THE EVOLUTION OF COMPLEXITY IN THE VALLEY OF OAXACA

Stephen A. Kowalewski

Department of Anthropology, University of Georgia, Athens, Georgia 30602

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INTRODUCTION

This article is directed toward those interested in the comparative study of how complex societies develop—urban and historical geographers, urban historians and sociologists, social and economic historians, or anthropologists in or out of Mesoamerican archaeology. It concentrates on aspects of complexity that can be most readily compared cross-culturally. Specifically the article describes formal characteristics of settlement hierarchies in the Valley of Oaxaca, in southern Mexico, from their beginnings at about 1500 BC until the Spanish Conquest 3000 years later. I omit the archaeological and analytical details and the intricate variations since a book-length review of the prehistory of the Valley and the adjacent Mixteca Alta and a technical monograph on the archaeological settlement patterns have recently been published (32, 45). Even without their details, the new archaeological studies of regions make it apparent that social science theories about state and urban evolution need to be upgraded to account for unexpected variation and unforeseen regularities.

By complexity I mean the multiplicity of different parts in a social system (12; cf 52 for a formal approach to cultural complexity). To monitor complexity one must be able to identify parts, specify that they are different, be sure that one has all the parts, count them, and ascertain that they form a system. Meeting these five data requirements is not easy, with either historical or archaeological data. The realm of the social is complex in this sense with its
multiplicity of individual and household roles or statuses, its division of labor, its array of institutions, and its functionally distinct communities. In principle all these dimensions are accessible through archaeological data. But for the Valley of Oaxaca we still have few data sets on burial treatment, households, economic specializations, or nonhousehold architecture that are systematic, representative of the whole regional society, and that cover many time periods.

At present for the Valley of Oaxaca only settlement-pattern data meet (with certain reservations) my above-stated requirements for monitoring complexity through time. Here the parts comprising the system are human settlements, identifiable and datable through their surface remains. We can specify that these parts differ in artifacts, major and minor architecture, settlement layout, location, and so on. The settlements have been systematically enumerated and described by a thorough archaeological survey. We can assess the degree to which they form a system by finding boundaries (the region changed its boundaries over time, but generally its edge was marked by fall-off in settlement density), by studying flows of goods among them, and by showing concerted change in settlement patterns over time.

Anthropological interest in the evolution of hierarchy traces from the noble questions of state origins and cultural evolution, with recent, useful input from systems theory (30), organization theory (39, 84), and geography (38, 74). Anthropology and geography share close parallels in subject matter, disciplinary history, and the adoption of new fashions in method and theory (25; 45:3; cf 79). Central-place analysis, an important tool for understanding past regions, seems passé in geography (23, 76). Besides exegesis of the classics (63), a few geographers continue to explore properties of formal central-place models (e.g. 53, 54, 57) to make them broader and more general (5), or to apply them either in Third World countries (e.g. 35, 36) or, rarely, in archaeological cases (7).

The sociologist Rozman (66) and historians de Vries (22) and Bairoch (6) have published comparative, empirical studies of systems of cities that changed over periods of several hundred years. Issues of completeness, scale, and time-depth make some studies (e.g. 18, 19, 67, 68; various local histories) less appropriate for comparative purposes. Despite calls for regional approaches in urban history (e.g. 77), this field, like urban anthropology, concentrates on cities and people in cities, not on systems of cities (23). In these literatures, descriptions of settlement hierarchies that can be traced over the long term are surprisingly few.

In Eurasia, Africa, and the Americas, the duration of complex societies and urbanism and their periods of original variety extend beyond the reach of documentary history. Prehistoric cases should enrich the content of models of regional development, broaden them, and make them more powerful, flex-


ible, and realistic. One obvious topic is variation in long-term urban development. The historians Hohenberg & Lees (37:57) complain of the almost mythical beginning points postulated in some formal models: “the idea of ‘distributed’ or isolated centers seems to be a fiction of modern geographers trying to situate in the past a starting point for their central place model.” Johnston’s (41) “let us assume . . .” chapter on the evolution of preindustrial urban systems, in which the sizes of centers are said to depend on the agricultural surplus of hinterlands and the amount of tribute, and Rozman’s (66:35–37) developmental Stage A, consisting of an undifferentiated mass of villages, are other examples of fictions created to fill gaps in knowledge. In fact, typical sizes, functions, and locations of centers in early urban systems are highly variable over time, and they often do not correlate with local agricultural productivity; further, early farming villages were parts of systems with central places.

