Press, New York, 1992. xii, 257 pp., illus. $29.95.

Dealing with Genes. The Language of Heredity. Paul Berg and Maxine Singer. University Science, Mill Valley, CA, 1992. xvi, 269 pp., illus. $34.

Dispelling the Manufacturing Myth. American Factories *Can* Compete in the Global Marketplace. Committee on Comparative Cost Factors and Structures in Global Manufacturing. National Academy Press, Washington, DC, 1992. xiv, 112 pp., illus. Paper, $24.95.

Eustasy. The Historical Ups and Downs of a Major Geological Concept. Robert H. Dott, Jr., Ed. Geological Society of America, Boulder, CO, 1992. viii, 111 pp., illus. $45. GSA Memoir 180. From a symposium, Dallas, Oct. 1990.

Experimental Slips and Human Error. Exploring the Architecture of Volition. Bernard J. Baars, Ed. Plenum, New York, 1992. xx, 346 pp., illus. $50. Cognition and Language.

Fiber Optics. Research and Development. Ye. M. Dianov, Ed. Nova, Commack, NY, 1992. x, 278 pp., illus. $98. Proceedings of the Institute of General Physics, Academy of Sciences of Russia, vol. 15. Translated from the Russian by Al Peabody.

A Field Guide to the Stars and Planets. Jay M. Pasachoff. 3rd ed. Houghton Mifflin, Boston, MA, 1992. x, 502 pp., illus. $24.95; paper, $15.95. Peterson Field Guide Series.

Global Climate Change. Linking Energy, Environment, Economy, and Equity. James C. White, William R. Wagner, and Carole N. Beal, Eds. Plenum, New York, 1992. xiv, 242 pp., illus. $65. Environmental Science Research, vol. 45. From a conference, Washington, DC, Dec. 1991.

Guide to the Sun. Kenneth J. H. Phillips. Cambridge University Press, New York, 1992. xiv, 386 pp., illus. $29.95.

The Human Machine. R. McNeill Alexander. Columbia University Press, New York, 1992. 176 pp., illus. $34.95.

Immunology in the 21st Century. Frederick W. Alt. Published for the Irvington Institute for Medical Research by Sigma Chemical, St. Louis, MO, 1992. x, 202 pp., illus. $55. Sigma Product no. 17766. From a symposium, New York, Oct. 1990.

Journal Literature of the Physical Sciences. A Manual. Alice Lefler Primack. Scarecrow, Metuchen, NJ, 1992. x, 211 pp., illus. $29.50.

The Language of the Cell. Claude Kordon. McGraw-Hill, New York, 1993. 104 pp. Paper, $9.95. Horizons of Science Series. Translated from the French edition (Paris, 1991).

The Machinery of Life. David S. Goodsell. Springer-Verlag, New York, 1993. xvi, 140 pp., illus. $29.

Magnetic Measurement and Alignment. S. Turner, Ed. CERN, Geneva, 1992. xiv, 374 pp., illus. Paper. CERN 92–05. From a course, Montreux, Switzerland, March 1992.

Mazes for the Mind. Computers and the Unexpected. Clifford A. Pickover. St. Martin's, New York, 1992. xx, 427 pp., illus. $32.95.

Nuclear Reactions. Science and Trans-Science. Alvin M. Weinberg. American Institute of Physics, New York, 1992. xvi, 334 pp., illus. $25. Masters of Modern Physics.

Oceanography in the Next Decade. Building New Partnerships. Commission on Geosciences, Environment, and Resources. National Academy Press, Washington, DC, 1992. xiv, 202 pp., illus. Paper, $39.95.

Oscillations and Morphogenesis. Ludger Rensing, Ed. Dekker, New York, 1993. xiv, 501 pp., illus. $175. Cellular Clocks, 5.

Path Integrals and Coherent States of SU(2) and SU(1,1). A. Inomata, H. Kuratsuji, and C. C. Gerry. World Scientific, River Edge, NJ, 1992. x, 318 pp., illus. $56.

Proceedings of the International Symposium on the Application of Fundamental Theory to Problems of Biology and Pharmacology. St. Augustine, FL, March 1992. Per-Olov Löwdin *et al.*, Eds. Wiley, New York, 1992. xxiv, 273 pp., illus. Paper, $150. *International Journal of Quantum Chemistry*, Quantum Biology Symposium no. 19.

Quantum Fields on the Computer. Michael Creutz, Ed. World Scientific, River Edge, NJ, 1992. xvi, 427 pp., illus. $86; paper, $48. Advanced Series on Directions in High Energy Physics, vol. 11.

The Realm of Molecules. Raymond Daudel. McGraw-Hill, New York, 1993. 132 pp. Paper, $9.95. Horizons of Science Series. Translated from the French edition (Paris, 1991).

The Sky in Mayan Literature. Anthony F. Aveni, Ed. Oxford University Press, New York, 1992. x, 297 pp., illus. $39.95. Based on a workshop, Nov. 1989.

Tropical Forests and Their Crops. Nigel J. H. Smith *et al.* Cornell University Press, Ithaca, NY, 1992. xvi, 568 pp., illus. $69.95; paper, $27.95.

Turntable Illusions. Kinetic Optical Illusions for Your Record Turntable or 101 Uses for an Obsolete Turntable. John Kremer. Open Horizons, Fairfield, IA, 1992. 96 pp., illus. Paper, $9.99.

Understanding and Preventing Violence. Albert J. Reiss, Jr., and Jeffrey A. Roth, Eds. National Academy Press, Washington, DC, 1993. xvi, 464 pp., illus. $49.95.

Working with Congress. A Practical Guide for Scientists and Engineers. William G. Wells, Jr. Carnegie Commission on Science, Technology, and Government, Washington, DC, and American Association for the Advancement of Science, Washington, DC. xiv, 153 pp., illus. Paper, $12.95; to AAAS members, $10.36.