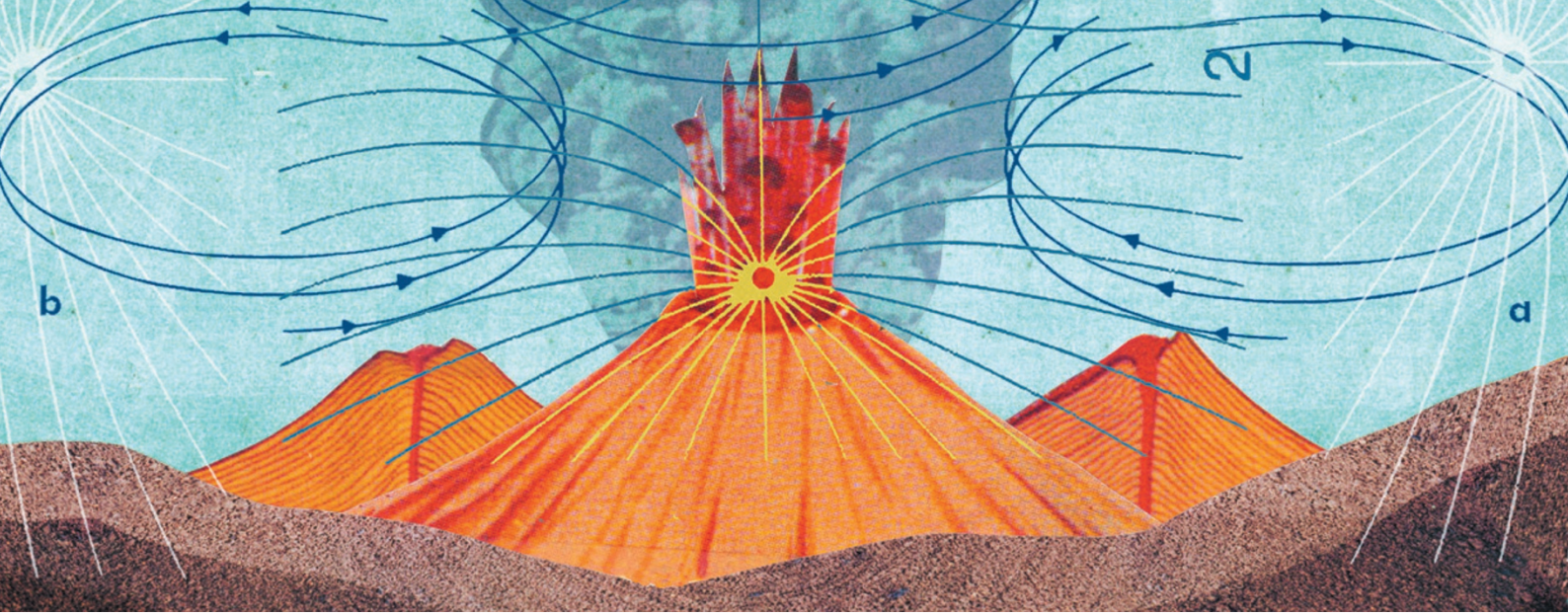


MARTIN O'NEILL

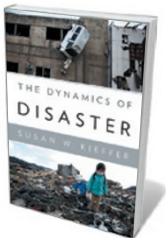
DISASTER MANAGEMENT

Preparing for the worst

A study on natural disasters puts fizz into the physics, finds **Roger Bilham.**

Susan Kieffer's *The Dynamics of Disaster* will attract readers much as a road accident slows a passing motorist. But those seeking Hollywood-style gore and fright are in for an education. Kieffer's geophysical study is much more than a litany of bad things happening to people who are in the wrong place at the wrong time. It delves into the physics responsible for many of the extreme events that society finds inconvenient, and offers hope that, rather than meekly accepting the rubbish that nature throws at us, we can attempt a societal fix.

Do not be put off by the rather dull introductory chapter, in which Kieffer dispenses some necessary definitions of disaster and places her book in context. Catastrophic surprises (such as earthquakes) or insidious change (global warming) have an obvious common denominator: in a world without people, disasters do not exist. One is reminded of graffiti scribbled in the 1960s on a wall in Cambridge, UK — "Hair needs a comb" — beneath which an undoubtedly long-haired student had scrawled "but not as much as a comb needs hair".



The Dynamics of Disaster
SUSAN W. KIEFFER
W. W. Norton: 2013.

The book's theme is that disasters are characterized by a change of state from normal to briefly abnormal. What is intriguing is the breadth of extreme geological events that Kieffer invokes and explains, given this basic view of Earth's processes. We expect to read about earthquakes, volcanoes, cyclones, landslides and tsunamis, but lurking within these pages are some less familiar oddities — quick clay, lateral blasts, explanations of Mach numbers and rotating volcanic plumes.

It is Kieffer's gung-ho approach to the underlying mechanisms of all these extreme events that really makes this book interesting. Throughout, she invokes analogies and personal experiences to explain some of the more elusive concepts, and many that are less so. Her well-meaning comparisons are sometimes a bit odd, for instance: a tsunami taller than any mountain in Minnesota; "to sprint eighty-six storeys up to escape this wave"; "landslides are like robbers"; and "waves are rather like teenagers". But, as literary tools in the hands of a clever scientist, they do force the reader to grapple with the sometimes prodigious numbers involved.

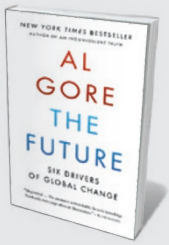
Some will find the exuberant subheadings vexing. But at least lines such as "Shake, bake, zap, and glow" will grab the attention of politicians (and undergraduates who are poised to start texting in class), drawing them into the easy authority with which she explains the atmospheric features known as Hadley cells and the complexities of tsunami generation.