Systematic archaeological studies of urbanized regions were spawned by Steward (78) and begun in the 1950s (best reviewed in 85; also 3, 59). While social scientists who relied on the comparative method could jump from one case or period to another in order to construct plausible sequences of evolutionary stages, those of us who did archaeology had the good or bad fortune to be stuck with our chosen regions. As a result, the new archaeological studies of regions provide information that no theory prior to the 1970s envisioned: periodic, systematic “censuses” and descriptions of virtually all of a society’s central places, extending from pre-village times to the modern era.

From 1971 to 1980 the Valley of Oaxaca Settlement Pattern Project (45) walked this entire Valley, using surface techniques to find all the big sites (and most of the small ones), thus avoiding the stupendous expense of excavating thousands of holes to achieve dubious results. The Valley is ideal for the surface-mapping of archaeological sites. Erosion is not so great as to obliterate remains of settlements, and alluviation obscures sites only in a few areas. Constant agricultural and domestic use of the land has turned up pottery from all periods. The limits of settlements occupied during several periods can be mapped individually from the pottery on the ground. Excavations at a variety of sites (32) help us interpret the surface data. Population estimates rely mainly on the areal extent of surface material dating to one phase and secondarily on the density or character of features. The assumed density range for most sites is 10–25 persons per ha; this may be too low for some towns (60:69–72; 69:34–40).

These data have limitations that should be recognized at the outset. They are strongest for the preponderant trends of settlement over the long run. The chronology is limited to 250–300-year intervals. Measurements on individual sites can be inaccurate, usually erring on the side of underestimating size and internal variability. The results are not exact, but applying the same method
through all periods gives a relative idea of change in regional patterns. Today the full-coverage regional survey is the only practical way to describe the evolution of prehistoric central-place hierarchies (29).

A SKETCH OF THE PREHISTORY

Since the body of this article is about formal properties of the central-place system, it may be helpful to sketch the cultural context. Flannery & Marcus’s (32) volume is the bibliographic source throughout, but I mention several studies completed since their work.

From initial colonization at the end of the Pleistocene until about 2000 BC, hunter-gatherers included the Valley in their nomadic range. Gradually, through artificial selection, several plant species underwent changes that boosted their productivity for humans (31). A longstanding and reasonable hypothesis is that sedentism came when the cost-benefit equation tipped in favor of tending domesticated plants, particularly maize. At any rate the earliest villages appeared in the second millennium. For several centuries this was an egalitarian, tribal society of fewer than a thousand people. San Jose Mogote had already distinguished itself as the largest village, having public buildings, trade connections to elsewhere in Mesoamerica, and small-scale, specialized production of crafts (see 58 for specialization in chipped stone).

The political and social hierarchy became more vertically differentiated after 1000 B.C. San Jose Mogote was then the head town for a chiefdom of several thousand people (Figure 1, 1st stage). How local or kin groups were integrated is not clear, but rank differences show up even among the families of small hamlets.

Monte Alban, the first truly urban place, appeared rather suddenly, on a conspicuous mountaintop in the center of the Valley, at about 500 BC. Whether the political apparatus was a state at this time, at 100 BC, or not for another two or three centuries (at the latest), the greatest and most rapid political growth took place between 500 and 100 BC. Blanton and co-workers (11, 27) see markets of some type developing at this time and playing an increasingly important role in regional dynamics, but most questions about political economy in Oaxaca still cannot be answered in satisfying detail.

As elsewhere in Mesoamerica, the Valley’s centralized state and primate capital broke apart around AD 700 (Figure 1, during the period between the 3rd and 4th stages). Population declined, but rebounded to its highest level in the last centuries before European contact (Figure 1, 4th stage). Politically the Valley consisted of about 20 petty kingdoms (city-states? cf 14) integrated by strong economic ties (see 65 for the post-Conquest period).

Since 1980 no major research project has been undertaken on the Valley’s 2000-year urban period. (More attention has justifiably been paid to other
regions in the State of Oaxaca.) The Centro Regional de Oaxaca, INAH, has
done many small salvage excavations. Lind & Urcid (49) related architectural
features of 7th-century houses, tombs, and iconography at Lambityeco to
16th-century Zapotec political structure; the final report on these extensive
excavations is still in preparation.

