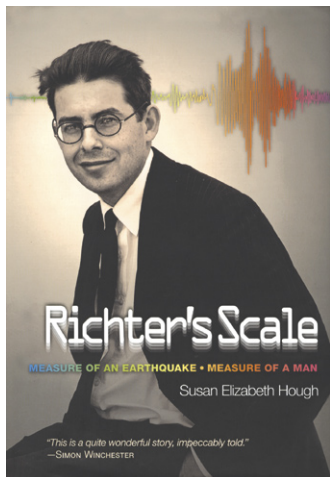


## MAGNITUDE 10.0



***Richter's Scale: Measure of an Earthquake, Measure of a Man***

336 pages

Princeton University Press, 2007

\$27.95

It's fair to say that the name Charles Richter (PhD '28) rings bells not only in earthquake country, but across the globe. *Richter's Scale: Measure of an Earthquake, Measure of a Man*, by U.S. Geological Survey seismologist Susan Hough, explores how this came to be. In so doing, she describes not only why and how Richter devised the earthquake magnitude scale that bears his name, but also the personal anguish that may have made such an undertaking possible.

According to Hough's book, Richter was an accidental seismologist, meaning that he was an intelligent but aimless guy who happened to have found work in the newly established Pasadena Seismological Laboratory after he finished his PhD in physics at Caltech. In the Spartan concrete building that housed the lab until it moved to the main campus in 1974, Richter managed to harness the mental demons that drove him, years before, to quit his first attempt at a PhD at Stanford University a year after he had begun.

The nature of Richter's demons—and their manifestation in poetical outpourings—constitutes the first four and final few chapters of the book. "Adolescent confusion and near-nervous breakdown, 1921," he wrote in a journal he kept throughout his life, and soon after, "... my mother had the good sense

to refer me to a psychiatrist." Hough speculates that Richter was plagued by Asperger's syndrome, a form of autism, though there was no diagnosis for this in his lifetime. He was sensitive to light and sound and sought sanctuary in the mountains. But the problems that sometimes unraveled him also made him great. "The laboratory routine, which involves a great deal of measurement, filing, and tabulation, is either my lifeline or my chief handicap, I hardly know which," he wrote in 1949.

It is Richter's scientific contribution and the context in which he devised the Richter magnitude scale that makes his story so incredible. When the 1906 San Francisco quake struck, there was no measure of how it compared to any past or potential future temblor. This disaster motivated the first mapping of the full extent of the San Andreas fault, as well as the founding of seismological laboratories in both northern and southern California. First on the scene in southern California was Harry Wood, who had a background in geology but lacked the PhD necessary to easily gain a position in UC Berkeley's earthquake lab. He recruited physicist cum lab rat Richter and the

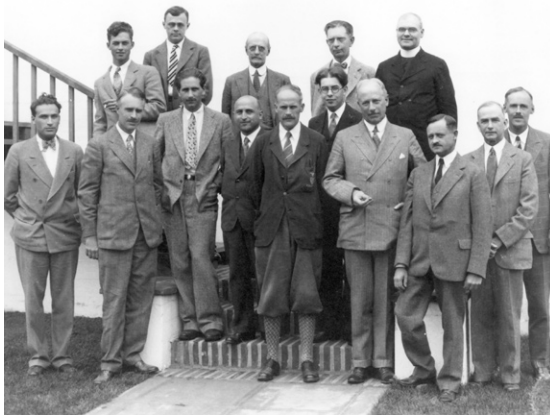
geologically reknowned Hugo Benioff. Then he coined a new seismometer—one was installed at the new lab and another at Mount Wilson Observatory—that Richter used to construct his scale.

Richter began by measuring the amplitude, or height, of seismic waves in southern California as recorded by seismograms—those wiggles that mark the passage of waves generated when land moves along a fault. But amplitudes differ depending on how far away the waves' source is, so he had to apply a distance correction. Then he realized that he had to restrict the scale's numbers to some manageable realm, like one to 10. Richter borrowed the notion from astronomers, who had classified stars by their brightness since time immemorial, but promptly turned their scale on its head—the brightest stars are first magnitude, but small quakes have small magnitudes on Richter's scale. He did this in part so that his scale would have no upper bound. The popular notion that magnitude 10 is the biggest possible quake is wrong—Richter noted that extreme shaking was rare, and 10 might be a natural upper limit, but he never excluded the possibility of something much greater.

Which brings us to the



**The Kresge Building, home to Caltech's Seismological Laboratory from 1927 to 1974, when it moved to campus. The back and attached tunnels were carved into granite bedrock, providing a quiet setting for seismometers.**



confusion surrounding how multiple, conflicting reports of earthquake magnitudes find their way into the press. For starters, the closer you are to the earthquake's source, the stronger the shaking, but damage is greatest where buildings and people are clustered, and epicenter and population centers don't always coincide. An earthquake *intensity* scale has been around since long before Richter and is still used to report damage. Richter's scale really quantified *magnitude* for the first time, but it still had one major flaw, which has since been corrected—because of the limitations of early seismometers, it was inaccurate for earthquakes larger than around a six on his scale.

