

ual and political center, Great City Shang. The place he chose to do this was the area of deep Yellow River alluvial deposits in the eastern end of Henan province. As reviewed by Murowchick and Cohen, the Shangqiu Project illustrates the merging of traditional text-based archaeological approaches with the application of a new array of survey and analytical methods from diverse disciplines in the natural and physical sciences.

That multidisciplinary archaeological data can be used to examine environmental issues in China is a new realization that can be found in the essay by Song and Zhang. Desertification is a very real and troubling issue facing modern China, with more than one-fourth of the nation currently covered by deserts that are rapidly expanding into key agricultural regions. Song and Zhang look at one such area in northeast China to identify patterns over five thousand years in order to assess the impact of human activities on the process of desertification. The paper is exciting not only for the evidence it provides to understand this relationship, but also because it represents what must be one of the first instances of the archaeological record being used in order to guide the formulation of modern social and economic policy, in this case to counter the effects of desertification today.

We hope that the papers herein will interest archaeologists working in other parts of the world. While on the one hand, the introduction of modern methodologies in archaeological survey and analysis is causing rapid changes in Chinese archaeology, the discipline continues to rely heavily on its rich and long tradition of historical scholarship. Taken together, Chinese archaeology in the

21st century promises both to shed new light on the cultural developments of ancient East Asia and to bring new approaches and hypotheses to the table of world archaeology. This was K.C. Chang's long-held wish. □

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Kwang-chih Chang was born in Peking in 1931. His family emigrated to Taiwan where he attended the National University. Accepted to graduate school at Harvard, he received the PhD in 1960. He taught at Yale from 1961 until 1977, then moved to Harvard where he remained until his death in 2001. He was a major figure in Asian archaeology and was a Contributing Editor of *The Review of Archaeology*.

Settlement Archaeology and the Study of Social Complexity in China

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SETTLEMENT ARCHAEOLOGY:

THE CONCEPT AND ITS APPLICATION

The study of settlement patterns, often referred to as settlement archaeology, has become one of the most common approaches employed in Western archaeology, especially in the United States (Billman and Fein-

man 1999; Sabloff and Ashmore 2001), since Gordon Willey conducted the Virú Valley Project in Peru in the late 1940s (Willey 1962, 1974). The successful development of settlement pattern studies owes much to the late Professor Kwang-chih Chang and his active engagement in discussions of the concept and methodology relating to this new approach from the 1950s to 1970s (Chang 1958, 1968, 1972).

Chang called for a radical approach to the investigation of settlement patterns in social rather than in archaeological terms: "It should be the archaeologist's first duty to delimit local social groups such as households, communities, and aggregates, rather than to identify archaeological regions and areas by time-spacing material traits, since cultural traits are meaningless unless described in their social context" (Chang 1958: 324). Chang advanced the settlement pattern approach

as the first order of archaeological investigation, although his proposal for the reconstruction of community pattern as the starting point of settlement archaeology became controversial (Rouse 1968; Tringham 1972; Willey 1968; Willey and Sabloff 1993: 173-76).

In order to understand more fully the composition of a settlement as a whole, Chang (1968) suggested two models, microstructure and macrostructure, to reconstruct social systems within and beyond a community. Similarly but more elaborately, Bruce Trigger (1968) suggested three analytical levels in the study of settlement patterns: (1) individual buildings, (2) community layout, and (3) zonal patterns. Trigger's analytical method has been widely adopted within settlement archaeology, and its levels are commonly described as (1) household (micro level), which is the most basic social unit of a society; (2) settlement (semi-micro level), which provides a framework of spaces and boundaries for the locational activities of the community it contains; and (3) region (macro level), which comprises a number of sites integrating into a settlement system across the landscape (Clarke 1977; Fletcher 1977; Wilk and Rathje 1982). The application of this approach in the West during the past few decades has confirmed its great value to archaeology. It is the spatial organization of, and interrelationships among, different components on each level that provide the most information for understanding the social formation of ancient societies.

The study of regional settlement patterns (Fish and Kowalewski 1990), in particular, has revolutionized the way in which archaeologists conduct fieldwork and interpret research results. The regional settlement pattern provides important information about the organizational complexity of a culture, which is indicated by the number of different site types and their size and distribution over the landscape. The settlement patterns of simple egalitarian societies are largely determined by the availability of material resources (e.g., Binford 1980). However the settlement patterns of stratified societies show dependence on other factors in addition to natural resources, being more influenced by lucrative trade routes, expanding political frontiers, and effective administrative networks (e.g., Schortman and Urban 1992).

