

*List of Figures* | ix

*List of Tables* | xiii

*Foreword*

*George R. Milner* | xv

*Preface*

*Nancy Gonlin and Kirk D. French* | xxvii

## **Section I: Introduction**

---

1. Empirical Archaeology and Human Adaptation in Mesoamerica

*Kirk D. French and Nancy Gonlin* | 3

## **Section II: Water and Land**

---

2. Water Temples and Civil Engineering at Teotihuacan, Mexico

*Susan Toby Evans and Deborah L. Nichols* | 25

3. Measuring the Impact of Land Cover Change at Palenque, Mexico  
*Kirk D. French and Christopher J. Duffy* | 53
4. Complementarity and Synergy: Stones, Bones, Soil, and Toil in the Copan Valley, Honduras  
*John D. Wingard* | 73

### **Section III: Population and Settlement Studies**

---

5. Chronology, Construction, and the Abandonment Process: A Case Study from the Classic Maya Kingdom of Copan, Honduras  
*AnnCorinne Freter and Elliot M. Abrams* | 97
6. The Map Leads the Way: Archaeology in the Mixteca Alta, Oaxaca, Mexico  
*Stephen L. Whittington and Nancy Gonlin* | 125

### **Section IV: Reconstruction and Burial Analysis**

---

7. The Excavation and Reconstruction of Group 8N-11, Copan, Honduras: The Process of Discovery and Rediscovery  
*Randolph J. Widmer and Rebecca Storey* | 155
8. The Maya in the Middle: An Analysis of Sub-Royal Archaeology at Copan, Honduras  
*David M. Reed and W. Scott Zeleznik* | 175

### **Section V: Political Economy**

---

9. Life under the Classic Maya Turtle Dynasty of Piedras Negras, Guatemala: Households and History  
*Zachary Nelson* | 211
10. The Production, Exchange, and Consumption of Pottery Vessels during the Classic Period at Tikal, Petén, Guatemala  
*Kirk Damon Straight* | 241

### **Section VI: Reflections and Discussion**

---

11. Forty Years in Petén, Guatemala: A Hagiographic Prosopography  
*Don S. Rice and Prudence M. Rice* | 295
12. Two-Katun Archaeologist  
*David Webster* | 335

*List of Contributors* | 361

*Index* | 363

## Empirical Archaeology and Human Adaptation in Mesoamerica

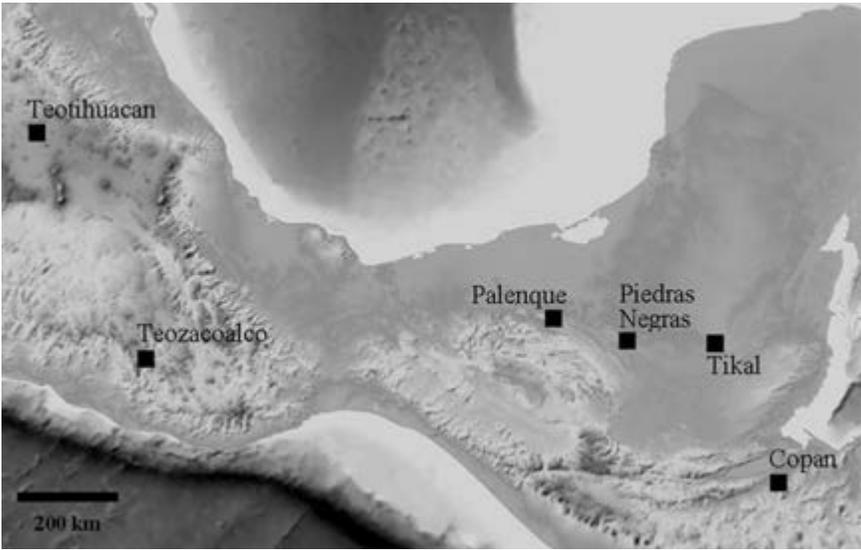
---

KIRK D. FRENCH AND NANCY GONLIN

*Archaeological imagination [is] finding new ways of asking questions that link the most empirical of research projects with innovative social theory.*

—ELIZABETH BRUMFIEL (HAUSER 2012, 184)

Over half a century ago the deliberate transformation of archaeology into a more scientifically based discipline from its culture-historical period began in North America (Willey and Sabloff 1974). Ten years prior to that time, an innovative explanatory perspective called cultural ecology emerged as a viable theoretical orientation to explain human adaptation and cultural evolution in both contemporary and ancient societies. These separate yet intertwined pursuits created the foundation for a paradigm shift in North American archaeology that was embraced by numerous researchers who were dissatisfied with simply documenting chronology and culture areas and were seeking an explanatory framework such as that provided by the combination of ecology and culture. The New Archaeology was, and still is, the dominant paradigm in North American Archaeology (e.g., McClung de Tapia 2013), although numerous



**FIGURE 1.1.** Map of Mesoamerican sites discussed in this volume.

other paradigms have significantly contributed to our understanding of the past. And while it has evolved in recent years with the incorporation of different perspectives, the core commitment of New Archaeology to a comparative anthropological basis, explanatory power, and scientific robusticity remains a key contribution of this perspective. The chapters in this volume highlight the applicability and sustainability of the concept of adaptation within the perspective of cultural ecology in archaeological research in Mesoamerica, and particularly in the Maya area.

The theoretical orientation of the Anthropology Department at The Pennsylvania State University (Penn State, or PSU) has emphasized the intersection of ecology and culture, whether in the field of archaeology, biological anthropology (e.g., Baker 1978; Wood 1992), or cultural anthropology (e.g., Johnson 2003). The approaches of anthropological archaeology and human adaptation have been successfully used to orient the investigation of ancient cultures through dozens of Penn State archaeological projects over the last 50 years (figure 1.1) with the production of abundant research that has furthered the knowledge of the human condition (see Milner, this volume). Understanding of sociopolitical evolution and conflict has been advanced through an empirical approach to the studies of settlement patterns, household archaeology, demography, the environment, and mortuary studies, among other topics.



