

represent both the effluents of affluence (industrial production and automobiles) and those of poverty (burning tropical vegetation). Although there are still some who question that the observed temperature rise is a result of the increase in greenhouse gases, several global circulation models (GCMs) predict that a doubling of preindustrial CO<sub>2</sub> concentrations will cause an overall average warming of 1.5°C to 4.5°C or so within the next century.

The effects that such a warming trend will have on agricultural production and coastal regions have received much discussion. The primary goal of this book, which emerged from a symposium on the topic in 1988, is to focus attention on its impacts on biological diversity and natural ecosystems. To this end, the editors have brought together a stellar assemblage of authors. Following a foreword by Michael Soule and a preface by Thomas Lovejoy, Robert Peters provides overviews of the problem from two different perspectives. George Woodwell follows with a revealing chapter on government attitudes to the climate change problem, and Stephen Schneider and coauthors discuss the general conclusions—and deficiencies—of present GCMs.

The next section, with chapters by Thompson Webb and Russell Graham, describes the impacts of past climate changes on the world's biota. This is followed by reviews on the effects of climate on vegetation (Ian Woodward), soils (Walter Whit-

ford), wildlife diversity (Herman Shugart and Thomas Smith), animal physiology (William Dawson), ecology (Richard Tracy), behavior (Daniel Rubenstein), and migration (P. J. P. Myers and Robert Lester), and parasites and diseases (Andrew Dobson and Robin Carper).

How might global climate change affect specific regions? Vera Alexander provides informed speculation on arctic marine ecosystems, Carleton Ray and coauthors on coastal marine zones, Gary Hartshorn on tropical forests, and Dwight Billings and Kim Moreau Peterson on the arctic tundra, Jerry Franklin and coauthors on the northwestern North American forests, Walter Westman and George Malanson on the Mediterranean ecosystems of California, Dennis Murphy and Stuart Weiss on the Great Basin, and Larry Harris and Wendell Cropper, Jr., on Florida. Potential changes in eastern North American forests are treated in papers by Daniel Botkin and Robert Nisbet and by Margaret Davis and Catherine Zabinski. Finally, indirect linkages and synergisms among climate change, biodiversity, the geosphere, and various anthropogenic stresses are addressed in contributions by Norman Myers and John Harte *et al.*

What do all these papers tell us? First, all predict that the consequences of global change for biodiversity will be dramatic and disastrous. Many ecosystems will be fundamentally altered as a result of changes in abundance and local extirpations of more

common species, extinctions of geographically restricted species, expansion of exotics and disease vectors, increases in catastrophic storms, fires, and seasonal extremes, and unknown interplays among all these events. These in turn are likely to result in irreversible losses of germ plasm, reductions of forest yields, and declines in the quantity and quality of freshwater resources. Clearly, such impacts not only will alter natural resources but also human economic futures.

Aside from providing "creative speculation" on the qualities of a changing world, few of these papers are able to make specific, unequivocal predictions. The complexities of the real climate system still vastly exceed the comprehensiveness of today's GCMs, and the grid size of these models is too large to predict local conditions very accurately. Climate can affect almost every conceivable aspect of plant and animal biology, so we have only rudimentary ideas about how species' tolerances may respond to climate change. We know even less about how the loss of species can affect basic ecosystem processes. While we do know a bit about the relationship between past climates and community composition, extrapolation to the future from this information is risky. The rates of change are likely to be much faster than previous onsets of natural greenhouse conditions, and the flora and fauna must respond to this change in landscapes highly modified and fragmented by human activities.

The most serious consequence of our current inability to generate specific predictions is that it provides a grand excuse for continued inaction. As Woodwell points out, the "concept of a large and resilient world open to infinite compromise persists." However, the take-home lesson from this book is that the changes likely to be wrought by global warming are not going to be very convenient, pleasing, or profitable to its human inhabitants and that the time available for altering its course is growing short. The prudent action is to follow Woodwell's advice and take immediate steps to "restabilize the human habitat and preserve opportunities for our children to live in it." Perhaps the first step is to buy this book and give it to your favorite politician for Christmas.