Levels of sociopolitical integration can be determined by studying regional settlement patterns, including the range of community types (by variation in function), and the sizes and number of each type (Johnson 1975). Complex societies manifest an increased range of settlement types and sizes. While the majority remain villages, a few settlements, because of their administrative functions and the other kinds of integration they provide, emerge as central places. Central places differ from secondary settlements both in size (larger) and configuration (e.g., the presence of public monumental struc-

tures, fortifications, and communal granaries) (Steponaitis 1981). As complexity increases, central places may be ranked. The political capital may also be a highest-order central place in other respects—economically, culturally, or ritually. Second-order central places might function as local centers for regulating the flow of goods and services up from lower-order centers and, reciprocally, down to the masses of population in the hinterland (e.g., Kipp and Schortman 1989). The numbers of tiers in the settlement hierarchy of a region may be indicative of its degree of social complexity. Early states tended to have more administrative and settlement levels than the preceding chiefdoms, and these differences can be observed in survey data. For example, the presence of a settlement size hierarchy can be indicated by natural breaks between clusters of sites distributed in site-size histograms (Johnson 1975: 295-296).¹ Flannery notes that administrative hierarchy and settlement hierarchy are not synonymous: the former refers to the number of tiers of administrators in the system, while the latter refers to the number of tiers of community size and to the administrative institutions present in each tier (Flannery 1998: 16). However, based on cross-cultural comparative studies, a two- or three-tiered settlement system may suggest a ranked prestate society, and a four- or more tiered settlement system may manifest a state-level social organization (Wright 1977: 389; Wright and Johnson 1975; Peebles and Kus 1977; Earle 1991: 3). Flannery has further argued that a four-tiered settlement hierarchy, especially if the settlement system forms a central-place lattice around a major urban center, can be indicative of the presence of a state (Flannery 1998: 16-21).

This settlement pattern approach is the broadest and most direct approach available to archaeologists for reconstructing patterns of regional organization (Drennan and Uribe 1987: 60), and has been applied to regions where social complexities developed at different levels (Billman and Feinman 1999). The employment of this method in Mesopotamia (e.g., Adams 1965, 1981; Wilkinson 2000; Wright and Johnson 1975), Mesoamerica (e.g., Feinman et al. 1985; Kowalewski 1989; Sanders et al. 1979) and Peru (e.g., Masuda et al. 1985; Wilson 1988) has proved to be highly effective for the understanding of social processes in these regions.

INITIAL STUDIES OF SETTLEMENT PATTERNS IN CHINA

Settlement archaeology as a systematic study of material remains integrated on all three analytical levels (household, settlement, and region) is still in the early stages of its development and application in

¹ For examples in Chinese settlement archaeology employing this principle see Liu (1996) and Liu et al. (2002).

China. However, an awareness of changes in regional distribution of sites through time, and the study of the spatial arrangement of individual sites, are not new to Chinese archaeology. In the 1960s, based on limited data available at the time, Shi Nianhai, an historical-geographer, discussed different patterns manifested in the relationship between environmental conditions and settlement distributions from the Palaeolithic to the Neolithic periods (Shi 1963). This was the first attempt to study settlement distribution on a regional level in China. Unfortunately, it was not developed into a more extensive research strategy by archaeologists.

Archaeologists, on the other hand, mainly focused on the intra-settlement patterns of individual sites. Several Neolithic sites, such as Banpo (Institute of Archaeology 1963) and Jiangzhai (Xi'an Banpo Museum et al. 1988) in Shaanxi Province, were excavated on a large scale to reveal the layout of the entire settlement. Excavation reports also emphasized relationships among house groups within a settlement, based on which forms of social organization, especially kinship organization, could be inferred. This approach reflects the strong influence of Soviet archaeology in the 1950s and 1960s in China (e.g., Institute of Archaeology 1963: 222-229). None of these projects, however, focused attention on the regional level of settlement organization

The Western practice of settlement pattern archaeology (called *juluo xingtai kaogu*) was introduced into China in 1984, when Professor Kwang-chih Chang delivered a lecture entitled "On the archaeology of settlement patterns" at Peking University; this lecture was subsequently published and widely distributed (Chang 1986a). Mainly derived from his article, "Settlement patterns in archaeology" (Chang 1972), Chang's lecture described the theoretical basis and the methodology used in settlement archaeology, such as central place theory, the different levels of settlement pattern analysis (microsettlement and macrosettlement), and the inter-relationship among different types of settlements.

