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Review Essay

ENVIRONMENT AND ADAPTATION METHODOLOGICALLY COME OF AGE IN PREHISTORIC STUDIES

David E. Stuart

This edited volume explores recent research in environmental change and its influence on prehistoric ecological, cultural, and technological adaptation in the American Southwest. These papers, presented to the late Donald A. Graybill, rely heavily on scientific methodology drawn from archaeology, ethnobotany, geology, climatology, and human geography. The focus is primarily on Arizona and New Mexico, with some secondary attention to climate and prehistory in southern Utah and southern Colorado.

Virtually all of the book's chapters are data rich, well-written, and stick closely to fundamental questions about environment and adaptation. The adoption of agricultural enterprise and subsequent prehistoric transformations in it are one main theme. The effect of precipitation, stream flows, and ecological process as cultural economic parameters that must be reckoned with in archaeological explanation is another. A scientific view of cosmology serves as a third theme.

Alan H. Simmons's paper, "Early People, Early Maize, and Late Archaic Ecology in the Southwest," makes the case that the relatively more

Environmental Change and Human Adaptation in the Ancient American Southwest. Edited by Jeffrey S. Dean and David E. Doyel. (Salt Lake City: University of Utah Press, 2006. xvi + 344 pp. Maps, tables, figures, bibliography, index. \$45.00 cloth, ISBN-13: 978-0-87480-853-7.) David E. Stuart is Professor of Anthropology at the University of New Mexico. He is the author of several books including *Glimpses of the Ancient Southwest* (1984), *Anasazi America* (2000), and *The Guaymas Chronicles* (2003).

productive Sonoran Desert in the Southwest's southern geographic tier fostered the earliest and most rapid agriculture, while development in the riskier, less productive northern Southwest was much slower. Smart and informative, this article reinforces the old adage that "all life is multivariate." In this case, that reality translates into subregional adaptive variations that explain much dissonance between current, competing, but narrower, published archaeological interpretations.

Michael R. Waters's piece, "Prehistoric Human Response to Landscape Change in the American Southwest," clarifies the effects of low frequency changes (usually infrequent geomorphic), which often catch a society unaware. He also examines high-frequency changes, such as year-to-year variation in precipitation/temperature, to which most societies adapt rather effectively. He then presents case studies that compare each adaptation to low frequency change in the Santa Cruz basin with high-frequency landscape change in Arizona's Tonto basin.

"Cross-Cultural Perspectives on Prehispanic Hohokam Agricultural Potential" by Suzanne K. Fish and Paul R. Fish may become a classic in anthropological archaeology. The authors selected a variety of Native informants who continued to practice traditional agriculture. Fish and Fish took the informants to a half-dozen disparate, prehistoric sites, then interviewed each to determine what soil, vegetation, and landscape characteristics each used to assess a prehistoric site's agricultural potential and to reflect on how the sites might once have been farmed. The result is both illuminating and insightful, especially the concept that Native farmers assess plasticity and the potential for environmental modification even before they begin to farm a new district.

The following chapter, "Long-Term Streamflow Reconstructions, River Channel Morphology, and Aboriginal Irrigation Systems along the Salt and Gila Rivers" by Donald A. Graybill et al., is extensively technical and quantitative. The work combines hydrology, geology, and tree-ring data to compare prehistoric settlement patterns on the Salt and Gila rivers. If one wants to know why the Salt River basin (Hohokam) evidenced such large-scale prehistoric irrigation systems, while those of the Gila (mostly Mogollon population) did not, this article nails it down with fine-grained resolution.

Chapter 6, "Subsistence Management Strategies in the Grasshopper Region, East-Central Arizona" by J. Jefferson Reid, Graybill, and Ann Clair Seiferle-Valencia, reanalyzes models of low and high frequency climatic

events and amplitudes, attempting to refine pictures of prehistoric subsistence adaptation at the Grasshopper site in Arizona. In contrast chapter 7, "Settlement History and Environmental Variability in the Upper Little Colorado River Valley, Arizona" by David E. Doyel, analyzes the Upper Little Colorado drainage in Arizona, focusing on prehistoric settlement and subsistence using detailed archaeological data, climatic reconstructions, and analysis of dune field agricultural potential to interpret the local archaeology. The local archaeology is complicated by small sites with a mix of Mogollon and prehistoric Pueblo characteristics. Such sites are too often cryptically (if not lazily) reported in Cultural Resource Management (CRM) literature as "cultural affiliation uncertain/unknown." Doyel demonstrates that archaeologists can do better in this respect.

