Social Complexity at Cahokia

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Summary of a Working Group Held at the Santa Fe Institute, May 28-30, 2013.

organized by
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Abstract
A working group held at the Santa Fe Institute May 28-30, 2013, produced a set of consensus answers to questions about Cahokia, an urban place dating to the 12th and 13th centuries and located in what is today the greater Saint Louis region of Missouri and Illinois. Cahokia is an important urban place for theories of social complexity, as it appears to have emerged in the absence of a supporting regional administrative structure. The working group participants carefully investigated the city's regional social, political, and economic organization, and found that regional administration is, indeed, lacking apart from what appears to be a regional hierarchy of ritual spaces. Cahokia thus appears to be an exception to traditional models of social complexity and more recent models of urban scaling. This working paper provides an introduction to the questions surrounding Cahokia and the answers developed by the working group.

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Introduction: Cahokia in a Global Context
Scott Ortman

The working group *Social Complexity at Cahokia* was organized as part of a larger research initiative currently underway at the Santa Fe Institute, entitled "The Principles of Complexity: Understanding the Hidden Sources of Order among the Prodigies of Nature and Culture." This initiative addresses fundamental questions concerning regularities in complex systems across the biological and social realms through three organized, large-scale projects: (1) The evolution of complexity and intelligence on earth; (2) The hidden scaling laws that pervade complex biological and social phenomena with specific reference to urban life; and (3) Universal patterns in the emergence of complex societies.

The Cahokia working group was organized as part of Project 3, the specific goal of which is to improve general understandings of human social evolution—the fact that, over time, human societies have tended to grow in scale and to develop more extensive networks of coordinated, interdependent labor. Understanding this phenomenon has been and continues to be one of the central pursuits of anthropology, but in many ways a truly scientific understanding remains elusive. Our project adopts a complex systems perspective on the problem, viewing human societies as dynamic networks of people, energy and information that exhibit emergent properties central to their overall structure and functioning. We frame the changes in human social complexity that have emerged over the past 12,000 years as an example of a general evolutionary process driven by: 1) the intrinsic advantages of social coordination for groups (Bettencourt 2013; Bettencourt, Lobo, Helbing, et al. 2007; Bettencourt, Lobo and Strumsky 2007; Bettencourt, et al. 2010); 2) the invention and spread of ideas that encourage coordination (Blanton and Fargher 2008; Haidt 2012; Norenzayan 2013; Trigger 2003); and 3) increases in the ability of these groups to capture energy from, and represent information about, their environments (Morris 2010). We also adopt a view of the process as cumulative, in the sense that innovation typically derives from the recombination of existing elements into new structures, which then become elements for further combinations, and so forth (Arthur 2009; Gell-Mann 2011; Peregrine, et al. 2004).

The Cahokia working group was convened for two reasons. First, Cahokia stands out in a global context because most researchers currently view the site as an urban settlement that was not the center of a regional bureaucratic government. This possibility is intriguing because, although regional administration developed in the absence of cities in Polynesia (Kirch 2010) and coastal Peru (Wilson 1997), and there are many examples of the co-evolution of bureaucratic administration and cities in Mesopotamia, Mesoamerica, Egypt and China, Cahokia may be the only well-studied case of an urban-scale settlement that was not associated with a regional bureaucratic government. If this is in fact the case, Cahokia is extremely important for general theories of social complexity because it implies regional bureaucratic administration is not a prerequisite for the emergence of cities. In other words, Cahokia suggests the evolution of government and the emergence of cities may be separable processes.

Second, project members felt that a closer look at Cahokia would help address a fundamental shortcoming with most previous studies of social evolution. Although the scale and complexity of human societies has generally increased over time, the process has been uneven (see below).

Yet researchers have typically focused on the six well-known cases of primary state formation (Mesopotamia, Egypt, China, Peru, Mesoamerica and the Indus Valley) while neglecting cases where complexity has not accumulated or has done so in ways that produced unfamiliar social organizations. Most theories make at least implicit predictions about this broader range of cases, but such predictions are rarely checked systematically. Team members recognize that, from this perspective, North American archaeology has great potential for broadening scientific understanding of social complexity and its evolution, and Cahokia represents an important example of this potential.

A Global Perspective on Social Complexity
Although the working group "Social Complexity at Cahokia" focused on Cahokia and the larger Mississippian phenomenon, the organizers sought to frame the meeting discussions by placing this particular case within the big picture of human social evolution. This was done using a database of basic information on archaeological traditions from across the globe compiled by members of the SFI team (Ortman and Blair 2012). In the introductory session of the meeting we discussed the construction of this database and presented several quantitative summaries of the data it contains.

The backbone of the database is the *Atlas of Cultural Evolution* (ACE), which was compiled by Peter Peregrine (2003) based on information contained in Peregrine and Ember's (2001-2002) *Encyclopedia of Prehistory*. Peregrine and Ember compiled data for 289 archaeological traditions—which they define as a group of populations sharing similar subsistence practices, technology, and forms of socio-political organization across a contiguous area and over a long period—dating from the dawn of modern humans to the onset of written history in various world areas. These are not equivalent to ethnographic cultures, but there is a sense in which these traditions represent distinct adaptations to particular socio-natural contexts. It is also important to note that major cultural periods in well-studied areas are also divided into separate traditions; so Mesoamerica, for example, is represented by thirteen traditions (Highlands Archaic, Lowlands Archaic, Highland Early Preclassic, Highland Late Preclassic, Maya Preclassic, Olmec, Central Mexico Classic, Southern Highland Classic, Gulf Coast Classic, Classic Maya, Central Mexico Postclassic, Southern Highland Postclassic, and Postclassic Maya), the US Southwest by ten (Middle Desert Archaic, Early Hohokam, Late Hohokam, Patayan, Early Mogollon, Late Mogollon, Basketmaker, Early Anasazi, Late Anasazi, and Fremont), and so forth. The ACE contains information on the location, duration, and ancestor-descendant relationships of each tradition, as well as coded information on the following variables: writing and record-keeping, fixity of residence, degree of agricultural dependence, degree of urbanization, technical knowledge of materials, forms of land transport, forms of currency, population density, scale of political integration, and degree of social stratification. Each tradition is coded on a three-point scale for each of these ten variables, and these scores can be summed to produce an overall complexity score for each tradition ranging from ten to thirty. These ten ordinal-scale variables can also be transformed into a list of 30 presence/absence attributes, and Peregrine and others (2004) have shown that these attributes can be arranged in an implicational or Guttman scale in the same way cross-cultural ethnographic data have been arranged in previous studies (Carneiro 1962). So here, as in ethnographic studies, there is a basis for viewing social complexity as something that has accumulated over time.

Team members added a variety of additional data to that contained in the ACE for each tradition: the population and area of the largest settlement (from the literature), the time elapsed from the onset of agricultural dependence (calculated from the ACE data), the surface area encompassed by remains of each tradition (from maps in the Encyclopedia of Prehistory), statistical summaries of the net primary productivity of these areas (a measure of the rate of carbon fixation by plants, from the Atlas of the Biosphere), and a health index derived from studies of human skeletal remains for certain New World traditions (Steckel and Rose 2002). These additional data make it possible to characterize basic patterns in human social evolution quantitatively as a step in framing what exactly one needs to obtain from more detailed studies of societies like Cahokia.

Human societies vary along as many dimensions as one could choose to measure, but for a variety of reasons we feel the log of the population of the largest settlement is as good a single measure of social complexity as one could hope to recover from a broad range of archaeological traditions. There are several reasons for this. First, the largest settlements have long-attracted the most archaeological attention, and perhaps the most common question archaeologists are asked about these sites is how many people lived there. So for the majority of archaeological traditions the largest settlements are known and their populations have been estimated. Second, previous studies of social complexity in an ethnographic context (Carneiro 1967; Chick 1997; Naroll 1956), have found that the log of the largest settlement population is correlated with multivariate indices of social complexity drawn from the standard cross-cultural sample. Third, the same relationship noted in cross-cultural ethnographic studies is apparent in a comparison of largest settlement populations with the complexity score for archaeological traditions in the ACE (Figure 1), but the former is a continuous variable that varies over several orders of magnitude whereas the latter is an ordinal-scale variable with a range of twenty. Fourth, studies of entire settlement systems have often found that the distribution of settlement populations is well-approximated by something called Zipf's Law or the rank-size rule, which states that the population size of the nth ranked settlement (by population) is equal to the population of the largest settlement divided by n (Johnson 1977, 1980, 1987). So if the population of the largest settlement is known, something can often be said about the larger settlement system of which it is a part.

Finally, the largest settlement population is related in a surprising way to another basic measure of social complexity—the ability of human societies to capture energy from the environment. In his recent book, "Why the West Rules—For Now," Ian Morris (2010) developed data series representing the per capita rate of energy capture for food, industry, commerce and transportation in Western civilization from 16,000 BP to the present, and in Eastern civilization from 6,000 BP to the present. He also independently compiled estimates of the largest settlement populations in both civilizations over the same period. There are many details one could argue about in these data, but they nevertheless represent a serious attempt at quantifying levels of human social development over many millennia, and importantly, the two series were estimated independently. Figure 2 presents these data for the East and West, taken from the appendix to Morris' book which he published online (http://www.ianmorris.org/socdev.html). These data show that largest settlement populations generally increased much more rapidly than energy capture over time, but it can be shown that the two series are related in a deeper way. Recent analyses of aggregate socioeconomic quantities from contemporary metropolitan areas have shown that a variety of per capita socioeconomic quantities, y, can be estimated from the size of

the population aggregate according to $y = y_0 N^{1/6}$, where y_0 is the quantity per capita in the smallest settlement (Bettencourt 2013). From the perspective of per-capita energy capture, this relation indicates that the existence of a settlement of a given population size implies a per capita energy capture rate above the basal metabolic needs of a person, given here by y_0. Thus, the largest settlement population series can be transformed via this relation into implied rates of energy capture per capita. These estimates are shown as dashed lines in Figure 2, and closely track the energy capture rates estimated by Morris using independent lines of evidence. What this suggests is that increases in energy-capture rates have been closely-tied to agglomeration effects, and thus to social organization, throughout human history. As a result, largest settlement populations from archaeological traditions are reasonable proxies for energy capture rates as well as organizational capacity. Although we recognize that strongly-mixing groups are not always agglomerated, we nevertheless conclude that largest settlement populations are the most practical single indicator of organizational capacity and energy capture available from the archaeological record at a global scale.

We thus use the population of the largest settlement associated with each archaeological tradition as a measure of the overall complexity of the adaptation associated with that tradition in assessing the effects of several different variables on the accumulation of social complexity. When this is done across archaeological traditions worldwide, it becomes relatively easy to rule out several well-tried theories concerning its causes. For example, Figure 3 demonstrates that the accumulation of social complexity has not been an even or inexorable process. Although the envelope of complexity has expanded dramatically over the past 12,000 years, relatively simple archaeological traditions have continued to form up until recent times. This would seem to suggest that the benefits of social complexity are not always apparent to individuals, and thus, the accumulation of social complexity would appear to derive from multi-level selection over long periods as opposed to pure individual choice. That complexity may be better for groups than for individuals is also supported by Figure 4, which compares social complexity with a health index derived from studies of human skeletal remains for a sample of New World societies (Steckel and Rose 2002). At best, these data suggest there is no relationship between social complexity and individual health; at worst, they suggest social complexity may actually be detrimental to individual well-being, even if it is beneficial for the group overall.

Another important fact is that social complexity does not derive from the raw productive capacity of local environments. Figure 5 compares a measure of the intrinsic productivity of environments, in this case the maximum net primary productivity (kg of carbon captured per m^2 per year) across the 1 degree pixels within each archaeological tradition, to the complexity of that tradition. If salubrious environments were all that it took for complexity to accumulate, one would expect the envelope of complexity to correlate with productivity. Or, if pressures toward complexity were strongest in the most difficult environments, one would expect the opposite pattern. The fact that there is no overall pattern, either across all archaeological traditions or among those associated with the traditional hearths of early civilizations, tells us that social complexity does not just accumulate whenever it can. Environments have certainly played a role in the character of the economic systems that emerged in various places, but the intrinsic productivity of the environment was not a basic driver.

Finally, social complexity is not the result of any single technological innovation. Figure 6 illustrates this point for perhaps the most important innovation in human history—the production of food from domesticated plants. This plot compares the length of time that had passed since the ancestors of an archaeological tradition became dependent upon agriculture for subsistence to the complexity of that tradition. This analysis shows that, in areas where early civilizations emerged, complexity did accumulate in the millennia following the adoption of agriculture; but overall, there is no strong relationship between the years of agricultural dependency elapsed and the level of social complexity attained. Thus, it would seem that the accumulation of social complexity required a continuous process of technological innovation, in both the physical and social realms.

