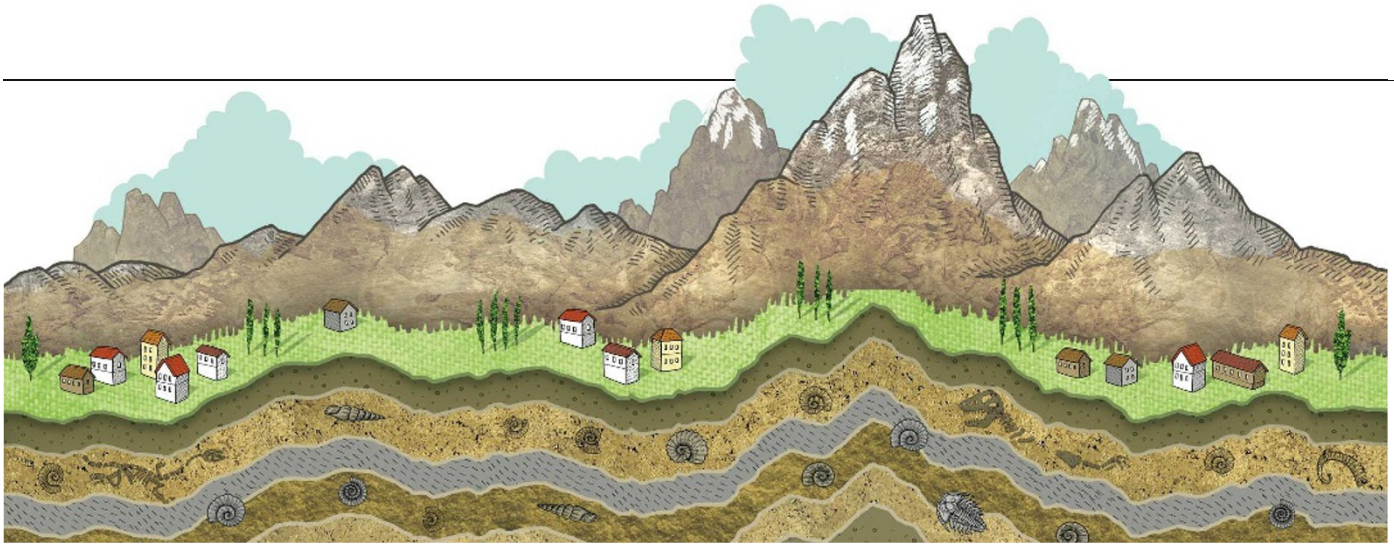
SUMMER BOOKS



Grand tour with a geologist guide

A field guide to the formation of Italy's Apennine mountains mixes the science behind the dinosaur extinction with accounts of travel and Italian history, explains **Ted Nield**.

The Mountains of St Francis: Discovering the Geologic Events That Shaped Our Earth
by Walter Alvarez
W. W. Norton: 2008. 288 pp.
$25.95, £16.99

In 1975, as Generalissimo Francisco Franco lay dying in Madrid, a party of geology students on an excursion to the mountains of northern Spain took a diversion to the Basque capital, Guernica. Had their leaders known a little more about art history, they would have realized that Pablo Picasso's iconic 1937 painting, the object of the detour, was still in exile in the United States at the time.

I was on that trip and remember this well-meaning yet misguided diversion because it was a rare event in my personal geological history. Sadly, when travelling the world at other people's expense, geologists will drive straight past every wonder of the world just to squeeze one more interesting roadside ditch into their itinerary. After reading *The Mountains of St Francis*, I feel certain that our trip would not have gone so awry had we been fortunate enough to have its author Walter Alvarez in our party.

If geologists built great cathedrals instead of ignoring them, they would probably put Alvarez's statue in a niche on the west front. Assisted by his father, Nobel prize-winning physicist Luis Alvarez, and nuclear chemists Frank Asaro and Helen Michel, Alvarez can claim priority as a principal discoverer of the global iridium anomaly that marks the junction between the Cretaceous and Palaeogene periods, the Cretaceous–Tertiary or KT boundary.

Iridium is rare on Earth's surface yet plentiful in space. The sudden spike in the element's abundance at the KT boundary on Earth is believed to have been caused by a comet or meteorite hit. The story of that discovery, and how it was linked to the dinosaur extinction and the offshore crater at Chicxulub, Mexico, was recounted in Alvarez's 1997 bestseller, *T. rex and the Crater of Doom* (Princeton University Press). It is this stunning series of discoveries with which Alvarez is most closely associated.