It was Richter's colleague Beno Gutenberg who first suggested the scale be extended for worldwide application, and herein lies a great dilemma in Hough's book: Why did the term *Richter scale* stick, when it excluded other scientists who helped Richter develop it? Gutenberg was the one who suggested it would be handy to plot amplitudes logarithmically, meaning that the peak height of a magnitude 5 earthquake is 10 times higher than that of a magnitude 4. (The energy released is 30 times as great, but read the book for more insight on that point.) Indeed, in a 1979 interview Richter acknowledged the

term *Richter scale* "somewhat underrates Gutenberg's part in developing it for further use." It was Wood who suggested the term magnitude. And Richter's scale relied on the distance corrections of Japanese seismologist K. Wadati. Hough advances several thoughts on why the homey moniker "Richter scale" is hard to shake. She also points out that seismologists have greatly refined the original formulation of the Richter scale, and use amongst themselves the more universally accurate moment magnitude scale.

Still, Richter's name remains burned into the public consciousness of earthquakes. He became the media's go-to guy of the day, despite his sometimes anticongenial air. During one of many radio appearances, a caller confessed that she was afraid of earthquakes and asked Richter's advice. According to colleague Tom Heaton, Richter replied without hesitation, "Why don't you get the hell out of the state?"

One drawback of Hough's otherwise delightful book is its lack of maps. Keep an atlas on hand as you read, because references to various earthquake regions of the world abound. □—EN

## THE RICHTER SCALE

Charley Richter made a scale for calibrating earthquakes  
Gives a true and lucid reading every time the earth shakes  
Increments are exponential, numbers 0 to nine  
When the first shock hit the seismo everything worked fine, it measured

One two on the Richter scale, a shabby little shiver  
One two on the Richter scale, a queasy little quiver  
Waves brushed the seismograph as if a fly had flicked her  
One two on the Richter scale, it hardly woke up Richter

Nineteen hundred thirty three and Long Beach rocked and rumbled  
School house walls and crockery and oil derricks tumbled  
Hollywood got hit but good, it even shook the stars  
Shattered glass and spilled martinis on a hundred bars, it measured

Six three on the Richter scale, it rattled tile and plaster  
Six three on the Richter scale, a rattling disaster  
Waves bounced the seismograph as if a cue had clicked her  
Six three on the Richter scale, it almost rattled Richter

Came the turn of County Kern, the mountains lurched and trembled  
Bakersfield, which jerked and reeled, was almost disassembled  
Arvin town was battered down in rubble and debris  
Spasms racked the women's prison at Tehachapi, it measured

Seven eight on the Richter scale, it fractured rails and melons  
Seven eight on the Richter scale, it fractured female felons  
Waves smacked the seismograph, a casualty inflicter  
Seven eight on the Richter scale, it almost fractured Richter

Came a cataclysmic quake at Anchorage Alaska  
Seisms ran from Ketchikan to Omaha Nebraska  
Polar bears were saying prayers, the tidal wave was grand  
Planted boats in California way up on the sand, it measured

Eight five on the Richter scale, it loosened kelp and corals  
Eight five on the Richter scale, it loosened faith and morals  
Waves bashed the seismograph as if a mule had kicked her  
Eight five on the Richter scale, it failed to loosen Richter

Someday pretty soon we fear our many faults will fail us  
Slide and slip and rip and dip and all at once assail us  
Seismic jolts like lightning bolts will flatten us that day  
When the concrete settles down geologists will say, it measured

Eight nine on the Richter scale, it rocked 'em in Samoa  
Eight nine on the Richter scale, it cracked like Krakatoa  
Waves crunched the seismograph, just like a boa constrictor  
Eight nine on the Richter scale, it really racked up  
One two on the Richter scale, three four on the Richter scale  
Five six on the Richter scale, seven eight on the Richter scale  
Eight nine on the Richter scale (CRASH)  
It really racked up Richter

K. Clark



**Top left: Some notable attendees of a 1929 seismology workshop in Pasadena were (lower row) Hugo Benioff (third from left), Beno Gutenberg (fourth from left), Charles Richter (fifth from right), Harry Wood (third from right), and John Buwalda (far right). Top: Lyrics to "The Richter Scale," written by Kent Clark, professor of literature, emeritus, and**

**sung at Richter's retirement party in 1970. Bottom: Richter and the seismometer installed in the living room of his home. He could estimate an earthquake's magnitude and location from a handful of seismograms, and was thus on call at all hours.**