Hopefully these data are sufficient to set aside models for the accumulation of social complexity that view the process as inevitable, as something that necessarily benefits individuals, or as something determined by the environment. There would seem to be little point in pursuing such models further. However, a wide range of models are still possible, and a basic question that follows from the discussion to this point is whether the expanded ACE can provide guidance on what *does* characterize the process? These data are too coarse for detailed testing, but there are several strong patterns apparent in the data that a good theory of social complexity should attempt to account for. One is the notion of economies of scale. Several recent studies of contemporary urban systems have demonstrated that larger cities use resources more efficiently per capita, and produce more per capita, than smaller ones (Bettencourt 2013; Bettencourt, Lobo, Helbing, et al. 2007; Bettencourt, Lobo and Strumsky 2007; Bettencourt, et al. 2010). Initial studies of this phenomenon in an archaeological context suggest that these advantages may be universal (Ortman, et al. Submitted). Figure 7 provides support for this idea, as indicated by the population vs. settled area of largest settlements from various archaeological traditions. Note that in this case both data series are plotted on logarithmic scales; the solid line represents a power-law fitted to these data; and the dashed line represents the relationship that would be apparent if settled area increased linearly with population (i.e. with an exponent of 1 instead of the observed .86). This analysis suggests that, on average, individuals require less area per person as settlements grow in population. This in turn suggests that resources are used more efficiently in larger aggregates. Remember also that largest settlement populations are proxies for organizational capacity and energy-capture technology. Taken together, these facts suggest the accumulation of social complexity derives, in part, from the economies of scale associated with social coordination.

A second strong pattern is that the complexity of human societies does not vary continuously. Figure 8 illustrates this in the form of a histogram of largest settlement populations across 157 archaeological traditions. Note that the distribution is multi-modal, with peaks corresponding to settlements of 25, 500, 2,500, and more than 10,000 people. These peaks correspond closely to thresholds in human social organization observed in cross-cultural studies (Kosse 1990, 1992, 1996, 2001) and to traditional neo-evolutionary typologies of human societies (band, tribe, chiefdom, state) (Fried 1967; Service 1962). Although we do not favor the return to a typological approach, these data nevertheless suggest that there are basins of attraction for various scales of human social organization, and that these basins correspond in some sense to the neo-evolutionary types recognized many decades ago. A good theory for the accumulation of social complexity needs to account for these thresholds, whether they derive from human information

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processing limits, characteristics of social networks, nonlinearities in energy-capture technology, or some combination of these and other factors we have yet to consider.

A final point is that the pace of change in human societies has been increasing over time. This is apparent when one compares the time spans of archaeological traditions in the ACE against the midpoint date of that tradition (Figure 9). The idea here is that archaeological traditions represent distinctive socioeconomic adaptations, and thus, the duration of a tradition is a rough proxy for the pace of cultural change: the shorter the duration of a tradition, the faster the pace of change. One could argue that this pattern is merely due to the fact that a wider-range of more precisely-datable materials occurs on more recent sites, but this is precisely the point. The pace of change has accelerated over time in part because there have come to be more elements changing simultaneously, and more potential combinations of elements. So these changes are not just easier to see; the pace of change itself has been accelerating.

The quantitative summaries of archaeological traditions presented here suggest the accumulation of social complexity is a process with the following dimensions:

- Increasing scale of coordinated labor
- Increasing rates of energy capture
- Group-level benefits that are separable from perceived (or real) individual benefits
- Continuous innovation in physical and social technologies
- Economies of scale
- Multivariate basins of attraction
- Increasing rates of culture change due to increases in the number of elements and possible combinations of elements.

The discussions at the working group meeting were geared toward understanding how these dimensions played out in the particular case of Cahokia.

Organization of the Working Group
Peter N. Peregrine

As Ortman noted in his introduction, we see Cahokia as extremely important for developing general theories of social complexity because the existing literature suggests Cahokia emerged without a regional bureaucratic administration. If this is accurate, then Cahokia represents one of only a very few cases where the evolution of a regional government and the emergence of cities are not linked, and might suggest the accumulation of complexity results from a number of somewhat independent processes. If, on the other hand, the political-economic complexity of Cahokia is similar to that of other archaeological traditions of comparable scale, it would suggest complexity emerges from a series of correlated processes. Understanding Cahokia is thus critical for progress on general theory regarding social complexity in humans.

The primary task of the working group, then, was to determine whether or not Cahokia was a "city" and the extent, both geographically and bureaucratically, of the Cahokian polity. We developed a series of discussion topics with associated questions which we provided to working group members in advance of our meeting. One member of the working group was tasked to give a summary of the existing literature on each topic, and then the lead discussion of the questions. We then attempted to arrive at broadly-acceptable answers to the individual questions.

The topics and questions are listed below, along with the participants who provided initial summaries and led the discussion. Responses to these questions follow, along with summaries of the surrounding discussion.

Territorial Organization (Thomas Emerson)
1. What area was integrated into a single Cahokian polity?
2. What was the relationship between Cahokia and its neighboring mound centers?
3. What were the roles or functions of Cahokian "outlier" communities?
   - local (e.g. Knoebel Site, Emerald Mounds)
   - regional (e.g. Spoon River Focus)
   - macro-regional (e.g. Aztalan, Trembleau)

Population (Timothy Pauketat)
4. What was the population of Cahokia itself?
5. What was the population of the Cahokian polity?
6. How do these population estimates compare with later Mississippian polities?

Economic Organization (Mary Beth Trubitt)
7. How was the population of Cahokia supported?
8. Were there markets at Cahokia?
9. What was the organization, scale, and spatial distribution of craft production in the Cahokian polity?
10. What was the organization and scale of trade/exchange in the Cahokian polity?
11. What accounts for the wide areal distribution of Ramey ceramics?

Political Organization (John Kelly)
    12. How many levels of organizational hierarchy existed in the Cahokian polity?
    13. Was there administrative specialization?
    14. How were conflicts adjudicated?
    15. Was there internal warfare? External warfare?
    16. Was taxation or tribute extracted?

Social Organization (William Iseminger)
    17. How many levels of social stratification were present in the Cahokian polity and how did
        this change over time?
    18. What were the roles/activities of members of the highest social strata?
    19. What were the roles/activities of members of the middle or lower social strata?
    20. Were internal divisions (e.g. moieties) present?
    21. Was there class endogamy or hypogamy?

Religious Organization (Timothy Pauketat)
    22. Were there religious specialists at Cahokia?
    23. Were there pan-Cahokian rituals which involved distant centers?
    24. Were there anthropomorphic gods?

Responses to Questions about Cahokia

Territorial Organization

Answers to the Questions
1. What was the largest area ever integrated into a single "Cahokian" polity?

The answer of course depends on how one defines the polity. There seem to be two levels of integration, one much larger than the other. First is a core region of almost continuous settlement stretching from the Cahokia site along the southern shore of Indian Lake to the East St. Louis site and finally across the Mississippi to encompass the St. Louis site. This region is commonly termed the "central administrative complex" (CAG) and was roughly 14 square kilometers in area (see Figure 11). Second is a region extending outward from Cahokia roughly 30 kilometers and forming a circle roughly 2000 square kilometers in area. This region is commonly termed "greater Cahokia" and encompasses at least 10 mound communities (see Figure 11)

2. What was the relationship between Cahokia and its neighboring mound centers?

The relationship was complicated and changing. At first it would seem that there were two separate mound centers in the American Bottom, one at the Pulcher site, the other at Cahokia (Figure 10). Within 50 years at least 10 mound centers were present, with the three mound groups making up the CAG far larger than the others (Figure 11). These appear to have been integrated into the regional "greater Cahokia" polity. In another 50 years only three mound centers remained, and it is unclear if they were integrated or functioned independent of one another, nor is it clear how many of the mounds at Cahokia proper were in use at this time (Figure 12)

3. What were the roles or functions of Cahokian "outlier" communities?

At the local level; that is, within the "greater Cahokia" region outlier communities were integrated in many ways. One significant way was through ritual and feasting at Cahokia and the other mound centers. Outlying communities also appear to have provisioned Cahokia (and perhaps other mound centers) with deer and maize, some of which was consumed in feasts, but some also kept for redistribution and local use.

At the regional level there are numerous occupation zones surrounding "greater Cahokia", often separated by large unoccupied regions. Trade and conflict occurred between Cahokia and these outlying communities, but they do not appear to have been formally integrated into the Cahokian polity.

At the macro-regional level there are clear Cahokian émigré communities in a number of locations throughout the midcontinent. There are also emissaries present at a number of other Mississippian sites. This suggests that at least some Cahokians were interacting regularly with people at great distances from Cahokia, though the role or function of this interaction is not clear.

Summary of the Discussion

Day One

Understanding the territorial organization of the Cahokian polity is a major problem. Not only are there serious questions about the scale and complexity of the polity, but there are also serious problems of how the polity has been historically understood. For example, images of the site shape both public and scholarly perception, suggesting it was a palisaded village for its entire existence. The truth is much more complex. There are three sites that make up the 'central administrative complex (CAC)' of the Cahokian polity (and these are themselves the 1st, 2nd, and 4th largest mound groups in North America). Another 14 mound groups exist within 25 kilometers of the CAC. There is another whole complex of sites within this 25 kilometer region, including villages in the uplands (e.g. the Richland Complex), as well as large mound sites like Emerald. These sites are well away from the floodplain, and do not accord with the traditional models of Cahokian economy relying on floodplain adaptations. Indeed, there were thousands of people were living in upland communities well away from the Mississippi Valley. Emerald, for example, was out on the prairie, and may have been a pilgrimage site, as roadways connected it to Cahokia and to the Southeast.

There appear to have been two types of Mississippian centers. Some are towns with many residents, and others are only intermittently occupied or used by people gathering periodically. Southeastern Indian contact era 'towns' were socio-political units of widely varying size and shape. So there is a serious question of what constitutes a community in the Mississippian world. The Cahokia heartland is about 2000 to 3000 square kilometers, but was all this part of the Cahokian "community" or "polity"? Confusion over scale results in people talking past one another about what Cahokia was, and what constituted its territorial organization. One way of overcoming this is to think of Cahokia at several different scales. First is the central administrative complex, containing three large mound and plaza complexes (Cahokia, East St. Louis, and St. Louis). The second is an area of regular interaction which might be called "greater Cahokia." This area contains 8-12 mound a plaza complexes with their own internal divisions. This "greater Cahokia" area is itself dynamic, ever changing, but we have good chronological control for many of the sites.

Third is a larger regional scale, including, for example, sites of the Langford Tradition and the Spoon River Focus. We do not have a good understanding of how sites in the larger region tie together. Each region seems to be separated by buffer zones. Perhaps each region reflects a single polity. Clearly there was a significant amount of conflict in this larger region, with lots of houses and communities burned, and considerable evidence of violence in skeletal populations. So, there were lots of people and lots of movement in the polities north of Cahokia. Indeed strontium analyses suggest that the prehistoric period was just as dynamic as the early contact period in terms of population movements. There were also fortified enclaves of Cahokians to the north, for example, at Aztalan in southeastern Wisconsin.

So, what was the areal extent of Cahokia, and was there a single polity? The answer depends on what you mean by polity. There was a Cahokian polity, but it was extremely fluid. At its height it integrated a surrounding region perhaps 30 kilometers in radius. But it is unclear what this means in terms of the nature of the polity. Paramountcies in the southeast at Spanish contact were perhaps as large in areal extent, but not nearly as large in population. There were also asymmetrical alliances that linked independent polities, but it is not clear how strong they were.

Looking outside of North America, early medieval states are "sloppy," with nobles fighting each other and integration occurring at multiple scales--tribute closer in, ritual gatherings from much further away.

It is perhaps important to note that a lot of the people living in the central administrative complex at Cahokia came from elsewhere, based on isotope data. So Cahokia was made up of different ethnic groups, perhaps even different linguistic groups. Movement in and out of Cahokia may have been in groupings like historic Indian towns, rather than as individuals. Migration should be thought about in terms of larger numbers of people. The communities may themselves not be stable. The Holliday site is an example of movement from SE Missouri/west Tennessee Varney peoples. People leave over time and go elsewhere. But there is variability within the Cahokia site in the form of separate "precincts" which could reflect people coming in en mass from elsewhere. Once at Cahokia people seem to switch fairly quickly to a Cahokian way of life. Whatever attraction Cahokia had, it was a powerful one for people across the midcontinent.

Day Two
A basic question is "what is the fundamental structure of the core polity?" Are there redundancies in each of the big three mound groups that might help us understand the 'structure' of the polity? A second basic question is what was the relationship of Cahokia to other sites and areas? Were there tributary polities, was there warfare? There is evidence for emissaries from Cahokia at Lake Providence to the south, and Jeff Brain he argued that a burst of mound building around AD 1200 might have been triggered by emissaries from Cahokia. On the other hand, a lot of aspects of Cahokian religion comes from the south, from the Coles Creek/Toltec site [Arkansas River] region.

We can start to answer these questions if we know something about administrative artifacts or the nature of tributary relationships define the nature of polities. Mapping mound centers might help. Where there are empty areas or buffer zones might indicate administrative regions. The 25km greater Cahokia area is one in which regular interaction could have occurred. The central administrative complex represents the core of the Cahokian polity. The location of ridgetop mounds within this area may equate with kin groupings or other administrative units. East St. Louis, being newer, may have been a higher status community of isolated elites. East St. Louis started out as a residential group, but evolved into an administrative/storage like complex, so may in fact have represented new elites. Cahokia, as the ancestral place, may be where the higher elites lived, East St. Louis may be where lesser elites lived. Toltec has a similar distribution, with a large central mound center and a few smaller outlying centers. It is interesting that using number of mounds as a measure of site size for mound centers in the "greater Cahokia" region gives a rank-size relationship that follows Zipf's law. This suggests greater integration than a simple group of distributed mound centers. So what is the rank size relationship demonstrating? Tribute flow, pilgrimage catchments, or administrative integration?