Soon after Chang's lecture, several new studies began to focus on general traces of settlement organization at the settlement and regional levels. Yan Wenming, of Peking University, presented a paper entitled "Settlement patterns in Neolithic China" at an international conference in Germany in 1987. He surveyed the different types of settlements that developed during the Neolithic period, from cave sites and shell mounds, to centripetally arranged small villages, and then to walled towns (Yan 1989a). Wang Miaofa, an historical geographer, analyzed the distributions of Neolithic sites along the Yellow River, and discussed various types of settlement distributions in relation to the natural environment (Wang 1988). Wang's research was more focused on ecological perspectives than social implications. In these studies, although the term settlement pattern was used, it referred to a typological analysis of

sites at a regional level and did not parallel conceptually the term as it is used in the West. Furthermore, the authors could only employ secondary data sources recovered from earlier excavations and unsystematic surveys. Fieldwork projects specifically designed to address particular research questions on settlement patterns were still lacking.

During the 1980s, nation-wide archaeological survey projects, mainly for the purpose of cultural preservation, were organized by the National Bureau of Cultural Relics and conducted at the provincial level. As a result, several provinces published volumes included in the *Atlas of Chinese Cultural Relics* series (National Bureau of Cultural Relics, 1991, 1993, 1996, 1997, 1999). These publications now can provide extremely useful data on site locations for settlement studies, although these data were not systematically collected and the dating assigned to most sites was not fine-grained.

In the early 1990s, Chinese archaeologists became increasingly interested in regional approaches and the relationship between settlement distributions and environmental change. The best example of such a study is a project carried out in the Hulu River Valley in Gansu that investigated cultural development from the early Neolithic period until the Zhou dynasty (ca. 6000-200 BC) (Li et al. 1993). The Hulu River is situated on a loess plateau in the upper Yellow River region, a region that has been subject to severe ecological deterioration caused by deforestation and soil erosion since prehistoric times. The project demonstrated close correlations between changes in the regional settlement distribution, population density, and the environment. However, it did not focus on the development of social complexity and provided little information on site distribution and site hierarchy.

Chinese archaeologists have focused more attention on settlement patterns at the community level and do so mainly through the large-scale excavation of what are deemed important sites. Yan's study of spatial layouts of Yangshao settlements is especially notable (Yan 1989b, c). However, his primary objective was to reconstruct social organization, particularly kinship organization, a standard approach employed by many Chinese archaeologists since the 1960s.

One of the most recent attempts to study settlement patterns at all three levels can be seen in American-trained Li Liu's doctoral dissertation project and subsequent publications focusing on the Longshan culture in the Yellow River Valley (Liu 1994, 1996, 2000). Liu's work combined an excavation program revealing household-level activities and the analysis of data derived from published material for understanding intra-site spatial relations and inter-site regional settlement systems. By employing analytical methods commonly used in Western archaeology, such as settlement hierarchy and rank-size variation, this research demonstrated the great

potential of settlement pattern archaeology to contribute to the understanding of the development of social complexity in China. However, most data on site size and site distribution used by Liu could only be obtained from published reports of unsystematic surveys, and so the research conclusions need to be further tested.

Traditional surveys in China are primarily designed as preparation for further excavations, to define the distribution of archaeological cultures, to understand the relationship between material culture and the geographic environment, and to record site locations for the purposes of cultural preservation. Surveys are also employed in cooperation with construction projects that are increasingly frequent in China. As finding rich sites for excavation is the focus, archaeologists tend to survey only areas believed to have been inhabited in ancient times, and selection is based on textual records, information from locals, and the experience of archaeologists (Shi 1982: 3-8). Such strategies are biased in selecting coverage areas, and the results suffer from three major deficiencies. First, many sites, either small ones or those located in areas that appear unlikely to have been inhabited, can be overlooked. Second, many reports provide only rough chronological intervals, typically by archaeological culture periods that can span periods of time ranging from a few hundred years (e.g., the Erlitou culture) to two thousand years (e.g., the Yangshao culture).² Third, changes in site size during different periods of a multi-component site are usually overlooked. In situations where sites are dated only to a culture period that lasted for a long time period, such as the Yangshao culture period, settlements dated to the same period may very well not have been contemporary, and the recorded site distributions may not represent the settlement pattern during the specific time period under consideration. It is clear that only systematic full-coverage regional surveys with refined chronological control can overcome these problems.

SETTLEMENT ARCHAEOLOGY PROJECTS

Since the mid-1990s, several field projects have employed systematic survey methods in China. These projects are specifically designed to reveal long-term social changes at the regional level. Several major factors are responsible for the promotion of this method in Chinese archaeology.

