

BOOK REVIEWS

HOUGH, S. E. 2007. *Richter's Scale. Measure of an Earthquake, Measure of a Man*. xiii + 337 pp. Princeton, Oxford: Princeton University Press. Price £17.95, US \$27.95 (hard covers). ISBN 9780 691 12807 8. doi:10.1017/S0016756807003652

Charles Richter is, by a long way, the world's best-known seismologist, perhaps the only household name the subject has ever produced, and all because of his earthquake magnitude scale. Indeed, it is quite common, especially outside the USA and Europe, to hear earthquakes spoken of without the word magnitude at all, as in: 'it was size 6 Richter'. Charles Richter (1900–1985) spent his entire professional career at Caltech in Pasadena, and was a central figure in the heroic age of observational seismology, when new instruments and determined, systematic collection of earthquake-related phenomena added hugely to what was known about the Earth and the earthquakes it produced. His colleagues at Caltech included other giants, particularly Benioff, Gutenberg and Wood, all of whom he outlived. He left all his personal papers to the Caltech archives, which Susan Hough has researched thoroughly for this first serious biography of his personal and scientific life.

As a seismologist myself, I read with great fascination about Richter's scientific career, his interaction with other luminaries of the day (Jeffreys, Byerlee, Macelwane) who helped shape the growing new subject, and of course of the Seismo Lab at Caltech itself, which has spawned so many leaders of the discipline. Hough is a practising seismologist with the US Geological Survey, based on the Caltech campus, and so speaks with clarity and authority on these aspects. There are many revealing, enjoyable anecdotes and photographs about the people and circumstances of that time, which Hough has extracted from Richter's former colleagues and students, and preserved here. For that alone, it was worth writing this book. Of the magnitude scale itself, Hough gives a balanced and fair account. There have always been doubts about whether Richter really devised the scale on his own, whether Gutenberg's contribution was properly recognized, and whether Richter unfairly hogged the limelight. Hough's view, convincingly given, is that it was, essentially, Richter's conception, though it was later extended and modified by others. Though this was, undoubtedly, Richter's biggest contribution in the public's eyes, it probably isn't in those of professional seismologists. The original magnitude scale served its purpose at the time, but has since been superseded by other, more physically meaningful, measurements. Yet such is everyone's attachment to it, that the new scales have all had to dovetail with the rather restricted and artificial limitations of the original, so that its influence lives on. I would have liked to read more of the genesis and context of Richter's book *Elementary Seismology*, a truly splendid, inspirational work, which I read in my first term as a graduate student and which helped determine my own direction. Though published in 1958, a large chunk of the book is devoted to arguing that earthquakes are caused by movement on faults. That this was necessary sounds odd now, and Richter clearly had no doubt that it was true then, but it remained a respectable, though minority, opinion to question whether fault movement caused earthquakes until

the mid 1960s, when the physics linking fault slip to seismic radiation was finally understood. This book, and Richter's collaboration with Gutenberg on the *Seismicity of the Earth* (1949), rank at least as highly as the magnitude scale in the estimation of many seismologists.

About half this book is concerned with Richter's personal life and character. He was clearly a difficult man, rarely at peace with himself (Hough keeps referring to his 'demons' without it being very clear what they were), a frustrated poet, a loner, and someone who easily took offence. His relations with colleagues were rarely smooth, though he did inspire a loyalty in many, at least among those who were young enough to survive him and be interviewed for this book. His relations with women, including his wife and sister, were also complicated and, in the end, remain ambiguous in spite of the archives. Indeed, the deliberate leaving of his personal papers for preservation, but without any clarification of some that clearly mattered to him and whose content was bound to provoke interest, leaving them open to possible misinterpretation and speculation, seems typical of the man. Hough portrays him as very sensitive to his own feelings, rather than those of others, somewhat dysfunctional and introspective, and speculates whether he would now be regarded as suffering from Asperger's syndrome. Perhaps; but maybe he was just difficult, private and rather antisocial. One of the most moving parts of the book is an appendix, recording a speech that Richter had prepared for his retirement party but in the end didn't give, because he took offence at the frivolous atmosphere of the occasion, whereas he was in a mood to be poetic and philosophical. He ends this speech with a statement of manifest good sense, that deserves to be aired again:

'For years I fought a losing battle to keep away from involvement with the notion of earthquake prediction. The press and public will go toward the suggestion of prediction like hog to the trough. Meanwhile, other objects of investigation are neglected or distorted; and aid is given to the people who would like to forget the fact that for public safety we don't need prediction – that earthquake risk could be removed, almost completely, by proper building construction and regulation.'

Susan Hough clearly became attached to her subject while writing this book, and interprets Richter's numerous foibles and eccentricities with sympathy, understanding and sensitivity. It is a measure of her success that she persuades the reader that she is right and humane to do so. Richter was lucky to have such a biographer.

James Jackson

LANZA, R. & MELONI, A. 2006. *The Earth's Magnetism. An Introduction for Geologists*. xi + 278 pp. Berlin, Heidelberg, New York: Springer-Verlag. Price £46.00 (hard covers). ISBN13 978 3 540 27979 2. doi:10.1017/S0016756807003238

Within both the subtitle and the preface the authors make it clear that they are attempting to explain geomagnetism to a geological audience. Do they succeed? Overall I believe

that they just about do but your average geologist, even at graduate level, may well be put off by the maths, especially as it starts so early (pages 3 and 4) in the opening chapter. In my opinion at least some of the mathematical treatment of the opening chapter could have been best avoided or perhaps, better still, confined to an appendix at the end. Throughout the rest of the book the mathematical side is downplayed and I think as a result makes the material more accessible rather than less so.