Population

Answers to the Questions
4. What was the largest population of Cahokia itself?

At its height (ca. A.D. 1100) the central administrative complex at Cahokia contained at least 15,000 residents though this high population was very short lived (probably less than 100 years).

5. What was the largest population of the Cahokian polity?

It is likely that at least 50,000 people lived within the 2000 square kilometer "greater Cahokia" region at its height (ca. A.D. 1100).

6. How do these population estimates compare with later Mississippian polities?

Cahokia is an order of magnitude larger than other Mississippian polities. For example, Moundville, often considered the second largest Mississippian polity, had only 2000-3000 residents in its central administrative complex, and there are a number of sites with similar population estimates. None come close to Cahokia.

Summary of the Discussion

Day One
George Milner estimates that there were roughly 8000 people in the Cahokia central administrative complex and up to 50,000 in the greater Cahokia region after AD 1050. Before that the neither had large populations—perhaps less than 1000 people in the entire greater Cahokia region. With new excavations at East St. Louis the estimate for the central administrative complex needs to be increased to something like 15,000. A lot of our estimates are problematic due to sampling error and varying assumption about household longevity and the number of unoccupied houses at any given time. Even so, Cahokia is an anomaly in the Southeast in terms of size. It is also an anomaly because population surges by at least an order of magnitude within decades and involves a redesign of the countryside.

How much land would it take to support this population? A lot, but the more information we have the more different our interpretations are, and our ideas change with new data. Early site catchment analyses suggested that food had to be coming in to Cahokia. Eric Rupley, however, calculated the catchment needed to feed 15,000 people would be 625 square kilometers, which is well within the possible land area available in the American Bottom. Milner says the same thing—people were not under stress from lack of food, but did need to be provisioned with deer, particularly with skins for clothing. Intensive deer harvesting in the immediately vicinity of Cahokia central administrative complex was likely to be insufficient. Within the greater Cahokia region hunting for surplus production to provide deer to the central administrative complex was likely occurring. Such hunting could well have been ceremonial organized as described for the Andies.

Cahokia is an order of magnitude larger than contemporaneous Mississippian polities. The entire Moundville polity at its peak probably had a smaller population than the Cahokia site itself. The core polity at Moundville had only a few thousand people, and it was anomalous in the region. Does monumental architecture correlate with population? Certainly it measure the labor

mobilized, when the phases of construction are considered. The Lower Mississippi Valley has dense numbers of sites and mound centers, but does not appear to have anywhere near as large a population as the American Bottom. Areas to the east are even more sparsely populated. Intervening polities in terms of scale may have been present, but Cahokia has been intensively studied so we know more about its size.

Day Two
Where are people on the landscape? There are more people living in the Cahokia precinct than in the East St. Louis area, based on the amount of refuse. Storage facilities and East St. Louis were destroyed in a conflagration that looks intentional in nature and may represent a deliberate abandonment. What is going on after A.D. 1150? Could these be independent polities? Could East St. Louis have been "sacked"? Probably not—significant mound building was still occurring and large populations remain. What is the shape of the population falloff curve away from the central administrative complex? Population falls off quickly and then rises again at the Richland Complex, which has 3000 to 7000 people. This pattern occurs in all directions away from the central administrative complex. There have to be subunits that manifest spatially within the greater Cahokian polity.

There would not be any real problem provisioning with maize and fish for the estimated population of the central administrative complex. Those were the twin pillars of subsistence. Deer is still a problem even at lower estimates--they were a scarce commodity, desired as much for food as for hides, though they probably did not contribute a lot to the diet of most of the people most of the time. The Richland Complex and other upland areas produced surplus rather than provisioned Cahokia, but getting the food from one place to the other would have been important. One thing that has not been discussed is the riskiness from one year to the next in terms of floodplain resources, and the nature of the interconnected sloughs (historically flooding can be problematic, and is sometimes localized). Major floods and droughts affect everyone. But smaller segments can be impacted by floods, hence the need for surplus to get people through these tough times. Organizational structure and mobility were needed to accommodate this.

Warfare around Cahokia is a multiscalar phenomenon. We need to look at a very broad geographic area to understand local events, to encompass the midcontinent. In Middle Woodland times there isn't much evidence for warfare. Later, after about A.D. 600 there is more evidence (scalping, embedded arrow points). After about A.D. 1100 there is an increase in numbers of palisaded sites (they were present earlier at Toltec). This increases over time until contact. During the A.D. 1100 to 1200 period there are pockets of evidence for conflict--Western Illinois, from Peoria to St. Louis, also the Ohio confluence area; further north into Wisconsin, Pennsylvania. After A.D. 1300 there is a significant arc of conflict across and around the Midwest. After 1500 conflict appears to intensify in the deep South. Spatial distribution of large population aggregates appears to be further apart than might be expected, and this may be related to conflict.

The notion of a *Pax Cahokiana* may not be viable at a larger regional scale, as warfare is widespread after ca. A.D. 1100. Warfare may ultimately have increased due to climatic change, and specifically by the onset of Little Ice Age. But climate is not the sole cause; rather, there appears to be increasing uncertainty--back to back bad years--tied in with greater emphasis on warfare as a means of solving problems. Unpredictable resource availability is a good predictor of conflict globally. The point isn't major disasters, but greater unpredictability creates a milieu

of distrust, promoting greater likelihood of conflict. Maintaining surplus is critical to maintenance of power.

People have two options when faced with warfare: run away or build fortifications. The Illini hide and run. But palisades are also effective offensive strategies, as they allow you to protect centers with a smaller number of people, and project force outward. There are two types of palisades--bastioned versus less complex, essential screening walls, to prevent surprise. Bastions make no sense unless there are large numbers of people involved. We need to think about different types of warfare and goals thereof. Attackers are often more interested in sacking temples than killing people. Often the goal of warfare is to generate tribute, to keep the people alive but kill or conquer the leaders. It is often not in anyone's interest to destroy trade routes, or peoples.

Economic Organization

Answers to the Questions
7. How was the population of Cahokia supported?

Most residents were self-sufficient, supporting themselves on a combination of maize-squash horticulture, fishing, and waterfowling. Surplus was provided for feasts, and "tribute" or "gifting" supported political and religious functionaries. Deer were also provided for feasts (2000-3000 were consumed in single events) and may have also been provided to political and religious functionaries. Fluctuation in agricultural production (especially due to flooding) would have affected specific areas of the American Bottom on an almost annual basis, and may have required provisioning some parts of the population on an irregular basis. Granaries and other storage facilities may have held the surplus required for this provisioning.

8. Were there markets at Cahokia?

There were probably no markets at Cahokia. Distribution of food and manufactured goods (e.g. shell beads) were likely "event based", taking place at feasts and rituals. Barter or reciprocal exchange was likely part of an informal economy that circulated goods on a limited basis. Some redistribution of surplus production may have taken place as well.

9. What was the organization, scale, and spatial distribution of craft production in the Cahokian polity?

Evidence of manufacture is found widely both within and between communities. There are concentrations of manufacturing tools and debris in some locations, and perhaps facilities that may reflect household specialization, particularly in microblades and shell bead production. There does not appear to be centralized organization of this production, or even clear evidence for "attached specialists".

10. What was the organization and scale of trade/exchange in the Cahokian polity?

There was geographically widespread trade between Cahokia and other communities (and between those other communities themselves) especially along the Mississippi. However, this trade appears to have been low volume, with only small amounts being exchanged at any given time. Canoes identified so far are small, unable to carry high volumes of commodities. There is no evidence for centralized control of this exchange, except perhaps for high-status goods and exceptional ritual objects.

11. What accounts for the wide areal distribution of Ramey ceramics?

Ramey ceramics were transported in small quantities probably by individuals as they emigrated to other communities from the American Bottom. Some may have also contained items being traded between specific individuals. Thus Ramey ceramics may not have been moving "more" than other items but rather along with other items that are less visible in the archaeological record.

Summary of the Discussion

Day One
How was Cahokia supported, and were markets present? No, there seems no evidence for markets at Cahokia. But there is a problem of how we might identify markets archaeologically. Soil chemistry analysis might be feasible. The questions remain, where do household goods come from, and since there is evidence that some raw materials came from far away that may suggest more formalized exchange systems. Riverine travel likely was extensive, and a good way to move goods. Livingood's (2012) least cost pathway analysis shows territorial extent isn't much different when riverine movement is factored in. People may bring things to the center when they come together or ritual.

Craft production (after Cathy Costin's (1991) organization of production model) shows an interesting pattern. There is evidence for marine shell bead production in both households and perhaps larger facilities, and this implies something unusual. The shell material comes from the Gulf of Mexico. Craft production is typically household production in other Mississippian sites, but larger facilities at Cahokia may reflect some other corporate group other than a household. Microdrills are widely distributed, suggesting shell bead manufacture was widespread and probably not restricted (or attached) to elite households. There are, however, are different kinds of marine shell ornaments, and we have to pay close attention to the context of use and deposition of these artifacts. In the Kunneman tract, for example, a lot of shell bead production was occurring--or at least a lot of microdrills were being used in a long linear tract along Cahokia Creek. This is also true in the Powell area—there are a lot of microdrills.

So what do we mean by specialized production or specialized trade? There is considerable evidence for movement of people, and in the historic period calumets offered formal mechanisms to allow such travel. Perhaps the importance of shell is what happens to it at the site. It is unlikely to have been the basis of the political economy. Large-scale microlith and bead production occurs during three major periods in eastern North America--Poverty Point, Hopewell, and Mississippian. In no case do they seem to be the basis of the economy, to be fungible, or to be anything like a medium of exchange. Shell beads may be analogous to pigs in New Guinea or to Potlatch articles on the Northwest Coast. Elite control of commodities in eastern North America never seems to have focused on the commodities themselves, but over the spiritual meaning of those commodities

There is a wide geographical distribution of Cahokian objects across the midcontinent--Ramey pots, long-nosed god masks, copper Braden style objects, among others. What was in the pottery that was being distributed? We know some contained *Ilex*, for example, coming from the south and almost certainly tied to ritual exchange. Ramey ceramics were produced in the American Bottom and traded out, but copies were also made, and it is not always clear whether reported Ramey pots were copies or not. Most Ramey pottery in the deep South consists of isolated sherds, so these items are not moving in bulk. We don't really know that Ramey has moved a lot, or at least a lot more than other items. Really this should be thought of as a context issue. For example, at Aztalan there is a lot of Cahokian Ramey (and Powell Plain), but other sites have only small numbers of sherds (i.e., Shiloh).

How did elites at Cahokia feed themselves? The answer seems to be through a basic staple finance system, with fields for the chiefs worked part-time by commoners, or through tribute.

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Neither requires markets. Market economy involves trading things so exchange is not mediated by kin relations, but is involves either barter and/or a medium of exchange. Most of the people at Cahokia were self-sufficient, but granaries are present in Stirling/Moorehead Cahokia. There is also an increase in internal household storage in Moorehead phase, which may suggest less sharing or "tribute" going on as the population of the region declined. Provisioning could also have occurred up and down the river. There is evidence of maize pollen in swales, and some drainage and irrigation facilities.

Deer and fish were important elements of the food supply. How were these acquired? Probably through provisioning or, more likely, through special procurement for feasting. Ceremonies are really attractive because they are the only time people get to eat a lot of meat is at the associated feasts. And deer would have been plentiful in the region. Deer reproduce rapidly, and sites like Banks show that younger deer are harvested intensively. "Deer make rabbits look like sissies" in terms of reproduction. The biomass is incredible in the Mississippi Valley.

Day Two
What are the bottlenecks or points of control for symbolic and political power? Each individual case is going to have its own particular history and circumstances. So with regard to the nature of food production as well as prestige goods, these do not seem to be readily controllable at Cahokia. Compared to the Bronze Age in Europe, real volumes of materials like copper and amber are moving. We have the boats and the rock art showing them. At Cahokia one does not see much evidence for control of large volumes of material. So, if control is not over wealth, then what? Staples perhaps, but this too seems difficult to control. There were, for example, no irrigation systems evident at Cahokia. Surplus production was directed to creating a built monumental landscape, which seem to reflect a classic corporate/group-oriented system. Cahokia's political economy seems to have been an inherently growth-oriented system, so why does it stop growing? Did the people exceed environmental potentials? Or did the inflationary demands of ceremonies simply exceed the local staple finance capability.

There are many examples of systems that collapse, or systems cycle up quickly and collapse, like Chaco Canyon. Cahokia as an analogous situation. It reaches a threshold and can't sustain itself, at least not as a centralized polity. We still need to ask why did Cahokian legitimization strategies fail? How does spiritual power play into this? Corn has to be a part of the answer, and there is a unique coming together of intensive maize production in a highly productive environment for that plant with massive population concentration and modification of the landscape. It may have been a religious impulse, tied to fertility and the new subsistence economy based on maize that drew people together. In this way the religious system linked to primary productivity, and when primary productivity system gets into trouble, everything else goes down. And the religion is also linked to a place, a created symbolic landscape. It is interesting to note that Cahokia is located not only in an excellent environment for maize production, but also at a geographically central point in the riverine transport network, a point were where tribute might be collected. It might also have made pilgrimage to Cahokia easy for people across the midcontinent.

