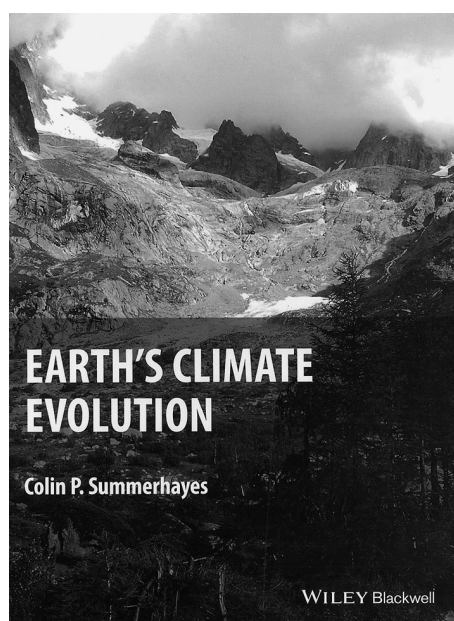


Book reviews

Earth's Climate Evolution, by C.P. Summerhayes, 2015. John Wiley & Sons, Chichester. 394 pages. Hardcover: price USD 79.95. ISBN 978-1-118-89739-3.



The present tome discusses climate changes in the geological past and how these can be detected. In this respect, it makes for excellent reading and is a mine of information on past climates, scientists who have studied them, methods used and the wider context of palaeoclimatic research. The story goes far back into history, to approximately 450 myr ago, which is a good means to convey the main message. Colin Summerhayes argues that whatever climate changes occurred in the past, the current rate of changes is beyond the limits of a natural envelope of variability and that the reasons behind it must be anthropogenic. Thus, the book is as much about geological time as it is an addition to the current debate about the causes of global change and a strong indication that humans are to blame for the current climate variability that would not have occurred otherwise.

The structure of the volume is an interesting combination of the chronology of the evolution of the Earth and the chronology of research, interwoven with a presentation of biographies of the most influential academics and their seminal works. It

starts with the discovery that climates in the past were different from today's, as traced back to the great minds of the late 18th and early 19th centuries such as James Hutton, Georges Cuvier, Alexander von Humboldt, Charles Lyell, Louis Agassiz and a few others. Then the story continues on and we learn about the suggestion and subsequent recognition of the cyclicality of ice ages, about the concept of the 'greenhouse effect' and the realisation of the role of carbon dioxide in the atmosphere; this is followed by a chronology of scientific endeavour. The subject then switches to major advances in geology: plate tectonics and dating the rock record. Having these different pieces put together, Summerhayes takes us into the world of mapping past climates and methods used. The Cenozoic era, with its progressive cooling, is then examined in detail, whilst in parallel we learn about the increasingly better understanding of the role of carbon dioxide in modulating Earth's climates. Some episodes are presented in more detail, such as the global climate warming at the Paleocene/Eocene boundary and the relatively recent Pliocene warming, along with its plate tectonics causal context. Travelling through time, we then approach the Quaternary, treated in considerable detail. Issues discussed include how signals from cores of sea bottom sediments were extracted and what they tell us about the rhythm of climate change, what messages are told by ice cores from Greenland and Antarctica and what were the reasons for asynchronous warmings and coolings at the end of the Pleistocene in both hemispheres. The final chapters focus on the Holocene and, to begin with, on natural climate changes that occurred throughout most of this period, inclusive of climate variability at millenium and century scale, followed by a close examination of the so-called Medieval Warm Period and the Little Ice Age, plus very recent temperature changes. Summerhayes draw conclusions in the final chapter (Chapter 16), emphasising the concept of natural envelope of climate change and summarising what we know about climate change through geological time and what

are the primary drivers of change. He argues that the Little Ice Age has not yet come to an end. We might expect it to last for another 1,000 years, but we experience something fundamentally different instead: the rise of CO₂ levels due to anthropogenic emissions.

I consider this book to be, first and foremost, an excellent review of the rapidly expanding field of palaeoclimatology, inclusive of very recent developments barely covered in academic textbooks. Looking at it from this perspective, it will definitely fill a niche and should enjoy a wide readership as a reference source. What the position of the au-

thor in the recent debate about the causes of climate change is clear. Those less convinced that the current global warming is entirely anthropogenic may be disappointed that counter views are not really presented. Nevertheless, anyone interested in the history of Earth's climate, in the history of geosciences and in Quaternary environmental changes will enjoy reading this tome and using it as a handy primer of climate change and its causes.

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