First, archaeological finds of recent decades have challenged the long-held view among Chinese historians that cultures of the Central Plains (or North China

Plain, encompassing present-day Henan, southern Shanxi, Shaanxi, and Hebei, and northern Hubei provinces) developed earlier and were more advanced than those of the periphery. However, it is now clear that Neolithic cultures on the periphery, such as the Dawenkou and Shandong Longshan cultures in the east, the Hongshan culture in the northeast, and the Liangzhu culture in the southeast, appear to have been more sophisticated than their counterparts in the Central Plains. As a result, some archaeologists have proposed new theories for the emergence of Chinese civilization, such as Su Bingqi's theory of a multi-centered developmental process (Su 1988, 1991). This new orientation raised many issues concerning the trajectories of social change in different regions, and it is now coming to be realized that traditional archaeological methods, which emphasize the excavation of major sites, are unable to provide adequate information for a more complete understanding of long-term social and cultural change. There is a great need to develop new methods in this regard.

Furthermore, new generations of young archaeologists, trained in archaeology after the Cultural Revolution, have become the directors of major field projects since the 1980s. These archaeologists have been more open to and hungry for knowledge from the West. As a result, recent publications on Western archaeological methods and theories, including some on settlement archaeology, have been translated and published (e.g., National Museum of Chinese History 1991; Institute of Archaeology 1996). Such publications have been well-received, and there is now increasingly widespread interest in the application of new approaches to Chinese archaeology.

Archaeological methods from the West, such as settlement archaeology, have also been promoted as a result of changes in government policy towards archaeological practice in China. In 1991 the Chinese National Bureau of Cultural Relics released a document on policies for Sino-foreign collaborative research in archaeology (National Bureau of Cultural Relics 1992), which, after more than forty years of exclusion, allowed foreign archaeologists to work in China. Many international collaborative projects have been carried out in recent years across the country. International scholarly exchange has also brought Western theories into China that have enriched research orientations and interpretations. New methods and technologies, including settlement archaeology, have been introduced. While some projects have continued to focus on the excavation of major sites,³ others have sought

² The term Yangshao culture has been used to refer to the material cultural remains characterized primarily by painted pottery distributed over a large region in the middle Yellow River valley dating to the fifth and fourth millennium B.C. However, the regional variations in time and space have led archaeologists to divide the Yangshao culture into a number of variants. Therefore, the Yangshao culture cannot be treated as a monolithic entity in survey data.

³ Several Sino-Japanese projects involve excavations of settlement sites in south China (e.g., Joint Archaeological Team 1998; Sino-Japanese Joint Archaeological Team 1998). These programs are beyond the scope of this discussion which focuses on studies of regional settlement patterns.

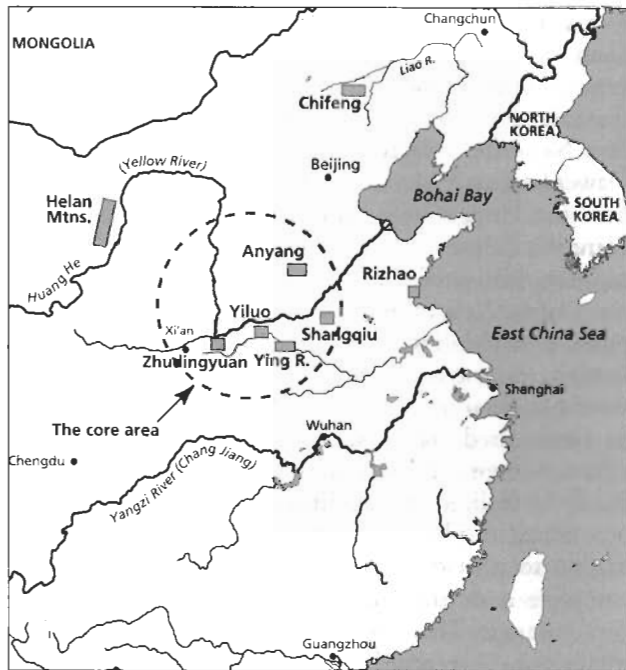


Figure 1. Locations of survey projects discussed in the text.

for alternative approaches. Because of the relatively small budget it requires, its recognized great research potential, and the fewer difficulties survey projects face in obtaining permits from Chinese authorities, settlement archaeology has become the preferred approach used by several international collaborative research projects in China since the mid-1990s.