It is also interesting that the American Bottom has almost no inhabitants until about A.D. 1000. What is the trigger that brings thousands of people to the area in a very short period of time? Perhaps three elements come together. First, it is central in terms of river transport, second, it is under-occupied, and third, it is a good location for a maize-based subsistence regime. The

Mississippi Bootheel would have been another logical place to start an intensive maize-based subsistence regime. But trail networks also are important, and some of the historic east-west ones cross near Cahokia. The number of folks moving through the Bootheel is likely to be very small. The reason Cahokia developed in the American Bottom and not the Bootheel could be in part contingency, and a highly concentrated, productive environment.

The initial residents of Cahokia also manipulate the environment to make it a bounded ritual center in addition to a productive agricultural region. This involved monumental changes to the landform, the creation of a place of power. Monuments are everywhere in the Coles Creek area, but those are not thought to have been inhabited by large numbers of people and the people are basically hunter-gatherers. At Cahokia intensive agriculture is first appearing, and maize and its productivity must be very important to the rise of Cahokia. People came from all over to take advantage of it. Immigration is occurring. Coles Creek people arrive. The Pulcher tradition comes out of the northern Ozarks. Lot of interaction is occurring in the Late Woodland in the American Bottom. They know each other well, so they can easily come together.

Two possible scenarios seem likely. Either one leader gains preeminence, or a confederation of towns work together. Given the diverse group of towns in pre-Mississippian times, is there any foreshadowing of what Cahokia might become? Not really. Toltec is quite large, and alignments at Toltec are comparable to those at early Cahokia, as is the settlement system with one major center and a few outlying smaller typically single mound centers. In the Lower Mississippi Valley there is a deep history of monumentality where people come together. Mound centers are gathering places, rather than permanent settlements. They reflect "structural poses" with different organizations at different times. People build a place to gather, then other things happen and these places get locked in as permanent places of power on the landscape. If everything is happening at Cahokia at A.D. 1050, there is maize for the first time, and this draws people there for the first time. The population influx creates all sorts of social problems and opportunities that didn't exist prior to Cahokia. People were living in communities year round back 5000 years without agriculture, but the gathering pattern is transformed by maize.

If we are talking about large community ceremonies, we have to talk about the mobilization of resources to support them. This is not a potluck. The Submound 51 deposit indicates that these ceremonies or feasts were major investments in labor and mobilization of resources. Perhaps maize was the key to providing resources to support this. It didn't happen before because maize was not a major part of the productive system.

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Political Organization

Answers to the Questions
12. How many levels of organizational hierarchy existed in the Cahokian polity?

There were at least four in terms of settlement, but it is not clear how or even if they were "stacked" organizationally. Smaller mound centers may have been independent but not "separate" from the larger Cahokian polity, perhaps reflecting a form of "complicated factionalism" in a network of elite controlling families.

13. Was there administrative specialization?

Given the population and physical size of Cahokia, there must have been form of administrative specialization, perhaps a complicated bureaucratic form, but not clear what form that took. Evidence of "palaces" atop mounds may indicate the residences of politico- administrative specialists. Mound and plaza groups may represent corporate (perhaps kin-based) political and ritual complexes, each of which would have been maintained by their own administrative specialists or generalized leader. Ridge top mounds may also reflect ritual performances or "tableaus" associated with these mound and plaza complexes. In this control of ritual activity there may have also have been specialists in maintaining and performing specific rituals at various community levels.

14. How were conflicts adjudicated?

Most conflicts were probably adjudicated informally. Given the large resident population in parts of the Cahokian polity, it seems likely that formal adjudication structures were also present, but it is not clear what these might have been.

15. Was there internal warfare? External warfare?

Burial populations and burned houses indicate a high level of violence associated with the Cahokian polity, so internal warfare is likely. There is good evidence for a high level of violence in regions surrounding greater Cahokia, (e.g., the central Illinois River Valley), so external warfare is likely as well (but probably not until the 1200s). The main mound and plaza region of Cahokia was palisaded after ca. A.D. 1200, also indicating a high level of violence. Climatic variability producing unpredictable resource scarcity has been suggested as a factor underlying the apparent increase in regional violence after ca. A.D. 1200. What was being defended? Could it have been the central monuments and associated religious significance? Much of Maya warfare apparently targeted religious constructions.

16. Was taxation or tribute extracted?

Tribute in the form of "staple goods" and special manufactures which were distributed and consumed at feasts were certainly present. Additional surplus production was also likely provided as "tribute" and stored to provision administrative specialists and populations experiencing annual variation in production.

Summary of the Discussion

Day One
Clearly Cahokia was planned. Bill Romaine's (e.g. 2009) idea of design modules may explain how the site was laid out. Might there be other plazas beyond those we know? Perhaps, but they would be difficult to identify. Plazas are typically defined by mounds, some of which may have been destroyed before they were mapped. LiDAR mapping is giving us a much better idea of what was present. For example, LiDAR helped to identify a causeway 25m wide from Monks Mound to Rattlesnake Mound. Geophysical work done by Dalan and Hargrave has also helped, but a lot more of the site needs to be done. Regarding the central administrative complex, we don't know what is between Cahokia and East St. Louis. Only about 10% of East St. Louis has been examined, and even less of Cahokia proper. Most of the St. Louis mound group was destroyed before any examination was done. We need to think about Cahokia Creek as a transportation artery linking many of the sites together. The various centers have different durations. Ceramic dating is used for much of the area, and it is imprecise.

In terms of the Cahokia regional settlement system, Fowler and Emerson's models suggest a number of tiers. The bottom of settlement hierarchy is more fluid than we once thought. There are not just farmsteads, but many other site types (nodal households, rural temples). How they came together at a higher level is uncertain. The FAI 270 project allowed a look at the countryside, not just at the centers. Probably 10-15% of the sites are special sites in the countryside. In addition, there are 14 mound centers in the greater Cahokia region. But there are also lots of missing pieces in our knowledge of the settlement hierarchy.

Does the settlement hierarchy form an organizational hierarchy? If not, how do they fit together? Fowler's model suggests a strong tribute/economic basis for the hierarchy, but there are other explanations. If one looks at the plans of the sites, they are each different, so there is not control over the planning of sites across the greater Cahokia region. On the other hand there has to be some form of hierarchical organization to keep 15,000 people in line. At Cahokia there may have been no difference between the religious and political hierarchy. They were interlocked, impossible to disentangle. There are ethnohistoric examples of similar cases, for example in Madagascar and Hawaii one capital may be dominant but others also exist. Factional competition creates new capitals. This might explain the creation of East St. Louis. Hierarchies of councils may also have been present, and these units, however constituted, would have had internal factional competition as well.

Are there palaces at Cahokia or other evidence of high-status elites? A large building was present on top of Monks Mound and atop other mounds at Cahokia, but how they were used is unknown. In Mississippian in general there are political officials and there are priests, and they are not entirely separate. Among the Natchez, for example, a lot of "prestige goods" were actually sacred objects, which were sometimes maintained in bundles. Different parts of the Mississippian world had different religious foci. Later Mississippian leaders figured out what earlier Cahokia had not in terms of how to survive over the long turn. That's not to say that Cahokia was unsuccessful, but there wasn't enough time for a state and the networks that made it possible to reconstitute, but it likely would have eventually. The network of interacting smaller polities in the central and lower Mississippi Valley may represent the collapse phase of a rise and fall pattern of state formation, if the European biological warfare hadn't intervened. Ties might

have been with the Caddoan area if the Spanish hadn't come in. The people that were a part of Cahokia made a conscious decision not to continue after ca. A.D. 1250.

What were the demographic consequences of Cahokia's collapse? The health of Cahokians was no better or worse than other Mississippian populations. There are parallels between Cahokia and Moundville, as both build rapidly, then fade away. But the opposite occurs at Poverty Point, where the biggest construction occurs last.

Was there a monopoly on the use of force at Cahokia? There is lot of diversity at Cahokia. There are Caddoan materials at East St. Louis, Coles Creek materials elsewhere. It was a true metropolitan environment. Warfare varies widely over the regional landscape. What are the goals of the warfare? It might be that warfare provided the sacrificial victims or captive slaves, though Mound 72 biodistance studies suggest that the sacrificed individuals are not different from the locals. And, by the way, the beaded burial is a man and a woman, and there are men in the female burial pits.

Day Two
What is a polity as the term has related to Cahokia? Seems to be situational, nested, dependent upon circumstance. We need better dating at specific sites (high precision dating of construction episodes; that is, what is being built when). These events need to be tied in with increased examination of year to year climatic variability (dendroclimatological as well as palynological), and local versus larger scale climate factors, and how this played out over the region. Fine grained chronology is important to reconstructing regional political geography both before and after the "big bang" at Cahokia. We also need explicit evidence for ties to particular places like Toltec, the Coles Creek area. We assume Cahokia drew people in. What if people came there to take over, take advantage of the great location?

The idea that everything is within ca. 30 km surrounded by a void, or buffer zone is interesting, as the location of empty areas or buffer zones might be a good way to determine the extent of regularly interacting polities. Does the number and locations of mounds equate with numbers of social groups or people using the area? Certainly they measure the amount of labor, which can be mobilized by a center. Are there ways we can determine social groups through paired mounds, ridgetop mounds? How was labor mobilized to build these mound centers? Over what scale and for what reasons? Warfare and massive monumentality involves larger numbers of people and greater administrative control than (perhaps) tributary/provisioning which is probably linked to more local sites or neighborhoods.

How was all this maintained in terms of information flow/ monitoring production/ coordinating ceremony and warfare, and the periodicity of ceremonies/events? How did communication within the polity occur, other than by on foot or by messengers? The tops of the mounds in the three subsidiary centers can be seen from each other. This provides not just a means by which community leaders could communicate with each other (using smoke and mirrors, after Lekson's (e.g. 1999) arguments for Chaco), but they can also monitor the actions of the commoners and lesser elites. Visual dominance would have been maintained by those residing on Monk's Mound. Elites like to be visually dominant, commoners were clearly not.

What is the evidence in the form of symbolism or iconography for ranked clans or otherwise for elites? What might they have been? Do any symbols suggest administrative or religious

specialists in the archaeological record at Cahokia? Are there shared symbols or emblems of office/roles? Are the Ridgetop mounds tied to specific social groups? What about Gorget styles? We need to find and examine more burials than those in tableaus like Mound 72.

Just as beginnings are important, so too are endings. How did Cahokia "collapse"? We have a 5000 year history of people coming together at particular places, but they never lasted very long, no more than a few centuries. Cahokia is part of this pattern, at a large scale. Why didn't it "stick"? Was there some kind of de-legitimization of what formerly made Cahokia important? Or did people simply no longer need what Cahokia provided? Who was the palisade at Cahokia built to protect? And from whom? There appears to be a change in religious emphases from lunar to solar imagery as the climate deteriorates. Perhaps uncertainty of primary productivity leads to de-legitimization of the polity. Also, of course, rise of rival polities elsewhere in the region may have succeeded in overthrowing the ruling elites, and perhaps preventing this was the role of the palisade.

Why didn't Cahokia re-emerge? There was simply not enough time before contact to allow a resurgence somewhere. Historic trajectories elsewhere in the world suggest that often times centuries elapse between decline of one overarching polity and the rise of another. Cahokia created a historical environment/set of circumstances others could emulate or seek to avoid. Perhaps there was no desire to re-create it.

Ridgetop mounds are virtually unique in the Eastern Woodlands, but there are 16 such mounds at Cahokia. These mounds started out as platform mounds with "performance" burials; that is, dead bodies are being used to tell stories. We don't know who they are, but they are the closest we have to the movers and shakers. Their burials created a tableau to legitimize their status and their descendants. They date from ca. A.D. 1050 to 1150, during the peak period of Cahokia. The alignment of these ridgetop mounds seem to be cardinal, but most are gone, so we cannot know for sure. They contain trenches full of sacrificial victims, and no single burial interments. They reflect a corporate mortuary behavior with selective destruction of wealth, like in Hopewell pipe destruction. Who or whom is doing this? Kings? Corporate groups? These are mass ritual events with a lot of sacrifices, far greater than anything seen in eastern North America before or since.

Sacrifices were also included with big posts, found throughout greater Cahokia, and which may have represented ancestor spirits. The sacrifices may have been offerings to the post and what it represents. Posts could also be calendrical. What is the Woodhenge at Cahokia used for? It may be an extension of the importance of posts in Mississippian religion or identity. Woodhenge becomes less significant once we realize that there are lots of posts everywhere at Cahokia. It is interesting to note that there are posts in Coles Creek sites, and wood for Cahokian posts (Bald Cyprus) comes from farther south, as do shell for beads.

Social Organization

Answers to the Questions
17. How many levels of social stratification were present in the Cahokian polity and how did this change over time?

There appears to have been at least three: elites, nobles, and commoners. Membership was likely kin or descent based. There were also likely captive slaves, but these positions were probably not hereditary.

18. What were the roles/activities of members of the highest social strata?

Members of the highest social strata probably included chiefs, sub-chiefs, elders, priests, and other religious functionaries. They controlled symbols of power and the physical and perhaps social organization of landscape. They resolved conflicts and organized labor for public events and the construction and maintenance of public facilities. They scheduled and officiated at public events. They were also engaged in external relations with other polities.

19. What were the roles/activities of members of the middle or lower social strata?

The middle and lower strata of Cahokian society included kin group leaders and lower-level religious functionaries, as well as semi-specialized warriors and traders. Commoners were by far the largest group in Cahokian societies, and their activities focused on the basic production of food, utensils, and public works.

