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# Diversity, Resiliency, and IHOPE-Maya: Using the Past to Inform the Present

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**ABSTRACT**

**How can the past inform the present? Archaeologists working though IHOPE-Maya seek to address this question by using archaeological data and ecological reconstructions to explore human–nature couplings. Maya archaeologists are revitalizing and contemporizing the field to focus on issues relevant today: the socio-natural boundary and the coupled human–nature dynamic. The ancient Maya occupied a diverse range of tropical environments that permits a comparative exploration of past permutations in adaptive responses and may also be instructive concerning issues of overexploitation. The variety of places that the Maya occupied afforded diverse opportunities and constraints. By providing access to long-term historical interactions between peoples and their landscapes, archaeology is uniquely qualified to define, examine, and interpret topics like sustainability, resilience, and vulnerability that are as equally significant to the past as they are to the present. Because Maya archaeology is well positioned to analyze ancient variability in political structures and cultural adaptations that can be related to differential societal success and decline, the discipline can contribute to broader, more current, debates concerning climate change, population limits, urban forms, landscape modifications, and stability. The research being undertaken by IHOPE-Maya hopes to serve as a catalyst for transforming the field. [archaeology, resilience, sustainability, vulnerability, Maya]**

It would be an understatement to say that the field of archaeology is facing an identity crisis. No longer is it satisfactory to simply study the past for the sake of personal intellectual gratification (e.g., Flannery 1982:278) or to add to a broader academic knowledge base (Willey and Phillips 1958). The tide has shifted. It is not sufficient to have an elegant research design that explicates some arcane academic argument about the past. Rather, researchers are now asking what insight their investigations can offer in terms of solving modern quandaries and dilemmas (Fisher et al. 2009; Scarborough et al. 2012). What lessons can the discipline of archaeology offer contemporary peoples? What relevance do archaeological data have to environmental and social issues facing today's populations? Archaeology is proud of its "time depth," but as a discipline it is only beginning to use that temporal barometer to address modern problems (see Kintigh et al. 2014).

Just as the world has changed and evolved, so too has the field of archaeology. Once largely directed to the collection of artifacts for the world's museums and the ordering of past cultures into unilinear developmental models (Willey and Sabloff 1993), archaeology then became focused on attempting to examine function, process, and change in past societies and civilizations (Sabloff 1994). However, as more and more stakeholders have become engaged in interpreting the past, archaeological interpretation

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has become more compartmentalized. The lack of a clear "big picture" approach, combined with a limited focus on explaining the contemporary impact of studies of the past, has marginalized the field. This also means that in times of reduced funding, such as currently exist, archaeology is at risk of being "cut" or, minimally, sidelined.

Maya archaeology is itself symptomatic of the contradictions that face the general field today. While a great wealth of archaeological knowledge exists on the Maya area of subtropical Central America, these data have not generally been applied to broader issues and modern problems. For more than a century, scientific research and excavations have been undertaken on the extraordinary remains of the Maya peoples who call this region "home" (Sharer and Traxler 2006). The ancient Maya adapted to a diverse range of environmental conditions, while simultaneously developing great civilizations and art styles independently of the Old World (Marcus 2007). Spurred on by the Resilience Center at the University of Stockholm and their IHOPE (Integrated History and Future of People on Earth) interests (see Costanza et al. 2007), in the summer of 2008 a group of Maya archaeologists began to focus on the long-term human–nature relationships that exist in the Maya area. The stated goal was to use a multidisciplinary approach to determine what could be gleaned from Maya archaeology that would be of use for modern policy decisions relating to climate change, resilience, sustainability, vulnerability, rigidity, and diversity. Working across diverse regions, research projects, sampling schemes, and time periods has proved both difficult and enlightening. However, after more than a half dozen formal meetings over 5 years, IHOPE-Maya is ready to offer some concrete results related to this concerted effort.