Five of these international survey projects are based in the Zhongyuan, or Central Plains of North China, an area that has traditionally been regarded as the cradle of Chinese civilization because it is the location of many of the capitals of the Bronze Age Three Dynasties (ca. 2000-221 BC), the Xia, the Shang, and the Zhou. These five projects have focused on the Yiluo River, Anyang, Zhudingyuan, the Ying River, and the Shangqiu regions, all in Henan Province. In areas outside the Central Plains, two projects, the Chifeng project in the Liao River Valley of Inner Mongolia and the Rizhao project on the east coast of Shandong Province, have been carried out (Figure 1). Differing from traditional Chinese surveys that primarily sought out important sites for further excavations, these projects not only have their own research orientations to address specific issues, but also employ interdisciplinary approaches to archaeological remains, such as geoarchaeology and paleoethnobotany.

Among these projects, the Yiluo, Anyang, Rizhao, and Chifeng programs use a similar methodology and are producing comparable data. These projects employ systematic regional survey methods and, in varying degrees of application, full-coverage survey strategies. They also focus on the analysis of settlement hierarchy and long-term changes in settlement patterns in order to under-

stand social transformations and the development of the level of social complexity. In most cases the scope of research has gone beyond the recording of site size and chronology, and other factors are being included in order to explore issues such as environmental impact, craft production, and political economy. The following discussion focuses mainly on these four projects.

PROJECTS IN THE CENTRAL PLAINS

Two projects, in the Yiluo River and Anyang regions, focus on related questions that Chinese archaeologists have contended with for decades: the rise of early states and the development of dynastic power in the core area of Chinese civilization.

THE YILUO PROJECT

The Yiluo Basin in western Henan has traditionally been regarded as the heartland of Chinese civilization. The Erlitou site, situated in the center of the Yiluo Basin, witnessed an important transformation in social complexity from the Neolithic to Bronze Age. Since its discovery in the 1950s, Erlitou has been a highly controversial site, generating disputes concerning its role in the emergence of Chinese civilization and its historical identity as a dynastic center. In recent years, while some believe that Erlitou was a Shang capital (e.g., Zheng 1998), an increasing number of archaeologists and historians have come to the conclusion that the site may have been a capital of the Xia, traditionally regarded as the first dynasty in Chinese history (e.g., Chang 1986b: 307, 1999: 71-73; Gao et al. 1998; Zhao 1987; Zou 1980). Although opinions regarding Erlitou's dynastic identification still vary, a consensus has been reached among most Chinese scholars that the Erlitou culture represents the first appearance of civilization or the state in China. The view that connects Erlitou with the Xia was supported by the results of the Xia Shang Zhou Chronology Project, a state-organized research project whose goal was to better determine the dating of the Bronze Age dynasties (Xia Shang Zhou Chronology Project Team 2000). The opinions held by the majority of Chinese archaeologists are by no means shared by all scholars, including many in the West who remain skeptical of the historical link between Erlitou and the Xia, and those who question if Erlitou featured state-level social organization (Allan 1984; Bagley 1999: 131; Keightley 1983; Railey 1999: 178-186; Thorp 1991). These differing views also stem from the range of scholarly attitudes concerning the archaeological use of ancient textual records, varying definitions employed for the idea of the state, and the lack of hard evidence for social organization in the ancient societies in question.

Because previous archaeological work in the Yiluo region, which primarily focused on the excavation of large sites, had not been able to provide the kind of information needed for the investigation of the social-

B.C.	Yiluo	Anyang	Rizhao	Chifeng
200	E. Zhou	E. Zhou	Zhou	E. Zhou
600	W. Zhou	W. Zhou		Upper Xiajiadian
1000	late Shang	late Shang	Shang	
	early Shang	middle Shang		
1600	Erlitou	Xiaqiuyan	Yueshi	Lower Xiajiadian
2000	late Longshan	Longshan	Longshan	Xiaoheyan
2600	early Longshan			
3000	late Yangshao	late Yangshao		Hongshan
4000	middle Yangshao			
	early Yangshao	early Yangshao		Zhaobaogou & Xinglongwa
5000	late Peiligang			
6000				

Table 1. Comparative regional chronology in four surveyed regions.

political organization of these ancient societies, the Sino-Australian Yiluo project was launched in 1998. This project features collaboration between archaeologists from the Institute of Archaeology of the Chinese Academy of Social Sciences, La Trobe University, Harvard University, the University of Michigan, and University College London. It seeks to understand the long-term development of social complexity in this region from the early Neolithic period to the full development of states in the Zhou dynasty (ca. 6500-200 BC) (Table 1). Full-coverage regional survey is integrated with geoarchaeological investigations, paleoethnobotanical studies, and lithic and ceramic analyses. The data generated from these investigations are used to assess changes in population, environment, land use, agricultural production, and craft specialization.