20. Were internal divisions (e.g. moieties) present?

Sodalities are common among historic Native American groups, and may have been present at Cahokia. Indeed, mound complexes may have been organized around sodalities rather than around kin groups. The physical organization of the Cahokia site itself may reflect the presence of a moiety (north sky / south earth). Perhaps these sodalities were secret societies.

21. Was there class endogamy or hypogamy?

There is no evidence available to provide an answer to this question.

Summary of the Discussion

Day One
Three levels or status groups likely present (elites, nobles/mid-level status, commoners, with subgroups within each), together with different clans. Sodalities were also likely present. Majority of people working today are looking at the Osage/Omaha for parallels, despite the fact that these societies never had the settlement or monumental scale of Cahokia. There may be moieties associated with secret societies represented at Cahokia (earth and sky) with crosscutting membership. Elites associated with symbols of the cosmos, and the organization of the landscape. Rural elites were probably related to the elites at Cahokia. Was there a paramouncy at Cahokia, was there a war chief and a peace chief, a council of elders? They would have been involved in conducting and scheduling ceremonies, maintaining order, celestial observations, managing the landscape, directing art and architecture. Mid-level elites exercised local control,

and were traders, warriors, lower level priests. Commoners were the primary producers of foods and perhaps some craft goods. They also served as the source of labor mobilization.

We know nothing of kinship, what it was or how it changed over time. There are changes from household to ritual to residential areas over time in Tract 15A, and the ICT shows changes over time in residential areas (over ca. 200 years). East St. Louis shows greater order in residences with houses in rows. A basic Cahokian residential / kinship module may have included a council house, a sweat lodge, and other buildings. The problem is that we have small slices of the landscape, with only small parts of the site carefully excavated, so it is hard to resolve a larger structure.

Were slaves present at Cahokia? They are common in ethnohistoric reports from the midcontinent and elsewhere in North America. Captives and adoptions were likely, but no real cemeteries at Cahokia have been examined yet so we cannot tell how diverse the population was. It is clear that different groups came together to create Cahokia, not just one group creating it and others joining it. They came with their prior structure, and remade it at Cahokia. Alignments of differing mound sites may reflect earlier different traditions. People from a number of places came together. This might be part of the problem with understanding Cahokia.

Religious Organization

Answers to the Questions
22. Were there religious specialists at Cahokia?

The physical cosmography of Cahokian mound centers and the locations and cosmography of some outlying communities reflects careful planning and implementation. Those who planned and organized the construction of the Cahokian cosmographical landscape can be interpreted as being religious specialists.

23. Were there pan-Cahokian rituals which involved distant centers?

Feasting almost certainly connected centers with one another. Roadways link external centers to Cahokia providing a physical connection between them. Lunar alignments both within centers and between them and Cahokia indicates close ritual connections. Cahokia also "exported" people and ritual to distant sites outside the greater Cahokia region.

24. Were there anthropomorphic gods?

There are a number of anthropomorphic figures found repeatedly on Cahokian ritual items. These include the "Old Grandmother," the "Long-nosed God," and the "Hawk-man." These figures may represent anthropomorphic gods.

Summary of the Discussion

Day One
When we talk about Native American religion, little things mean a lot--feathers, rocks, the histories of native peoples. People build their own histories and value systems, and we cannot forget this. We also cannot forget the exceptionalism of Cahokia. And we need to keep in mind problems with the "direct historic approach"--using contemporary pueblos to evaluate Chaco doesn't work, as they are a reaction to what happened at Chaco. Starting on an ontological note, religion may not have been all there at the beginning but was present and increasingly built along with Cahokia. Religion isn't necessary a good word. It was a way of living, a relational ontology between people and the surrounding world. Forces were in the world with power, agency. Historically people in the Plains and the Southeast didn't want to get "crosswise" with powerful forces, and priests were at the intersection of people and these forces. Visionaries create new ways of interacting with the supernatural. The Hopewellian world doesn't have much you can label as political, but there was a lot of organization involved.

The Toltec site in Arkansas is an example of a major center with lunar alignments. Bill Romaine (2009) argues that this esoteric understanding of the moon/lunar standstill 18.6 year cycle was transferred from Toltec to Cahokia about AD 1050. Emerald, Illinois, seems to have similar alignments ca. AD 1000-1050 along with lunar shrines with roadways. Could this be a reason for Cahokia coming into being, as a place of power? The moon is important to emergence of early Cahokian religion. The mass burials at Mound 72 are lunar aligned. The beaded burial is a little off. Some of the temples are lunar aligned, often very precisely. Emerald is perhaps the best case making this argument, both in terms of alignments, and sacrifices associated with markers. Cahokia has a weird alignment. The point of this is that there are a set of associations that we see archaeologically: women, lunar alignments, old woman. Underworld, serpents, agriculture was

what was traditionally considered. Experiencing the moon when the alignments click may have been a powerful experience.

There appears to be a revision to a solar alignment after A.D. 1200 or so. What happened to the lunar alignment? Cahokia picks out pieces from what came in, and solar symbolism became more dominant later. Did realignments occur related to changes in religious beliefs? Cahokia becomes a place of pilgrimage, and once it is copied and reinterpreted elsewhere, perhaps people did not need to go there. Trempeleau and Aztalan represent peoples from Cahokia who moved a long distance north. Perhaps these were attempts to proselytize. These missions targeted high population density areas, where older mounds were present, perhaps to establish linkages with earlier power centers.

Cahokian architecture is distinct, and has a religious flavor in terms of marker posts and L-shaped buildings. But there appear to be no burials of paramount chiefs at Cahokia. There are 250 people in Mound 72, what Jim Brown has described as a tableau. The beaded blanket burial has been interpreted as a paramount chief (but probably wasn't). Why not? What was it then?

Day Two
Was Cahokia a religious/ritual center in the sense of Renfrew's (2001)"loci of high devotional activity"? Cahokia was syncretizing information from many parts of North America, much as Poverty Point did earlier. It was a place designed to bring people together. The population growth far exceeds what biological reproduction would bring about, so people are definitely coming in, perhaps in large numbers. Cahokia is a large community doing community things, but it is also a means of defining and binding the cosmos. We no longer think in terms of power models for sites like this, but how does the political and religious economy work together? Religion alone doesn't explain it, as religion is a way of living. There has to be someone or some group that bring about what is seen--like designing a 17ha plaza with a massive mound at one end. There are ethnographic analogies; for example Nuer mound building from the late 19th/early 20th century shows what a charismatic leader can do. They attract followers who bring food and build a mound (30m mound with elephant tusks at the base). Can that sort of activity be translated into what happened at Cahokia? Earlier mound constructions in eastern North American are one-off things, and when the leader dies, the site is abandoned. But Cahokia seems to represent an institutionalization of the practice of mound building.

If something like Cahokia is born of a religious phenomenon, is there is no smoking gun for this? The political process seems to trail or be contemporaneous with the religious development. Why do people need this? What is driving people to do this? Perhaps it is a reaction to success--How do we deal with large numbers of people coming together? This is why we need to have the high resolution histories of these monuments--it is a very structured plan, the design of Cahokia.

Terminology works to bring people together or force them apart. We agreed not to get into debates about definitions. We are looking at variability, how decisions are made, so we use our terms like 'administrative center' to help partition the world. Think about connected subsystems instead of economy, think about craft subsystem and subsistence production. Politics is where higher level disputes are taken care of, administration tied with control over daily activities. Substitute 'ritual practice' for religion. Ritual involves public performance (Rappaport 1979)— there have been almost as many fights about what 'religion' is as there are about what 'culture' is or means. Religion as a separate subsystems with staffs of priests tend to occur in imperial/post-

imperial periods, and does not appear formally in early stages of complexity like Cahokia. Religion entails: discourses, practices, communities, institutions. This is not any different from the Boy Scouts!

What do we mean by control? More nuanced than a top-down situation. Power in Cahokia is related to leaders controlling religion--they use the system to reinforce their positions and authority. Control may be a better term than power. Control is variable, situational, context specific, and there are degrees of control. The false dichotomy between top control and communal control bedevil Cahokian archaeology. Stalinist versions of Cahokia are less realistic than kinship/community based control, but we can't take this to an extreme, we can't throw out the baby with the bathwater. There are differences that need to be examined. There are institutions as well as kinship systems. Terminology divides us, and can bring us together. Each term has a theoretical significance that frames our arguments. We need to be careful in how we are defining things, and using them. Are people using terms in a useful comparative perspective?

What Have We Learned About Social Complexity at Cahokia?

Peter N Peregrine

The answers provided by the working group seem to point to Cahokia being an urban settlement that was the center of a regional government, but the picture is not entirely clear. Cahokia was certainly urban in terms of its population and its spatial plan. Cahokia was also the center of a regional government of some kind, at least for a short period of time. There was a four-tier hierarchy of sites, and these sites were integrated in terms of the organization of ritual space and in terms of material culture traits. Indeed the ritual spaces were integrated strongly enough that they appear to follow Zipf's Law in terms of mound volume.

However, Cahokia does not appear to have achieved the organizational complexity expected through the scaling processes described by Ortman in the first section of this document. There is little evidence for occupational specialization and virtually no evidence for diversification of occupations, as would be expected if Cahokia followed the scaling laws identified through the "Principles of Complexity" project (e.g. Bettencourt 2013). There is also little evidence for political or economic integration beyond Greater Cahokia. There is no evidence for markets, no evidence for standards of weights or volumes (although there may have been a standard unit of length used to lay out ritual spaces), no maker's or owner's marks; in short, nothing that would suggest an integrated economy of any kind.

Regional political integration appears to have been an essentially ritual one; that is, the site hierarchy that is present appears to be more of a hierarchy of ritual spaces than of political jurisdictions. That said, it is difficult to know how one might expect to identify different levels of jurisdictional hierarchy in the Cahokian polity. Cahokia is "faceless" (Renfrew 1974). There are no inscriptions, images, or even unambiguous houses or burials of political leaders. And yet *someone* (or some group) was organizing Cahokia, supervising the building of ritual spaces, maintaining peace within the community. Who were these people, and what was the basis of their authority?

A common path along which political hierarchy evolves is from a priesthood to a ruler-priest to a king. Such a path has been posited for Mesopotamia, Egypt, and China, for example. China is illustrative. A basic task of Shang "kings" in the early period of political integration was to interpret the cracks on oracle bones. They were, in other words, diviners, and an important element of their authority was rooted in their ability to use supernatural power to divine the future. Part of the future they were expected to foresee involved interactions with rival polities, and in time Shang (and later Zhou) "kings" shifted from being diviners to being diviner-warlords, using their access to supernatural power (or perhaps supernatural "approval" as legitimate leaders) to aid them in defending their realm and conquering foes.

Cahokia may have been led by a priesthood or a group of ruler-priests, but a shift to "king" does not appear to have happened at Cahokia, perhaps because there were no rival polities of Cahokia's size and thus no regional scale conflict to foster consolidation of power (Redmond and Spencer 2012). On the other hand, Cahokian priests may simply have had no interest in consolidating power. Or, perhaps, other conditions—environmental, social, even ritual—led potential subjects to abandon Cahokia before political power could be consolidated. In any case, power appears not to have been consolidated at Cahokia, as would be expected under traditional theories of social complexity.

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Of course there is one important difference between Cahokia and the early Chinese, Mesopotamian, and Egyptian states—there is no written record for Cahokia. It is an interesting question whether or not we would understand the authority of Shang kings or the complexity of the Shang state without the later writings of Sima Qian. Perhaps Cahokia was as complex as other early states, but because we lack both contemporary written records and later written histories, we underestimate the complexity that accumulated there. When we consider the fact that more than 15,000 people were living in Cahokia's central administrative complex, we have to conclude that someone or some group was coordinating the day-to-day necessities that such population density creates, and that source of coordination remains elusive.

Cahokia, then, provides us the opportunity to examine a situation in which traditional theories of social complexity may not hold. Cahokia may be a rare, perhaps unique, case where urbanism evolved without a supporting regional bureaucratic administration. Cahokia does not appear to follow at least one of the scaling laws developed through the "Principles of Complexity" project, under which we would anticipate much greater organizational complexity than appears to have been present. Cahokia contains many hallmarks of an early state—large population, massive public architecture, concentration of "wealth" objects within specific precincts, staple finance support of public ritual and ritual organization—and yet Cahokia lacks an obvious regional administrative structure. So while we have learned much about social complexity at Cahokia, much work remains.