ELEVEN ASPECTS OF THE CENTRAL-PLACE
HIERARCHY

Urban Status

A few scholars might not call what I am about to describe “true cities” or
“urbanism” (see reviews in 22:11-12; 80:371-99; lingering ambivalence about
Maya urbanism in 81). Several recent papers describe Mesoamerican urban-
ism (10, 51). Sanders & Webster (70), following Fox’s (33) scheme, classify
Mesoamerican cities as mainly regal-ritual, with a few larger ones being
administrative and none mercantile. Smith (75) criticizes this as being overly
typological and variation-killing.

In population size and functional differentiality in a settlement system,
Oaxaca’s cities were like many others around the world. I am not yet certain
about the degree of differentiation, coordinating structure, city vs rural be-
havior patterns, personal anonymity, urban political autonomy, or com-
mercialization in prehispanic Mesoamerican cities, so I have less confidence
than others who may ignore American Indian cases in comparative con-
siderations of urbanism or classify them all by one type. The Oaxacan centers
are typically more than just aggregations of a farming population and its
priest-kings. These cities had special civic, ceremonial, economic, and elite
functions, and their inhabitants were more differentiated and had better access
to scarce goods than those of rural settlements. Rather than limiting the field
of potential comparison by culture-bound definitions of what city behavior
really ought to be, it is better to call cities those places at the top of a region’s
central-place hierarchy (9). However, this article is not so concerned with the
nature of the city as it is with systems of cities.

Regional and Urban Scale

The Valley of Oaxaca is a physiographic unit; more, it has had behavioral
significance as a nodal or functional region (as in 34), a quasi-autonomous,
bounded system of central places. The region (historians would say locality)
covers 2150 km, with a maximum distance from center to edge of 50 km². In
regional population and population density, city size, and density within
cities, the Valley was well within the ranges for other preindustrial urban
regions.
Total population varied from a few thousand in the chiefdom period prior to 500 BC, to 15,000–50,000 during the initial urban period, and 70,000–120,000 during the period AD 250–900. The last period (AD 900–1520) before the Spanish conquest saw a population of at least 165,000. Regional population densities ranged from less than one person per km$^2$ in pre-urban times to 77 or more per km$^2$, the latter figure roughly equal to the densities of Mesopotamia in the Sassanian Empire (2:180) or Spain in 1970. The Valley of Oaxaca is a relatively small region and consequently might be thought to have a high population density simply because its boundary is too tightly

![Figure 1](image)

*Figure 1* Urban evolution in the Valley of Oaxaca. This model is greatly simplified because it shows only 4 of 11 distinguishable time periods and because it does not show towns of 200–1000 inhabitants, which had functions in the central place system.
drawn. But this not so. For the several centuries prior to contact, every surveyed region in the State of Oaxaca except one in the mountains (15, 24, 28; 64:37, 162) had a population density equal to or higher than the densities of Russell’s (68:235) large late Medieval European regions. Thus a larger Oaxaca region centering on the Valley probably would have had a population density similar to that of pre-Modern European regions of equivalent size.

By AD 450 (Figure 1, 3rd stage) the region averaged one city or town of over 1000 inhabitants per 100 km\(^2\). The leading cities had populations of 5,000–25,000. Densities in some cities and towns varied between 30 and 80 per ha, based on sites for which direct counts of houses or terraces are possible. Compare this to other Mesoamerican cities: Tenochtitlan 120–170 per ha, Teotihuacan 80 per ha, Copan 50–100 per ha (70), Tenam Rosario 88 per ha (21:230), and Mayapan 28 per ha (61). Most late Medieval European cities had densities in the 70–125 per ha range (67:63). Near Eastern cities and towns vary in density by size and geography (plateau, hills, plain), with the larger having densities of 125–250 per ha or more, and others usually in the 50–150 per ha range (1:24–25; 2:349-50; 47:155–81).

**Index of Urbanization**

The percentage of the Valley of Oaxaca population living in urban centers seems high compared to preindustrial Europe and Asia, but it is not out of line with other ancient cases. How the index is interpreted depends on the urban threshold adopted (Table 1). The percentage of the total population living in places of more than 1000 persons generally increased through time, the percentage in places over 5000 stayed about the same, and the percentage in places over 10,000 declined slightly. This reversal in temporal trends depend-

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ing on which threshold one adopts is due to the fact that the early urban system was dominated by one center, and later on the system had more small cities and towns. The general trend toward increasing urbanization postulated by Rozman (66:282) holds only if the threshold is set at 1000.

