

Environment as Destiny, History as Science

A Personal Note

With this issue, I will have completed a six-year term as Associate Editor for Book Reviews. This period has witnessed a dramatic increase in the number of books published in the field, and I have found the work exciting and informative. During my tenure, I have examined approximately 1000 books, of which over 200 were sent out for review. It was satisfying to work with a wide range of helpful reviewers, and I thank them all. For assistance in dealing with these advances in technology, I have to thank my friends, students, and family, in particular my son Daniel, who got me through each deadline.

Richard B. Primack

From the Editor: I thank Richard Primack for his dedicated service to *Conservation Biology* over the last six years, and I welcome the new Associate Editor for Book Reviews, Dr. Peggy Fiedler of San Francisco State University. She has been handling the flow of new books for several months, and the first reviews under her tenure will appear in the next issue. I look forward to working with her in the coming months and years.

Guns, Germs and Steel: the Fates of Human Societies. Diamond, J. 1997. Norton, New York. 480 pp. \$14.95. ISBN 0-393-31755-2.

Few books can truly change the way we look at the world, but this one can. It assembles a fascinating range of facts about our species' cultural history and environment and shows us how to interpret these facts within an ecological and evolutionary framework. I was reading this book while on the Indonesian islands of Sulawesi and Bali, and I found myself looking up and seeing the rice fields, the malarial mosquitos, and the outrigger canoes as proximate causes for the Austronesian displacement, 4500 years ago, of the original Indonesian hunter-gathers. I found myself examining the contrast between the art-filled culture of Bali and the hard-scrabble life of hill farmers on Sulawesi in terms of the volcanic fertility of the former and the old, poor soils of the latter.

The book is framed as an answer to a question posed 30 years ago by a New Guinean friend of the author: "Why is it that you white people developed so much cargo and brought it to New Guinea, but we black people had little cargo of our own?" The question raises all kinds of racist and anti-racist ideas; we know what we should believe and what we want to believe, but doubts remain as to the truth. Diamond's case is clear and persuasive and partly a polemic against those who would attribute the current differences among continents in technological and economic dominance to biological differences (read intelligence) among their peoples. He contends instead that "history followed different courses for different peoples because of differences among peoples' environments."

Diamond's (perhaps overly long) answer starts with a striking example of the clash of two independently evolved civilizations. In 1532 Francisco Pizarro and 168 conquistadores defeated 80,000 Inca soldiers and captured the Inca emperor Atahualpa because of the Spaniards' access to steel-based military technology, horses, written information networks, and the resources of a large, centralized political state, and because of their transmission of and immunity to epidemic diseases. Diamond then traces these proximal factors back through 13,000 years of human history to find the ultimate causes of the differences between Europeans and South Americans.

His hypothesis is simple. Where potentially domesticable plant and animal species were present, natural selection—as opposed to intelligent choice—led to the adoption of sedentary agriculture. The large populations in these areas became afflicted

by, and partly immune to, epidemic diseases derived from their domesticated animals. Large populations required some centralized (literate) organization and freed up craftsmen to invent. Neighboring "civilizations" then borrowed each other's ideas, leading to positive feedback among population size, technological advancement, and population growth rate. Because Australia, the Americas, and Africa contained only a few suitable plants and animals for domestication, and because ecological and geographic barriers blocked the spread of domesticated plants, animals, and ideas from elsewhere, the agricultural and technological development of their cultures was held back. Eurasia, on the other hand, started with many suitable species and became a large, interconnected, fertile melting-pot of crops, domestic animals, and ideas.

What stops his explanations from becoming "just-so" stories is Diamond's application of the methodology of natural experiments, which he himself helped pioneer in the ecological literature. He uses it to best effect in the consideration of the "adaptive radiation" of cultures in the Pacific. Starting with an original farming and fishing culture in the Bismark Archipelago, the expanding Austronesians diversified into both "retrogressive" hunter-gathers (Chathams) and "progressive," multi-island chiefdoms (Hawaii), depending on the local conditions of the islands they colonized. Some historians will be dismayed at the low importance given to cultural factors as determinants of the success of societies, denouncing Diamond as a blind "geographic determinist." This criticism, however, represents a misunderstanding of the scale of Diamond's hypothesis: he is explicitly ad-

dressing broad, repeated patterns of societal change—the “macroecological” patterns of human history. He himself acknowledges that at smaller spatial and temporal scales, cultural stochasticity may play as large a role as environment. By factoring out the geographic determinants of history, however, the historian is actually in a better position to recognize and explain the cultural residuals.

Few of the ideas in this book may be original on their own, but Diamond’s brilliance comes in how he links the strands together in a single, compelling narrative. His melding of historical linguistics, biogeography, archeology, and genetic evidence into a “cultural cladistic” analysis of the mass movements of peoples is especially powerful. We are left at the end with a deepened sense of the essential similarity of all human races, despite the physical differences (beautifully illustrated with 32 plates). We also cannot escape wondering if we really are free of the influence of the environment on the future of our global culture, given the great effect it has had on societies in the past.

