A Brief History of Geology

Geology as a science has a fascinating and controversial history. Kieran D. O'Hara's book provides a brief and accessible account of the major events in the history of geology over the last 200 years – from early theories of Earth's structure during the Reformation, through major controversies over the age of the Earth during the Industrial Revolution, to the more recent twentieth-century development of plate tectonic theory, and on to current ideas concerning the Anthropocene. Most chapters include a short feature box providing more technical and detailed elaborations on selected topics. The book also includes a history of the geology of the Moon, a topic not normally included in books on the history of geology. The book will appeal to students of Earth science, researchers in geology who wish to learn more about the history of their subject, and general readers interested in the history of science.

KIERAN D. O'HARA is Professor Emeritus in the Department of Earth and Environmental Sciences at the University of Kentucky. He has published more than 40 articles in international journals and has received numerous research awards from the American National Science Foundation. He taught geology at undergraduate and graduate levels at the University of Kentucky for 30 years. His other books include *Cave Art and Climate Change* (2014) and *Earth Resources and Environmental Impacts* (2014).

'O'Hara does a great job of covering both the old (late 1800s) and the new (1960-1970) history of geology. Included are informative, but concise, biographies of all the major players in the nineteenth and twentieth centuries. The author shows very clearly how Wegner's continental drift – which was not originally accepted by the scientific community – came together with Harry Hess's seafloor spreading in the 1970s, and led to the "Great Plate Tectonic Revolution" in the Earth sciences. I really liked the chapter on isotopic dating, where the author clearly explains how geologists learned to use isotopes to date geologic events – no other book on the history of geology illustrates this so clearly.'

– Kent Condie, New Mexico Institute of Mining and Technology

'The nearly four-century existence of geology as a concept – "the study of the Earth with its Furniture" as it was first put – has been mired in periods of uncertainty, revolution, speculation and controversy. O'Hara has tied it all up in a concise, neatly arranged and highly readable summary, essential to all who want to know more of the fascinating story of this most fundamental of sciences.'

– Simon Winchester, author of *The Map That Changed the World*

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Preface

Charles Lyell's *Principles of Geology* (Vol. 1, 1830) is one of the earlier treatments of the history of geology, sketching progress throughout the history of geology. In that history, Lyell takes the Neptunist school to task for believing that all rock successions, including igneous rocks, were precipitations from a "chaotic fluid." He also praised the English surveyor, William Smith, who by 1790 had recognized that stratified rock formations could be identified by their fossil assemblages and who, by himself, produced the first geologic map of England and Wales in 1815 – this work is recounted in Simon Winchester's book *The Map That Changed the World* (2001). Subsequent histories of geology include Von Zittel's *History of Geology and Paleontology* (1901), Archibald Geike's *The Founders of Geology* (1905), and *The Birth and Development of the Geological Sciences* by Frank Adams (1938), which includes a chapter on ancient Greek and Roman writers.

Geology in the Nineteenth Century by M. T. Greene (1982) focuses on tectonic theories, the origin of mountain belts, and Continental Drift. The *Rejection of Continental Drift* by Naomi Oreskes (1999) discusses the major players involved in the arguments on both sides of the Atlantic on this issue. *The Ocean of Truth* (1986) is a personal account by H. W. Menard of discoveries made in the oceans in the 1950s and 1960s leading up to, but prior to, the discovery of plate tectonics. A compilation of historically important academic papers on plate tectonics was produced by Alan Cox entitled *Plate Tectonics and Geomagnetic Reversals* (1973). The introduction by Cox sheds substantial light on the history of plate tectonics. This compilation also includes a 1944 paper by the British geologist Arthur Holmes, whose contribution to global tectonics has largely been underestimated.

A series by H. R. Frankel entitled *The Continental Drift Controversy* was published in 2012 by Cambridge University Press and included four volumes: Volume 1, *Wegener and the Early Debate*; Volume 2, *Paleomagnetism and Confirmation of Drift*; Volume 3, *Introduction of Seafloor Spreading;* and Volume 4, *Evolution into Plate Tectonics*. Three important books by the historian and geologist Martin Rudwick published by Chicago University Press, are *Earth's Deep History* (2014), *Worlds before Adam* (2008), and the *Great Devonian Controversy* (1985). *Great Geologic Controversies* by A. Hallam (1989) is also notable (Oxford University Press). *Two Hundred Years of Geology in America*, edited by C. J. Schneer (University Press of New England, 1979) confines itself to American geology. *History of Geology* by H. B. Woodward (Arno Press, 1978) confines itself to the seventeenth and eighteenth centuries. *A History of Geology* by G. Gohau (Rutgers University Press, 1991), translated from the French, takes a somewhat Eurocentric view of the history of geology.

The present book begins in the 1780s with James Hutton and other founders of geology, and ends with the current proposal for an Anthropocene epoch, based on environmental considerations. I conclude the Anthropocene should be an archaeological subdivision rather than a geological one. Other topics are Continental Drift (Chapter 6) and the Pleistocene Ice Age (Chapter 9). Two topics not normally treated in a history of geology but included in this book are the history and origin of the Moon (Chapter 10) and a brief history of isotope geology (Chapter 8). A crisis in the subdiscipline of tectonics is identified in Chapter 5, beginning circa 1890s, and this crisis does not end until the discovery of plate tectonics in the 1960s (Chapter 7). The origin of igneous rocks is covered in Chapter 4. The final chapter attempts to examine whether the history of geology (not just that of plate tectonics) fits into the Kuhnian scientific revolution framework; I conclude that it does. Geologic jargon is kept to a minimum in the

hope that the book will be of interest not just to Earth science students and teachers, but also to a wider general audience. I would like to thank those who reviewed various chapters of the book: Steven Greb, Frank Ettensohn, David Moecher, Gustave Lester, Kent Ratajeski, Sean Bemis, and Malcom Rutherford.