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## Books Received

**The Archaeology of William Henry Holmes.** David J. Meltzer and Robert C. Dunnell, Eds. Smithsonian Institution Press, Washington, DC, 1992. Various



### Vignettes: Divine Terminations

Saddam Hussein had styled himself the heir of Nebuchadnezzar and Hammurabi, but, in truth, he was a modern-day Sennacherib. . . . [Sennacherib] invaded Judea and besieged Jerusalem. Like Hussein, his forces were shattered by air power—allegedly suffering 185,000 dead at the hands of the Angel of Death.

—Richard P. Hallion, in *Storm over Iraq: Air Power and the Gulf War* (Smithsonian Institution Press)

The direct influence of prophecy belief on nuclear decision making surfaced as an issue in the 1980s as the eschatological interests of several Reagan-administration officials became known. Secretary of Defense Caspar Weinberger, asked about the subject in 1982, replied, "I have read the Book of Revelation and yes, I believe the world is going to end—by an act of God, I hope—but every day I think that time is running out." Interior Secretary-designate James Watt, questioned at his confirmation hearing about preserving the environment for future generations, forthrightly replied, "I do not know how many future generations we can count on before the Lord returns." Reagan's Surgeon General, C. Everett Koop, attended a 1971 prophecy conference in Jerusalem and reported on it for a leading premillennial journal.

—Paul Boyer, in *When Time Shall Be No More: Prophecy Belief in Modern American Culture* (Harvard University Press)

paged. Paper, \$34.95. Reprints, with an introduction, of four publications by Holmes.

**The Art of Robert McCall.** A Celebration of Our Future in Space. Bantam, New York, 1992. x, 150 pp., illus. \$60.

**Axiom.** The Scientific Computation System. Richard D. Jenks and Robert S. Sutor, with contributions from Scott C. Morrison *et al.* Springer-Verlag, New York, 1992. xxiv, 742 pp., illus., + plates. \$45.

**Chromatin.** Structure and Function. A. Wolffe. Academic Press, San Diego, CA, 1992. x, 213 pp., illus. Paper, \$14.95.

**Cosmic Wormholes.** The Search for Interstellar Shortcuts. Paul Halpern. Dutton, New York, 1992. xii, 237 pp. \$21.

**During My Time.** Florence Edenshaw Davidson, a Haida Woman. Margaret B. Blackman, 2nd ed. University of Washington Press, Seattle, 1992. xxiv, 202 pp., illus. Paper, \$12.95.

**Entropy and Energy Dissipation in Water Resources.** V. P. Singh and M. Fiorentino, Eds. Kluwer, Norwell, MA, 1992. xii, 595 pp., illus. \$172. Water Science and Technology Library, vol. 9. From a conference, Maratea, Italy, June 1991.

**Granitoid Rocks.** D. B. Clarke. Chapman and Hall, New York, 1992. xii, 283 pp., illus. \$45. Topics in the Earth Sciences, 7.

**Handbook of Neuropsychological Assessment.** A Biopsychosocial Perspective. Antonio E. Puente and Robert J. McCaffrey, Eds. Plenum, New York, 1992. xxii, 526 pp., illus. \$70. Critical Issues in Neuropsychology.

**The Interpretation of Modern Synthesis Observations of Spiral Galaxies.** Nebojsa Duric and Patrick C. Crane, Eds. Astronomical Society of the Pacific, San Francisco, CA, 1992. xviii, 275 pp., illus. \$44.50. Astronomical Society of the Pacific Conference Series, vol. 18. From a workshop, Albuquerque, NM, March 1990.

**Neurotoxins and Neurodegenerative Disease.** J. William Langston and Anne Young, Eds. New York

Academy of Sciences, New York, 1992. xvi, 385 pp., illus. \$125. Annals of the New York Academy of Sciences, vol. 648. From a conference, New York, May 1991.

**Plant Resistance to Herbivores and Pathogens.** Ecology, Evolution, and Genetics. Robert S. Fritz and Ellen L. Simms, Eds. University of Chicago Press, Chicago, 1992. x, 590 pp., illus. \$75; paper, \$29.95.