**FIGURE 1.2.** Julian Steward (right) with a collaborator in 1940 (Smithsonian Institution, National Anthropological Archives, INV 02871300, Photo Lot 33).

## **A GENEALOGICAL HISTORY OF APPROACHES TO HUMAN ADAPTATION AND CULTURAL ECOLOGY**

---

As with the culture-historical approach that preceded the New Archaeology, it seems fitting to begin with a descriptive narrative detailing the background of cultural ecology, human adaptation, and empirical research in archaeology. To better understand these approaches and their relevance to the contributions in this volume, it is informative to present the background as an academic genealogy.

Julian Steward's (figure 1.2) theoretical trajectory was divergent to that of his mentor, Alfred L. Kroeber. Unlike Kroeber's reliance on the historical approach (adopted from his mentor, Franz Boas), much of Steward's energy was devoted to the study of the environmental adaptation of specific societies. Kroeber suggested that cultures in analogous environments would often follow the same developmental stages and formulate similar responses to environmental challenges. However, Steward did not believe that cultures followed the same universal development. Rather, he proposed that cultures evolved in many distinctive patterns depending on circumstances of their environment, referring to his theory as *multilinear evolution* (Steward 1955). The approach Steward outlined for multilinear evolution involved an area of study he called *cultural ecology*—the analysis of cultural adaptations formulated by human beings to meet challenges and opportunities created by their environments.



**FIGURE 1.3.** Gordon Willey in the Viru Valley, Peru, ca. 1946 (courtesy of the Peabody Museum of Archaeology and Ethnology, Harvard University, PM# 2002.26.19).

William Duncan Strong, who was also a student of Kroeber's and a classmate of Steward's, conducted exhaustive research in the western United States, eastern Canada, and Peru (Strong et al. 1930; Stewart and Strong 1939; Strong 1957). In 1941 Strong named his student, Gordon Willey (figure 1.3), as his field assistant for the Pachacamac Project in Peru. Strong taught Willey how to command and synthesize large amounts of data. A year after receiving his PhD in 1942, Willey had the opportunity to work for Strong's colleague, Julian Steward, at the Smithsonian's Bureau of American Ethnology. While there, Willey was assistant editor of Steward's monumental *Handbook of South American Indians* (Steward 1940–1947). Around the same time, Steward, Strong, and Willey began planning the Viru Valley Project of Peru. Settlement archaeology relies on landscape, ecology, and site recording, but it was the concept of culture that allowed for interpretations of settlement patterns, because ultimately, it is behavior and meaning that are of utmost importance to anthropological archaeologists in understanding the past. It was during this project that Steward suggested to Willey that he make settlement study his top priority (Billman and Feinman 1999). Willey joined the faculty in the Department of Anthropology at Harvard in 1948, and in the following year he accepted William T. Sanders (figure 1.4) as his graduate student.



**FIGURE 1.4.** William T. Sanders on location filming the documentary *Land and Water: An Ecological Study of the Teotihuacan Valley of Mexico* in 1961 (photo by William G. Mather III).

Bill Sanders (1957) was undoubtedly influenced by Willey's settlement pattern and cultural ecology studies, as evidenced in his dissertation: *Tierra y Agua: A Study of Ecological Factors in the Development and Personality of Mesoamerican Civilizations*. In 1959, Sanders was hired as an assistant professor of anthropology at Penn State. Over the next three decades Sanders directed projects in the Basin of Mexico, Highland Guatemala, and northern Honduras (Sanders and Michels 1969; Sanders et al. 1979; Sanders 1986–1990; *inter alia*).

In 1972, a fresh PhD out of the University of Minnesota, David Webster (figure 1.5) arrived at Penn State and became a colleague to Sanders. Although he studied under Richard E. W. Adams (a student of Willey), the majority of Webster's cultural ecology background came from a semester he spent at the University of Chicago in 1967 as a participant in the Committee on Institutional Cooperation (CIC). The CIC is a consortium of the Big Ten universities (plus Chicago) that provides opportunities for students to enroll in courses offered at any of their member institutions. A class taught by Robert Braidwood and titled "The Human Career," dealing with the evolution of complex societies, made an early impression on Webster. While at Chicago, Webster also took a class from Pedro Armillas (whose teaching assistant was Henry Wright!).



**FIGURE 1.5.** *David Webster in Copan, Honduras, at field house (1985) (photo by Nan Gonlin).*

As a graduate student Webster worked for Bill Sanders on the Kaminaljuyu Project in Guatemala in 1969. As a young professor at Penn State, Webster worked together with Sanders on many projects, such as the Proyecto Arqueológico Copán (PAC) and the *Out of the Past* video series (Sanders and Webster 1978, 1988; Webster et al. 1993; inter alia). While Webster was never directly a student of Sanders's, he undoubtedly was influenced by him as a colleague. As the reader will see in the chapters that follow, Webster has had a lasting influential effect on each of the contributing authors of this volume.

