



## REVIEW

### *Earth: The Operator's Manual*

by Richard B Alley

New York: WW Norton, 2011. 479 pages

reviewed by **Daniel Bedford**

I recently had the unnerving experience of trying to discuss climate science with a devout global warming skeptic. It was difficult to converse rationally about the subject with him, and impossible for me to dislodge the many inaccurate ideas that I was presented with. My interlocutor had recently read one of the many works of misinformation dressed up to look like real science, and, lacking a grounding in science himself, had chosen to accept every word of it as true. This person was (and is) highly intelligent and well-educated, and therefore found himself in good (or at least, extensive) company: survey research has shown that, while American public opinion about global warming is polarized along broadly partisan political lines, they become more polarized with higher levels of education and higher levels of general science literacy (see, for example, Kahan and others 2012). Evidently, our psychological defense mechanisms are hard at work deflecting ideas we disagree with and welcoming those that fit our preconceptions. At the same time, public knowledge of the science specifically of global warming is alarmingly low, with one recent poll finding 52% of those surveyed (a broad cross-section of the American public) scoring an F on a 42-question test (Leiserowitz and others 2010). Evidently, strong opinions on global warming are being formed in the absence of a good understanding of the science of the issue. In this environment of low levels of knowledge and high levels of polarization, where more education seems only to polarize people further, what hope is there for any attempt to raise the level of public understanding of climate science?

Enter Richard Alley, the Evan Pugh Professor of Geosciences at Pennsylvania State University, eminent geologist, glaciologist, and climate scientist, outstanding science communicator, aptly described as “a cross between Woody Allen and Carl Sagan” by the *New York Times's* Andrew Revkin. Alley's expertise runs broad and deep, but he arguably made his name in climate science by analyzing ice cores from Greenland in the 1990s to help understand natural changes in Earth's climate; and he arguably made his name in climate science communication with the critically acclaimed popular-audience book about this research, *The Two-Mile Time Machine* (Alley 2000). His latest book, *Earth: The Operator's Manual*, tackles human-induced climate change more explicitly, and addresses possible ways that humanity might use to escape the corner we seem so intent on painting ourselves into. Given a general climate (pun intended) of intimidation of many leading climate scientists, Alley is brave to plunge into these potentially dangerous waters where science, policy, and advocacy overlap. Here be dragons.

Does he succeed? In a word, yes. This is a terrific book. It is a much more detailed and elaborate version of the PBS television documentary of the same name (available via the

PBS website and at <http://earththeoperatorsmanual.com/>, essential viewing for anyone interested in the subject, or in communicating it effectively). The book is organized into three sections. “The burning question” examines the history of humanity’s relationship to energy sources, raising the intriguing possibility that we are human partly because of our use of energy, in the form of cooking; “Learning while we burn” is an extensive discussion of climate science and how past climate changes clearly show that carbon dioxide has been “the biggest control knob” of Earth’s climate machine over geologic time; and “Ten billion smiling people” addresses the range of solutions to the climate-energy conundrum. Throughout, there is an emphasis on the processes of science and how and why science ultimately produces reliable information—certainly more reliable than the metaphorical brother-in-law, who appears in two chapter titles as a stand-in for misinformants of all stripes. There is a very wide range of material here, and, while Alley is a heavyweight climate scientist, he writes with a lightness of touch and flair for analogy and metaphor that make the book a relatively easy read. Nonetheless, it carries more than enough depth and detail to be satisfying, and the extensive endnotes will make this a valuable reference work for anyone teaching about climate change, specialist and non-specialist alike. That said, Alley makes his subject as simple as possible but no simpler. *Climate Change for Dummies* this ain’t—but nor is it an impenetrable piece of technical literature. For the popular audience, then, the book should appeal to those who are intelligent, well educated, and science literate—some of whom, as the surveys mentioned earlier attest, are among the most skeptical about global warming, and most need to hear the book’s message.

Given this skepticism, and given our innate tendency to avoid or reject information we disagree with, what are Alley’s chances of preaching to those outside the choir? Certainly, he stacks the odds in his favor. Without downplaying the seriousness of the climate crisis, he avoids polemics and maintains a refreshing can-do optimism about humanity’s ability to meet the coming climate and energy challenges. I was particularly inspired by the idea that “[y]ou, and Einstein, and Beethoven, and Michelangelo, taken together, use or used less energy than a single chandelier” (p 18–19) in terms of the energy needed to keep our bodies going. The observation that people, at least in rich countries, have already mastered a challenge comparable to decarbonizing the economy—building adequate sewerage and clean water systems—is similarly encouraging. This fundamental optimism, combined with a recognition of the importance of the individual and the prospects for a solution springing from free markets, are consistent with a right-of-center political outlook, and may make the book more palatable to those who might otherwise tend to reject it out of hand. It might not hurt that Alley explicitly identifies himself as a church-going Republican, either.

The book is not perfect. The graphics and photographs are sometimes effective, but sometimes rather haphazard and not integrated well into the text; there is a very occasional lapse in the clarity of writing and explanation. But these problems are so minor in comparison to the book’s accomplishments that it seems almost churlish to mention them. As a source of information for those seeking to know more about global warming and what we can do about it—or as a source of persuasion for those who think they already know everything they need to—this book may well be the best, most authoritative, comprehensive, and concise, single volume for the intelligent lay reader currently available.

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