In two thirds of the periods since the earliest cities the index of urbanization was between 50% and 77% (threshold of 1000). In two thirds of the periods for 5000 years in Mesopotamia the index varied between 43% and 70%, with a high of 90% and a low of 36% (2). Comparable figures for the Valley of Mexico for 1800 years range between 60% and 75% (69).

These three ancient cases differ from Europe since AD 1000, which appears to have been more rural on the whole. The seven largest cities in all of England in 1086 ranged between 17,800 and 2300 in population, and even by 1377 London had only 35,000 people (67:69). The Valley of Oaxaca had about the same scale of urbanism in a small region as England had for the whole country. European data (37:9, 84, 110) show indexes of less than 15% between AD 1500 and 1800 (thresholds of 5000 and 10,000); de Vries (22:39) has the percentage in places over 10,000 at no greater than 21% in 1500 and no greater than 28% in 1800. "China was the most urbanized society in the world" in the 13th century (26:177), with 6–10% of the population in cities of 100,000 or more. Nineteenth-century China had proportions generally under 10% (the total urban population, however, was in the tens of millions) (73:223ff). While these crude rates could suggest lower urbanization than in Oaxaca, the threshold is higher, and historically China's rural areas have been heavily commercialized.

Variation in the urban proportion within the same broad culture-area may be a telling statistic (cf 22:39), but it is somewhat suspicious when used across different cultural contexts. Also, the European and Chinese data just cited pertain to continental or national areas instead of smaller regions. Rozman presents urbanization indexes for late preindustrial England (21%), Japan (18%), France (16%), Russia (9%), and China (7%) (66:245, 281). One could not rule out the factor of territory size, since the higher indexes are for the smaller countries, as he noted. This may apply to Mesopotamia and the Valleys of Oaxaca and Mexico. Furthermore, de Vries concluded that between 1500 and 1800 the percentage of European population living in cities moved little while the urban system grew and changed in important structural ways, so very different urban systems can have similar urbanization rates.

Number of Hierarchical Levels

In Christaller's central-place theory there are clear-cut classes of centers (20:59–60); modifications such as Losch's (50:437) have continuous size distributions. The division of size distributions into discrete classes is more or less arbitrary, and here I use two techniques. One is a completely arbitrary
scheme with intervals of 1000 and 10,000; the other forms classes by following natural breaks in histogrammed distributions.

Using the constant, arbitrary intervals of population size, the Valley had four levels of centers, which developed in scale first from the top, then in the middle intervals, and last in all intervals. The earliest phases had a simple hierarchy with a single large town. Next, the hierarchy built quickly from the top down, then fattened up the middle levels. In the last prehispanic period it grew in numbers of sites in all intervals.

The same intervals can be used to compare the Valley of Oaxaca to the Valley of Mexico (69). The latter's hierarchy tended to be dominated by more and larger centers in the top interval. The Valley of Oaxaca usually had more middle and lower-order centers than, and as many centers above 1000 persons as the Valley of Mexico, a much larger, more populous area. One difference is Mexico's megacenters, Teotihuacan and Tenochtitlan, which had over 150,000 people; but even without these cities the two regions are structured differently. The Valley of Oaxaca is not simply the Valley of Mexico without Teotihuacan.

Using an arbitrary lower population limit of 1000 ignores smaller places whose urban functions may be important (13, 55). Towns as small as 100–200 inhabitants probably had functions in the Valley's urban network. Defining size classes by "natural breaks" in size distributions is more sensitive to the smaller centers and to the nature of urbanization in particular regions. Our project divided the centers of the earliest urban period into four size classes. This number increased to seven by the end of the sequence. The size classes are usually fairly discrete and make sense in terms of spacing and other attributes, though typically not much information is lost if two size classes at the lower end are combined. We found it analytically convenient to use between four and six size classes, as Hohenberg & Lees (37:51) did for Europe.

The number of levels in the civic-ceremonial or administrative hierarchy, determined by architectural features instead of settlement size, grew from the chiefdom through the state periods. The former had up to about three levels, while the latter had between four and six.