## **HUMAN ADAPTATION AND MESOAMERICAN ARCHAEOLOGY**

Alfred V. Kidder, Jesse D. Jennings, and Edwin M. Shook's work at Kaminaljuyu, Guatemala, between 1936 and 1942 is one of the earliest examples of an

expressively scientific and multidisciplinary project concerned with cultural adaptation in Mesoamerica (Kidder, Jennings, and Shook 1946). A few years later in the early 1950s, Gordon R. Willey et al. (1965) initiated archaeological research in the Belize Valley, relying heavily on the framework of cultural ecology. Their volume, *Prehistoric Maya Settlements in the Belize Valley*, is a cornerstone of regional archaeology because of its documentation of numerous house mounds and the consideration of these mounds for implications related to associated population density for the Classic Maya. For the majority of early states, subsistence economy is generally commensurate with settlement densities and the cultural and technological achievements of a society. Prior to Willey's work in the Maya area, few scholars focused on the study of settlement patterns, primarily because Mayanists concentrated their energies on the core of major sites, prioritizing the lives of royal elites as most central to the history of the region. Willey's settlement pattern survey of Belize also revolutionized population estimates, which were previously calculated by assessing the carrying capacity of land for slash-and-burn agriculture. When settlement surveys began to identify residential units, their counts became a preferred and more accurate method for estimating population. These ancient landscapes showed a general trend for the frequency of residential house mounds to decrease with greater distances from the centers, but documentation of house mounds scattered throughout the intervening territories in between centers suggested significantly larger populations than previously claimed. The new population estimates necessarily advocated for different and more-intensive cultivation methods to support dense populations, such as terracing and the use of raised-field wetland agriculture. Many of these alternate methods were eventually confirmed (Turner 1978).

For Willey, settlement pattern studies contained more than just insights into human adaptation to the environment. He saw those studies as vehicles through which to see human behaviors that were influenced by both cultural and ecological dynamics. He believed that a settlement reflects not only a society's natural environment and technological achievements, but also the influence of various institutions of social interaction and control (Willey 1953, 1). In this vein, Binford (1962, 218) stated, "it is consistent to view technology, those tools and social relationships which articulate the organism with the physical environment, as closely related to the nature of the environment."

In the study of ancient hierarchical civilizations, analysis of ruins over large areas reveal geographical locations of centers of varying sizes that reflect organizational features and sociopolitical processes. Permeating all levels of cultural development is ideology, interpreted from the material remains that reflect subsistence, settlement patterns, and sociopolitical organization. It is an oft-cited criticism of the cultural ecological perspective that it lacks concern for ideology; however, the full recognition of the infusion of ideology into this perspective

has been present from its inception (see chapter 2, this volume, for a particularly elegant example of the combination of cultural ecology and ideology). Willey's (1980, 1982) research uncovered a connection between the basic concerns of trade, warfare, and ideology. Because of this correlation, he was a proponent of a holistic approach that does not necessarily perceive a significant divide between science and humanism in archaeology.

Willey's holistic approach made cultural ecology and settlement studies applicable and appealing to later archaeologists, who still rely on spatial analyses in an attempt to explain the human past. The use of predictive modeling in archaeology began with the settlement studies performed by Willey (1953, 1975) in the 1950s and 1960s. Following Willey's Viru Valley project, several archaeologists begin adopting Willey's methodology. Bill Sanders applied his mentor's ideas in Kaminaljuyu (1968), the Basin of Mexico (1979), and later at Copan (1990). Robert Santley (1994), a student of Sanders, initiated the Matacapán Archaeological Project in 1979 that led to useful population profiles generated by regional survey. Charles Stanish (BA in Anthropology, Penn State) conducted vast settlement surveys throughout the Juli-Pomata area of Peru (Stanish 1990). Two of David Webster's recent PhD students used GIS to study settlement patterns: Timothy Murtha (2002) at Caracol, Belize, and more recently Robert Griffin (2012) at San Bartolo, Guatemala. These examples illustrate how Gordon Willey's pioneering work provided a strong methodological foundation that has been greatly enhanced by the new spatial analytical approaches.

While this approach focuses on culture, rather than the individual, as the unit of adaptation, and makes use of an ecological and materialist model of culture (Ashmore and Sharer 2014, 45–52), it profoundly contributes to our understandings of how societies have interacted with their environments through time and of the implications of these relationships for culture change. Cultural ecology is often misconstrued by some archaeologists as environmentally deterministic, even though proponents view environment as only an influencing factor, not a determining one. Unfortunately, Steward incorrectly saw humans as separate from the environment, and this view no doubt fueled the fire of many later naysayers. Unlike cultural ecology, strict determinism fails to consider the role of culture. Over time, as cultural institutions and technology gradually became more complex, the environment played a decreasing role in limiting human responses to adaptation. Further critiques of the cultural ecological perspective with its focus on culture is that groups within a culture and the tensions and dynamics of these groups are not considered (Brumfiel 1992), however this approach does not preclude the investigation of gender, class, or faction. In fact, more recent work has effectively incorporated these aspects of adaptation (see Barlow 2002; Boone 2000; Gonlin 2012; Kelly 2001; MacDonald 2001).

Smith (1991) argued against the usefulness of cultural ecology by claiming that “it predicts nothing specific.” However, many of these critics (e.g., culture historians, structuralists, post-processualists) have undeniably been influenced by Stewardian cultural ecology (Sutton and Anderson 2004, 28). David Webster further explains:

Seen as a pervasive and dynamic point of view rather than an identifiable discipline or school, culture ecology’s legacy includes the convictions that humans and their cultures are integral parts of larger, natural systems, that causal, scientific explanations of cultural phenomena are possible, and that the enterprise of archaeology requires strong linkages not only with the other subfields of anthropology, but with the hard sciences as well. (Webster 1996, 156)

### **SCIENTIFIC APPROACHES TO MESOAMERICAN ARCHAEOLOGY**

---

The late 1960s witnessed a new development in archaeology that allowed for sizable data sets to be statistically analyzed. For American archaeology as a whole, these shifts in direction were being vehemently driven by the fire and brimstone of Lewis Binford (1962) and his “New Archaeology” (Binford and Binford 1968). Interestingly, New Archaeology (known today as Processual Archaeology) had its roots with Gordon Willey and Philip Phillips’s publication of *Method and Theory in American Archaeology*, where they declared, “American archaeology is anthropology or it is nothing” (Willey and Phillips 1958, 2). This paradigm stood firmly behind the use of the scientific method to utilize the archaeological record (cataloguing, describing, and creating timelines), rather than simply recording it, to learn and explain how people of the past lived.