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Playing Earth Jazz

The Ecology of Eden. Eisenberg, E. 1998. Alfred A. Knopf, New York. 592 pp. \$16.00. ISBN 0-375-70560-0.

Some musicologists consider Debussy’s *Golliwogg’s Cake Walk* from his *Children’s Corner Suite*, a predecessor to jazz. In the midst of the song, Debussy uses the “Tristan chord” (from Wagner’s opera *Tristan and Isolde*), a revolutionary chord that introduced the world to atonality and is important in the development of modern Western music. This unresolved chord-motif represents the

yearning, longing, and desire of Tristan and Isolde for each other.

Tristan’s and Isolde’s desire for each other could be satisfied only in death, the Liebestod. Similarly, our attempt to return to Eden has so far been met with generally disastrous consequences or at least expensive consequences, as demonstrated by the \$150+ million Biosphere 2. Evan Eisenberg, in his engaging and stimulating *The Ecology of Eden*, depicts humanity’s desire to return to Eden as a Tristan chord of sorts—unattainable and ill-fated. Eisenberg argues that we need to realize that humanity cannot return to Eden by trying to recreate it. Rather, humans must learn “Earth Jazz,” the ability to swing with nature, if we want the Earth to remain a garden planet lush with life.

The book charmingly recounts the story of humanity’s relation with the earth through ecological, biblical, mythical, and historical perspectives. *The Ecology of Eden* is in four parts. Part one focuses on past human activities and effects on the earth. The second part develops Eisenberg’s concept of the “mountain” and the “tower”: loosely stated, wilderness and the city. These two “world poles” have been the central themes of various civilizations’ myths as well as Western religious stories of Eden. Part three continues the survey of ancient to contemporary civilizations and their quest to create Eden, as a compromise site (“Arcadia”), somewhere between the Mountain and the Tower.

In the last section, Eisenberg calls for humanity to play Earth Jazz. In Earth Jazz, human activity imitates and echoes nature, allowing nature to manage itself rather than being managed by humans. Eisenberg concludes that humans need both the Mountain and the Tower, but we cannot live in both simultaneously, lest we destroy Eden. According to Eisenberg, humans need to both work and protect Eden. Working in the Garden means using the Tower efficiently, creating livable cities that will allow humans to remain out of the wilderness. Protecting Eden means

leaving the Mountain alone and conducting minimal management. These beliefs are represented by the Jewish kabbalistic “tsimtsum,” the withdrawing of our activities inward toward the Tower and restraining ourselves from further encroaching upon the Mountain.

Both the lay reader and the conservation biologist will appreciate Eisenberg’s witty and novel descriptions of ecological principles. For example, Eisenberg entertainingly portrays modern humans as a saprophytic species, thriving on dead plants and plankton of past epochs in the form of fossil fuels. Not only do catastrophic oil spills create a “kind of a night of the living dead, in which dead organic matter that we have called from its grave rises and strangles the living,” but the oil fuels the destructive machines that both ravage the land and emit carbon dioxide, ultimately resulting in a hell on earth (and the earth as hell). The endnotes are just as entertaining and insightful.

According to Eisenberg, Earth Jazz, like real jazz, is for the moment, ideally suited for contemporary problems. Like the playing of Louis Armstrong or the scat singing of Ella Fitzgerald, however, jazz can also be for the ages, like the revolutionary *Tristan and Isolde*. We must be wary because the music we make today will be heard for centuries. I hope that Eisenberg’s book, like Wagner’s and Debussy’s music, predates a new age in human development: humanity living in harmony with nature.

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Starfish and People in the Coral Reef Drama

What is Natural? Coral Reef Crisis. Sapp, J. 1999. Oxford University

Press, New York. 320 pp. \$30.00. ISBN 019-512364-6.

This book examines the history of a major marine controversy (also catastrophe), *Acanthaster planci* (crown-of-thorns starfish [COTS]) plagues on coral reefs around the world since the 1960s. The author delves into the biology and geological history of the starfish to ask whether the plagues are natural or human induced. More important, the author examines closely another animal species: human scientists, politicians, and the public who played major roles in turning these events into almost daily news. The careful interweaving of marine biological and human behavioral cycles make riveting reading.

I admit to being a bit nervous when asked to review Jan Sapp's book. The sharp, inquiring mind of a social scientist and historian was delving into my field of coral reef biology; how many skeletons would he find in our cupboards? How many revered scientists would have feet of clay?