## General Considerations

The discipline of archaeology gathers and interprets data relevant to past human societies, specifically how they developed, interacted, and adapted. Most archaeologists use the data that they collect to examine past human development and social change, and many of these data can be brought to bear on modern human–environment interactions associated with climate change and drought. They are also suitable for examining ancient and modern sustainability (Blinman 2008; Marston 2011, 2012; Miller and Marston 2012; Scarborough and Burnside 2010; Tainter 2006; Van der Leeuw 2004). By examining settlement patterns and past demography, the sustainability of ancient agricultural processes can be assessed. Yet, the past is not the only purview of the archaeologist. If properly developed, the archaeological remains themselves may provide a sustainable resource that can be used by modern people and countries to promote tourism and economic development (Sabloff 2008). Archaeological data have also been used to identify cultural continuity between ancient remains and modern people, thus directly engaging modern social issues relating to legal rights about land, human remains, artifacts, and even cultural existence (Boytner et al. 2010; McGuire 2008). But, while modern particularistic issues sometimes have been addressed through archaeology, broader global assessments are rarely aired.

Archaeology is positioned to play a key role in the long-term modeling of agricultural systems, urban systems, tropical adaptations, deforestation, and responses to climate change (Gunn et al. 2002; Lentz and Hockaday 2009; Lucero et al. 2011; van der Leeuw 2009). In some parts of the world, past agricultural systems were far more productive and or integrated into the social fabric than they are today; modeling the sustainability of such systems may yield viable solutions for modern populations. Similarly, many ancient urban areas, particularly those found among the tropical civilizations like the ancient Maya, used a diverse set of strategies to integrate farming and settlement into an interdependent or "single" landscape system. Modern urban planners have only recently discovered the benefits of "greening" (Lehmann 2010) despite its prevalence in ancient contexts (e.g., Fletcher 2009); thus, archaeologists can significantly contribute to this discussion. Finally, climate change was constantly faced by past societies (Ruddiman 2003; van der Leeuw and Redman 2008). The many responses and adaptations to diverse environmental situations found in the long-term archaeological record likely hold clues to both successes and miscalculations that are of use in policy decisions facing modern societies. While the future of archaeology is in the past, the past also holds information vital for the world's future—perhaps yielding solutions in spite of modern denials that problems even exist.

If this is the case, then why has archaeology not already played a larger role in present-day management decisions? The answer to this question resides both in the nature of archaeological data and in the way that archaeologists have traditionally collected and shared it. Because of the variability that is apparent in the archaeological record, each site and region presents different problem sets. Controlling time in the absence of absolute dates is a difficult task. Sometimes the collected sample size does not permit the resolution required to address "big picture" questions. Moreover, different and emergent paradigms within Maya archaeology influence research designs and interpretations of different researchers. Each researcher collects and categorizes archaeological data in slightly different ways, meaning that standardization of archaeological data across sites is often difficult (e.g., van der Leeuw and Redman 2002). The individuals participating in IHOPE-Maya are making a concerted effort to resolve issues of definitions, comparisons, scales, and paradigms that have precluded collaboration in the past. This kind of open communication was not traditionally a hallmark of Maya archaeology. Much of our past meeting time has been devoted to establishing mechanisms for effectively sharing and comparing data.

## Changing Perceptions and Models within Maya Archaeology

Within the last 50 years, there have been at least three major changes in archaeological perceptions of the ancient Maya that have ramifications for any attempt to be relevant to the modern world. First, there is recognition that the Maya were not a unitary culture facing a single evolutionary trajectory (e.g., Fash 1994). Second, contrary to arguments originally articulated within a cultural ecological framework, where environment largely determined cultural responses and where the Maya Lowlands were viewed as a redundant and uniform environment (e.g., Sanders and Price 1968), more recent research has conclusively demonstrated the usefulness of newer approaches to human–nature interfaces and that the Maya occupied truly diverse environments in which they employed a wide variety of adaptations (e.g, Dunning and Beach 2010; Dunning et al. 1998; Fedick 1996; Ford and Nigh 2009; Harrison and Turner 1978). Third, archaeological data have demonstrated that ancient Maya societies were far more differentiated and complex than widely embraced, and than epigraphically based sociopolitical models would indicate (e.g., Chase and Chase 1992; Chase et al. 2008; Fox et al. 1996; Scarborough et al. 2003). Any examination of the dynamics behind the coupling of human–nature systems in the Maya area should start with these basic premises.