At the same time, the advent and spread of computers during the late 1950s and early 1960s allowed for large amounts of data to be analyzed in an unprecedented way. Accurate analyses using standardized statistical methods in scientific studies are critical to determining the validity of empirical research. Penn State’s Kaminaljuyu Project, directed by Bill Sanders, was one of the first to rely heavily on computers both in the field and laboratory. Project codirector and Penn State professor, Joseph Michaels, had an understanding of the early mainframes at a critical time when many universities were just beginning to acquire them. Other empirically-based projects soon followed suit, such as Richard Diehl’s (Diehl and Feldman 1974) early work at Tula in the 1970s, Dennis E. Puleston’s work on ancient settlement patterns and environment at Tikal, and Billie Lee Turner II’s exhaustive research on intensive agriculture in the Maya Lowlands, to name just a few (Puleston 1973; Turner 1974, 1978).

Processual research in archaeology continued to expand throughout anthropology departments across the United States into the 1980s. But by the mid-1980s the post-processual movement began providing critiques of the objectivity,

normativity, and biases of this approach. Some anthropology departments such as Stanford became so embroiled and contentious that the field of archaeology split from the field of sociocultural anthropology to form separate departments in 1996, only to reunite in 2007. While many processualists may not agree with post-processual approaches because of the lack of connection between data and interpretations, and the resulting subjectivity, processualists (e.g., the authors in this volume) have benefited from considering multiple perspectives by incorporating a wider range of inquiry into their research designs.

The divide between researchers over the degree of objectivity and scientific basis in archaeology is linked with larger separations within the discipline of anthropology. In mid-November of 2010, the American Anthropological Association (AAA) revised their long-range plan and omitted all mention of the word *science* from the organization's vision for its future. The groundswell of outrage from the anthropological community seemed to be a surprise to the AAA board and a comfort to those who view anthropology as a primarily scientific endeavor. Within several weeks, the fallout of the AAA's decision was highlighted in the *New York Times* article, "Anthropology a Science? Statement Deepens a Rift" (Wade 2010). Within a short time, the AAA board altered its position and unanimously passed a resolution requesting that *science* be reinstated into the organization's Long Range Plan (Lancaster and Hames 2011). The AAA has further addressed this issue (Peregrine et al. 2012) with considered responses from several notable anthropologists. The bottom line is that multiple approaches inform about the present and the past, and ultimately contribute to understanding the human condition (Harrison-Buck 2014). It seems as though Kent Flannery was on to something when he claimed, "anthropological archaeology was saved from extinction by its own resilience" (Flannery 2006, 1).

Mesoamerican archaeology as it is practiced today grew from empirical research documenting the complexity of Mesoamerica's past. While a discipline thrives on multiple viewpoints and disagreement is healthy for advancing knowledge, science is a self-correcting endeavor. Regardless of one's theoretical orientation, the commitment to understanding ancient lifeways and the conservation of sites and collections remains a priority for twenty-first century archaeologists.

## **ORGANIZATION OF THIS VOLUME**

---

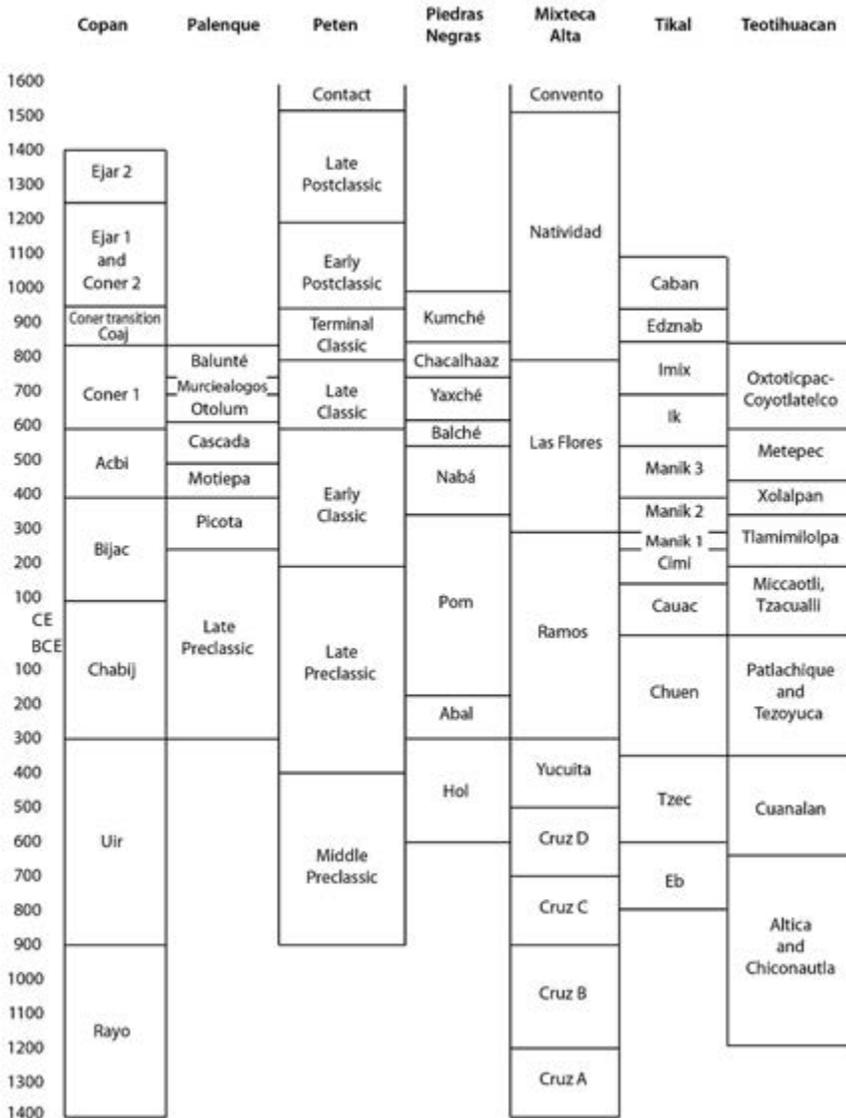
This volume brings together a number of Penn State doctorates who have oriented their research on ancient cultures through the lens of human adaptation and processual archaeology. They also happen either to be former students of David Webster or to have been heavily influenced by Penn State's emphasis on the influence of ecological aspects on adaptation and an anthropological