The controversy was generated upon a field of ignorance about coral reef biology and ecology; coral reef science was unprepared for the sudden focus of media and political attention. The protagonists included scientist-advocates who were blaming human activities for the destructive plagues (deliberately emotive words) and demanding immediate and costly intervention; politicians seeking to avoid blame (and possibly with other development agendas); novice reef managers who would have to accept the consequences; a budding tourism industry worried about its key resource; and "objective" scientists who lined up on all sides. Our knowledge of the system and understanding of marine ecology were rudimentary at best. Thus, when seemingly outlandish statements were made by one group of protagonists, the sound reasoning of ecology was not there to bring sense into the argument. But reef ecology owes a lot to this controversy, because it spawned new paradigms

about reefs and considerable reef research. It is no coincidence that the golden age of Australian reef science (and my job at the Australian Institute of Marine Science) followed the COTS controversy.

A comparison of the controversy over COTS with another occurring now over coral reefs is unnerving. In both areas, the media and politicians are asking for immediate, clear answers to incredibly complex questions and wanting quick-fix resolutions. Then, the enemy was more tractable: one species of starfish that was eating the corals. The answers seemed obvious: call in the Marines and kill the lot of them. But against this were another group of scientists who were urging caution that this was a natural phenomenon and an example of Joe Connell's intermediate disturbance hypothesis.

The other current controversy is over whether human activities are leading directly to the death of coral reefs through coral bleaching as a result of global climate change. Here the enemy is more intractable: gas in the air and global climate. But the answers are equally difficult to find (and with much greater consequences). Another comparison is interesting: the U.S. government led the COTS charge with money, much as it is doing now with climate change and coral reefs.

As well as coral reef biology, the book also contains a potted history of coral reef scientists. I was surprised to find that many of the established figures in coral reef research and management were caught up in this controversy: Jeremy Jackson, Jeremy Woodley, Rick Grigg, John Ogden, Jim Porter, Don Potts, Charles Birke-land, Tom Goreau Sr., Peter Glynn, as well as the front-line actors Bob Eidean, Richards Chesher, Richard Kenchington, and Roger Bradbury.

Through all of this, I could find only one factual error, and it wasn't in biology: the Liberal (conservative) Prime Minister John Gorton is listed as a member of the Labor party (liberal in the U.S. sense). There were

no errors in biology or geology, which illustrates the author's care in his research. I recommend this book as a great example of how scientists can get caught up in controversy and how we should be better prepared.

Clive Wilkinson

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Long-Term Perspectives on Forest Biodiversity

Forest Biodiversity Research, Monitoring and Modeling: Conceptual Background and Old World Case Studies. Man and the Biosphere Series. Volume 20. Dallmeier, F., and J. A. Cominsky, editors. 1998. Parthenon Publishing Group, Pearl River, New York, and UNESCO, Paris. 671 pp. \$95.00. Parthenon ISBN 1-85070-963-7. UNESCO ISBN 92-3-103408-1.

Forest Biodiversity in North, Central and South America, and the Caribbean: Research and Monitoring. Man and the Biosphere Series. Volume 21. Dallmeier, F., and J. A. Cominsky, editors. 1998. Parthenon Publishing Group, Pearl River, New York, and UNESCO, Paris. 768 pp. \$95.00. Parthenon ISBN 1-85070-964-5. UNESCO ISBN 92-3-103409-X.

In May of 1995, 300 specialists in forest ecology came together in Washington, D.C. Their objective was to share the knowledge they had gained through research in long-term inventory plots in protected forest areas around the globe. These plots are part of a research and training program organized under the auspices of the Smithsonian Institution/Man and the Biosphere (SI/MAB) Biological Diversity Program. The material presented at this meeting was compiled to create a two-volume set. The re-

sulting books are well produced, carefully edited, and contain a valuable collection of case studies based on primary data and assessments of methodological approaches to problems in forest ecology.

The SI/MAB Biological Diversity Program was founded in 1987 with the dual aims of facilitating the documentation of plant diversity and providing long-term data on the demographics of rain-forest trees. This organization's main objectives are to support the development of an information base for research and education and to contribute to the conservation and management of protected areas throughout the world. The long-term ecological research plots included in the organization's network are primarily, though not exclusively, located in tropical forest sites, and these two books reflect that bias.

Forest Biodiversity Research, Monitoring and Modeling: Conceptual Background and Old World Case Studies is composed of 38 chapters on forest tree ecology organized in five major sections. The second volume, *Forest Biodiversity in North, Central and South America, and the Caribbean: Research and Monitoring*, focuses on forests of the New World. In this volume, the 40 chapters are not organized into sections, making the information less accessible. The first volume is particularly valuable because it contains the thoughts and ideas of many of the world's most highly respected forest ecologists. This volume also includes the SI/MAB protocols for monitoring projects and outlines monitoring projects in Europe. These chapters lay out criteria for the establishment of research objectives, sampling designs, data management and analysis, and evaluation. Both volumes address various approaches to the development of regional and global networks to facilitate the exchange of information about the ecology of forest sites.