The book follows a slightly quirky path with chapters on Geomagnetism, Rock Magnetism, Magnetic Prospecting, Palaeomagnetism, Magnetic Fabrics, The Magnetic Signature of the Earth's Crust, Magnetic Chronology, Environmental Magnetism and finally a brief history of the study of magnetism. The organization of the book might have been better served by bringing the magnetic prospecting and crustal magnetism sections together so that one led on from the other but the rights and wrongs of any such organization is always subjective.

I think one of the highlights of the book is the extremely good use of Italian examples to explain the various topics under discussion. If nothing else these, perhaps less familiar, examples will serve as a valuable resource to those teaching in the broad discipline of geomagnetism. The text is very well written and I think most readers will find the book quite readable. However there is a certain quiriness to it all – some slightly odd phrasing or the occasional missing word strikes one quite often, which after a moment's pause one realises is due to the fact that the authors' first language is not English but in fact does not obscure the authors' meaning in any way.

At the end of each chapter the authors provide a brief set of recommendations for suggested reading and combine this with a short set of references for figure sources. While this is not an extensive reference list it does give the interested reader enough information to begin to follow up the various topics under discussion. Throughout the quality of the diagrams is very good with many very clean, simple line drawings and a limited number of colour plates.

In the end I think this will become a reference book in libraries rather than a true textbook for the undergraduate or graduate geologist. Having said that I would hope it would become a standard on taught graduate courses in geophysics where its broad introduction to the diversity of geomagnetism would serve such readers well.

Graeme K. Taylor

CALDWELL, D. R., EHLEN, J. & HARMON, R. S. (eds) 2004. *Studies in Military Geography and Geology*. xiv + 348 pp. Dordrecht, Boston, London: Kluwer. Price Euros 119.95, £79.00, SFr 194.50, US \$159.00 (hard covers). ISBN 1 4020 3104 1. doi:10.1017/S0016756806002378

More than six decades on from the end of World War Two, there are few people who have personal experience of warfare involving conventional battlefields. Apart from low-intensity, counter-insurgency conflicts, the post-WW2 period, one of continual conflict somewhere on the planet, has seen not a single campaign that has pitted large armies on a roughly equal footing, except occasionally in Korea and Vietnam. Pitched battles, such as Desert Storm in the first Gulf War, have been decided by overwhelming air power and surface-to-surface firepower in a matter of a few hours, irrespective

of ground. So a book on the central role of terrain in military strategy and tactics is more of historical interest than looking ahead to battle plans that are dominated by conditions under foot. Stemming from a conference at the US Military Academy, West Point in 2003, it is no surprise to find *Studies in Military Geography and Geology* dominated by North American issues from the War of Independence and the Civil War. But there are vignettes about Hannibal's invasion of southern Europe, and the role of German geologists and geographers in planning the invasion of the Soviet Union and the aborted invasion of Britain.

That being said, anyone likely to come under fire aims to seek natural cover, and maintaining supply lines will depend on whether or not vehicles can become bogged and water supplies assured. The second is now less appropriate to armies of the last remaining superpower; millions of litres of bottled spring water, as well as TV dinners, fly into Iraq. Yet the first Gulf War was only able to sustain hundreds of thousands of troops by exploiting a major aquifer in northern Saudi Arabia from wells drilled to a depth of a kilometre, and using remote sensing to locate existing wells in the featureless desert that formed the main battle ground. Interestingly, the UN military force that is deployed along the Eritrean–Ethiopian border to observe adherence to the cease-fire terms at the end of the 1998–2000 war there uses bottled supplies. Not having drilled wells, they have done little to restore groundwater supplies in anticipation of the return of tens of thousands of refugees displaced by the war.

The abortive hunt for Osama bin Laden since the invasion of Afghanistan in 2002 highlights the tremendous advantage to small defensive forces of limestone terrain – highly irregular karst topography and a multitude of caves in which to hide. There is an interesting parallel account of how the intricate tropical karst of upland Jamaica – Cockpit Country – thwarted British forces' attempts to suppress a guerrilla force of escaped slaves during the Maroon Wars of 1690–6. A combination of cordoning the karst terrain from which the guerrillas operated, deforestation, and guarding the few surface water supplies enabled the British to contain the rebellion. Maroon fighters, however, only sought terms after a measles epidemic weakened their forces. That karstic regions still worry counter-insurgency forces is emphasized by a detailed analysis of Afghan limestones. Its scope is from microscopic and geochemical studies of hand specimens, to determine which facies are most prone to solution cavities, to geospatial analysis of lithofacies maps and fracture systems as a means of predicting where most caves might be. The outcome was blanket bombing of limestone country close to the Afghan–Pakistani border, but no significant achievement of its objectives.

The central political purpose of conventional warfare is to wreak as much devastation as possible to force opponents to submit. But in these sensitive times, it seems that armies have some duties similar to those of mining companies: they are supposed to protect environment and heritage as best they can – at least on their training grounds. So there are two chapters dealing with environmental impact of marching and movement of armour. In the first, case studies focus on a bayonet assault course at West Point (has any reader actually seen news footage of US soldiers with fixed bayonets?). Equally earnest is the account of how vehicle tracks on surfaces coated by desert pavement last for tens if not hundreds of years, from studies of US arid-land training sites. To this day, the El Alamein battlefield lays out the to-ing and fro-ing of the Afrika Corps and the Eighth Army. And what of the impact on archaeology, for which US legislation has