approach to archaeology. Archaeological case studies from the Maya region (eight chapters), the Mexican central highlands (one chapter) and the Mixteca Alta region (one chapter) of Mesoamerica are divided thematically into six main sections described below (figure 1.1). Chronologically, most chapters focus on the Classic Period (250–900 CE), one case study (chapter 6) primarily pertains to the Postclassic (900–1519 CE), and one chapter (chapter 11) spans a number of Mesoamerican periods (figure 1.6).

Section II of the volume—“Water and Land”—emphasizes the core components of subsistence for ancient agrarian societies and the infusion of these components into ideology. Chapter 2 provides a classic illustration of water use at the great central Mexican city of Teotihuacan. Susan Toby Evans and Deborah Nichols deconstruct archaeological remains of iconography and architecture to further our comprehension of how ancient Mesoamericans manipulated and perceived their world and managed the landscape. The evolution of an ancient people’s mastery over a precious resource is reflected in changes in ceremonial space, civil engineering projects (including construction of canals, monumental architecture, and residences), settlement history, demography, planning and design of the city’s grid system, temples, and murals. Hydrology and hierophany are intertwined to produce powerful political control as evidenced through these various media. The widespread symbolism of the pierced disk is contextualized within a chronological framework extending beyond Mesoamerica’s Classic period. Environmental challenges faced by ancient Teotihuacanos permeate modern concerns in the valley’s towns and cities.

In chapter 3, Kirk French teams up with Penn State hydrologist Christopher Duffy to analyze the effects of land-cover change on the availability of water for the Classic Maya city of Palenque, Mexico. Their use of spatially distributed hydrological modeling, which relies on simulated daily paleoclimatic data, watershed modeling, and archaeology, offers insights into how ancient Palencanos impacted their watershed. Various plausible scenarios are produced, as well as scenarios relating to extreme conditions of flood and drought. As land cover changed through time due to the process of urbanization, the city’s access to water was drastically affected. These processes continue to the present and with the use of the hydrological model, the practical application is of use to modern inhabitants living in the region.

One of the strengths of anthropological archaeology is the interaction between various researchers using different data sets to investigate significant issues of the past. In chapter 4, John Wingard uses a vast array of soil sample analyses to model agricultural productivity in the Copan Valley, Honduras, and subsequently answers questions about the Classic Maya collapse as it occurred in this particular southern Maya site. The EPIC program used by Wingard is multivariate in its modeling process, allowing the researcher to produce several



**FIGURE 1.6.** Chronology chart of phases for major sites/areas discussed in this volume (compiled by David M. Reed).

plausible outcomes. The complementarity of several approaches strengthens the overall conclusion reached by Penn State archaeologists that the collapse at Copan was a protracted affair, rather than a sudden total systemic failure. The role of the environment through soil studies produces a powerful tool to understand the potentials and possibilities of past landscapes.

Section III—“Population and Settlement Studies”—illustrates two concentrations for which anthropological archaeology is well known. The contribution of AnnCorinne Freter and Elliot Abrams in chapter 5 focuses on the depopulation of the Copan Valley from the perspective of ecological and economic factors as they affected individual courtyard groups throughout the kingdom. Seven courtyard groups were chosen to demonstrate the out-migration of families and lineages and how this movement at the end of the ninth century was a protracted affair. Although this inference is not a new one, the use of multiple lines of evidence (radiocarbon dates, obsidian hydration dates, artifact seriation, stratigraphy, middens, and architectural building episodes) reinforces the conclusion that the phenomenon of the Classic Maya collapse at Copan occurred over a few centuries rather than a few decades.

Stephen L. Whittington and Nancy Gonlin in chapter 6 report on their use of an ethnohistoric source to identify and record settlement in the Mixteca Alta, while keeping the local community abreast of their findings. They make use of the 1580 CE *Mapa de Teozacoalco*, one of the many maps composed during the Spanish Crown’s *Relaciones Geográficas*. The findings of four field seasons of survey and test-pitting around the Mixtec site of Chiyo Ca’nu (San Pedro Teozacoalco) in Oaxaca, Mexico, are presented. The nature of the *Mapa* further lends itself to instruction in the college classroom where students learn alternative ways of perceiving and portraying worldviews.