Additional topics addressed in the first volume include an overview of the major conceptual issues concerning diversity in Neotropical tree

communities; the work of the Center for Tropical Forest Science of the Smithsonian Tropical Research Institute; satellite imagery, ground-truthing, and the production of forests maps; the design and assessment of biodiversity monitoring programs; the statistical methods and issues involved in the assessment of forest structure, diversity and dynamics within and across research sites; a comparison of rapid vegetation assessment techniques; the use of long-term forest dynamics as an indicator of global climate change; and the implications of seed-dispersal strategies for forest structure and regeneration following disturbance. Papers in the second volume address the effects of large-scale disturbances on Caribbean and Mexican forests, ethnobotany, and the spatial distribution of vegetation. In addition to studies of trees, this volume also includes chapters on other vascular plants, amphibians, snails, and Neotropical migrant birds.

The remaining portions of both books are composed primarily of case studies from Africa, Australia, and the Asia-Pacific region (Volume 20), and the Americas and the Caribbean (Volume 21). These chapters report on floristic composition and structure, forest dynamics, and assessment of diversity. They provide detailed descriptions of the methodologies employed and describe the results of on-going research at long-established sites.

Both volumes present a wealth of information on some of our best-studied, long-term forest research sites and thus will be helpful references. Whereas some chapters update or summarize previously published information, many provide descriptions of studies that are not available elsewhere. The preface states that the knowledge gathered by these scientists can be immensely helpful to resource managers and decision-makers, and I concur. I suspect, however, that the level and organization of the material would be less appealing to a non academic audience. Managers would benefit from a distilled ver-

sion of the information contained in these books, with a strong emphasis on the practical implications of the research. I recommend these books primarily for researchers and students who are working in forest ecology. These volumes provide an excellent overview of the scope and depth of forest biodiversity research currently underway.

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Diagnosing River Health

Restoring Life in Running Waters: Better Biological Monitoring. Karr, J. R., and E. W. Chu. 1999. Island Press, Washington, D.C. 206 pp. \$29.95. ISBN 1-55963-674-2.

The idea to conserve, protect, and restore the health and integrity of the Earth's ecosystem was officially recognized in the Rio Declaration on Environment and Development of 1992. Since then, many efforts have been made to reverse the declining trend in the health and integrity of ecosystems in the world. James R. Karr, co-author of *Restoring Life in Running Waters*, is a leading scientist in the biological monitoring of river environments in the United States. He developed a multimetric biotic monitoring approach called the index of biological integrity (IBI) to measure and evaluate the condition of living waters to detect changes, mainly caused by human activities, and identify the ecological risks that affect human health. Since he developed IBI using fish in 1981, 42 states currently use multimetric assessments of biological conditions, and 6 states are developing them. Many states still have a long way to go toward collecting and using biological data to improve the management of their waters.

This book aims to discuss freshwater ecosystems in the United States and to explain the theory and prac-

tice of biological monitoring, especially the use of IBI to assess aquatic ecosystems. Although IBI is now used widely in more than three-fourths of the United States, and on every continent except Antarctica, the approach has its critics. Therefore, another aim of the book is to attempt to answer many of the criticisms in an innovative format. The book consists of 37 premises and seven myths.

The book begins with four premises (Section 1), describing the present situation of declining water resources and the importance of biological monitoring to protect biological resources and environmental management. Section 2 focuses on calling for biological monitoring because of changing waters and changing social conditions. Section 3, about one-third of the book, gives an overview of IBI, its definition, concept, important aspects, approaches, sampling protocol, and application. The IBI's approach

consists of four steps: (1) defining the biological condition in a minimally disturbed area (what the natural condition in the area is to be); (2) defining biological attributes (metrics) that change along the gradient of human influence; (3) associating those changes with specific human effects; and (4) identifying management practices for improving biological integrity. Section 4 describes common pitfalls when people develop or apply IBI. Section 5 describes reasons why the seven major criticisms are myths. The final section describes the necessity of translating biological conditions to regulatory standards and the role of citizens in upholding such standards.

The book gives a clear view of the challenges we face in restoring living water systems upon which all life depends. The authors emphasize the necessity of IBI by explaining that only 25% of evaluated river sections

in the United States showed impairment when the chemical condition was assessed, but 50% showed impairment when their biological condition was assessed. The book also explains clearly why IBI is the most effective method for evaluating the integrity of bodies of water.

I highly recommend this book because we are all responsible for protecting the biological condition of waters, and we all need to be better informed. Managers and agency administrators in particular can increase their understanding of rivers with IBI. This book provides a timely discussion of ways to restore healthy living waters for the citizens of the twenty-first century.

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