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Earthshaking Science: What We Know (and Don't Know) About Earthquakes



Synopsis

This is the first book to really make sense of the dizzying array of information that has emerged in recent decades about earthquakes. Susan Hough, a research seismologist in one of North America's most active earthquake zones and an expert at communicating this complex science to the public, separates fact from fiction. She fills in many of the blanks that remained after plate tectonics theory, in the 1960s, first gave us a rough idea of just what earthquakes are about. How do earthquakes start? How do they stop? Do earthquakes occur at regular intervals on faults? If not, why not? Are earthquakes predictable? How hard will the ground shake following an earthquake of a given magnitude? How does one quantify future seismic hazard? As Hough recounts in brisk, jargon-free prose, improvements in earthquake recording capability in the 1960s and 1970s set the stage for a period of rapid development in earthquake science. Although some formidable enigmas have remained, much has been learned on critical issues such as earthquake prediction, seismic hazard assessment, and ground motion prediction. This book addresses those issues. Because earthquake science is so new, it has rarely been presented outside of technical journals that are all but opaque to nonspecialists. Earthshaking Science changes all this. It tackles the issues at the forefront of modern seismology in a way most readers can understand. In it, an expert conveys not only the facts, but the passion and excitement associated with research at the frontiers of this fascinating field. Hough proves, beyond a doubt, that this passion and excitement is more accessible than one might think.

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Customer Reviews

One of Choice's Outstanding Academic Titles for 2002" Earthshaking Science takes on the difficult task of reviewing the state of earthquake science at a time when the field is evolving rapidly. Its author, Susan Hough, has done an admirable job of clearly and accurately illuminating the boundary between our knowledge and our ignorance. . . . [She] has written a book that is accessible to readers in other disciplines and to a non-technical audience, but provides enough thoughtful commentary and perspectives to hold the attention of specialists."--Gregory C. Beroza, *Nature* "A reader with no background in earth science or seismology can easily absorb the material presented. . . . Hough's writing style is easy and engaging, and she makes the subject matter entertaining."--Mark Zoback, *American Scientist* "An excellent outline of how, why and where earthquakes happen. . . . It presents a real picture of a lively research field in all its gritty glory, written with a sharp eye for the absurdities of scientific life. . . . This is an intelligent look at a broad field of science that affects many lives. Anyone heading for an earthquake area should buy a copy."--Sue Bowler, *New Scientist* "Earthshaking Science is without equal--literally, a book for everyone. . . . Hough's writing style is exceptionally engaging; she asks copious insightful questions to reveal the current state of knowledge and where research and discovery must lead."--Choice "Fascinating and clearly written."--Thomas Jones, *London Review of Books* "This is a very ambitious book. . . . Hough does a good job, and the interested non-scientific reader will come away with a solid knowledge of the topic. . . . [T]hroughout the book [Hough] integrates state-of-the-art research with explanations of earth quake phenomena and attempts to explain many of the current controversies."--Sandy Steacy, *Times Higher Education Supplement*

"By frankly taking the point of view of a participating seismologist, this book is a fresh contribution to the shelf of science for the public."--Robert Phinney, Princeton University "I know of no other book for the general public that presents seismic hazards better than Earthshaking Science. It offers a great deal to commend: Hough conveys the big picture really well, and hits the nail on the head with important details."--Paul G. Richards, Lamont-Doherty Earth Observatory, Columbia University "This book is a major contribution to its field, and an excellent summary of our current approaches to understanding earthquakes. All geoscientists should find it a stimulating read, and others with a reasonable grounding in science will be well rewarded for the time spent with it."--William R. Green, *The Leading Edge*