**Plasma Technology.** Fundamentals and Applications. Mario Capitelli and Claudine Gorse, Eds. Plenum, New York, 1992. viii, 224 pp., illus. \$65. From a workshop, Lucca, Italy, July 1991.

**Prairies, Forests, and Wetlands.** The Restoration of Natural Landscape Communities in Iowa. Janette R. Thompson. University of Iowa Press, Iowa City, 1992. xii, 139 pp., illus. \$24.95; paper, \$10.95.

**Proceedings of the Workshop on Nonassociative Algebraic Models.** (Zaragoza, Spain, April 1989.) Santos González and Hyo Chul Myung, Eds. Nova, Commack, NY, 1992. x, 246 pp. \$98.

**Programs, Recursion and Unbounded Choice.** Predicate-Transformation Semantics and Transformation Rules. Wim H. Hesselink. Cambridge University Press, New York, 1992. xiv, 223 pp. \$39.95. Cambridge Tracts in Theoretical Computer Science.

**Space, Time and Archaeological Landscapes.** Jacqueline Rossignol and LuAnn Wandsnider, Eds. Plenum, New York, 1992. xvi, 298 pp., illus. \$47.50. Interdisciplinary Contributions to Archaeology. From a symposium, Phoenix, AZ, 1988.

**Star Maps for Beginners.** I. M. Levitt and Roy K. Marshall. 50th ed. Simon and Schuster, New York, 1992. 64 pp., illus. Paper, \$10.

**Statistical Mechanics of Phase Transitions.** J. M. Yeomans. Clarendon (Oxford University Press), New York, 1992. x, 153 pp., illus. \$49.95; paper, \$24.95. Oxford Science Publications.

**Statistics for the Twenty-First Century.** Florence Gordon and Sheldon Gordon, Eds. Mathematical Association of America, Washington, DC, 1992. xii, 318

pp., illus. Paper, \$22. MAA Notes, vol. 26.

**Strengthening Research in Academic OB/GYN Departments.** Jessica Townsend, Ed. Institute of Medicine. National Academy Press, Washington, DC, 1992. x, 309 pp., Paper, \$30.

**Striking the Mother Lode in Science.** The Importance of Age, Place, and Time. Paula E. Stephan and Sharon G. Levin. Oxford University Press, New York, 1992. xiv, 194 pp., illus. \$29.95.

**Structure and Evolution of Single and Binary Stars.** C. W. H. De Loore and C. Doom. Kluwer, Norwell, MA, 1992. xvi, 458 pp., illus. Paper, \$69. Astrophysics and Space Science Library, vol. 179.

**Structure and Function.** Vol. 1, Nucleic Acids. R. H. Sarma and M. H. Sarma, Eds. Adenine Press, Schenectady, NY, 1992. x, 275 pp., illus. \$95. From a meeting, Albany, NY, June 1991.

**Structure and Function.** Vol. 2, Proteins. R. H. Sarma and M. H. Sarma, Eds. Adenine Press, Schenectady, NY, 1992. x, 192 pp., illus. \$95. From a meeting, Albany, NY, June 1991.

**Structure Reports for 1984.** Vol. 51B, Parts 1 and 2, Organic Section. G. Ferguson, Ed. Published for the International Union of Crystallography by Kluwer, Norwell, MA, 1992. 2 vols. xii, 2094 pp., illus. \$375.

**Topological, Projective and Combinatorial Properties of Spaces.** C. S. Chogoshvili, Ed. Nova, Commack, NY, 1992. vi, 191 pp., illus. \$68. Translated from the Russian by Prem Kumar Dang.

**Transition Metal Oxides.** An Introduction to Their Electronic Structure and Properties. P. A. Cox. Oxford University Press, New York, 1992. x, 284 pp., illus. \$75. International Series of Monographs on Chemistry, 27.

**Wave-Particle Duality.** Franco Selleri, Ed. Plenum, New York, 1992. xiv, 306 pp., illus. \$89.50.

**Workshop on Photon Radiation From Quarks.** (Annecy, France, Dec. 1991.) S. Cartwright, Ed. CERN, Geneva, 1992. xii, 234 pp., illus. Paper. CERN 92-04.-

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