IHOPE-Maya has adopted several approaches to analyzing the past, with a view to using terminology that can be conversant across disciplines. First, human–nature coupling is considered at different scales of time, from millennia to centuries to decades (Costanza et al. 2007:6–10). This approach recognizes that different questions and concerns may require different scales of temporal analysis, all of which are approachable in the archaeological record. Second, spatiotemporal variability is placed within an environment that is considered to be dynamic, is scaled according to the level of observation, and is viewed in terms of complex behaviors that do not easily resolve into cause–effect explanations or simple overarching syntheses (Dearing 2007; Tainter 2000). Third, much of the terminology that is used is grounded in resilience theory, which focuses on an adaptive cycle concerned with degrees of both stability and transformation (Holling 2001; Holling and Gunderson 2002; Holling et al. 2002). Thus, researchers tend to categorize their case examples using terms that have meaning in ecological studies, such as "resilience," "sustainability," and "rigidity." *Resilience* is "a construct representing positive adaptation despite adversity" (Luthar and Cicchetti 2000:857). *Sustainability* implies the ability to continuously utilize natural resources, such as land, water, or energy, while managing these items for long-term future exploitation (e.g., Tainter 2006). *Rigidity* implies an inability to change in the face of stress, often caused by past decisions or adaptations both cultural and natural (see Hegmon et al. 2008).

Archaeological remains provide direct examples of the complex adaptations of past human societies to a wide variety of ecological circumstances. In many instances ancient populations were larger than the modern populations currently living in the same area; this is clearly seen both in the Maya area (Culbert and Rice 1990) and in the Amazonian basin of South America (Balee and Erickson 2006; Erickson 2008, 2010; Heckenberger et al. 2008; Roosevelt 2000). The lack of substantial numbers of people in these regions today implies both the success and failure of ancient adaptations. These past collapses capture the modern imagination and are often invoked as examples of what our global community is facing (Diamond 2005). The successes and failures of past civilizations and the reasons for these failures or continuities (McAnany and Yoffee 2010; Schwartz and Nichols 2006; Tainter 1988) have a direct bearing on modern problems and issues—and archaeology is in a unique position to address these phenomena.

The Maya provide one of the best examples of complex adaptations to a tropical environment. Their largest, densest, and greatest levels of complexity appear to be located in the harshest environments. Thus, the continuity of archaeological occupation implies that contemporaneous groups of Maya were able to survive periods of drying or drought, rising sea levels and water tables, and differential effects of an already modified environment. However, deforestation occurred early in the Maya area, caused by extensive farming practices and an excessive need for fuel in order to make plaster for architecture (Dunning and Beach 2010:375). Denuding the landscape resulted in severe erosion, which is credited with infilling *bajos* (low areas under water during the rainy season) and, perhaps, even lakes; nevertheless, while part of the landscape was degraded, another part was enriched, meaning that farming practices shifted as an indirect result of deforestation. While wetland farming strategies have been extensively examined in the Maya region (e.g., Scarborough 2009), the dryland farming strategies that supported self-sufficient garden-cities have also been a focus of research (Chase and Chase 1998; Dunning and Beach 1994). Because of the need for intensive agriculture to support large populations, different strategies were employed throughout the Maya area. Large, contemporary, urban cities were supported by: wetland agriculture (e.g., Edzna; see Matheny 1978); terraced agriculture (e.g., Caracol; see Chase et al. 2011); swidden and bajo cultivation (e.g., Tikal; see Dickson 1980); and a combination of strategies that may have included tree-cropping, pot irrigation, and gardens made of imported organic soils (e.g., Chunchucmil; see Dunning and Beach 2010). During the Classic period, there may even have been peripheral marginal areas that functioned as bread-baskets for the interior regions (Dahlin and Chase 2014).

