Heatstroke: Nature in an Age of Global Warming

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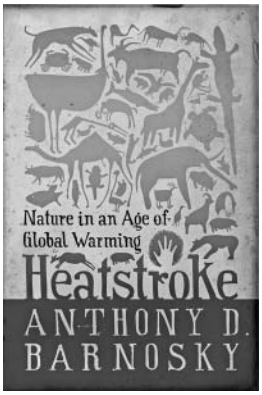
Overheated

Heatstroke: Nature in an Age of Global Warming. Anthony D. Barnosky. Island Press, 2009. 288 pp., illus. $26.95 (ISBN 9781597261975 cloth).

In the late 1960s, I began studying the possible ecological effects of global warming, and I first published a paper about these possibilities in 1973. I have watched with surprise, and sometimes dismay, the development of scientific and public concern over this issue. When I first began to explore the mechanisms by which a trace gas such as carbon dioxide (CO_2) could influence our planet's climate, studying the then-abstruse topics of atmospheric physical chemistry and energy exchange, there were just a few other scientists—mainly climatologists, meteorologists, and ecologists—who even knew about the possibility, and even fewer who were doing research on it. It was a time when few were aware that life of any kind could affect the environment at a planetary level. I was fortunate to be one of the first to help NASA as it began using satellite remote sensing to study a planetary perspective on life; I also worked with scientists at IBM to develop one of the first computer models to forecast possible effects of climate change on any kind of ecological system. It seemed at that time, through the 1970s and early 1980s, an uphill battle to get a large number of scientists, let alone the public, to believe such possibilities.

In 1968, I never could have imagined the way that global warming and climate change in general have captured public attention and become the focus of international treaties and negotiations, some of which could have great effects on the world economy. On the one hand, it is good that people around the world now think of life as a planetary phenomenon; accept that people could affect the environment at a planetary level; and therefore understand that people can affect, at least in some senses of the term, most or all of life. But on the other hand, I am deeply saddened by the intense politicization of global climate change and the changes that that attention has wrought on the science itself. I value my friends and colleagues on both sides



of the debate about the role of human actions in changing the climate, yet each side is convinced that the other is initiating a new McCarthyism against them as people; they believe that the other side is funded by some hidden agents. In other words, objective scientific debate that could have developed into a great new science of the biosphere—the planetary system that contains and supports life—appears to have devolved into double paranoia and worse.

Given this background, I eagerly accepted when invited to review *Heatstroke: Nature in an Age of Global Warming.* I hoped the book would help clear the air and reinvigorate the science of climate change. I had considered writing such a book myself, and was encouraged to read in Anthony Barnosky's preface that he had set out to seek in the existing scientific literature whether there was an answer to the question, "Will global warming be the coup de grâce to many already-stressed ecosystems?" and, not finding a "comprehensive synthesis" about such matters, he decided to write this book. Overall, he provides a useful synthesis of many environmental problems other than global warming. An appealing aspect of *Heatstroke* is Barnosky's use of his own experiences as a paleoecologist, including his work on pack rats.

However, recent events and scientific findings get the author into trouble from the beginning. For example, he quotes Stephen Schneider's 1989 speculation that warmer tropical oceans would lead to more and worse hurricanes, and then writes "seventeen years later, in fact, Schneider's scenario proved overly optimistic…when Hurricane Katrina destroyed New Orleans." He tells the reader that global warming caused that destruction. Today, few if any hurricane experts believe that hurricanes will increase in number or intensity as Schneider had suggested. And Barnosky begins to stray very early in the book from a scientific analysis, saying on page 8: "Think of [Stephen] Schneider as the Bob Dylan of climate science…. [J]ust as Dylan worked his crowds in the ensuing decades, so did Schneider in congressional halls and meeting rooms where national climate policy was discussed at the highest levels." This points the rest of the book in a certain direction: toward the author's view of the truth.

Barnosky also immediately gets some of the basic facts wrong—for example, that "since 1950, we have approximately doubled the amount of greenhouse gases in our atmosphere." In fact, the best information is that since the beginning of the Industrial Revolution, the CO_2 concentration has increased by 36 percent, and the increases of all human-induced greenhouse gases have had an effect equivalent to a 56 percent increase in carbon dioxide since preindustrial times. Perhaps Barnosky meant to write that the emission rates have doubled. And since water vapor is Earth's primary atmospheric greenhouse gas, the author makes a

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fundamentally misleading assertion. Barnosky himself points out that he comes to this discussion not as a climatologist but as a paleoecologist. As such, we could forgive these mistakes if they were limited to a few misstated facts, even ones such as these that are so well known.

