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## **Coupling Earth History and the Human Past**

*A Review of Climate Change and the Course of Global History: A Rough Journey, by John L. Brooke (Cambridge University Press, 2014)*

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When I was in high school and very keen about studying ancient history and archaeology, I learned about an exciting new approach to archaeological fieldwork that had been making waves since the 1960's. I keenly absorbed everything I could read about it at a field school in Kampsville, Illinois, at the now-famous site of Koster. Led by Lewis Binford, the PhD advisor of Stuart Struever at the University of Chicago, the "New Archaeology," or what is now called "Processual Archaeology," was strongly connected to a new way of understanding cultural evolution. It brought to bear a wide range of new techniques and scientific analyses (soil science, palynology, and osteology, among many others) to understand the human past in its environmental context. Not all accepted the approach of the processual archaeologists, despite some powerful studies, and Archaeology as a discipline has developed considerably and in several different directions since the New Archaeology revolution in the 1960's. Among the criticisms leveled at "New Archaeology" has been the "post-processualist" charge of "environmental determinism." That charge has been leveled at nearly any archaeological or historical study that begins to include climate or environmental data within a framework of historical causation. There is no room here to summarize that debate. But in any case, the rules of the game have now completely changed. Armed with much more data, new archaeological techniques to study organic materials, and the ability, increasingly, to generate annually resolved climate data, we have arrived at a new era in the integration of science and history that promises a deeper understanding of cultural evolution.

A new book by John Brooke surveys these exciting developments. This is a large book about a fundamentally important topic, the relationship between global climate, climate change on various scales, and the history of the planet, including the recent past during which humans have existed. It chronicles the history of the earth's climate and the spectacular advances that the field of Paleoclimatology has made in the last few years. The evolution of life on Earth and the history of the Earth are intertwined. This is the basic thesis of Brooke, and one can hardly quarrel. He provides a good period-by-period summary of the paleoclimatic, demographic, and epidemiological record. What could have been treated more

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thoroughly are the social structures and dynamics that interacted with long and short-term climatic change. Overall though, while not an easy book to summarize properly, the book will serve as a good orientation for anyone seeking an introduction to global climate history. It is important to note that practically every footnote of the book can be updated. That is how rapidly the field of Climatology is advancing.

The book is divided into Four Parts: I. Evolution and Earth Systems, II. Domestication, Agriculture, and the Rise of the State, III. Ancient and Medieval Agrarian Societies, and IV. Into the Modern Condition. Before each part, a summary of stacked proxy data is provided for reference. The references cited are enormous, and clearly the author has read through a lot of it.

Brooke's starting point is the "earth systems approach" that arose in the late 1960's and combined several advances in Biology and Geology. The early history of the Earth is traced in "super-cycles" and "mass extinctions," (pp. 38–54), and the advances by Earth scientists are briefly outlined. Among these are Cox's work on plate tectonics, mass extinction driven by meteors, Lovelock's Gaia principle, and punctuated equilibrium theory in evolution propounded by Gould and Eldridge. The latter idea of genetic mutation and "evolutionary bottlenecks" was related to environmental forcings (p. 29), and it appears to explain the fossil record. Dawkins disagrees, and a new synthesis has emerged in recent years, but it is still without universal acceptance. However, the basic point remains: evolutionary and earth system forces combined to create life in the context of the "vagaries of a rough world" (p. 36).

Human emergence, marking a significant break with the past, is treated in Chapter 2. Biota and earth systems are "inherently coupled," but humanity and earth systems became "progressively decoupled," creating opposed forces between biological and cultural evolution. Abrupt forcings (e.g., tectonic, orbital, and the precession of the earth) that lead to "turnover pulses," especially notable in the work of Elizabeth Vrba relating to emergence of *Homo habilis* ca. 2.5 million ybp, are well-treated in pp. 66–69. Brooke develops how these key events affected the emergence of modern humans for the remainder of the chapter. The Holocene is noted as "uniquely stable, almost surreally flat, compared to the jagged instabilities of the Pleistocene" (p. 102). Stress, cultural innovation under pressure of intensification in the Upper Paleolithic, and the growth of the human brain are summarized in such a manner to convey that "human evolution" is now understood to have occurred on the scale of roughly 100,000 years, more gradually than earlier theory, which suggested that modern humans emerged in a "single dramatic transition" about 45,000 years ago (p. 105).

In Part II, covering Chapters 3–7, Brooke integrates climate history with all of the key subjects in human history—agricultural revolutions during the sudden

transition from the Pleistocene to a warmer, wetter Holocene. The slow emergence of agriculture comprised two broad “agroecologies”: 1) cereal and domesticated animals, which supported large populations, and 2) mixed horticultural practices in the tropics, which were rarely productive enough to sustain large populations. Brooke also states four prerequisites for agriculture: human intelligence, a suitably warm and stable climate, biotic life cooperation, and the push of necessity. The section concludes with the mid-Holocene urban revolution, the rise of the state, and a discussion of human health and well-being during the Paleolithic.

Part III, Chapters 6–9, covers the rise of civilization, agro-empires, climate optima and crises, “global antiquity,” and decline into the “Global Dark Ages” and the Middle Ages. Ten key themes include abrupt climate change and human adaptation. Brooke sees exogenous shocks or “forcings” as the key historical driver (p. 391). These abrupt climate changes can now be measured, and thus historical analysis can be joined to precise data. Growth and technological innovation are well-surveyed here. The contours of classical Mediterranean history, settlement and demographic expansion, and the rise (and Decline) of Rome are well—if minimally—treated by Brooke. Curiously absent, on the other hand, is any discussion of the Hellenistic Mediterranean period (ca. 300–30 BCE), as opposed to his longer discussion of the “Long Classical Optimum” of the first four centuries AD. We now know, thanks to the recent recalibration of Greenland and Antarctic Ice Core of Sigl et al. (2015), that the Hellenistic Near East and Egypt, centers of the two great kingdoms of the Ptolemies and the Seleukids, were rocked by continual exogenous climate shocks driven by large volcanic eruptions. The decline of the Hellenistic kingdoms and the rise of Rome must be seen, at least in part, against this backdrop (Manning et al., in prep).

After taking us through the rest of human history, we reach the current state of affairs. Chapter 13 is entitled “Growth beyond limits: 1945 to Present” which is an apt final, substantive chapter of the book and serves as a warning. In his “Coda,” Brooke meditates on the human future under the current conditions of climate change.

Some topics could have received more attention. One is the recent work of Bowles and Choi on the coevolution of private property and agriculture (Bowles and Choi 2013). Another is the 4.2 ka event, treated by Brooke on pp. 292–93, which is increasingly supported by proxy data, but vigorously denied in historical circles (e.g., Walker et al. 2012). There are some odd mistakes in the book. Kilimanjaro is not in Kenya (pp. 180, 612) but in Tanzania. A bibliography for the data provided at the head of each section of the book is provided, but an overall bibliography is not. This would have been quite handy to have. Overall, though, this book is well worth reading through and serves not so much as a summa but as a starting point for continued historical work.

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