Figures

Figure 1. Correlation between ACE complexity score and the log of the largest settlement population. Archaeological traditions are plotted as open circles, with the Mississippian (Cahokia) tradition highlighted as a solid circle.
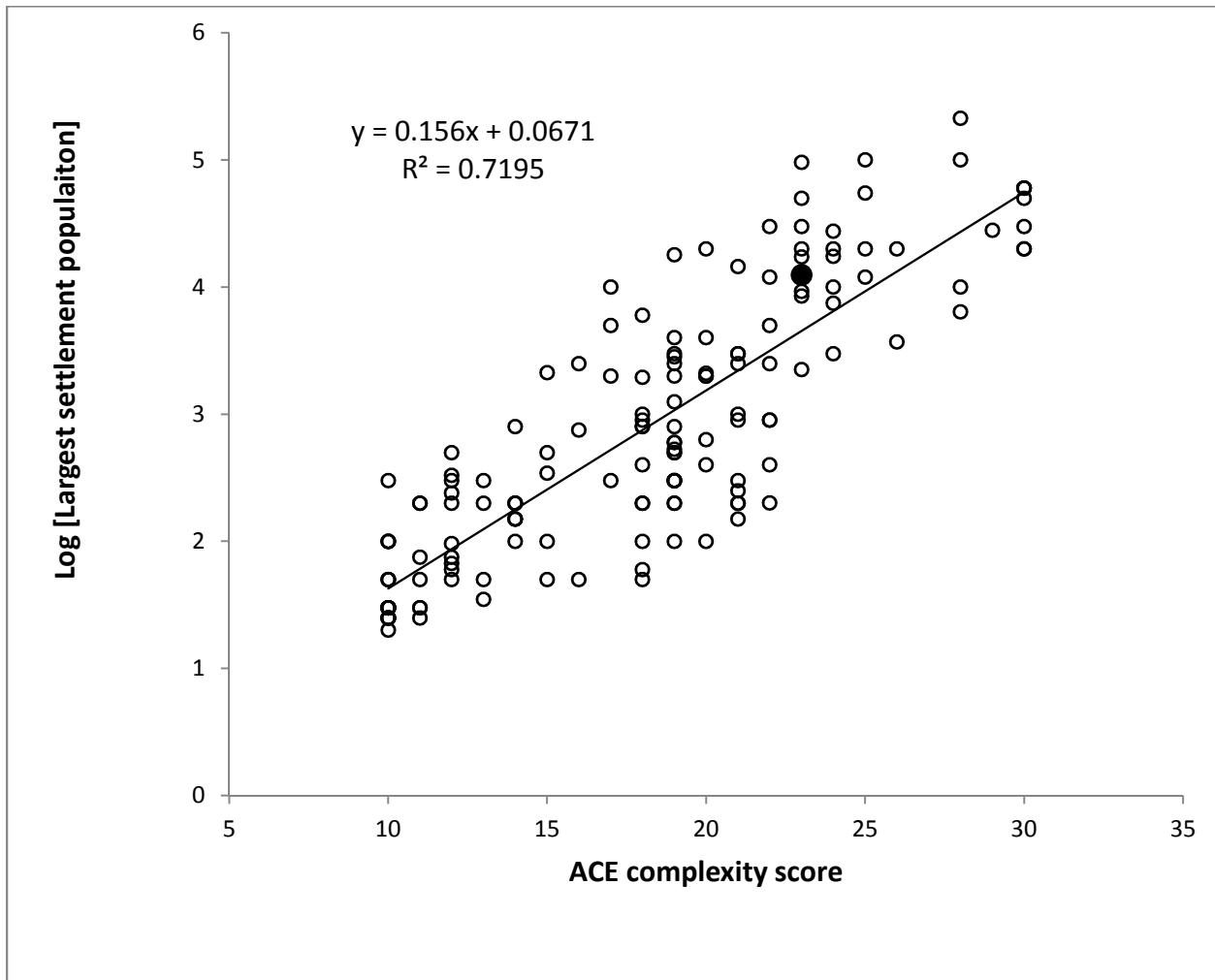
Figure 2. The history of energy capture and social organization in Western (A) and Eastern (B) civilization, 16,000 BP to the present. In both charts, the dashed line represents $y_t = y_0 N_t^{1/6}$, where y_t is an estimate of energy capture rate per capita at time t, y_0 is the minimal energy requirement of an individual (2,500 kcal/day), and N_t is the population of the largest settlement at time t.
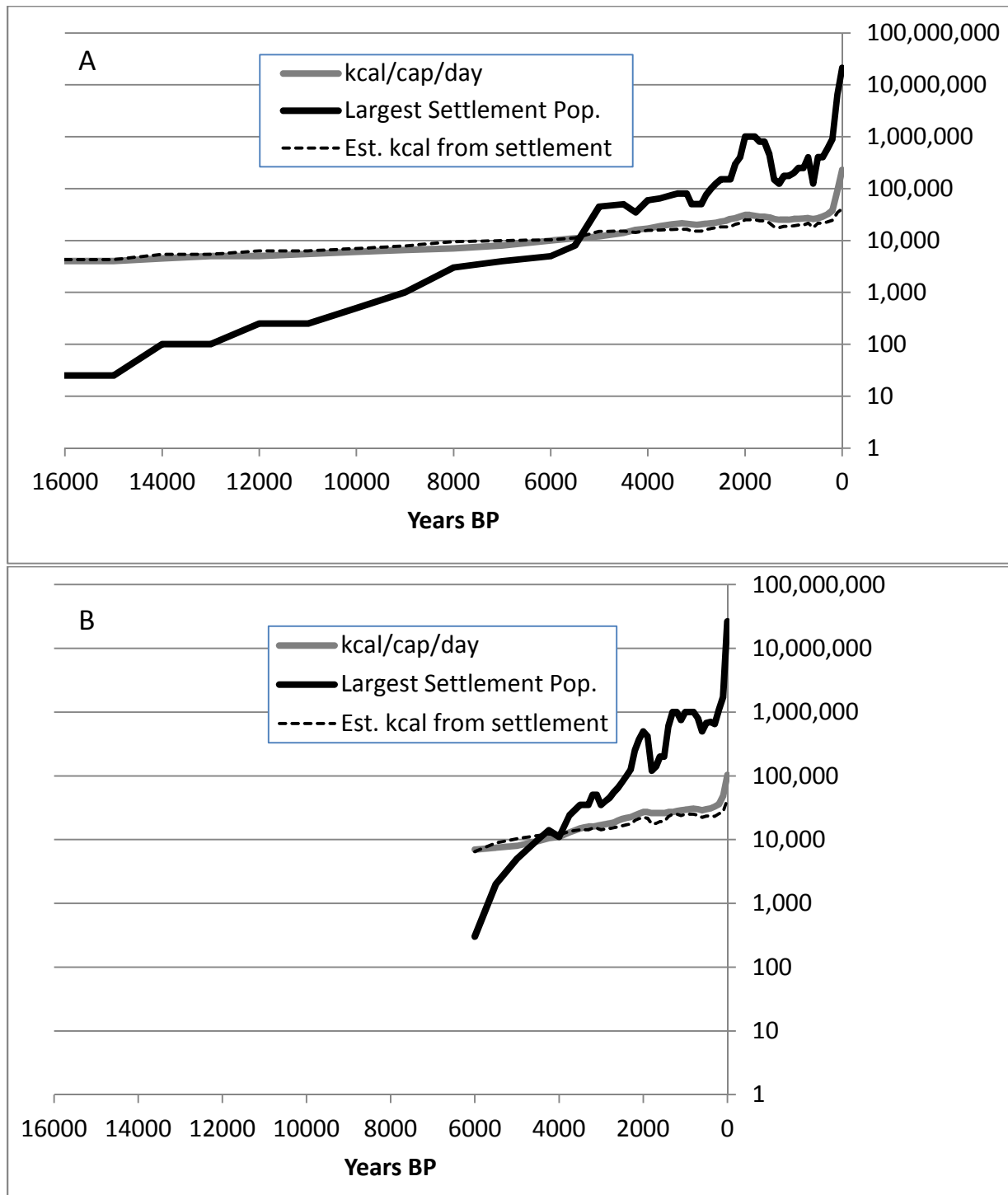
Figure 3. Time in years before present vs. the largest settlement population of archaeological traditions.
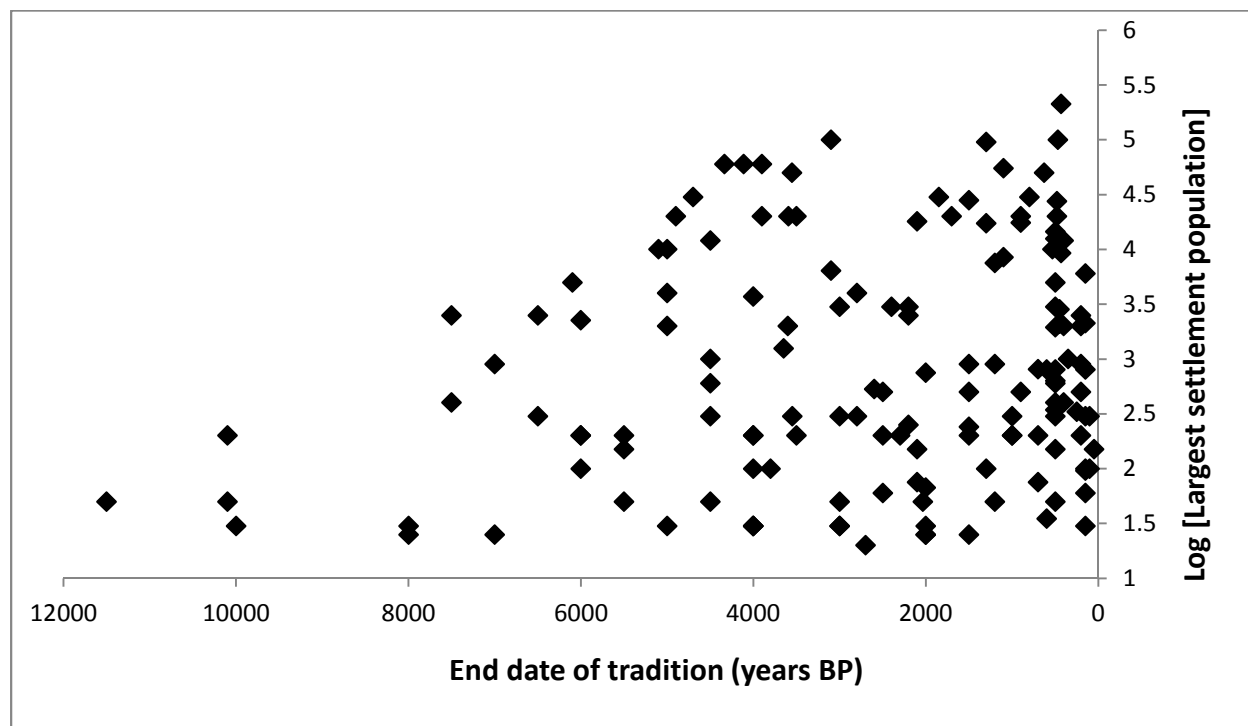
Figure 4. Largest settlement populations vs. health for a sample of New World societies.