Barnosky wanders even further beyond his area of expertise and experience when he begins to discuss computer-based forecasts. He writes that "the nature of climate science is computer models and probability calculations," as if there really could be a science without empiricism—without direct observations and the development of methodologies which have allowed satellite remote sensing of sea ice cover and techniques to reconstruct climate and atmospheric chemistry far into the past. He refers specifically to a paper by Thomas and colleagues (2004) in *Nature*, which stated that 15 to 37 percent of species considered by those authors would be "committed to extinction" in the next several decades because of global warming. Barnosky writes that the authors of this paper used "state of the art climate modeling techniques," and then used species-area curves to forecast effects on biota. In fact, the modeling techniques used in that paper were a peculiar mixture of recent and old, as with the species-area curve. And, as 16 of us pointed out in a 2007 *BioScience* article, that particular analysis used questionable data and relied on species-area curves in a way that was readily open to criticism. Our article "Forecasting the Effects of Global Warming on Biodiversity" was an attempt to take an open and objective approach to the methods in use, and the authors included a wide variety of perspectives on global warming. In that article we pointed out a "Quaternary conundrum": Modern forecasting methods discussed in papers like Thomas and colleagues' suggested many extinctions in the near future, but, in contrast, major climate changes of the Quaternary resulted in few known extinctions around the world.

I mention these specific papers to show that Barnosky strays rapidly from his stated goal of finding a scientific answer to the overarching question about the effects of global warming. He has instead created—perhaps because he has reached far beyond his field and knowledge—a one-sided review that is not an independent, open presentation of all sides of the scientific debate. I wish that this book had asked some of the fundamental scientific questions often left aside in the global warming debate: The first is the meaning of nature's stability. Current forecasting methods use steady-state theoretical approaches for what are non-steady-state systems. Second, discussions like Barnosky's seem to fall into a peculiar biological contradiction. Since Darwin, we have known that adaptation to a changing environment is a plus, a necessity, for life to persist. Yet Barnosky's review of each observed change in the behavior and distribution of species, which he believes to be a response to global warming, is negative; he sees such change as a threat to species and a potential disappointment to we who seek what we saw as children and won't find in the future—or at least not where we first saw it.

A third fundamental error that many discussions of global warming commit, and one that appears throughout *Heatstroke*, is to list the many other causes of environmental degradation, state that rapid climate change on top of these must be bad, and thereby attribute many environmental problems to global warming. In the end, discussions like this one do not help a reader determine which of the many human-induced and undesirable environmental changes should take top priority. Having accepted at the outset that global warming is the fundamental disaster, despite his claimed desire to find a scientific answer, Barnosky is not open to such a question. Those who believe that human-induced global warming is inevitable and will have disastrous effects on much of life on Earth, on people, and on civilization will love this book; those who are skeptical will dislike it. What *Heatstroke* won't do is help a person who wants to know the best that science can offer in answer to Barnosky's leading question—whether global warming is or is not the incredibly disastrous crisis some have warned us it will be.

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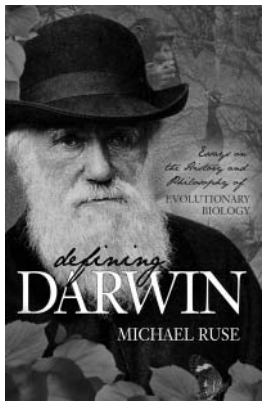
A CLEVER RUSE

Defining Darwin: Essays on the History and Philosophy of Evolutionary Biology. Michael Ruse. Prometheus Press, 2009. 271 pp., illus. $26.98 (ISBN 9781591027256 cloth).

Michael Ruse is the Lucyle T. Werkmeister Professor of Philosophy and director of the history and philosophy of science program at Florida State University. He is the founding editor of the journal *Biology and Philosophy*, and is the author, coauthor, editor, or coeditor of some 38 books, beginning with *The Philosophy of Biology*, which appeared in 1973. Reading Ruse is always entertaining and frequently enlightening as well. His latest book, *Defining Darwin: Essays on the History and Philosophy of Evolutionary Biology*,



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