Chapter 8 deals with subsistence stress and food storage at Kiet Siel. The piece is classic Jeffrey S. Dean—well-written, well-argued, with a clearly stated conclusion. At Kiet Siel, lowering alluvial water tables (initially a highly reliable source of water) are replaced over several centuries by an insufficient and highly variable source—ordinary precipitation. In response agricultural storage capacity explodes to compensate but appears to be driven at the household level. "Such storage changes may serve as warning signals . . . of developing problems in the production aspect of prehistoric subsistence systems" (p. 178). This statement is an eye-opener: the time has come to rethink our interpretations of the Chacoan system and its regional expansion in the number of Great Houses and their rapidly increasing storage capacities during the mid- to late-1000s AD.

Chapter 9, "The Effects of Environmental Fluctuations on Ancient Livelihoods: Implications of Paleoeconomic Evidence from the Upper Basin, Northern Arizona" by Alan P. Sullivan III and Anthony H. Ruter, is another highly technical treatment and demonstrates what can be learned from the authors' methods of analyzing and quantifying botanical remains from prehistoric sites. This paper will have a profound impact on standard archaeological interpretations, which see prehistoric southwestern maize agriculture as the staple and wild-gathered foodstuffs as a minor sideline. In many instances, food economy could prove to be precisely the reverse.

Chapter 10, "Environmental Variation and Prehistoric Culture in the Mimbres Area, Southwestern New Mexico" by Darrell Creel, deals with the prehistoric Mimbres Valley during classic times, and, like a number of the other articles, its findings challenge standard interpretations. Creel's

view is that droughts in the 1130s AD may explain the decline of classic Mimbres society and the partial depopulation of the Mimbres Valley before the subsequent Black Mountain phase sites were constructed atop the earlier Mimbres ones. His paper is pleasing. For the last twenty-five years, I have been arguing much the same scenario for the 1130s in both the Chaco and Mimbres districts, based on changing settlement patterns.

In chapter 11, James A. Parks, Dean, and Julio L. Betancourt use tree-ring data from New Mexico's Sevilleta National Wildlife Refuge near Socorro, in combination with other nearby tree-ring sequences, to adumbrate historical pueblo abandonments, especially Piro and Salinas. Annual inches of total precipitation at Socorro are published by decade from 1590 to 1990, and the figures for Mountainair from 1290 to 1970 are also listed. The resolution of these data is highly satisfying. The authors' method is laid out clearly, and then traditional historical accounts of agricultural conditions are correlated to the data. The conclusion is that Spanish settlement, the encomienda, Apache raids, and the severe droughts of 1667–1681 undid traditional communities, which were abandoned. Do the droughts of 1667–1681 also play a seminal role in generating the historical events of the Pueblo Revolt of 1680? We will soon get that answer.

Chapter 12, "Sky as Environment: Solar Eclipses and Hohokam Culture Change" by W. Bruce Masse and Fred Espenak, is based on a conjunction of astronomy, written and oral history, and cosmology in an attempt to evaluate the role of solar eclipses in Hohokam culture change. The last several decades of nearly constantly hyped cosmological interpretations of Chaco have left this reviewer skeptical—especially since many may have been, at least partially, "divined" or "intuited" from happy accidents and then romanticized. Yet, this paper is not only technical and data rich but also makes good sense. Especially useful is a description of the sequence of physical events attendant on a solar eclipse (pp. 240–41). Historians and general anthropologists will also find much of value in the well-executed section "The Southwestern Sky World." A detailed account of solar events and major systemic changes in prehistoric Hohokam society follows that section. The whole effort is meticulous, intriguing, and thought provoking.

Chapter 13 summarizes the goals and directions of the volume. As one might expect, George J. Gumerman argues for a more empirical approach to southwestern prehistory than previous works offer. If *Environmental Change and Human Adaptation* is the measure of what he has in mind, that

shift needs to happen, and soon. After several decades of often clubby, involuted introspection with regard to archaeological explanations, this book is a clarion call for bigger thinking, a more data-based approach, and far less speculation. This reviewer, first trained as a cultural ecologist and only later involved in CRM and in writing a series of prehistoric archaeological overviews of the Southwest, found the volume to be the most informative and one of the most important published in the last thirty years. Methodologically, environment and archaeology have come of age. A must read.