The particular roadside ditch in which Alvarez first discovered the iridium layer is not far from the town of Gubbio, near Perugia, in the Appennine Mountains in Italy. Alvarez has spent his career looking at the geology of how that mountain range has been, and is still being, created. This forms the subject of his second foray into popular science.

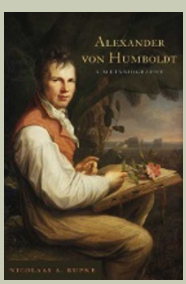
Forming the backbone of Italy and enclosing the Adriatic embayment, the Apennines have long been difficult to reconcile with conventional plate tectonics alone. Their basic shape is governed by rock structures known as fold-thrust belts, where low-angle reverse faults in Earth's crust are formed as accumulated layers of sedimentary rock from former Adriatic seas have folded. The belts of rock become pushed up and over themselves to form upfolds, or ramp anticlines, at their leading edges.

Perplexingly, the compressional tectonics that push the crust together at the leading edges of these fold-thrust belts is followed by extensional tectonics behind, where the crust is pulled apart. This sequence of compression and extension calls for special explanation. It is believed to be caused by 'delamination and roll-back', whereby a slab of deep-lying continental crust undergoes mineral transformations that allow it to fall into Earth's mantle. This downward peeling process exerts drag on the crust above, thus creating compression at the leading

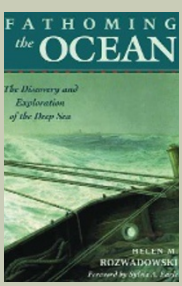
ILLUSTRATIONS BY P. HACKETT

NEW IN PAPERBACK

Alexander von Humboldt: A Metabiography
by Nicolaas A. Rupke
(Univ. Chicago Press, $24, £11)
Rupke looks at how Alexander Humboldt's life story has been adapted to suit changing philosophies or political ideals. "His metabiography helps us to appreciate the historical instability of any scientific life, not just one as complex as Humboldt's," wrote Steven Shapin (*Nature* **441,** 286; 2006).



Fathoming the Ocean: The Discovery and Exploration of the Deep Sea
by Helen M. Rozwadowski
(Harvard Univ. Press, $19.95, £12.95)
This book explores the birth of deep-sea oceanography in the nineteenth century, covering the breakthroughs in gathering data and the social impacts. It explains how the presence of researchers on naval vessels led to cultural shifts for scientists, sailors and Western society.



edge and extension at the trailing edge.

Alvarez leads us to this hypothesis along a personal and scientific journey through many scientific, historical and cultural byways. The book reads like an extended field guide and notebook — Alvarez mingles the story of his involvement with Italian geologists with accounts of his travels, discoveries and what might be called an Italian history of the world, in which various historical figures receive proper credit for thinking of things first. Many of them, such as the seventeenth-century Danish geologist Nicolaus Steno, need no introduction to geological readers. But some Italian figures will be unfamiliar, such as the 'father of Italian geology' Giovanni Arduino, who gave us the now obsolete term 'tertiary' in the eighteenth century.

Alvarez obsesses a little about issues of priority, recalling my feeling that his other book was uncomfortably full of praise for those collaborators who had set their competing claims aside. Here, too, using many historical examples, Alvarez shows the reader how well scientists behave when science works.

I particularly relished the moral he draws from how alpine thrust faults were correctly explained. These faults are flat planes along which huge masses of rock have travelled horizontally, often for hundreds of kilometres. After years of doubt, geologists finally accepted that rocks could be pushed such large distances — their acceptance of plate tectonics sapped all controversy from the issue. Alvarez uses this to remind us of a phenomenon first identified by astronomers Alan Lightman and Owen Gingerich in 1992, whereby well-established ruling theories "develop a life of their own" and seem to take forever to collapse under the weight of conflicting evidence.

There is an irony here because the connection that Alvarez and others made between the iridium anomaly and the Chicxulub crater has become just such a ruling theory in recent years, one that sceptical scientists have challenged at their peril. One must conclude that the book was already with the publishers last year when Gerta Keller, a professor at Princeton University in New Jersey, persuasively debunked Chicxulub as *T. rex*'s crater of doom by proving it was 300,000 years too old. Alvarez's frequent references to the crater as the uncontested 'smoking gun' would otherwise, presumably, have been phrased more circumspectly.

