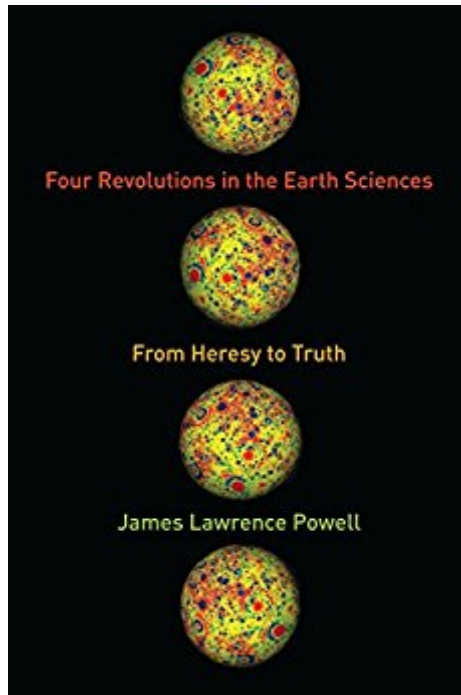


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# Four Revolutions In The Earth Sciences: From Heresy To Truth



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## Customer Reviews

Jim Powell has written a welcome history of some of the most important and contentious ideas in science. Almost everyone has heard of the topics he analyzes: the age of the Earth and Moon, plate tectonics, the discovery that the Earth and Moon have been battered by cosmic impacts, the impact extinction of the dinosaurs, and global warming. While these basic concepts are widely accepted by scientists, there are still influential members of the public (like politicians who love to expose their ignorance by answering questions with "I am not a scientist") who oppose them. Powell has written a lively history of these ideas, and this book provides a welcome window into the basics of modern geosciences. This book is more than a good read; Powell has an important message for us. He uses the sometimes tortured history to explore the basic questions of how scientists decide what is correct – not absolute truth, which is never possible, but at least a consensus with a high level of confidence. This is not a pretty history, with many wrong turns and quite a few villains who refused to believe evidence that undercut their own pet ideas. When the deniers held senior positions in universities or government agencies, they were able to block progress for as much as a generation. One motivation was an inherent distrust of outsiders, especially the arrogant physicists who

questioned the geological consensus. Another important factor in the first two case studies was the very small numbers of scientists who were working in a given field, and the absence of real data with which to test theories. In the second half of the twentieth century, there are many more researchers, equipped with marvelous facilities and aided by powerful computers, and communication among them is far easier than in the past.

One of the many great things about *Four Revolutions* is that it jumps right in. There isn't the endless groundwork and foundation building of so many such efforts. It is captivating right off the top. Being the history of discovering how the Earth works, it is intuitive and has universal appeal. Its cast of miscreants and creatives makes it colorful. And Powell has a terrific knack for harpooning just the right keywords for the titles and subtitles, along with dramatic endings for sections. The four revolutions are: determining the age of rocks and the Earth-continental drift-meteorite impacts on the moon, and dinosaur extinction here-global warming. While the first is a quite civil disagreement among natural philosophers (as scientists were called), the second gets into vicious mudslinging, as scientists use ad hominem attacks on each other to denigrate their theories, their qualifications and even their personalities. Continental drift had all the appeal of forced abortion to American scientists in the first half of the last century. It is astonishing how they wielded their ignorance as if it were unimpeachable truth, and accused each other of being unqualified quacks. Rather than consider a new theory, they would conjure absurd patches to paper over faults in their own work. They worked to banish the printing of references in textbooks, or even the names of the perpetrators. They refused to cite competitors in their papers. It has of course, been this way for centuries. Global warming is the most obnoxious story. It was theorized in the late 1800s. "Greenhouse Effect" was coined in 1913. And the issue has been proven again and again and again since.

In the introduction, Powell tells us he was inspired to write this book when a friend, discussing the fact that the vast majority of scientists accept that the activities of man are contributing to global warming, remarked that scientists have been wrong before. Accepting the undeniable truth of that, Powell decided to look at the recent history of four important theories in earth sciences, showing that though scientists may have been wrong at first, they "eventually came to be right". "The history of the four discoveries confirms the cardinal virtue of science: it is self-correcting. Scientists pushing the boundaries of knowledge are often wrong, but they do not stay wrong." Considering the fair amount of depth Powell goes into on each of his subjects, the book is surprisingly accessible to the non-scientists among us. I found I only got lost occasionally and, when reading books like this, I

accept that there are things that are too complex to simplify down to my level! In each section Powell starts at a point before the theory he is discussing was developed, explaining the existing state of knowledge and supposition. He then introduces us to the scientists who contributed to the development of the new theory, along with those who opposed it, and finally to those who 'proved' it. He provides little anecdotes of their lives, or their friendships or quarrels with each other, which prevent the book from becoming too dry a read. There are two types of enjoyable popular science books as far as I'm concerned - those that clearly explain something and convince me of it, and those that clearly explain something and provoke me to argue with the author's conclusions. This one falls firmly into the latter category.

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