$y = -1.4151x + 23.496$
$R^2 = 0.4096$

(Health Index vs. Log [Largest site population])
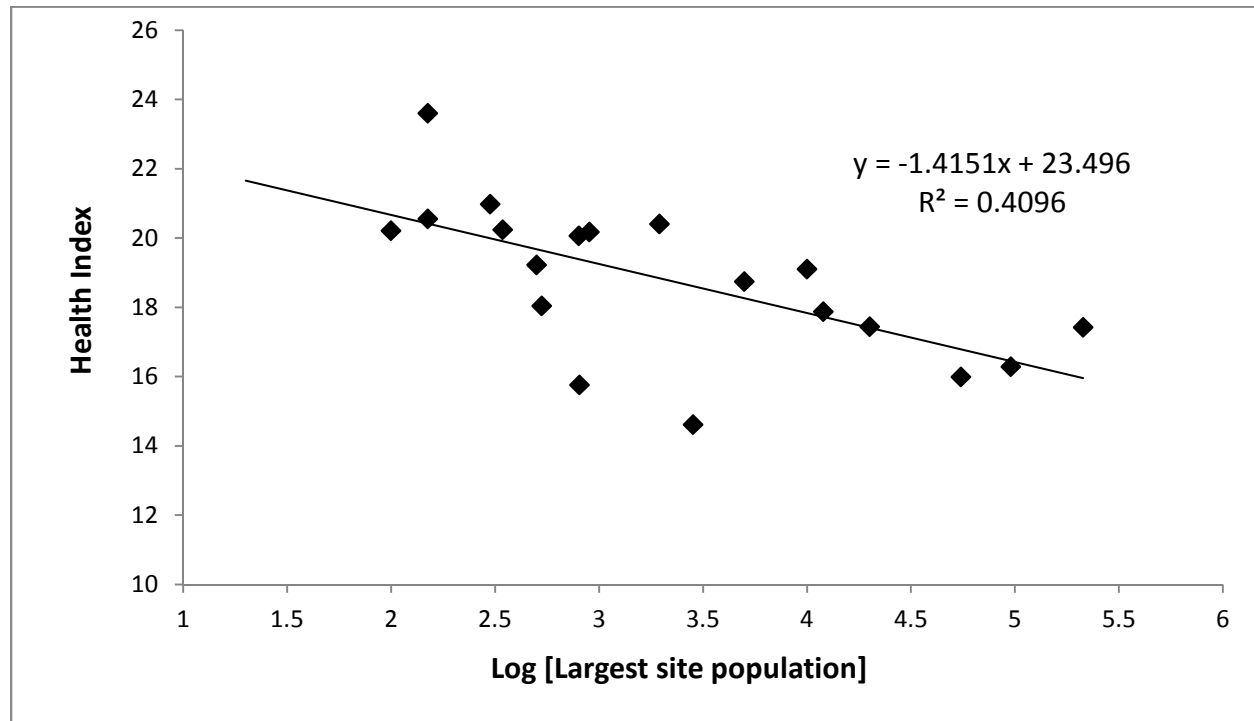
Figure 5. Intrinsic productivity of environments (net-primary productivity of the most productive area) vs. largest settlement populations for archaeological traditions. Traditions from areas of primary state formation and Cahokia are emphasized.
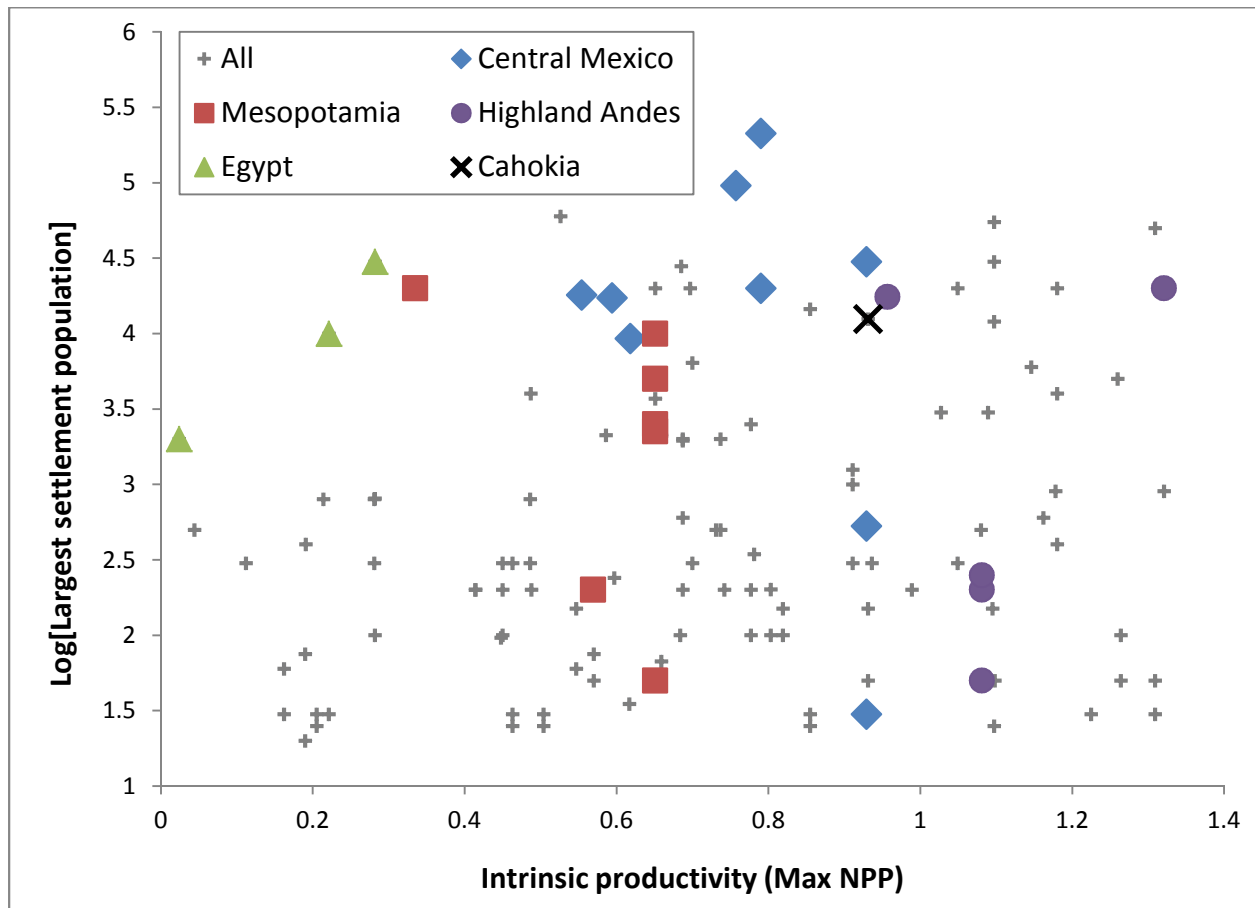
Figure 6. Time from primary agricultural dependence vs. largest settlement population. Traditions from areas of primary state formation and Cahokia are emphasized.
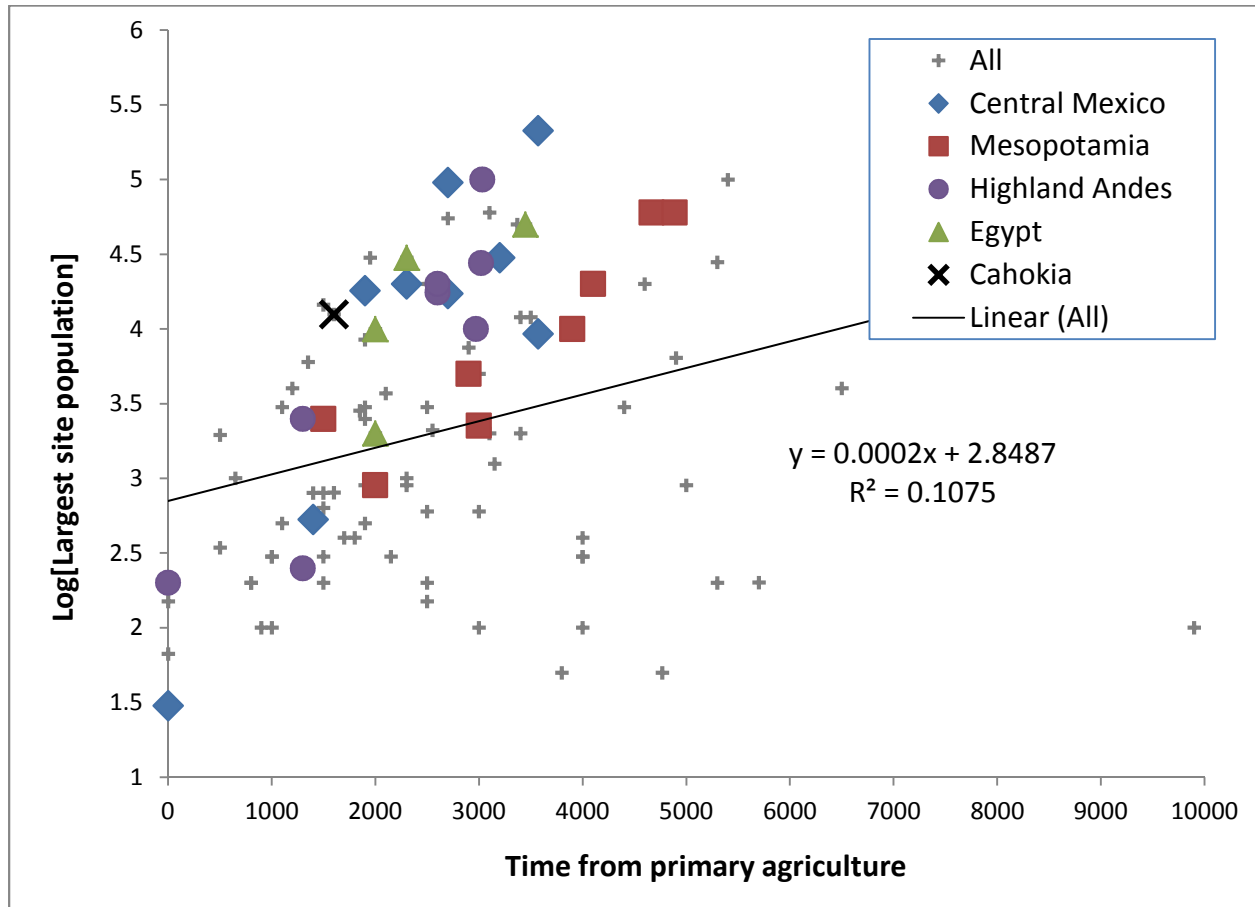
Figure 7. Population vs. settled area for the largest settlement in archaeological traditions. The solid line represents the best-fit line and the dashed line linear scaling. Cahokia is marked by a solid circle.

$$y = 0.0463x^{0.8653}$$
$$R^2 = 0.6958$$
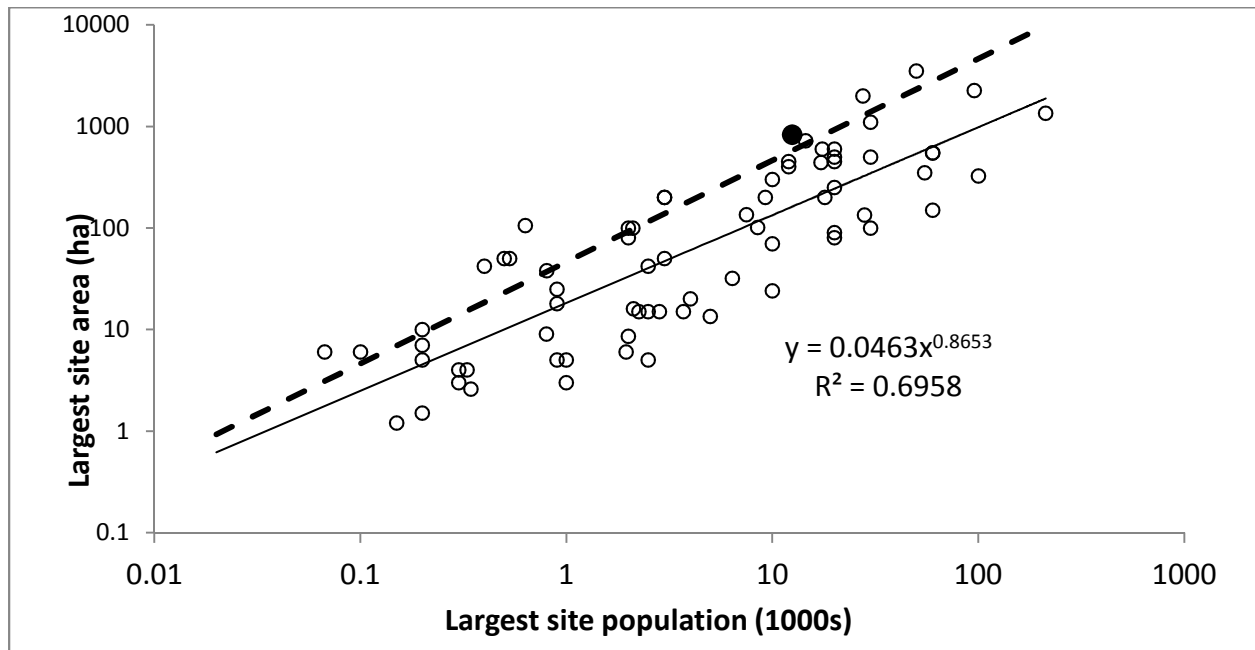
Figure 8. Histogram of largest settlement populations across archaeological traditions.
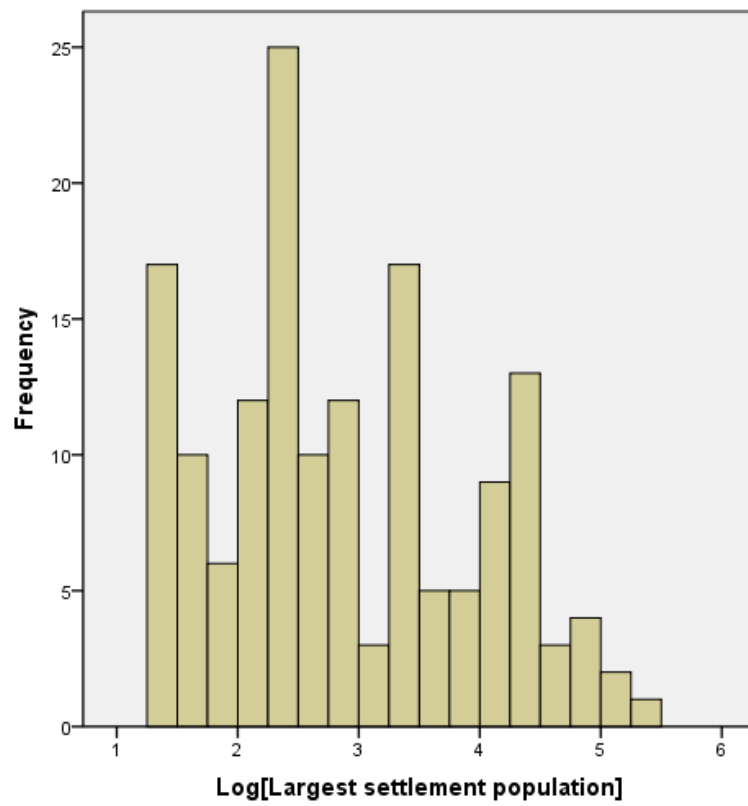
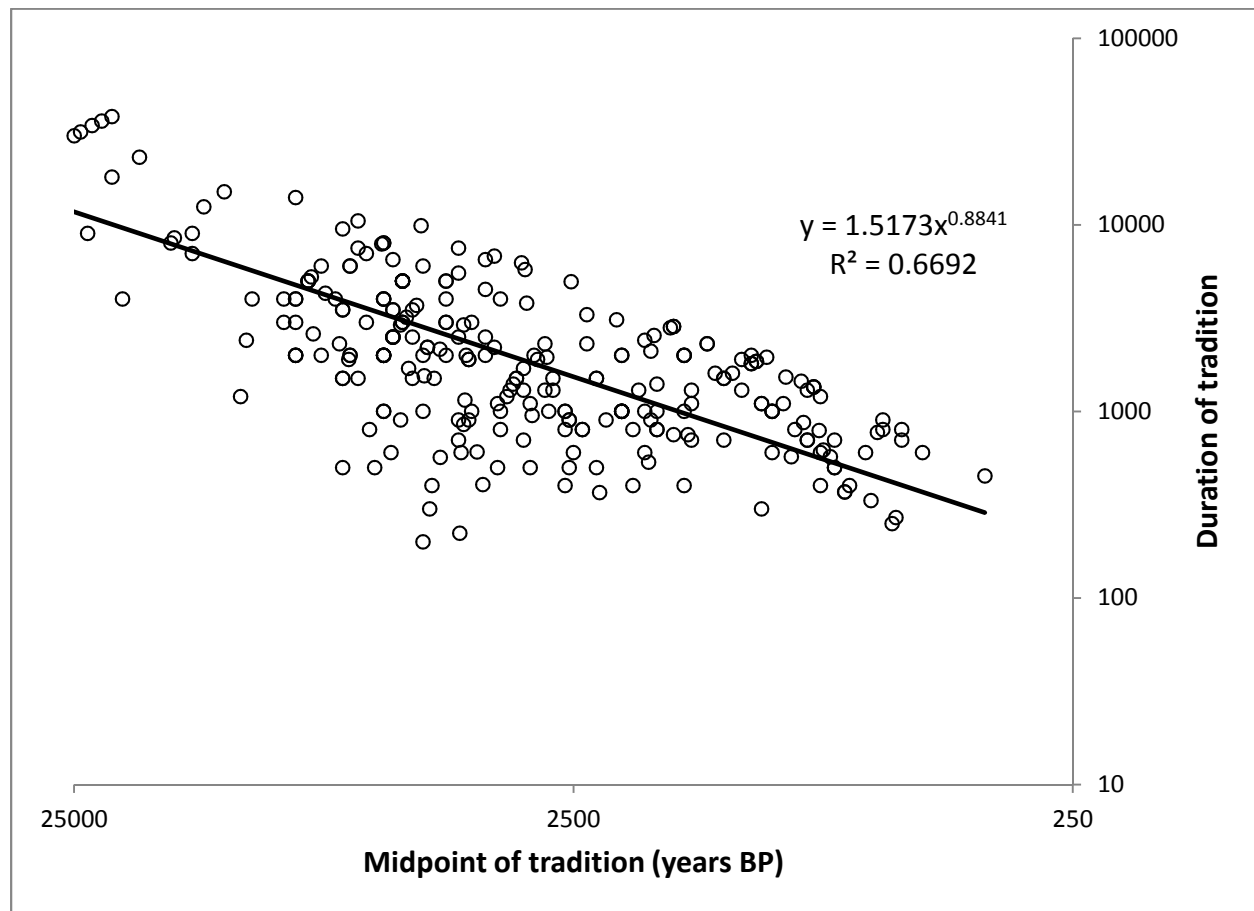**Figure 9.** Midpoints vs. durations of archaeological traditions.