The research area is situated in the region of Gongyi in the eastern part of the Yiluo Basin of western Henan, where the landscape changes from the piedmonts of the Song Mountains to loess tableland and alluvial plains. The mountainous regions were rich in natural resources, such as stone, kaolin clays, and wood, and the lowlands were fertile for growing crops, including millet and rice. Agricultural and non-agricultural products from this area may have been highly

desirable for the elite at the primary centers in the Yiluo Basin. This project, therefore, is particularly focused on settlement distribution in relation to natural resources, in order to understand the functional interaction between the primary center and secondary centers in terms of the procurement of natural resources and agricultural products.

During the initial five seasons of fieldwork from 1998 to 2001, the field crew covered an area of 185 km² on alluvial plains and loess tableland. During fieldwork, topographic maps of 1: 10,000 scale are used. The field crew (7-10 persons) systematically traverses the survey area on foot to observe and check for archaeological remains on the ground surface, and finds are recorded on the maps. The distance between two surveyors is approximately 15-30 m depending on the physical environment. The crew has paid special attention to terrace cuts for cultural features, such as pits, burials, kilns, and house foundations. Section plans of many features are drawn, datable ceramics are collected, and sediment samples are taken for dating, flotation, and phytolith analysis. This method has enabled the crew to verify that sherd scatters were actual living sites, rather than the result of later earth moving, and also to directly assess activities undertaken at these sites. The crew tentatively subscribes to a criterion of at least 3-5 diagnostic sherds of the same archaeological period found within an area of 100 m square as the minimal definition of a site. In most cases the crew has used archaeological features for verifying the existence of sites. Site boundaries on maps are determined after a larger area is covered and artifacts are securely dated. Pottery sherds gathered from the survey are used as the primary phase markers in the study and are sorted according to an established local ceramic sequence. It has been sometimes necessary to perform subsurface coring, in order to record spatial and volumetric information about ancient occupations. The project attempts to date all sites to the finest chronological intervals—phases as short as 100 years—in order to better monitor population change through time. The site-size data are plotted into histograms in order to identify the settlement hierarchy.

A total of 127 sites dating from the late Peiligang to the Zhou periods (ca. 6000-200 BC), have been recorded. The majority of the sites are multicomponent, and more than half of them were newly found. Most sites (117) were distributed along two river systems, the Wuluo in the north and the Gan'gou in the south, with a few small sites found in the area between these two rivers. The following discussion is primarily based on the 117 sites found along these two river valleys (Liu et al. 2002).

For the late Peiligang period (ca. 6000-5000 BC) only five small sites (less than 0.7 ha) were located. These represent the first sedentary or semi-sedentary villages in the region. During the Yangshao culture

period (ca. 5000-3000 BC), the number of settlements increased to 34. Population growth became especially apparent in the middle and late Yangshao, as is indicated by the emergence of a two-tiered settlement hierarchy along the Gan'gou river, which can be seen in the site-size distribution histograms, with the largest site measuring 20 ha. There may have been a population decline during the early Longshan period (ca. 3000-2600 BC), when the number of sites dropped to nine. The region seems to have flourished again in the late Longshan period (ca. 2600-2000 BC), as the number of sites increased to 29, and each river valley became dominated by a local center, measuring 13 ha and 20 ha respectively.

A marked settlement nucleation occurred in the Erlitou period (ca. 1900-1500 BC), when a large regional center (Shaochai, 60 ha) developed at the confluence of the Wuluo and Yiluo Rivers, forming a three-tiered settlement hierarchy for the entire survey area, and the number of sites increased to 51. As the Erlitou site (located only 20 km to the west of Shaochai) developed into a large regional center of 300 ha in size during this period, the settlement hierarchy over the whole of the Yiluo Basin appears to have become at least four-tiered. The project team has attempted to date the Erlitou materials found at sites to the four established Erlitou phases, each about 100 years long. The settlement data show that a rapid increase in site number, the size of the Shaochai major center, and the total area under occupation in the area occurred during Phase II of the Erlitou period. These changes coincide in time with urban development at the Erlitou site, including the construction of large public buildings and the first casting of bronze ritual vessels (Institute of Archaeology 1999).

The Yiluo region continued to flourish during the early Shang period (ca. 1600-1250 BC), with a total of 46 sites being found, but the largest center, at Shaochai, became reduced in size to 18 ha: the settlement hierarchy in the survey thus can be seen to have become reduced to being two-tiered. However, since a new large regional center of 200 ha in size, known as the Yanshi **Shang City**, had by then become established in Yanshi County, less than 20 km to the west of Shaochai, the entire regional settlement system can be seen as three-tiered in this part of the Yiluo Basin. This apparent decline in social complexity, reflected in the change from a four-tiered to a three-tiered settlement hierarchy, may be related to the shift of the principal (and probably dynastic) political center from Erlitou in the Yiluo Basin to Zhengzhou in central Henan, as the latter developed into a primary center (25 km² in area) during the early Shang dynasty, or what is called the Erligang phase (Henan Institute of Cultural Relics 1993).

