

BOOK REVIEW - 2003 - #1

Book:

The Moon in the Nautilus Shell: Discordant Harmonies Reconsidered, From Climate Change to Species Extinction, How Life Persists in an Ever-Changing World by Dr. Daniel Botkin 449 pp. Oxford University Press, New York, NY, \$22.12, ISBN 978-0-19-991391-6

Reviewer:

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REVIEW

Dan Botkin, the author of *The Moon and the Nautilus Shell*, is an ecologist whose iconoclastic ideas may make some environmentalists uncomfortable. Dr. Botkin has had a long career solving environmental problems. He helped to develop JABOWA, a very successful early computer-based forest growth simulation. He also has had close contact with the paleoecology community so he has a view of ecology on a geological time scale. He has written extensively on environmental topics working as a sort of "free-lance" environmental problem solver while based as a professor at UC Santa Barbara. *The Moon and the Nautilus Shell* is partly a memoir and partly a discussion of his ideas about nature and people's place in it.

Botkin's main argument is that the idea of "Balance of Nature" is not supported by science even though it is a commonly held paradigm among environmentalists. Some of the book is devoted to an academic discussion of the origins of the balance of nature paradigm and arguments against it. Botkin believes that equilibrium models of nature will ultimately fail because the earth is dynamic. Throughout geological history, life has responded to environmental change without any possibility of equilibrium. Botkin believes that there is no natural equilibrium but that life responds opportunistically to these changes. The logistic growth/carrying capacity model that we all learned in introductory ecology class is inadequate to describe nature. Even the landscape that the early American natural history explorers found was not in a natural equilibrium because it was managed by the people who were already living there. This realization presents a problem for ecological restoration. To what state should we restore a landscape if everything is always changing? Dr. Botkin argues for a paradigm

shift from an equilibrium view of nature to a dynamic view.

A large portion of the book is devoted to a consideration of the impact of the dynamic view of nature on environmental management. The "Balance of Nature" model is deeply embedded in the environmental movement. Rachel Carson explicitly invoked the Balance of Nature in her two masterpieces, *The Sea Around Us* and *Silent Spring*. In *Silent Spring* she argues that the indiscriminant use of pesticides disturbs the balance of nature to the peril of humankind. Botkin believes that it is still important to protect the environment against human damage, but good data is important in environmental decision-making. Good data does not support a natural equilibrium. He has a great story of being called in to enhance salmon runs in Oregon and finding that no one had good counts of salmon in the important rivers. He cites numerous other examples where good data falsifies the application of equilibrium theory to environmental problems. He argues that the Balance of Nature is a soothing concept with no basis in fact and he provides many examples where equilibrium models failed to support good management decisions.

The controversial part of *The Moon and the Nautilus Shell* begins with Botkin's application of his theory to modern environmental problems. His consideration of global warming and its impacts will surprise many environmentalists. He believes that global warming is occurring, but is skeptical about whether it is human caused. As a computer modeler, he questions the projections of the global climatic models that are so important in predicting future climate change. He argues that a dynamic view of ecosystems suggests that living things have endured large climatic changes in the past without loss. The climatic warming at the Paleo-

cene/Eocene Thermal Maximum (PETM) was as great as or greater than that predicted for our future. Also, at the end of the last glacial period, the Younger Dryas period was a 1,300 year long return to glacial climates. This period began and ended suddenly (probably in less than 100 years). However, both of these climatic changes occurred at times of large ecosystem change. The PETM resulted in increased speciation among mammals and caused extinctions of marine foraminifera. The close of the latest glacial age resulted in the extinction of many large mammals in North America. It is unclear whether this change resulted from human colonization of North America, from the climatic stress of the Younger Dryas or from both events acting together. This evidence from the paleoecological record would seem to suggest that Botkin is wrong about the impacts of global warming on living systems. However, his emphasis on the dynamism of earth's environment in contrast with a static equilibrium model is, I believe, correct.

Botkin argues that concern about mitigating global warming diverts our resources from more immediate problems. He explicitly mentions that he is not interested in overturning the advances of 50 years of environmentalism. He says that he does not mean to challenge Aldo Leopold's "Land Ethic." Environmentalism is still relevant. However Botkin says that we need to select among environmental issues and work on the ones that are solvable with current knowledge and methods. He also argues that, ultimately, solving the basic problems of the environment will allow us to meet the challenges of global warming. He lays out a series of problems that will resonate with environmentalists. He is most concerned about 1) sustaining the diversity of life on earth, 2) a sustained population of humans and 3) a continuation of human civilization. He provides a list of attainable goals which

include providing energy to society with the fewest negative effects, greatly reducing habitat destruction, and controlling invasive species. Dr. Botkin suggests that we can best solve these problems by abandoning an inappropriate faith in the balance of nature and equilibrium thinking and replacing it with a clear scientific understanding of the dynamism of nature.

In summary, *The Moon and the Nautilus Shell* is a thought provoking book that offers an alternative to the equilibrium thinking that dominates our ideas about nature. Dr. Botkin offers a rational alternative to the “Balance of Nature” that may be helpful in thinking about modern environmental problems. Some of his conclusions may disturb environmentalists but his theory is strongly supported by evidence. His ideas offer no less than a new direction for the environmental movement.