BOOK REVIEWS

that will likely be new to New World readers. Between the table of contents, which is essentially a comprehensive outline of the book, and the subject index at the end of the volume, readers will be able to easily locate their topics of interest.

This ambitious book is a convenient starter reference for those unfamiliar with basic chemical and biological processes in water, air, and soil. Given the book’s high cost, advanced readers may wish to fill gaps in their libraries with more-specialized, less expensive texts.—BLYTHE L. HOYLE, Department of Geological and Atmospheric Sciences, 253 Science Hall I, Iowa State University, Ames, IA 50011.

Integrating Economics, Ecology and Thermodynamics


The 1992 United Nations Conference on Environment and Development in Rio highlighted the global awareness of the tight relationship between economic and ecological systems. This hardcover volume is part of a growing literature that explores the linkages between those systems. The author notes that this study is distinguished from others by the complete integration of disciplinary concepts into a unified approach. As the title indicates, the integration draws upon economics, ecology, and thermodynamics. The author hails from a Center of Energy and Environmental Studies and a Department of Geography and his entry into these disparate fields shows a mastery of distinct literatures.

In a well organized text, the author presents “core concepts” from each of these three disciplines. He selects opportunity costs, substitution, and time preference from economics. From ecology come the concepts of material cycles, energy flow, interconnectedness, exponential and logistic growth, competitive exclusion, and evolutionary change. Finally, from thermodynamics comes the definitions of systems and system boundaries, the evaluation of matter and energy flows across these boundaries using the laws of thermodynamics, and the distinction of systems at different states of order.

Following the introduction of core concepts are a series of chapters in which there are pair-wise comparisons of models in which these disciplines are combined. This literature review is particularly helpful, as the author uses it skillfully to distinguish his unified approach. In his integrated model, ecology is used to define a sustainable reference system and deviations from it. Thermodynamics is employed via the use of energy flows to distinguish system boundaries and evaluate changes in systems and system components associated with economic and biological processes. Economics is utilized by placing an anthropocentric valuation of alternative processes of a system. Consumer autonomy is recognized in choosing among alternative consumption plans, guiding the allocation of materials, and energy. Using these principles, in the final two chapters, the author constructs a model incorporating environment and economy sectors and uses it in a simulation exercise.

Throughout the text, the exposition is clear. During the introduction of the various disciplinary concepts, the use of mathematics is minimized, enabling the readers not from those disciplines to keep pace. The author has advanced the discussion of environment—ecosystem modeling with a comprehensive exposition of how to work with first principles to integrate rather than simply combine these disciplines.—C.C. CRISSMAN, International Potato Center, Box 17-16-129-CEQ, Quito, Ecuador.

Earthkeepers—Observers and Protectors of Nature


I have no trouble beginning this review with the statement that I found Earthkeepers to be a very enjoyable and enlightening series of essays on the experiences, motivations, and contributions of some of the most important naturalists of the last 250 years. While this book is marketed as part of the Oxford Children’s Library, I feel that is serves a potentially much larger audience. The individuals profiled in this book are the true contributors to our recognition of the importance of our natural resource heritage and its conservation. How refreshing and stimulating it is to read of their dedication, often over a lifetime, to honest and often unsung and unrewarded conservation efforts. Every budding environmentalist should read these profiles to learn what true commitment to conservation entails.

In an oversized and beautifully composed format, Earthkeepers covers the obvious contingent of such luminaries as John James Audubon, Charles Darwin, John Muir, Theodore Roosevelt, John Wesley Powell, and Rachel Carson. Further, it provides insight into other naturalists sometimes overlooked, such individuals as Alexander Wilson, John (the father) and William (the son) Bartram, John Chapman (Johnny Appleseed), William Temple Hornaday, Anna Botsford Comstock, Grey Owl (Archibald Belaney), and Katharine Ordway, to name but a few of the total 45 individuals separately profiled. Additional notable earthkeepers are recognized in one to two paragraphs at the end of each of the four sections into which this book is chronologically divided.

While I knew of perhaps half the individuals included in Earthkeepers, I certainly learned far more from reading this book than I previously knew. Additionally, at the end of each profile a list of several references are provided for further reading. The book includes a picture of each individual and the liberal use of both black-and-white and color photos and illustrations. The three appendices are useful, particularly Appendix 3, which provides an extended list of names, addresses, and telephone numbers of organizations promoting conservation and nature study. An extensive list of further reading beyond the references in each profile is also included. The book is also written in clear and concise prose that transcends a children’s audience.

Earthkeepers is a somewhat hidden gem as part of the Oxford Children’s Library. It is a bargain at only $30.00. I recommend it for any level of teaching and to anyone, of any age, interested in the “personality” of natural resource conservation.—R.J. WAGENET, Department of Soil, Crop and Atmospheric Sciences, Cornell University, Ithaca, NY 14853.

Isotopic Studies of Azolla and Nitrogen Fertilization of Rice


In the next 30 years, agronomists predict that rice production will need to increase 70% to meet the food demands of a growing population, especially in Asia. To meet this need, green manure amendments have been advocated not only as a low-cost substitute for inorganic fertilizers, but also to regenerate depleted soil resources and boost declining yields. One