Section IV—“Reconstruction and Burial Analysis”—starts off with chapter 7 by Randolph J. Widmer and Rebecca Storey, who provide new information on the sub-royal compound of 8N-11 in Copan, Honduras, which was partially excavated in 1990 by a project directed by David Webster. This courtyard group lies in the urban neighborhood of Sepulturas, adjacent to the Principal Group (site core) of Copan. As a tourist, one of the highlights of visiting this World Heritage site is walking through this neighborhood, which has been restored by the Honduran government. The concerns of restoration necessarily drove the excavation strategy, which revealed only the last construction phase. However, an extraordinary opportunity to be involved in the restoration process allowed for the recovery of data that greatly enhanced archaeological understanding of the growth and decline of this compound. Additional building phases and numerous burials and caches were recorded and analyzed. What one sees on the surface today is a fraction of the prehistory of the residents who lived out their lives here.

David M. Reed and W. Scott Zeleznik in chapter 8 tackle the thorny problem of the nature and role of non-royal elites in Classic Maya society. To address these issues, they present robust evidence that has been compiled over several years of archaeological projects from the site of Copan, Honduras. Using a framework adopted from David Webster (2002), they explore whether Classic

Maya sociopolitical organization is better understood through a class model, a ranked model, or the house model. Only through the thorough consideration of the intersection of multiple data sets (mortuary data, artifactual data, and settlement pattern and household data), as employed by Reed and Zeleznik, can our knowledge of the complexity of ancient civilizations be advanced.

Section V—“Political Economy”—begins with a contribution from Zachary Nelson, who writes about what life was like under the ruling lineage of Piedras Negras, a Classic Maya site in the Usumacinta drainage basin of Guatemala and Mexico. Chapter 9 illustrates the effectiveness of combining two strong data sets: the artifactual database from recent excavations and the well-known sequence of rulers from hieroglyphic records. The artifactual database comes from hundreds of test excavations spread throughout the center, as well as intensive large-scale excavations that took place in several patio groups. These data are interpreted within the historical framework of rulers’ reigns and monumental construction episodes, as determined through hieroglyphic records. What emerges along with the documented waxing and waning of various rulers and their polity is the independent confirmation of broad historical patterns manifested in the artifact densities, types, and origins. A correlation of the material record with cultural reconstructions informs us about how Classic Maya life changed through time at Piedras Negras.

In chapter 10 Kirk Straight reports on the provocative finds from his research at various locations around Tikal, Guatemala, that greatly add to our understanding of economic exchange models for the Late Classic Maya. Rather than relying on only the visual inspection of ceramics, as many archaeologists are constrained to do, the method of Instrumental Neutron Activation Analysis (INAA) is employed to determine composition and source of materials. The results allow Straight to comment on the number of production units and their distribution throughout Tikal and how these data inform us about production, distribution, and consumption of pottery in a Late Classic Maya polity. The relevance for reconstructing ancient Maya economic systems is invaluable and this study also serves as a cautionary tale for relying upon artifact appearances only, particularly when ceramics are involved.

Section VI—“Reflections and Discussion”—contains two chapters that bring the unifying themes of the volume full circle. In chapter 11, Don and Pru Rice provide an engaging account of the scholastic genealogy of cultural ecology in archaeology. By using their own careers to exemplify the connections between numerous pioneers and personalities in the field and the ideas that are today recognized as standard modes of inquiry, they personalize the journey that has been taken to achieve the current state of archaeological inquiry. The Rices carried out several projects that incorporated ecology into an examination of the past, and these projects provide a concrete basis upon which to

reflect on the conjoining of these two pursuits. Science is not conducted in a vacuum but within particular historical and political circumstances that influence one's research and perspectives, a point well known to processualists and post-processualists alike. This chapter deftly highlights these circumstances and provides cultural context to those contributors, with David Webster among them.

David Webster wraps up the volume in chapter 12 through his reflection on how insights gained from a general anthropological perspective in archaeology have furthered our knowledge of human cultures, both past and present. It is only after reading this final chapter that we have come to realize the full extent of the impact that Webster has had on all of his students, whether they have enrolled in a single undergraduate course with him or have had the privilege to work with him many times throughout their careers.

## **CONCLUSIONS**

---

Every department of anthropology is known for its contributions and particular theoretical orientations (e.g., Iannone and Healy 2012; Reese-Taylor 2012). The success of Penn State's department has been built on the shoulders of many individuals who have made and continue to make significant contributions to the field of Mesoamerican archaeology. The enduring significance and appeal of using the concept of human adaptation to frame research is that it explicitly combines ecological criteria with culture, a concept critical to anthropology. A recent review of anthropological archaeology highlights how the "modeling of human-environmental interactions, resilience, and sustainability" (Kahn 2013, 249) remains thematic in archaeological inquiry. As numerous others in various disciplines (e.g., McKibben 2007) are espousing, the ultimate connection between what humans do and how our cultures fare may have little to do with political philosophies, but more to do with the land upon which we stand and the water that we liberally consume.

The chapters presented in this volume represent a sample of the research conducted by graduates of the Anthropology Department at The Pennsylvania State University over the last 40 years. Since graduating, they have continued to push the boundaries of understanding the past by asking creative questions and using innovative methodologies to expand the archaeological record. Their perspectives give insights to broader anthropological knowledge. And as the genealogical history continues to branch out into anthropology departments across the country, the authors raise a glass and dedicate this volume to our mentor and friend, anthropologist, and extraordinary archaeologist, David Webster.

## ACKNOWLEDGMENTS

---

We thank the Department of Anthropology at Penn State for covering the licensing costs for figure 1.3. Gratitude to Christine C. Dixon, David M. Reed, and K. Viswanathan for their assistance with this chapter.