## Approaches to the Maya Data

Throughout the Maya area, there are both differences and similarities in environment, human occupational history, and adaptations that were made by the ancient Maya. To approach the human–nature interface, the IHOPE-Maya group subdivided the overall Maya region into a series of zones that were correlated with soils and ecology (Dunning et al. 1998) as well as with the existence of intensive archaeological research within a given zone that could provide needed time depth for human–nature correlations. The subtropical Maya environment ranged from barely elevated coastal areas with mangrove swamps or scrub-forest to karstic uplands covered with jungle forest to cooler mountainous zones containing pine trees. Standing water was rare in much of the Maya area, occurring in the northern Lowlands at Coba, at only a very few points in the central Lowlands (Lakes Civiltuk and Bacalar), and spread inconsistently across the central part of the southern Lowlands (from west to east: Lake Salpeten, Lake Peten-Itza, Lake Yaxha-Sacnab). In the north, the water table resides at some depth and is retrievable primarily through accessing *cenotes* (that is, sinkholes). Seasonally running water, as well as a very few perennial rivers, do bracket the eastern, western, and southern sides of the southern Lowlands and were probably the initial focus for early colonization in this region. These rivers also anchored east-west communication and trade routes through the Yucatan Peninsula in combination with seaborne routes that circumnavigated the entire region. Importantly, during the rainy season, several rivers in the southern Lowlands directly articulated with bajos, forming even more impressive interior routes that could be navigated by canoe (e.g., Fialko 2004).

Vegetation also varied throughout the region, dependent on rainfall, soils, and elevation. There is a vast difference in rainfall totals in the northern Maya Lowlands as compared to the southern area, ranging from 500 millimeters to over 2500 millimeters per year. Airflow patterns also govern the amount of precipitation that a given area might receive. While early and late settlements were concentrated in areas that had permanent or running water, the largest Classic period Maya settlements were located away from such water sources, meaning that the landscape was modified to catch and preserve rainwater. Agricultural soils also varied throughout this region and also over time. With the exception of the Puuc region, the soils in the northern Lowlands were generally thin and poor. In the southern region, however, rich soils infilled some of the bajos as a result of erosion events brought about by the initial deforestation of the landscape by the original settlers. Fertile soils were also found along river margins and were replenished annually because of the rainy season cycle. Soils were also manipulated and moved early in Maya prehistory, as noted by evidence from Chunchucmil in the northern Lowlands (Dunning and Beach 2010) and from terraces in the southern Lowlands (Chase and Chase 1998). Most ancient Maya areas implemented a diverse mix of cultivation practices. Agricultural adaptations included walled gardens in the north, raised field agriculture in the central Maya area, and terraced agriculture in the Vaca Plateau. Ancient social and political systems similarly varied. Thus, different cultural groups in the ancient Maya area exploited a wide variety of resources and emphasized a multitude of adaptations to their environments over both time and space.

The contributions presented within this volume examine the temporal and spatial variability of a number of datasets and questions. An initial overview (Chapter 2) contextualizes the Maya area over time, examining general similarities and differences in archaeologically recorded responses to environmental factors. Chapter 3 specifically examines the Maya as a rainfall-dependent agricultural society, looking at the complexity of their interactions with water (e.g., Iannone in press; Lucero and Fash 2006; Scarborough and Lucero 2010). The introductory sections are followed by a number of case studies. In the northern Lowlands, the archaeology of the Puuc region is examined by way of a Maya adaptation to good soils amidst a lack of water (Chapter 4; see also Dunning 1994; Isendahl 2006). In the western part of the northern Lowlands, where extensive settlements occurred within areas of limited agricultural potential, differential adaptive responses are seen in the archaeological records of Chichén-Itzá (Chapter 5; see also Cobos 2007; Cobos and Fernandez 2011) and the Yalahau region (Chaper 6; see also Fedick and Morrison 2004). The western Maya region (the location of Palenque, Pomona, and Tortugeruo) provided the ancient Maya with rivers, a rich environment, and linear strips of settlement (Chapter 7; see also Liendo 2005)—a very different setting from that seen along the