The book Earthshaking Science: What We Know (and Don't Know) about

Earthquakes by Susan Elizabeth Hough explains several concepts about earthquake science that the general population may not have an understanding of: plate tectonics, measuring earthquakes, the history of measuring the magnitude of earthquakes, the discovery and implementation of seismic waves, earthquake prediction, earthquakes in the past, and minimizing the risk of destruction from earthquakes. As she states in the preface, she has two main goals for the book: giving the public useful information about earthquakes while also imparting the interest of earthquake science to others. In addition to accomplishing these goals within the parameters of a two hundred page book, she also explains in easily understandable language the history behind earthquake science and how it has developed throughout the nineteenth and twentieth centuries. Hough goes back to the beginning with the discovery of plate tectonics. Despite the fact that most people interested enough to pick up her book already know something of the basic mechanics of how earthquakes happen, she manages to explain even more interesting details that most people would not have known. She then proceeds describe the different types of faults and the basics of how seismic waves are measured, another topic which anyone with a high school education would have learned something about, but of which not many people outside the earthquake science community would have an in-depth understanding of. Even the complex information that she later elaborates upon are supplemented with examples of actual earthquake events where concepts can clearly be seen. An example of this can be found when Hough explains aftershock sequences in technical but still understandable language and then uses the 1992 Landers, California sequence to illustrate the concept further. In the last chapter of the book, she provides information on major earthquakes that have happened throughout the world, including several places in North America where risk from earthquakes is not widely thought of. Throughout the book, Hough uses historical anecdotes to help explain the concepts she presents. I found this helpful, especially once she moved on to more complicated concepts in later chapters. She presents highly technical information in such a way that a casual reader can sit down and read straight through the book and finish with a decent understanding of the concepts the book covers. She uses the same few earthquakes, such as the New Madrid earthquake, to illustrate her concepts, which shows the reader that a single earthquake can explain several different concepts. The advice that she presents in the last few pages of the book is particularly helpful for people in places where earthquakes happen infrequently. She proves repeatedly throughout her book that the Midwest and the Northeastern areas in North America are not immune to earthquakes. This is a fascinating concept that most people do not understand. The majority of the population in the United States believes that earthquakes happen only on the west coast, along the Ring of Fire. However,

Hough's book challenges that notion. This book should be required reading for everyone, as earthquakes can happen anywhere.

Dr. Hough provides a compelling account of the state of knowledge of Earthquakes, their association with foreshocks, aftershocks, and clustering of events of similar magnitude. Of particular interest for me was the discussion of the essential physics of the earthquake source, with very intuitive concepts. Highly recommended and very entertainingly written.

This book basically teaches you a new vocabulary. It explains a large number of theories on earthquake prediction and why none work. It goes into tuned circuits which is electrical engineering 101 but it uses a lot of new and different terms from what electrical engineers use. If you want to enlarge your vocabulary then it is a good book, other wise not so much.

Dr. Hough's new book is very readable in a journalistic style, like a set of Scientific American articles, or the NY Times Sunday magazine. There is little jargon and almost no equations to slow down the reader. That makes it suitable for the general public or high school to early college textbook. But it is a little lightweight to be an advanced seismology textbook or reference work. The first several chapters of the book explain plate tectonics and basic seismology. Then there are some very good descriptions of the state of earthquake prediction and of how the national seismic hazard maps were compiled. These are probably the best current descriptions of these topics in the general science literature and a reason to read this this book. This book also brings seismology into the 21st century, incorporating lessons from large 1990s US quakes and current seismic research. In some respects the material resembles another journalistic seismology book "The Earth in Turmoil" by her across-the-street colleagues Dr. Sieh (with LeVay). Hough's book progresses in topical order, while Sieh's visits ten geologically active areas in North America. Hough's is slanted more on seismology and the hazards mitigation efforts of the US Geological Survey. Sieh's is slanted more geology and his specialty of understanding pre-historic quakes.

I live in Whittier, California and get to fill out "Did you feel it?" reports on the USGS web site several times a year. As a resident of the earthquake laboratory we call southern California, it's obvious that I should keep abreast of the latest news from the seismology labs. But what about folks in New York, NY? Or Memphis, TN? Or Charleston, SC? Earthquakes don't happen in the eastern United States...do they? Actually, not only do they happen in the eastern US, but a large earthquake in the

eastern US today would probably make Loma Prieta or Northridge look like practice runs. Look around your neighborhood and the area where you work. Do you see any unreinforced brick buildings? If I have your attention and you're curious about the latest information about earthquakes, I highly recommend Susan Hough's *Earthshaking Science*. *Earthshaking Science* is a tour to the edge of the scarp of what we do know [and what we'd like to know] about earthquakes. It is NOT a comprehensive guide to earthquakes and plate tectonics. If you're looking for the basic textbook version, try *Earthquakes* by Bruce Bolt or *Living With Earthquakes In California* by Robert Yeats. Hough takes off from the basic textbook knowledge of earthquakes and takes the reader to the edges of seismology. She covers everything from studies of ground response to the fledgling science of paleoseismology. She apologizes for a California focus, but she does quite a bit on earthquake dangers in other parts of the United States. I would recommend that potential readers have a basic background in science. If you dream of short term earthquake prediction, this book isn't the good news you've been looking for. Whether you've read every book on earthquakes or you're a scientifically literate person who has little experience with seismology, I highly recommend *Earthquaking Science* by Susan Hough.

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