**Rank-Size**

The rank-size curve for settlements can be of three general types: log-normal or rank-size; primate, in which there is one dominating city; and convex, in which centers tend to be similar in size (8, 40, 43). The Oaxaca sequence divides into three periods for rank-size characteristics. An initial primate pattern lasted from earliest sedentism through the first 750 years of urbanism (to AD 250). Primacy can be a stable form, since it lasted well over 1500 years, from the origins of social ranking well into the period of the state. The
middle period of about 700 years had more or less log-normal patterns. The final, petty-kingdom period had a strongly convex curve. This movement from primate to rank-size to convex distribution is related to permeability of regional boundaries, scale of the regional system, and manner and degree of interaction among centers (44). The primate systems of the early periods were relatively closed and fairly small; much of the interaction took place through the primate center. The rank-size systems of the middle period were somewhat more open and larger; they involved more interaction among functionally differentiated centers. The convex pattern of the final period is associated with open boundaries, large scale, and intensive internal and external interaction.

**Span of Control**

Here I refer to the number of centers of the next lowest order dominated by or in the territory of a high-order center, a variable roughly similar to Losch’s \( k \), Parr’s \( s \) (56), or Skinner’s span of control (73:305).

Ratios of higher- to lower-order places in the Valley are irregular from the top to the bottom of the settlement hierarchy. Higher-order centers typically had rather few centers beneath them in the next order. The ratios of higher- to lower-order places are generally 1:3 or narrower, not as wide as in Rozman’s sample of late preindustrial cities (66:223, 245). The Valley’s earlier urban period averaged about 1:2.5, while the later periods averaged consistently around 1:2. If we could calculate a meaningful ratio for the pre-urban period it would be 1:3 or wider. Thus span-of-control values appear to be low and to decline over time. Some aspects of the spatial patterning resemble Christaller’s separation or administrative principle (20:77–80), but the narrow span of control does not conform to the \( k = 7 \) expectation. It better resembles a \( k = 3 \) marketing pattern. Oaxacan marketing institutions probably date back to the earliest urban period. However, not until the last prehispanic period is there evidence from spatial patterning and artifact distributions to suggest a marketing system with settlement patterns close to the ideal model (4, 45).

The number of centers between 1000 and 10,000 people per city of over 10,000 usually varied between 7.0 and 9.6. The number of central places smaller than 1000 per mid-level town was high in the early urban periods (averaging 14.9) but low in the later periods (averaging 4.1). The patterns are consistent with the heavily administrative or civic-ceremonial character of the leading centers and the rising commercial importance of middle- and lower-level centers in the later periods.

For the periods when the region was politically centralized, spans of control in the administrative hierarchy, which is analytically independent of the settlement-size hierarchy, average 5.5 second-order centers to one primary center, 3.7 third-order centers to each secondary center, and 2.2 tertiary...
centers to each quaternary center. The narrowing in span through the ranks could be due to small territory size. Ancient Oaxaca had writing, but as far as we know writing was not used for bureaucratic or accounting purposes. The narrow spans of control may be related to a less-developed administrative bureaucracy, but this line of research has scarcely been pursued.

**Vertical Complexity**

Vertical complexity in settlement hierarchies is a measure of the degree to which central places differ in composition depending on their hierarchical level. Information on the composition of centers comes from excavations and surface survey and consists of common and exotic artifacts and architectural groups of plazas and pyramid-mounds. Interpretation of site function can become very involved, so I simply summarize the main conclusions.

Lower-order towns were not small versions of larger cities, and the cities were not small centers writ large. Especially after AD 250 and to a lesser extent even before, central places at different levels were functionally distinct. Temples—larger or smaller—existed at all levels of the hierarchy (51), but state administration, marketing, and craft manufacture were more segregated. Although one expects agricultural specializations to have been most significant in this region, historically a breadbasket, we know almost nothing about them except by circumstantial evidence. Direct indications about specialization are limited to enduring but petty items like pottery and flaked stone tools.

The leading (primate) centers from almost the beginning of sedentism until about AD 650 were qualitatively and quantitatively distinct from all other centers. They possessed by far the greatest concentration of civic-ceremonial architecture, art related to state ideology, exotic goods, and craft manufactures; and they had the best access to the widest range of utilitarian goods. The primate center served as regional capital and means of articulation to the rest of Mesoamerica. After AD 650 such functions were more evenly dispersed in several competing centers.

Secondary and tertiary cities and towns were centers of subregional or local importance. They serviced and dominated subregions and connected these to the state, but they probably lacked pan-Mesoamerican functions. They had impressive art and architecture, but these were more limited than at the regional capital. In the earlier periods these centers differed markedly from each other and from the primary center in access to a variety of goods; in the later periods they gained in relative access to goods. In the middle and later periods they had market functions.