Following this change during the Erlitou/Erligang periods,⁴ which should be seen as the first settlement

nucleation in the Yiluo basin, the Yiluo region saw a sharp decline in population. This is indicated by the near absence of a late Shang period (ca. 1250-1046 BC) occupation and the presence of only a few Western Zhou period (ca. 1046-771 BC) sites. Another period of marked population growth occurred in the Eastern Zhou period (771-221 BC) when the Zhou court moved its capital from Feng near Xi'an in Shaanxi Province eastward to Luoyang in Henan Province, about 40 km west of Gongyi. The study area was then alternately dominated by the regional states of Hua and Gong. A three-tiered settlement hierarchy is observable during this period, with large, fortified state capitals (125 ha for the Hua state), and the number of sites (74) in the region reached its highest level (Liu et al. 2002) (Table 2).

Archaeological survey shows constant changes in population density, settlement hierarchy, and settlement distribution in the Gongyi region during the 6000 years under investigation. Fluctuation in population density and settlement hierarchy went through three cycles of growth and decline, reaching peaks in the late Yangshao, Erlitou, and Eastern Zhou periods. There were two episodes of settlement nucleation in the survey area. These are indicated by the presence of large regional centers and the three-tiered settlement hierarchies observed in the Erlitou and Eastern Zhou periods. These changes coincided with two events of socio-political transformation at the greater regional level. The first development correlated with the emergence of the urban site at Erlitou, which featured the construction of a palatial complex and the development of intensive craft specialization in bronze, pottery, and bone manufacture. The survey area became integrated with the primary center at Erlitou, thereby forming a large, four-tiered regional settlement system. The second development of a four-tiered hierarchy occurred with the establishment of a capital city at Luoyang by the Eastern Zhou court. However, it is the Erlitou period that shows the greatest change in all variables, including settlement hierarchy, the number of sites, and the total area under occupation, analyzed in settlement patterns at the regional level (Liu et al. 2002).

The rapid settlement nucleation witnessed in the Erlitou period coincides with changes occurring in other social sectors, such as resource procurement and craft specialization. The survey program has identified a secondary center at Huizui (25 ha), in Yanshi county, to the east of the Gongyi survey area. Huizui appears to have been a stone tool manufacturing center during the Erlitou period. Its location is 15 km south of Erlitou, and it is near the Song Mountains to its south. More than 400 semi-finished tools, flakes, and grinding stones were collected. A detailed analysis of these artifacts indicates that the stone tool manufacturing techniques at Huizui included flaking, hammer

⁴ This is equivalent to the Xia through Early Shang historical periods.

project	Yiluo	Anyang	Rizhao	Chifeng
BC survey area	124 sq. km	800 sq. km	400 sq. km	550 sq. km
200				
E. Zhou	3 tiered 125 ha 74 sites	2 tiered 50 ha 40 sites	3 tiered 170 ha 409 sites	12 ha 189 sites
600				
W. Zhou	2 td, 20 ha, 10 sts	2 td, 10 ha, 24 sts		245 sites
1000				
late Shang	1 td, 3 ha, 4 sts	4 td, 1000 ha, 27 sts		?
early Shang	2 td, 18 ha, 46 sts	3 td, 500 ha, 19 sts		
1600				
Erlitou	3 tiered, 60 ha 51 sites	1 td, 1 ha 14 sites		23 ha 299 sites
2000				
late Longshan	2 tiered, 20 ha 29 sites	3 tiered 56 ha 35 sites	4 td, 246 ha 199 sites	28 sites
2600				
early Longshan	1 tiered, 5.75 ha 9 sites			
3000				
late Yangshao	2 tiered, 20 ha 27 sites	2 tiered 15 ha 7 sites		11 ha 129 sites
middle Yangshao	2 tiered, 20 ha 10 sites			
4000				
early Yangshao	1 tiered 1.7 ha 2 sites	2 tiered 10 ha 12 sites		1 tiered < 3 ha 22 sites
5000				
Peiligang	1 tiered 0.7 ha 5 sites			1 tiered < 3 ha 14 sites
6000				

	High level of social complexity
	Medium level of social complexity
	Low level of social complexity

Table 2. Fluctuations of social complexity indicated by tiers of settlement hierarchy, size of largest site, and total site number in four surveyed regions.

