16. EPILOGUE

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The mid-sixth century appears to have been a period when human societies in many parts of the globe experienced appreciable stress. We do not know exactly what happened, but there is evidence to suggest that global climate changed somewhat in the years around and following ca. A.D. 536, growing slightly cooler. Tree ring records, sea level curves, and documentary accounts, as well as more indirect archaeological evidence, all indicate that something apparently happened to effect climate at a planetary scale.

What we have chosen to call the A.D. 536 event, if indeed a single event is ultimately implicated, and not a series of events and/or processes operating over a number of years, appears to have had long term effects on both climate and culture. The ensuing three centuries were somewhat cooler than normal, with the result that a number of cultural systems in widely differing parts of the world exhibit evidence for depopulation, changes in land use, large scale relocation or movement, or a reduction in organizational complexity.

Critically important lessons of this volume, accordingly, are that human cultural systems can be profoundly effected by comparatively sudden changes in global climate; that such changes can occur at any time; and that these changes do not need to be large or dramatic to have long-term and far reaching effects. Our global technological civilization, while unquestionably resilient, is not invulnerable to such changes, and we must beware of hubris when judging its ability to cope with what the universe can throw at us.

The changes observed in mid-sixth century cultures worldwide may eventually be linked to a specific physical mechanism, such as a volcanic eruption, meteor impact, or some other natural phenomenon. It is the belief of most of the authors of this volume that something significant, at least in terms of its effect on human cultures, did occur at this time. A fairly sudden change in global climate appears to be the most likely explanation for what has been observed. We ask our colleagues in the natural and physical sciences to seriously explore this possibility.

The extent to which global climate may have changed in the mid-sixth century, we must emphasize, was comparatively minor when compared to some of the truly dramatic events that have occurred in earth history, such as the extended periods of continental glaciation that characterize much of the Pleistocene epoch, or the cataclysmic asteroid impacts at the ends of the Permian and Cretaceous periods. Nonetheless, for human societies in many parts of the globe even a comparatively minor change in climate, like that inferred to have occurred at ca. A.D. 536, could have had profound effects. We must explore what happened in the mid-sixth century, and more importantly, determine whether similar events or processes occurred at other times in human history and prehistory, what their effects were on the cultures of the time, and assess the probability of similar events occurring in the years to come. Seriously addressing such questions, we believe, can profoundly shape how we as a civilization look at the world around us, and plan for the future.

As exciting and challenging as determining the physical causes of A.D. 536-like events is determining their effects on human cultural systems. Here archaeology and history have much to contribute, by providing detailed information on the short- and long-term consequences of global climate change. This potential is increasingly being recognized. In the mid-sixth century, as we have seen, different reactions to the A.D. 536 event occurred in societies at differing levels of organizational complexity. In general, those societies most dependent upon intensive agriculture, and at the same time least able to fall back on alternate resources, appear to have been the most vulnerable. These tended to be among the most complex civilizations of the time, as the case studies in this volume from Western Europe, China, the Mayan area, and eastern Africa indicate. Organizational change, typically a reduction in complexity or social unrest, as well as outright suffering (i.e., starvation, disease) appear to have been greatest in these societies. In contrast, less complex societies dependent on wild plant and animal resources, such as some of the native societies of the southeastern United States, seem to have come through this event more or less unscarred. Even in these societies, however, there are hints that all was not completely well, given evidence for changes in subsistence practices, material culture, and settlement patterning, as well as for occasional large scale population movements. That the extant regional civilizations did not completely collapse in most of the areas examined in this volume during the mid-sixth century, however, indicates that whatever happened to the global climate system was comparatively mild or short-lived. It also indicates that the state level cultural systems of the time were themselves quite resilient. A hallmark of complex organizational forms, particularly state level societies, of course, is the ability of their ruling classes or elites to marshal resources, and use them to advance their personal agendas. Survival and the maintenance of power are, of course, the most fundamental social agenda of such groups, and hence only the greatest of trauma could end these systems.

State-level societies in the sixth century, as indeed at any time, overcome periods of adversity by having the ability to buffer food shortfalls through the use of adequate appropriation and storage technologies, and having the physical force necessary to maintain control over these resources. While suffering may have been profound among commoners, and individual elites and their families may have perished in some areas, no doubt many elites and their supporters, and hence the organizational systems they