Like Alvarez's previous book, *The Mountains of St Francis* is a first-person participant history. This genre carries dangers, not least the pitfall of overplaying the author's centrality. Alvarez is given to grand gesture, and sometimes allows himself to come too close to writing what Stephen Jay Gould dubbed "cardboard history". For example, he avers that, by the 1930s, Alfred Wegener's ideas on continental drift had been "mostly rejected". True, Wegener's fellow geophysicists rejected his hypothesis because they thought it was physically impossible. But, as science historian Naomi Oreskes has shown, it was only in the United States — for a long time a bastion of old-fashioned continental fixism — that geologists rejected drift en masse. Elsewhere they remained more open-minded.

Alvarez deserves his place in posterity. Along with others, including my late professor, Derek Ager, he has helped geologists to understand that uniformitarianism and gradualism are not the same thing. On the timescale of a planet, uniformity must also embrace rare, catastrophic events that may recur on timescales far beyond the duration of civilizations and even species.

Whatever the truth behind his sometimes overconfident side-statements about the end-Cretaceous extinction, meteorite impacts, the iridium anomaly, Chicxulub crater and science history, the tectonic story running through this book is compelling and engagingly told. It also holds appeal for lay readers, perhaps less so than his previous book, but those who venture into the mountains of St Francis with Alvarez will not regret it. I would make it required background reading for students of Earth science. It would certainly help counteract the occasional philistinism of those leading their field trips. ■

Ted Nield is editor of *Geoscientist* magazine and author of *Supercontinent*.
e-mail: ted.nield@geolsoc.org.uk

Stalin's war on genetic science

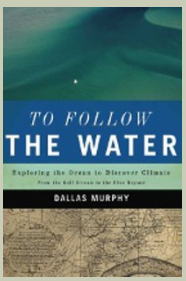
The Murder of Nikolai Vavilov: The Story of Stalin's Persecution of One of the Great Scientists of the Twentieth Century
by Peter Pringle
Simon and Schuster: 2008. 384 pp. $26

It is not surprising, given the parlous state of Russia in the years following the Revolution, that its political system put ideology and practical outcomes above all else, including scientific fact. This was most evident in agriculture, where it was imperative to produce more food by whatever means. The consequences were tragic for the Russian people and for Nikolai Ivanovich Vavilov, Russia's greatest geneticist. Vavilov fell foul of Trofim Denisovich Lysenko who, through political manipulation and intrigue, came to dominate Soviet genetics.Peter Pringle's compelling book, *The Murder of Nikolai Vavilov,* tells the story of the Lysenko affair with verve and pace. Pringle makes it clear how Vavilov's patriotism, dedication to science and determination to be open-minded led to his downfall and death.

Vavilov was born in 1887 in Moscow into a comfortable, bourgeois family. In 1906 he entered the Petrovskaya Agriculture Academy, or Petrovska, one of many institutes established after the devastating famine of 1892. Russian agricultural practices lagged behind those of other European countries and the United States, and efforts to reform them were unsuccessful. Vavilov undertook "to work for the benefit of the poor, the enslaved class of my country, to raise their level of knowledge". This pledge, Pringle explains, drove Vavilov throughout his life.

After graduating, Vavilov spent a year researching wheat with Robert Regel at the Bureau of Applied Botany in St Petersburg,

To Follow the Water: Exploring the Ocean to Discover Climate
by Dallas Murphy (Basic Books, $15.95, £9.99)
As well as covering the history of human expansion across the globe and the science of oceanography, Murphy also gives first-hand accounts of life on a research vessel. "Meticulously following the waters of the Gulf Stream into the blue beyond, Murphy's book gets it right," wrote Arnold Gordon (*Nature* **449,** 407–408; 2007).



Brussels Versus the Beltway: Advocacy in the United States and the European Union
by Christine Mahoney
(Georgetown Univ. Press, $29.95)
Political decisions made in Washington DC and Brussels have global effects, but US and European advocacy styles are often assumed to be culturally different. This book challenges stereotypes, arguing that the context of issues and institutions is more important than differences between cultures.