Centers below the tertiary level did not have the plaza space, elaborate architectural complexes, and artifacts associated with the marketing and multiple administrative functions of larger cities. Often these centers had
limited civic-ceremonial or special boundary functions. This functional differentiation among smaller centers may be relevant to the narrow spans of control discussed above, an observation that also applies to the next topic.

**Horizontal Complexity**

Horizontal complexity is a measure of the degree to which central places at the same hierarchical level differ in composition. I again summarize what can be a very involved interpretation.

Oaxaca had few examples of centers designed to the same plan. Most groupings of civic-ceremonial architecture had no close copies anywhere. Core/periphery, intensive vs marginal agriculture, gateway, boundary, and defensive functions differentiated centers at the same level from one another. In the earlier periods horizontal differentiation among centers was most obvious between large geographical subareas such as core and periphery. By the last period, horizontal differentiation occurred simultaneously in multiple criteria and the region was a finer mosaic of neighboring centers with differing functions.

Another way of looking at horizontal complexity is to measure the congruence between population size and position in the administrative or civic-ceremonial hierarchy. Until about 300 BC the two hierarchies were fairly isomorphic, but after that time a center’s administrative importance was not well correlated with its population size. Especially after AD 250, towns and cities were more varied in function than would be expected if they were structured only by their political, agricultural, or demographic importance.

**Spatial Patterns**

The Valley of Oaxaca, unlike Mesopotamia or the Valley of Mexico, had physiographically distinct and separate, semiautonomous subregions (the north, south, and east), usually integrated by the high-order city in the Valley’s center. The central-place systems of the subregions differed strongly. There was always one “city-rich” subregion, though it shifted from north to south to east (Figure 1).

In the earlier periods the spatial arrangements of centers were linear, rather than lattice-like, networks. More complex, nonlinear arrangements evolved after AD 250, when a triangular axis of centers tied together the southern and eastern subregions with the Valley center, and other centers ringed the frontiers (Figure 1, 3rd stage). In the last period a more complex lattice formed, evident especially in the spacing of secondary and tertiary centers. This development of more complex lattices closer to those predicted by classical central-place theory was associated with the growth of markets and the decline of the regional state (after AD 700), when the balance of governmental and economic power tilted more toward the commercial side than the political (cf 71, 72).
Continuity of Occupation

The history of particular towns and cities was anything but static. In 3000 years the region had four different leading centers. Of the 20 largest places at 200 BC, 7 were not in the top 50 250 years later; of the 20 largest places in this latter period, 9 were not in the top 50 250 years later. The best explanation for these movements is not local, but involves the changing requirements of the regional system. De Vries (22:142ff) and Carter (16:109–12; 17) discuss similar discontinuities in European urban systems, Carter contrasting the discontinuity in England and Wales with the continuity Pred (62) observed in US cities. Carter explains that new centers developed in response to exogenous, technologically inspired transformations. But for Oaxaca, urban dislocations are not associated with European-style technological transformations or with the fate of irrigation canals as in Mesopotamia. The causes of discontinuity are more likely to have arisen from within the dynamics of the regional and greater Mesoamerican political economy.

Centralization

By centralization I mean the degree to which functions concentrate in a single place rather than being dispersed throughout the population. In Oaxaca hierarchy did not grow gradually from the bottom up, but in leaps, first by creating a primate center and only later by adding more tiers of centers between the largest city and the smallest centers. The evolution of hierarchical complexity here is not one of increasing centralization, for the primate systems of the earliest phases were as centralized as can be. Indeed for most of the sequence the story is about proliferation and decentralization of top central-place functions.

Some functions originally carried out in households and local communities were lifted into central places by the earliest urban period. That is, from the point of view of the lowest level, specific functions were centralized, albeit in many places. The best evidence of this is in craft manufacture and the lowest-level civic-ceremonial activities. But the concentration of these functions should not be interpreted to mean that centralization generally increased over time. Greater regional integration and scale were achieved not by overall centralization but by the developing strength of middle-level centers.

Discussion

These 11 characteristics of the urban hierarchy are interrelated. The main secular trend was from centralized to decentralized regional organization, evidenced in the primate-to-convex rank-size curves, linear-to-lattice spatial patterning, growth and then decline in regional state power, increasing scale of the system, increasing permeability of its boundaries, increasing commercialization, increasing horizontal and vertical differentiation of centers,
and increasing importance of secondary and tertiary centers having control over local administration, production, and commerce.

