The Two-Mile Time Machine: Ice Cores, Abrupt Climate Change and Our Future

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After WW II the invention of the piston corer revolutionized the study of the Earth by providing often continuous sedimentary records stretching back millions of years.  Unlike land-based stratigraphy which characteristically discontinuous and focuses on terminal events that separate strata, the nature of deep-sea cores opened the entire stratigraphic record to the geoscience community.  What resulted from this study initially led to a revolution in our understanding of the Pleistocene and, eventually, an extension of that detailed stratigraphy to older and older records stretching back to the Jurassic and beyond.  Along the way, geochemistry became geology's most important tool for understanding the way the Earth works.  But the marine record is inherently fuzzy - ubiquitous bottom-dwelling organisms stir the top layers of sediment so that the best time resolution attainable is on the order of centuries or millennium.  Is the devil in the details?

Over the past 30 years the search for continuous, high definition records of the Earth's past has shifted back to the land - but this time ice, not rocks.  In The Three-Mile Time Machine Richard Alley spends about half of this too-short book on the story of the development of ice-core studies.  He then spends another third of the text on a very sketchy attempt to explain rapid climate change, ending with a few very good chapters basic climatology, ocean circulation, the carbon cycle amid some speculation on what the climate future may hold.  Two Appendices - one on people the other on units (unnecessary) - and an annotated bibliography complete the text.

The Three-Mile Time Machine is an outstanding and important contribution to the climate-change literature with a few caveats. The section on ice-core history, while accurate and engaging, could have been much more detailed and could have easily incorporated the material placed in the first Appendix and annotated bibliography. The material on rapid climate change is, similarly, too brief - the text is nowhere near as convincing as the graphs would have it.

This book is meant for the general public. The general public can grasp climate change in terms of the greenhouse effect - most of them have been inside a greenhouse and (glass versus gas technicalities aside) find some personal link to the concept. The community of climate understanding begins to fade with Milankovitch, but many non-scientists are intrigued when they finally catch on to why the Earth has seasons. But can the climate community grow beyond that? Isotopic fractionation? Down-warping bottom-and-top warming glaciers? Climate scientists need to tread carefully. Geoscience doesn't have the cache that biotechnology has - the biology community can always fall back on "It saves lives, damn it."  The point at which the geoscience community will be able to say the same about addressing drastic climate change is, one hopes, some decades or centuries ahead. In the meantime, climate scientists need to lay out the facts clearly and succinctly.
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