## REFERENCES CITED

---

- Ashmore, Wendy, and Robert J. Sharer. 2014. *Discovering Our Past: A Brief Introduction to Archaeology*. 6th ed. Boston: McGraw-Hill.
- Baker, Paul T., ed. 1978. *The Biology of High Altitude Peoples*. Cambridge: Cambridge University Press.
- Barlow, Renee K. 2002. "Predicting Maize Agriculture among the Fremont: An Economic Comparison of Farming and Foraging in the American Southwest." *American Antiquity* 67 (1): 65–88. <http://dx.doi.org/10.2307/2694877>.
- Billman, Brian R., and Gary M. Feinman. 1999. *Settlement Pattern Studies in the Americas: Fifty Years Since Virú*. Smithsonian Series in Archaeological Inquiry. Washington, DC: Smithsonian Institution Press.
- Binford, Lewis R. 1962. "Archaeology as Anthropology." *American Antiquity* 28 (2): 217–225. <http://dx.doi.org/10.2307/278380>.
- Binford, Lewis R., and Sally R. Binford, eds. 1968. *New Perspectives in Archaeology*. Chicago: Aldine Publishing Co.
- Boone, James L. 2000. "Status Signaling, Social Power, and Lineage Survival." In *Hierarchies in Action: Cui Bono*, ed. Michael W. Diehl, 84–110. Occasional Paper No. 27, Center for Archaeological Investigations. Carbondale: Southern Illinois University Press.
- Brumfiel, Elizabeth. 1992. "Distinguished Lecture in Archaeology: Breaking and Entering the Ecosystem—Gender, Class, and Faction Steal the Show." *American Anthropologist* 94 (3): 551–567. <http://dx.doi.org/10.1525/aa.1992.94.3.02a00020>.
- Diehl, Richard, and Lawrence H. Feldman. 1974. "Relaciones entre la Huasteca y Tollan." In *Proyecto Tula: Primera Parte*, ed. Eduardo Matos M., 105–108. Instituto Nacional de Antropología e Historia, Colección Científica No. 14. Mexico: INAH.
- Flannery, Kent V. 2006. "On the Resilience of Anthropological Archaeology." *Annual Review of Archaeology* 35 (1): 1–13. <http://dx.doi.org/10.1146/annurev.anthro.35.081705.123304>.
- Gonlin, Nancy. 2012. "Production and Consumption in the Countryside: A Case Study from the Late Classic Maya Rural Commoner Households at Copán." In *Ancient Households of the Americas: Conceptualizing What Households Do*, ed. John G. Douglass and Nancy Gonlin, 79–116. Boulder: University Press of Colorado.
- Griffin, Robert E. 2012. "The Carrying Capacity of Ancient Maya Swidden Maize Cultivation: A Case Study in the Region around San Bartolo, Petén, Guatemala." PhD diss., Pennsylvania State University, University Park.

- Harrison-Buck, Eleanor. 2014. "Anthropological Archaeology in 2013: The Search for Truth(s)." *American Anthropologist* 116 (2): 338–351. <http://dx.doi.org/10.1111/aman.12101>.
- Hauser, Mark W. 2012. "Messy Data, Ordered Questions." *American Anthropologist* 114 (2): 184–195. <http://dx.doi.org/10.1111/j.1548-1433.2012.01417.x>.
- Iannone, Gyles, and Paul F. Healy. 2012. "The Trent Connection: A Cornerstone of Maya Archaeology in Belize." *Canadian Journal of Archaeology* 36: 29–50.
- Johnson, Patricia L. 2003. "Male Migrants as a High-Risk Group: Harm Reduction and HIV/AIDS in Bangladesh." *Asian Affairs* 25 (3): 5–29.
- Kahn, Jennifer G. 2013. "Anthropological Archaeology in 2012: Mobility, Economy, and Transformation." *American Anthropologist* 115 (2): 248–261. <http://dx.doi.org/10.1111/aman.12007>.
- Kelly, Robert L. 2001. *Archaeological Survey and Excavations in the Carson Desert and Stillwater Mountains, Nevada*. University of Utah Anthropological Papers 123. Salt Lake City: University of Utah Press.
- Kidder, Alfred V., J. D. Jennings, and E. M. Shook. 1946. *Excavations at Kaminaljuyu, Guatemala*. Washington, DC: Carnegie Institution of Washington.
- Lancaster, Jane B., and R. Hames. 2011. "Statement on the Publication of Alice Dreger's Investigation, Darkness's Descent on the American Anthropological Association: A Cautionary Tale." *Human Nature (Hawthorne, N.Y.)* 22 (3): 223–224. <http://dx.doi.org/10.1007/s12110-011-9106-8>.
- MacDonald, Douglas H. 2001. "Grief and Burial in the American Southwest: The Role of Evolutionary Theory in the Interpretation of Mortuary Remains." *American Antiquity* 66 (4): 704–714. <http://dx.doi.org/10.2307/2694183>.
- McClung de Tapia, Emily. 2013. "Enfoque ecológicos para la arqueología mexicana: El impacto de hombre en su medio ambiente." *Arqueología Mexicana* 21 (121): 66–70.
- McKibben, Bill. 2007. *Deep Economy: The Wealth of Communities and the Durable Future*. Oxford: One World Publications.
- Murtha, Timothy Michael. 2002. "Land and Labor: Classic Maya Terraced Agriculture at Caracol, Belize." PhD diss., Pennsylvania State University, University Park.
- Peregrine, Peter, Yolanda T. Moses, Alan Goodman, Louise Lamphere, and James Lowe Peacock. 2012. "What Is Science in Anthropology?" *American Anthropologist* 114 (4): 593–597. <http://dx.doi.org/10.1111/j.1548-1433.2012.01510.x>.
- Puleston, Dennis E. 1973. "Ancient Maya Settlement Patterns and Environment at Tikal, Guatemala: Implications for Subsistence Models." PhD diss., University of Pennsylvania, Philadelphia.
- Reese-Taylor, Kathryn. 2012. "The Contributions of the University of Calgary to the Field of Maya Archaeology." *Canadian Journal of Archaeology* 36: 1–28.