The comparatively high proportion of urban population, many centers, and narrow span of control are less readily interpreted. The narrow span of control may reflect the large numbers of centers, a small region, a too-inclusive definition of centers, or inaccurate definition of levels. It could be that a large proportion of city dwellers carried out activities little different from rural activities, though in that case their nucleation remains unexplained. But accepting these data at face value—which I think is most appropriate—it seems most likely that they are not artifacts of analysis, that the Valley indeed had comparatively high numbers of central places, high urbanization rates, and narrow spans of control. Explaining these characteristics will require more research on the nature and concentration of administrative and economic activities.

Hierarchical growth in the Valley of Oaxaca cannot be generalized as a model for Mesoamerica. The Valley of Mexico experience was quite different. There, the settlement hierarchy tended to grow mainly at the top in the early periods. In the middle period giant Teotihuacan obliterated the middle of the hierarchy entirely. Only after Teotihuacan’s demise around AD 700, when the Valley was peripheral to more powerful regions in Central Mexico, did major growth occur in the middle ranks. Growth of mid-ranking centers was the basis of Aztec-period urbanism, just as growth of mid-ranking centers was important over a longer period in Oaxaca. The Maya area, though not as thoroughly surveyed, clearly had an urban history different from those of the Valleys of Mexico and Oaxaca. Systems of cities extended over broader, less-bounded areas. Probably as a consequence, urban primacy was short-lived in the Maya area, and networks of central places developed multiple, horizontal connections (12:170–221).

UNSOLVED PROBLEMS AND NEW DIRECTIONS

In my opinion none of our current explanations of how complex societies evolved yet comprehends the prehistoric cases described by the regional archaeological surveys. Most such explanations are not equipped to reflect the behaviorally significant variation within a region at one time, between regions, or in one or several regions over the long run. Theory and data scarcely speak to one another. I address here only a few problems of form and substance.

One difficulty is in perfecting cross-culturally valid dimensions for comparison. Formal methods developed in geography and other urban studies have heuristic worth. Rank-size characterizations, for example, can be found in the journals of a half-dozen disciplines. But besides the feeling of empti-
ness or lack of cultural content inevitable in abstract measures, some may have built-in biases toward a particular cultural tradition. These biases are not necessarily pernicious; they may be quite informative. One example is the index of urbanization. As noted above, the ancient regions appear to have had a higher proportion of their populations in cities than did historic Europe or China. Region size has something to do with this, but substantive differences among the three culture-areas also may have had an effect. In the mid-latitude Old World, barnyard animals, dairying, cartage, and water transport spread high-energy economic activities out over rural areas, producing lower urban proportions than in the pre-Columbian Americas.

Analytical scale factors affect the utility of formal measures. Regions within culture-areas differ in their city-systems—e.g. in Europe, the south and the north, the Low Countries, and Poland. Other regularities are particular to whole culture-areas or world-systems: China’s emphasis on craft manufacture and the great size of its cities, Europe’s extraordinary leap from the 16th to the 19th centuries, Mesopotamia’s canals, or the inelasticity of Mesoamerica’s transportation. Formal measures such as the index of urbanization or span of control perform well for understanding variation within broad culture-areas; more caution, but not complete skepticism (e.g. 16), is needed when the comparisons are between culture-areas. Formal conceptualizations of vertical and horizontal complexity need more application and improvement.

I now turn to the substantive content of concepts used to explain the evolution of complexity. Theories in wide use today about cultural evolution, the rise of the state and urbanism, and so on, were formulated when almost nothing was known about long-term change in actual prehistoric societies. These ideas relied on the comparative method to bring together into a coherent framework fragments from ancient history, historical cases shaped by events since the 16th century, and vivid but certainly unrepresentative images from archaeology. Misleading images from archaeology infected the public and the scholarly community too.