Belize River in the eastern Lowlands (Garber 2004). Some of the largest-known Maya urban developments, such as those found at Calakmul (Folan et al. 1995) and Caracol (Chase and Chase 2007; Chase et al. 2011), occur in regions that were largely devoid of standing water. Clearly, different settlement adaptations occurred in areas of standing or running water than in areas devoid of such resources. In topographically flatter regions, like the one in which Calakmul is located (Chapter 8), bajos were used as a water source; in more hilly terrain, like the area in which Caracol is situated (Chapter 10), a large number of reservoirs were constructed. The agricultural systems within these centers also differed. Caracol covered its landscape with agricultural terraces (Chase and Chase 1998). In contrast to the more complex adaptations of the larger Maya sites, archaeological survey in the Three Rivers Region of Belize provides examples of a network of small, resilient communities that peaked in terms of settlement at different times (Chapter 9; see also Scarborough et al. 2003). The special circumstances and temporal trajectories of smaller hinterland communities (Chapter 11) provide examples of alternative adaptations that can be explored through comparing and contrasting archaeological data from Minanha (Iannone 2005), Uxbenka (Prufer et al. 2008), and Santa Rita Corozal (Chase and Chase 1988).

With a better understanding of Maya adaptations over time and space, it is possible to examine comparative developmental trajectories and the applicability of these data to modern issues and concerns. Comparing the complexity and sustainability of ancient Rome (Tainter and Crumley 2007) to the Maya trajectory permits the extraction of ideas that are of relevance to our modern society (Chapter 14). The archaeology of the Southwest United States has also received extensive analysis of its human–nature interaction and researchers there have also embraced IHOPE's goals (Hegmon et al. 2008; Redman et al. 2009); comparing and contrasting the archaeological data gained from the U.S. Southwest and northern Mexico with that of the Maya Lowlands provides archaeological examples of resilience, rigidity, and path dependence (Chapter 12; see also Nelson 1995). Of particular interest are general comparisons that may be made between the New World Maya and the Old World Near Eastern societies (e.g., Wilkinson and Rayne 2010) in terms of low-density urban adaptations and settlement dynamics framed to address issues of water usage, sustainability, fragility, and scalar responses to stresses relating to collapse and resilience (Chapter 13). These case studies and comparisons suggest both resilience and rigidity of Maya culture at different places in time and space. Finally, lessons drawn from specific ancient Maya cases and from trajectory comparisons in the archaeological record are informative for modern assessments of sustainability, climate change, and adaptations to various stresses (Chapter 15). The successful use of these data to advise modern policy and to guide related concerns would represent a tidemark for Maya archaeology.

## Summary

Once thought to be little more than the erudite study of ancient pottery types, untranslatable hieroglyphs, and dead kings, Maya archaeology is in the midst of recasting and rejuvenating its legacy. Through an alignment with IHOPE, Maya researchers are using their archaeological expertise and their control of variable temporal scales both to remodel the past and to probe for solutions to modern problems. With an infusion of ideas borrowed from ecology, Maya archaeologists are revitalizing and contemporizing the field to focus on issues relevant today: the socio-natural boundary and the coupled human–nature dynamic. The ancient Maya occupied a diverse range of tropical environments that permit a comparative exploration of past permutations in adaptive responses and may also be instructive in evaluating notions of overexploitation. The variety of places that the Maya occupied afforded diverse opportunities and constraints. By providing access to long-term historical interactions between peoples and their landscapes, archaeology is uniquely qualified to define, examine, and interpret topics like sustainability, resilience, and vulnerability that are as significant to the past as they are to the present. These same data showcase how a single society may at different times in its history be alternatively adaptive, flexible, and resilient or rigid and vulnerable. Because Maya archaeology is well positioned to analyze ancient variability in political structures and cultural adaptations at a variety of scales that relate to differential societal success and decline, the discipline can—and should—contribute to broader, more current debates concerning climate change, population limits, urban forms, landscape modifications, and degrees of stability. This volume presents some of the research being undertaken by IHOPE-Maya that is serving as a catalyst for the transformation of Maya archaeology.

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