- Sanders, William T. 1957. "Tierra y Agua: A Study of Ecological Factors in the Development and Personality of Mesoamerican Civilizations." PhD diss., Harvard University, Cambridge, MA.
- Sanders, William T. 1986–1990. *Excavaciones en el area urbana de Copán*, Vol. 1–3. Tegucigalpa: Secretaría del Estado en el Despacho de Cultura y Turismo, Instituto Hondureño de Antropología e Historia.
- Sanders, William T., and Joseph Michels. 1969. *The Pennsylvania State University Kaminaljuyu Project: 1968 Season, Part 1, The Excavations*. Occasional Papers in Anthropology No. 2. University Park: Pennsylvania State University.
- Sanders, William T., Jeffrey R. Parsons, and Robert S. Santley. 1979. *The Basin of Mexico: The Ecological Processes in the Evolution of a Civilization*. New York: Academic Press.
- Sanders, William T., and David Webster. 1978. "Unilinealism, Multilinealism, and the Evolution of Complex Societies." In *Social Archaeology: Beyond Subsistence and Dating*, ed. Charles L. Redman, Mary Jane Berman, Edward V. Curtin, William T. Langhorne Jr., Nina M. Versaggi, and Jeffrey C. Warner, 249–301. New York: Academic Press.
- Sanders, William T., and David Webster. 1988. "The Mesoamerican Urban Tradition." *American Anthropologist* 90 (3): 521–546. <http://dx.doi.org/10.1525/aa.1988.90.3.02a00010>.
- Santley, Robert S. 1994. "The Economy of Ancient Matacapán." *Ancient Mesoamerica* 5 (2): 243–266. <http://dx.doi.org/10.1017/S0956536100001206>.
- Smith, Eric Alden. 1991. *Inujjuamiut Foraging Strategies: Evolutionary Ecology of an Arctic Hunting Economy*. New York: Walter de Gruyter.
- Stanish, Charles. 1990. "Complementariedad zonal en Moquegua: Una aproximación desde el Valle de Otorá." *Gaceta Arqueológica Andina* 5 (18/19): 137–157.
- Steward, Julian H., general ed. 1940–1947. *Handbook of South American Indians*. Washington, DC: Smithsonian Institution.
- Steward, Julian H. 1955. *Theory of Culture Change: The Methodology of Multilinear Evolution*. Urbana: University of Illinois Press.
- Stewart, T. Dale, and William Duncan Strong. 1939. *Anthropometric Observations on the Eskimos and Indians of Labrador*. Publication 462, Anthropological Series 31(1). Chicago: Field Museum of Natural History.
- Strong, William Duncan. 1957. "Paracas, Nazca, and Tiahuanacoid Cultural Relationships in South Coastal Peru." *Memoirs of the Society for American Archaeology* 13: 1–48.
- Strong, William Duncan, W. E. Schenck, and Julian H. Steward. 1930. "Archaeology of the Dalles-Deshutes Region." *American Archaeology and Ethnology* Publication 29(1). Berkeley: University of California.
- Sutton, Mark Q., and E. N. Anderson. 2004. *Introduction to Cultural Ecology*. Lanham, MD: Altamira Press.

- Turner, Billie L., II. 1974. "Prehistoric Intensive Agriculture in the Maya Lowlands." *Science* 185 (4146): 118–124. <http://dx.doi.org/10.1126/science.185.4146.118>.
- Turner, Billie L., II. 1978. "Ancient Agricultural Land Use in the Central Maya Lowlands." In *Prehispanic Maya Agriculture*, ed. Peter D. Harrison and Billie L. Turner II, 163–183. Albuquerque: University of New Mexico Press.
- Wade, Nicholas. 2010. "Anthropology a Science? Statement Deepens a Rift." *New York Times*, page A16. December 9.
- Webster, David. 1996. "Cultural Ecology Theory." In *The Oxford Companion of Archaeology*, ed. Brian Fagan, 155–156. London: Oxford University Press.
- Webster, David. 2002. *The Fall of the Ancient Maya: Solving the Mystery of the Maya Collapse*. London: Thames & Hudson, Ltd.
- Webster, David, Susan Toby Evans, and William T. Sanders. 1993. *Out of the Past: An Introduction to Archaeology*. Mountain View: Mayfield Publishing Company.
- Willey, Gordon R. 1953. *Prehistoric Settlement Patterns in the Virú Valley, Perú*. Bureau of American Ethnology Bulletin 155. Washington, DC.
- Willey, Gordon R. 1975. *Excavations at Seibal, Department of Peten, Guatemala*. Cambridge: Peabody Museum Press.
- Willey, Gordon R. 1980. "Towards a Holistic View of Ancient Maya Civilization." *Man* 15 (2): 249–266. <http://dx.doi.org/10.2307/2801670>.
- Willey, Gordon R. 1982. "Maya Archaeology." *Science* 215 (4530): 260–267. <http://dx.doi.org/10.1126/science.215.4530.260>.
- Willey, Gordon R., William R. Bullard, John B. Glass, and James C. Gifford. 1965. *Prehistoric Maya Settlements in the Belize Valley*. Papers of the Peabody Museum of Archaeology and Ethnology, Vol. 54. Cambridge, MA: Harvard University.
- Willey, Gordon R., and Philip Phillips. 1958. *Method and Theory in American Archaeology*. Chicago: University of Chicago Press.
- Willey, Gordon R., and Jeremy A. Sabloff. 1974. *A History of American Archaeology*. San Francisco: W. H. Freeman and Company.
- Wood, James W. 1992. *Dynamics of Human Reproduction: Biology, Biometry, Demography*. Hawthorne, NY: Aldine de Gruyters Publishers.