Book Review

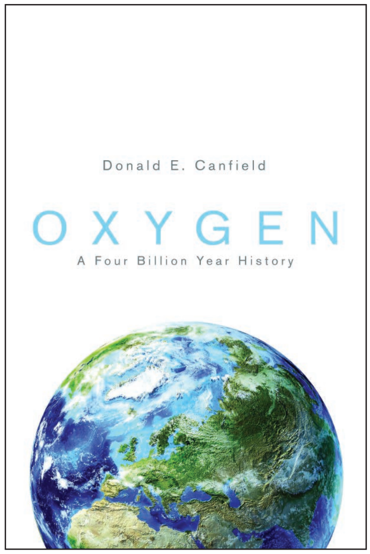
Book Review: Oxygen: A Four Billion Year History. (2015) By Donald E. Canfield. Princeton University Press. ISBN: 9781400849888, 216 pp. Paperback $17.95.

A glance at the table of contents of *Oxygen: A Four Billion Year History*, by Donald Canfield (University of Southern Denmark) suggests that his book will be an up-to-date summary of almost the entire subject matter of oxygen levels through time. This is a heroic undertaking even for an Earth history and geochemistry specialist, and the book does not disappoint. A goal of the book is to bridge the gap between experts in their field and a more general readership interested in learning about Earth's O_2 history. The effort is as important as it is difficult, and the author achieves this with both personality and humanity.

Canfield begins with an interdisciplinary summary of present-day Earth processes and of the reasons the Earth is the premier planet for life. This chapter serves as both an introduction and review of topics such as the importance of water, sun-created thermal balance, and the carbon cycle. This chapter provides the most relatable and important background information that a non-specialist, who is interested in the evolution of the atmosphere, should know about our planet for these processes are the very ingredients of life itself.

Canfield is conservative where discussing oxygen content in the first billion years, describing it as "whiffs of oxygen" before the Great Oxidation Event (GOE). He cites that any free oxygen would quickly react with iron, until the point was reached that free oxygen began to overcome the iron "oxygen sinks," launching into the single most important shift in Earth history—the GOE. It is at this point that Canfield addresses one of the "gaps" in research, starting with our inability to explain the approximately 900 million year gap from the debut of photosynthetic organisms to actual worldwide oxygenation.

Canfield uses the gap preceding worldwide oxygenation to initiate discussion of different hypotheses. In the case of the GOE oxygen gap, Canfield ultimately champions the idea that ocean floor iron kept ocean anoxia high during this time, but also touches on other hypotheses to show that our evidence is limited with new discoveries to be made.



The approach taken to explain conclusions and models in his sources illustrates a general strength of the book: Canfield explains the derivation of the conclusions and then follows them up with a discussion of their implications. His discussion of setting up the models, may lack some technical detail, but this is to help readers with less rigorous scientific backgrounds grasp the material. Science needs more researchers capable of breaking down complex scientific discoveries in an accessible, complete, and engrossing narrative. Canfield brings out his own personality and sheer enjoyment in the information being presented, all while providing true insight into fundamentals of our natural world.

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