$y = 1.5173x^{0.8841}$

$R^2 = 0.6692$

Duration of tradition

Midpoint of tradition (years BP)

Figure 10. Mound centers in the American Bottom before A.D. 1050. The red line reflects a possible division between two polities.
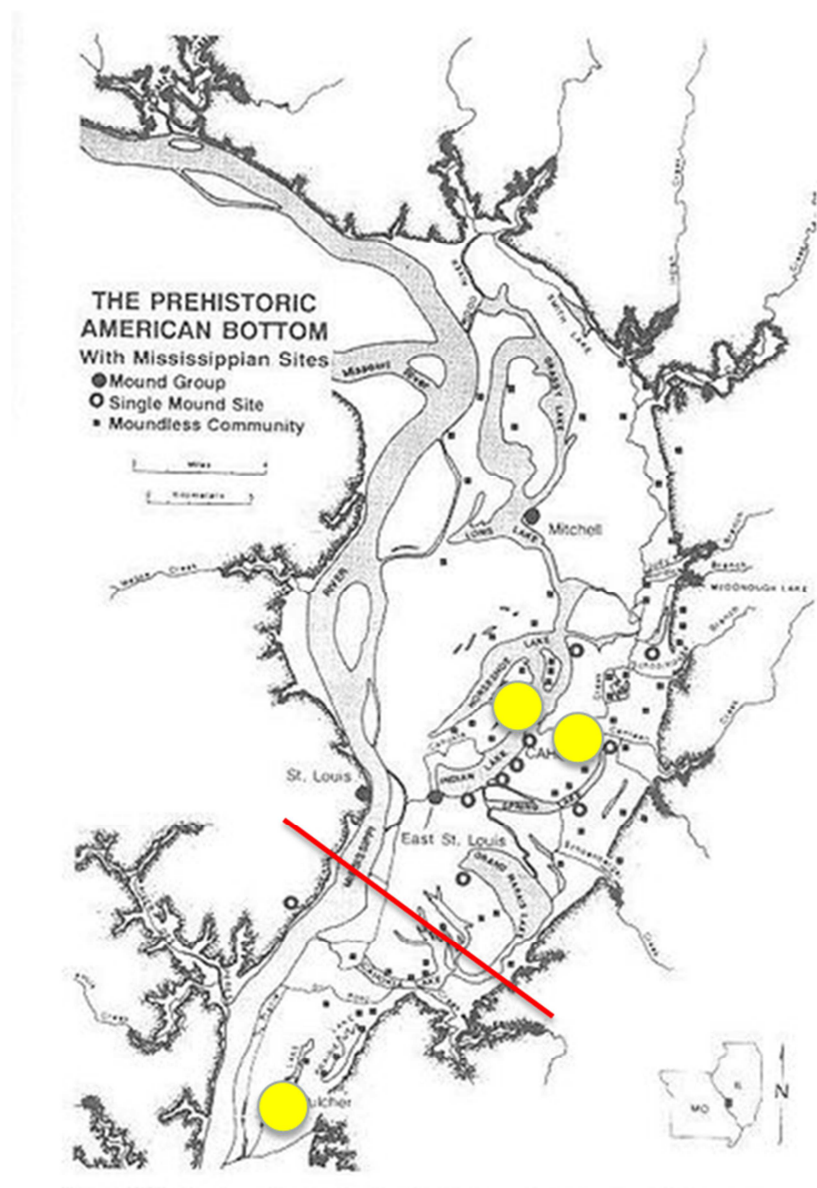
Figure 11. Mound centers in the American Bottom between ca. A.D. 1050 and 1150. Numbers represent the number of mounds.
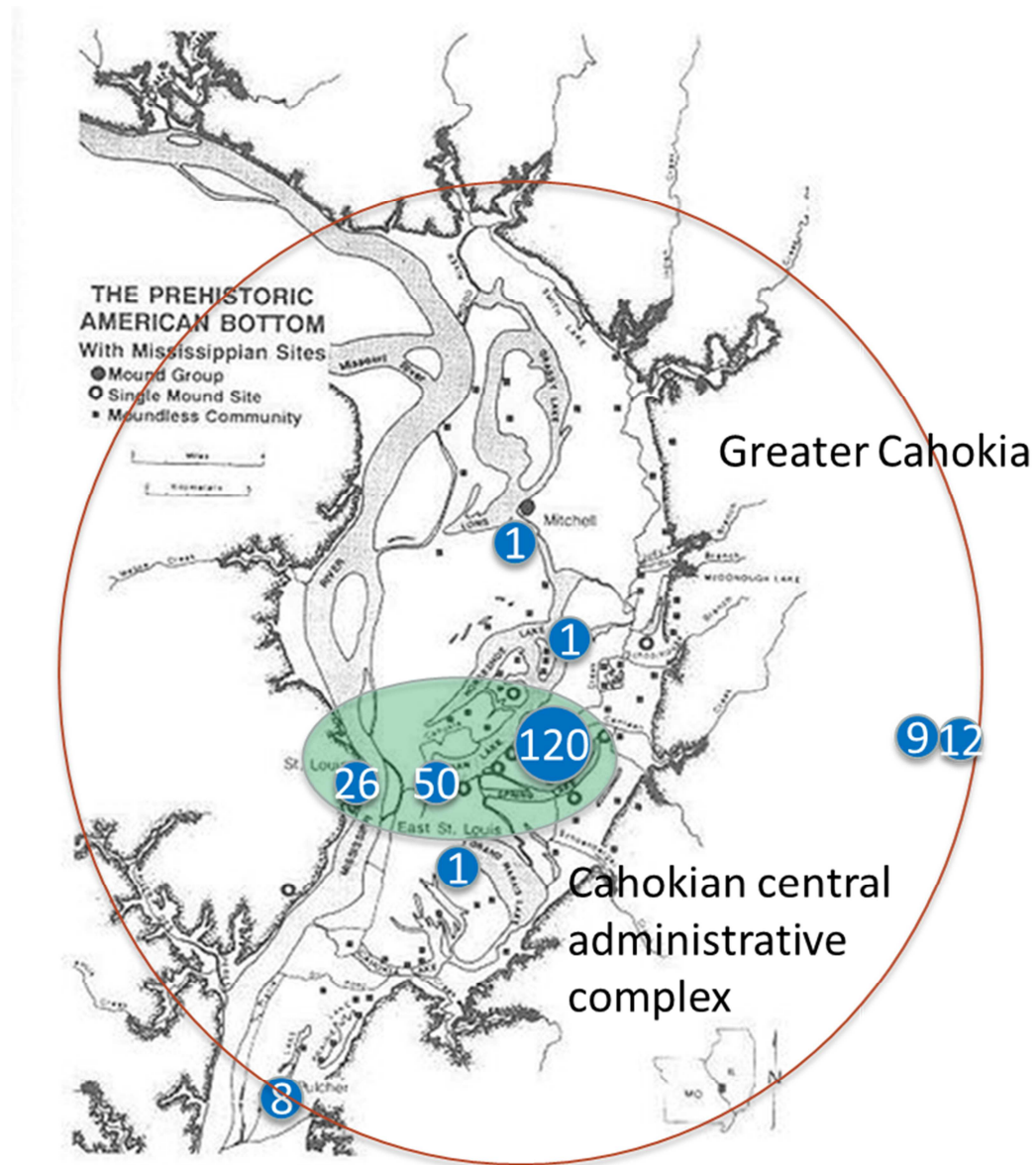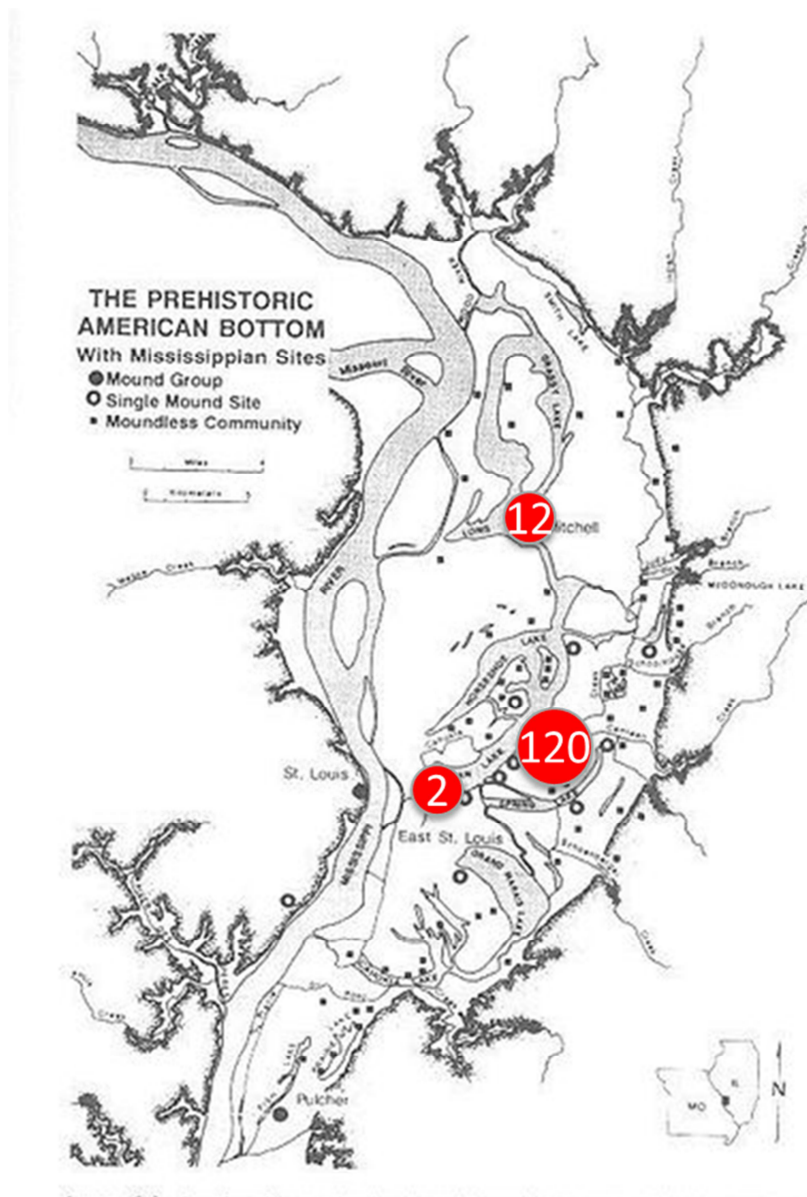
Figure 12. Mound centers in the American Bottom between ca. A.D. 1150 and 1250. Numbers represent the number of mounds.

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