

# The Archaeology of Geological Catastrophes

edited by W.J. McGuire, D.R. Griffiths, P.L. Hancock and I.S. Stewart



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## The Archaeology of Geological Catastrophes

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# The Archaeology of Geological Catastrophes

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## Preface

The Archaeology of Geological Catastrophes brings together a diverse collection of papers that address the archaeological identification and cultural significance of large-scale geological events, mainly earthquakes and volcanic eruptions. Major earthquakes and volcanic eruptions typically recur at intervals of anything between a few decades to many tens to hundreds of thousands of years. Yet the instrumentation by which we record and monitor them has only been around for little over a century. To reduce the hazard posed by earthquakes and volcanism, we require a longer record of them than can be provided from modern instrumental snapshots. On the assumption that future earthquake and volcanic activity will be like that of the recent past, we need to understand the history of earthquakes and volcanism over millennial timescales. For the geologist, therefore, archaeology presents a potential tool to illuminate this time window, lying astride the documentary archives of historians and the geological archives of the surficial rock record. For the archaeologist, recognizing the impact of earthquakes or volcanic activity on a site or region more often provides a missing piece of the human history of that area, often explaining the conditions for cultural development or demise. In this context, an individual earthquake or volcanic eruption may often be the solution to an archaeologist's interpretation of inferred local or regional upheavals. By contrast, for the volcanologist or earthquake geologist, the identification of a major prehistorical seismic or volcanic event is generally the starting point from which to go on to derive other parameters (e.g. event magnitude, source etc.), or fit into regional models or datasets. For example, for archaeologists, the 464 BC earthquake at Sparta, Greece, was the trigger for a major change in political conditions in the Peloponnese region; for earthquake geologists it provides key evidence to estimate the earthquake energy released on a major fault that has since been seismically quiescent (Armijo *et al.* 1991). Furthermore, this difference is more than simply one of perspective, since it is generally underpinned by contrasting philosophical and theoretical frameworks, by varying methodological approaches, and by practitioners using distinct terminologies and presenting results in widely differing forums.

In short, in many ways, archaeology and geology are fundamentally distinct disciplines. The distinction leads to uncertainty, or even suspicion, about studies that seek to integrate the two. Many seismologists, for example, will no doubt still



Paul L. Hancock who sadly died during the completion of this volume.



empathize with comments made by Charles Richter 40 years ago, complaining that 'Ancient accounts of earthquakes do not help us much; they are incomplete, and accuracy is usually sacrificed to make the most of a good story' (Richter 1958, cited by Vita-Finzi 1986, p. 8). Guidoboni (1996) is more generous though equally cautious, noting that 'Earthquakes are not kind, and they do not care for researchers. Their traces can travel through strata and upset methods for dating in unexpected ways. This is one reason why so many important pieces of archaeological evidence are lost for seismology'. To some extent, these criticisms may be less resonant for volcanic archaeology investigations, since eruptive activity frequently leaves geochemically or petrographically distinctive 'event horizons' (e.g. Riehle *et al.* this volume), or even volcanic deposits that preserve the archaeological record more or less intact (e.g. Gonzalez *et al.* this volume). By comparison, destruction horizons produced by seismic shaking must compete with the often comparable debris traces of warfare and natural collapse of poor constructions. In this regard, the focus in this volume on 'catastrophes' is less to do with the assumption that these events are inherently more important (or interesting) for our understanding of recent geological history or of our cultural heritage. Instead, it reflects the recognition that it is the large-magnitude geophysical events that are most likely to leave the clearest signals in the archaeological record. The diverse ways in which investigators may interpret those signals is arguably the main theme of this volume.

The Archaeology of Geological Catastrophes presents a broad spectrum of papers on the geoarchaeology of earthquakes and volcanoes, and here we draw attention only to a few general themes. Although earthquakes and volcanic eruptions are generally viewed as agents of destruction, numerous papers discuss their potential benefits to past cultures – providing materials for tools, building and sculpture, and even the fertile environmental conditions on which societies depended. Perhaps the most intriguing proposal is the suggestion that the power of the Delphic oracle to the ancient Greeks derived from the geological setting of the site, specifically from gaseous emissions from an underlying active fault. The bulk of contributions, however, focus on the destructive power of earthquakes and volcanoes. Several papers deal specifically with 'archaeoseismology' – the study of pre-instrumental earthquakes that, by affecting locations and their environments, have left their mark in the archaeological record. An important debate to emerge from these papers is whether major past earthquakes are more effectively recognized through regional disturbances in occupation or settlement patterns (territorial archaeology) or through the identification of 'diagnostic' structural indicators at individual sites. A suite of papers tackle different facets of arguably the most prominent geological catastrophe in the archaeological record – the Bronze Age eruption of Thera (Santorini, Greece) and its consequent regional impacts on Minoan culture. Human responses to major volcanic eruptions are also discussed, both in terms of local reactions to volcanism in Sicily and Mexico, and far-field effects, such as the impacts of Icelandic eruptive activity on agricultural demise in the Scottish Highlands. In turn, the value (and potential pitfalls) of historical records of past eruptive activity in documenting the capricious character of volcanism in an area are assessed in case studies from Italy, Germany, the Canary Islands and the Cape Verde islands. Other themes covered within the volume include the application of tephrochronology in volcanic archaeology, the value of volcanic soils in archaeological research, the use of geographic information systems in preserving vulnerable archaeological information

at key cultural sites and the assessment of the vulnerability of important cultural centres to seismic and volcanic threats.

To those that may dislike the eclectic character of this volume, the editors would argue that this only serves to reflect the rather disparate state-of-play within the burgeoning fields of earthquake and volcanic archaeology. Furthermore, the papers presented here show varying degrees of cross-disciplinary co-operation, but the bulk of the research is still largely being undertaken by archaeologists or by geologists working in relative isolation. It is hoped that by raising some important research questions, volumes like *The Archaeology of Geological Catastrophes*, will accelerate the move towards the type of interdisciplinary research advocated by Van Andel (1991, p. 324), in which historians, archaeologists and geologists (among others!) participate in a '... collaboration which assumes intensive exchange of information, ideas and procedures from the planning stage through to final publication'. Such collaborations are likely to be essential if the past societal impacts of earthquake and volcanic activity are to be effectively unravelled.

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Iain Stewart  
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