In its fascination with pyramids, tombs, and inscriptions, has not archaeology contributed mightily to images of prehistoric civilization as a social engine for pyramid-building, the pyramid as reflection of the entire social order, and the view from the top of the pyramid as the best view in the ancient world? Pyramid-building conjures up an Asiatic mode of production, if not Oriental despotism. Zapotecs in the Valley of Oaxaca did build over 2000 pyramid-mounds. But to put this in a different light, in the Medieval period alone, the Dutch, not generally considered to have practiced the Asiatic mode of production, constructed terpen—earthen platforms—on the coast of Friesland and Groningen (an area the size of the Valley of Oaxaca) having a volume an order of magnitude greater than all the pyramids ever built in the
Valley of Oaxaca (48:86–95). The labor required to build all the Valley of Oaxaca's pyramids apportions out to less than 0.5% of an ancient Zapotec's work career (46)—hardly the labor of which major social formations are made.

Many current theories about the evolution of complex societies emphasize (a) the ability of central political authority (the chiefdom, the state) to control and determine events, and (b) tribute as the primary economic sector and the key economic relationship structuring society. In rare prehistoric cases have these two propositions been demonstrated using systematic data. These ideas could be true, but they are difficult to demonstrate, and I argue that they are accepted too readily. When we find scraps of information about the state or tribute, do we also assess the importance or weight of kin groups, associations, other types of economic exchange, local or community groups, or other institutions? No, more commonly we assume that such institutions, if they existed, were totally subsumed by the state, because this is what theory tells us about early states.

The tributary mode of production (83:79–88) is a useful concept for cross-cultural generalization. However, even if we can show that tribute existed in some form in an actual case, it is another matter to show that tribute structured or determined economy and society. Tribute documents have been better preserved than other written evidence on the Mesoamerican economy, but this should not automatically assign lower priority to less paper-proven institutions of labor or exchange. Archaeological evidence from Oaxaca bearing on the economy permits inferences about the minimal ranges from which cities must have been supplied with food; foreign conquest; manufactures that vary in scale and central control, points of exchange; patterns of consumption; spatial relationships among producers, points of exchange, consumers, and the various branch-offices of the state; and various scales of local organization. But this information is incomplete and difficult to interpret, both theoretically and analytically. Hence a conclusion about a tribute mode of production, one demonstrable with archaeological and historical evidence, would be premature. Yet similar attributions of a tributary mode of production are made all the time for other areas about which we have considerably less information. For a more familiar example, a reasonable case can be made that tribute played a smaller role in structuring Aztec society than did production, exchange, and consumption mediated through the market system, yet the idea is common that the Aztec state was based on tribute and tribute enabled the state to rule society, top-down.

What concerns me is that in current social science theories, millennia of change and variation are often subsumed under one typological concept. The urban historian Carter (16:102–4) and the Near Eastern archaeologist Kohl (42) voice parallel concerns. In the present article I have taken a formal,
somewhat formalist perspective, but the identical call for analytical concepts sensitive to on-the-ground variation is made by de Montmollin (21), from a more substantivist perspective. Prehistory had variation, change, reorganization, tumult, new directions, and regularities unforeseen by us—all of which made such impact that they become imprinted not only on peoples’ lives but also in the archaeological record. More attention ought to be paid to explaining these everyday, archaeological facts, while we continue to “render unto the tributary mode” when it will do for our broadest purposes.

Regional archaeological surveys are beginning to provide a new kind of data not available before the 1970s. Prehistoric cases such as the Valleys of Oaxaca and Mexico, Mesopotamia, the Santa Valley in Peru (82), and others, display much more variability, complexity, and change than we have imagined in proposing our overly broad types and creating theoretical fictions to fill gaps in our knowledge. These studies offer admittedly more mundane but scientifically more interesting views of prehistoric civilizations than can be generated from theoretical fiction. Facts such as the Valley of Oaxaca’s high urbanization indexes, its one town or city of at least 1000 inhabitants for every 100 km$^2$, and the increasing noncongruence through time between its settlement and administrative hierarchies raise significant scientific problems; they also help situate Mesoamerican complex societies among the familiar and the living instead of the exotic and the dead.

This article treats only the topic of complexity in regional city-systems. These are important social structures and they can be formalized for cross-cultural comparison, but they are not whole sociocultural systems. At present, data on other aspects of sociocultural complexity in the Valley of Oaxaca, while often excellent in detail, are still spotty in coverage. The regional survey depended at every step on knowledge gained from prior excavations at particular sites. More excavations and research designed for smaller spatial scales than the region are an absolute requirement for understanding the political economy of the urban period. In particular, we need to know more about nonstate institutions and their relationships to the state; and we know almost nothing about agriculture and textiles, which must have been the two most important economic sectors.

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