Kieffer is at her best when describing the fluid dynamics of the climate, atmosphere and oceans — this section is a good read for a solid-Earth scientist who wonders what all the fuss is about above ground. For example, I found her discussion of rogue waves (which may be responsible for the loss of 30 ships each year) surprisingly interesting.

On earthquakes, her explanations are a trifle misleading. Although liquefaction certainly contributes to the damage caused by earthquakes (such as those in Christchurch, New Zealand, in 2010 and 2011), its onset

NEW IN PAPERBACK

Highlights of this season's releases



The Future: Six Drivers of Global Change
Al Gore (Random House, 2013)
Former US vice-president and prominent voice in climate politics Al Gore tackles six areas of rapid change that are transforming our world — from the Internet and environmental crises to globalization and population growth. Gore's analyses of the scientific, political and economic aspects of each are thorough and compelling as he works towards a cautiously optimistic synthesis. (See Barbara Kiser's review: *Nature* **494,** 429; 2013.)

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is not instantaneous but follows minutes after the earthquake. Liquefaction in Haiti's earthquake disaster of 2010 was responsible for few fatalities, with most of the damage occurring on bedrock.

The occasional jibes at the insensitivity and ignorance of myopic politicians will raise a cheer from many readers, as will Kieffer's championing of the precautionary principle. Simply stated, it is not up to the suffering world to prove that it is suffering. More precisely, if a government sanctions actions that may be harmful to our environment, it is up to the perpetrators to prove that their deeds are harmless. The principle applies well to profitable corporations. But how does it apply to unregulated deforestation by the world's poor, or to those who drive their cars to work?

At the end of each chapter, Kieffer explores the societal implications of the disasters, the threads of which she gathers in her concluding chapter. For instance, the double disaster in L'Aquila, Italy (the fatal earthquake of 2009 and its unexpected legal consequences), raises an important issue all scientists must face — how to describe uncertainty to a public that wants a black-and-white view of the future. In Italy, government representatives have chosen the moral high ground in condemning the absence of a clearly stated probabilistic assessment of potential future seismicity. Kieffer rightly views the L'Aquila process as a wake-up call for improving tools for characterizing future disasters. In a post-Fukushima world, we cannot afford to suppress an honest discussion of low-probability extreme events. But assessing what constitutes an acceptable risk to society is currently something that scientists and present societal structures are ill-equipped to handle.

Anyone interested in the processes that underlie catastrophic events within Earth will welcome this book, part riveting and all informative. We cannot prevent disasters, but with a little bit of foresight and a lot of common sense, we can reduce their impact on our growing population. Give a copy to your local politician! ■

Roger Bilham *is a professor of geology at the University of Colorado in Boulder. He has published more than 200 articles on aspects of earthquakes and their effects on society.*
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MARTIN O'NEILL; BASED ON A PHOTO BY NEILLD/BIGSTOCK

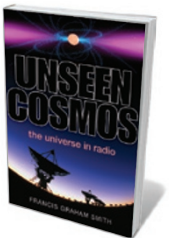
RADIO ASTRONOMY

Finger on the pulsar

Bernie Fanaroff probes a study on how radio telescopes have opened up our understanding of the Universe.

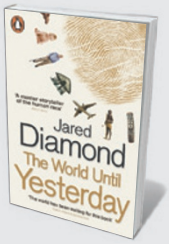
Francis Graham-Smith's *Unseen Cosmos* sets out the unique role of radio telescopes and observations at radio wavelengths in transforming our understanding of the Universe. The former UK Astronomer Royal describes the many important discoveries in radio astronomy and the techniques that made them possible. It is an extraordinary tour, from the rotating ultra-dense neutron stars known as pulsars and the cosmic microwave background left over from the Big Bang to powerful, distant radio-wave-emitting galaxies and the radio emission from molecules in galactic regions where stars are born.

Astronomy today is a multi-wavelength discipline. Observing astronomical objects and even the structure of the Universe at wavelengths from radio waves to gamma rays allows us to see different processes and often different parts of these objects.

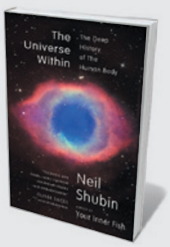


Unseen Cosmos: The Universe in Radio
FRANCIS GRAHAM-SMITH
Oxford University Press: 2013.

Observations in the infrared reveal cool galactic gas and dust; in the ultraviolet, hot young stars. At radio wavelengths, we spot neutral hydrogen gas and its motion, as well as synchrotron radiation (from electrons moving in a magnetic field at close to the speed of light) in galactic or intergalactic magnetic fields. X-ray telescopes detect very hot gas in and between galaxies, and optical wavelengths reveal the light from stars and ionized gas clouds. All of these data must be combined for a full understanding of objects. ▶



The World Until Yesterday
Jared Diamond (Penguin, 2013)
The cultural gap between traditional societies and the West is a rich seam for anthropologist Jared Diamond. Here, he explores what indigenous cultures can teach the West in areas from childcare to dispute resolution. (See Monique Borgerhoff Mulder's review: *Nature* **493,** 477–478; 2013.)



The Universe Within: The Deep History of the Human Body
Neil Shubin (Vintage, 2013)
Palaeontologist Neil Shubin unpicks the intertwined evolution of Earth and life, finding intriguing links, for example, between continental break-up and mammalian evolution. (See Birger Schmitz's review: *Nature* **493,** 25; 2013.)

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