formed, were able to continue, albeit in weakened or changed condition. It is thus critically important to explore relationships between climate change, food production (i.e., crop yields, fishing harvests), and cultural (i.e., socio-political or organizational) stability. Fortunately, a great deal of research along these lines is now being conducted, as climate modeling becomes more sophisticated, and the global impact of events like El Ni-o, or carbon dioxide and fluorocarbon emissions, is coming to be widely appreciated, far beyond the realm of a few knowledgeable researchers. Basic questions that are coming to be asked by governmental bodies as well as individual citizens in nations around the world include: (1) what kinds of changes might we expect to occur in global climate in the years to come? (2) how vulnerable are our current cultural and political systems to such changes? and, (3) how can we minimize or at least anticipate any possible negative consequences of such changes? As we have seen in this volume, the past offers a vast record for comparison, and archaeology and history can make major contributions to the answering of these questions. Such questions are fundamental to human existence and perhaps even to our survival. Just as the asteroid impact that killed off the dinosaurs sixty five million years ago gave our mammalian forebears the chance to spread over the planet and achieve dominance, a similar event could end our own species' reign on earth. As this volume has attempted to demonstrate, there appears to be little doubt that similar, albeit lesser events have also shaped the course of human development. We have seen through archaeology and history that whole civilizations have been profoundly effected by natural calamities, such as the eruption of Santorini on the island of Thera in the eastern Mediterranean in the mid-second millennium B.C., the eruption of Mount Tambora in 1815 (Stothers 1984), or the aftermath of the A.D. 536 event. The record of earth's history is being closely scrutinized for evidence of past trauma, and the incidence and effects of massive volcanic eruptions or the impacts of extra-terrestrial objects such as meteors, comets, or asteroids has moved from the realm of wild speculation to serious scientific examination in the recent years. We now know, for example, that large objects regularly hit the earth, with a probability of occurrence, or periodicity, that is related to the size of the impactor (Gehrels 1994). Thus, a major life-shattering event like the impact at (and creating) the Cretaceous-Tertiary, caused by a ca. 10 km diameter asteroid, occurs about once every 100 million years or so. It is fortunate that such events are extremely rare, because such an impact today would probably result in the extinction of our species and, as in past comparable events, most life on earth. Less dramatic impacts, by objects a few hundred meters to a kilometer or so in extent, occur more frequently, every few hundred thousand to few million years. Such an impact, while perhaps not fatal, would likely result in the collapse of our global technological civilization (Sagan 1994:311-313). Finally, every few hundred years, the earth is hit by an object a hundred meters or so in diameter, causing the devastation of the largest of nuclear weapons. Such an impact in a densely populated area would cause unimaginable suffering.

Whether the A.D. 536 event was caused by the impact of an object somewhere in the few hundred to few million year periodicity range, or resulted from some other cause, such as a massive volcanic eruption, is currently unknown. The physical signatures of such events should be ultimately discernible, although if an extraterrestrial source, such as a comet or asteroid is involved, these will likely differ appreciably depending on whether a land or ocean strike occurred, and on the composition of the impacting body.

How many unrecorded yet equally profound or even greater events have shaped the human past? We now know, for example, that a major asteroid impact occurred in the southern Pacific ocean approximately 2.15 million years ago, and that it apparently had significant and long-term effects on global climate (Gersonde et al. 1997). What role, if any, did this late Pliocene event play in the evolution of our own species? The emergence of the genus Homo occurs about this time, as well as a fairly dramatic upswing in stone tool use, and it is at least possible that these events are in some way linked. We know from the aftermath of Mount Pinatubo, Mount Tambora, and other examples dating back over the centuries that major volcanic eruptions can effect global climate, and have a major impact on human society (Simkin and Siebert 1994). The systematic examination of such events, through the cooperation of scholars in the various disciplines capable of exploring these kinds of questions, we believe, can greatly improve our understanding of the past.

Ultimately, what holds our interest as archaeologists and historians is how our species, and its varied cultures and individuals, have responded to perturbations in global climate such as those discussed here, and how they will likely respond in the future. The contents of this book suggest that we have much to contribute to the study of these questions.

References

Gehrels, T. (editor) (1994) *Hazards Due to Comets and Asteroids*. University of Arizona Press, Tucson.

Gersonde, R., F. T. Kyte, U. Bleil, B. Diekmann, J. A. Flores, K. Gohl, G. Grahl, R. Hagen, G. Kuhn, F. J. Sierro, D. Volker, A. Abelmann, and J. A. Bostwick (1997) Geological record and reconstruction of the late Pliocene impact of the Eltanin asteroid in the Southern Ocean. *Nature* 390:357-363.

Sagan, Carl (1994) Pale Blue Dot: A Vision of the Human Future in Space. Random House, New York.

Simkin, T., and Siebert, L., (1994) *Volcanoes of the World*. Geoscience Press, Tucson, Arizona.

Stothers, R.B. (1984) The great Tambora eruption of 1815 and its aftermath: *Science* 224:1191-1198.

The Years without Summer

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