... dressing, grinding, polishing, and hafting. The products are predominated by spades, followed by axes, adzes, chisels, and knives. The raw materials of the stone artifacts found at the site match lithic resources available in the mountainous areas near the site. This manufacturing center appears to have produced a large quantity of limestone spades, and the use of the same types of limestone in spades found at Erlitou as in tool blanks found at Huizui indicates that some Huizui tools were transported to the primary center at Erlitou (Ford 2001). Elite goods, such as white pottery vessels, may have been produced near the kaolin deposits in the Gongyi region. Shaochai, a secondary center in the Gongyi region near the Yiluo River, may have functioned as a transport node for channeling goods from the surrounding areas to the primary center (Liu et al. 2002).⁵ If this is the case, then the political-economic function of secondary centers in relation to the primary center in the Yiluo Basin seems to conform to the

⁵ Other key resources (e.g., metal and salt) needed by the Erlitou and early Shang elite may have been obtained from the more remote periphery, such as from southern Shanxi and the middle Yangzi River Valley. This topic, which is beyond the scope of this paper, has been dealt with elsewhere by the authors (see Liu and Chen 2000).

model of central place theory described above, in that material goods would be channeled from producers through the secondary centers to the primary center of the region. Together with the development of an urban center at Erlitou and the presence of a four-tiered regional settlement hierarchy, as described by Flannery and others (see above), these data demonstrate the emergence of a state-level social system centered in the Yiluo Basin during the Erlitou period.

The complexity of the primary center of this political system has been revealed at the Erlitou site, and it is reflected in the construction of monumental architecture, the centralized production of elite goods (e.g., bronzes), and the great social stratification seen in burials (Institute of Archaeology 1999). Our previous research has suggested that the expansion of Erlitou material cultural may have manifested a state-controlled population movement to resource-rich regions for the purpose of procuring copper and salt in the periphery, especially in southern Shanxi, some 200 km northwest of Erlitou (Liu and Chen 2000, in press; 2002, in press). The survey data now allow us to explore the mechanisms of the political-economic system of the Erlitou polity in its core area. Based on the hierarchical distribution of settlements and the functions of secondary centers, the Erlitou polity may have developed managerial capacity in producing and redistributing both elite and non-elite goods within a large economic system. A polity displaying such great political and economic control should have developed a complex administrative network at a state level (Liu and Chen 2002, in press). The transformation to a state-level social organization in the Yiluo Basin may have been a long process during which different social sectors played different roles. Crucial to understanding the nature of the social organization and political economy of the Erlitou polity is knowing the scale and mechanism of the settlement system, and this is the focus of this project. This project, however, does not provide new information for determining the relationship between the Erlitou site and the Xia dynasty of the historiographic traditions. That Erlitou is the Xia dynastic capital remains a working hypothesis.

The dramatic decrease in the number of sites and settlement occupations during the late Shang and Western Zhou periods in the survey area finds parallels in the archaeological records from western Henan and southern Shanxi. In these regions, three early Shang fortified towns—the Yanshi Shang City in the Yiluo region, and Yuanqu Shang City and the Dongxiafeng site in southern Shanxi—were all abandoned about the same time, and by the late Shang period, few traces are found in their surrounding areas (Liu and Chen 2000). This suggests the large-scale movement of populations into other regions. Historical records show that this movement of population was followed by the movement of

the Shang dynastic capital into the northern Henan region during the late Shang period, and then the shift of the dynastic center, following the Zhou conquest of Shang, to the Feng capital, near Xi'an, Shaanxi, in the west during the Western Zhou period.

THE ANYANG PROJECT

The modern city of Anyang, in northern Henan Province, is the location of the late Shang dynasty capital city of Yin (ca. 1250-1046 BC). This Shang site is located along the Huan River, and is also known as Yinxu (literally, "the ruins of Yin"). Yinxu has been extensively excavated since the first scientific excavation of the site in 1928, yielding a tremendous amount of remains including inscribed and non-inscribed oracle bones, ritual bronzes, jades, pottery, stone carvings, bronze foundries, monumental architecture, and royal tombs. This site not only symbolizes the highly developed culture of ancient civilization in China, but its earliest excavations also mark the beginning of Chinese archaeology as a modern, scientific discipline.

Despite the great number of excavations at Yinxu, the regional context of this urban center has remained poorly understood. The Anyang project, conducted jointly by the Institute of Archaeology of the Chinese Academy of Social Sciences and the Archaeometry Laboratory of the University of Minnesota, was launched in 1997. The aim of the project is to understand the dynamic relationships between human societies and the evolving landscape in the Huan River Valley (Sino-American Huan River Valley Archaeology Team 1998). The project has engaged in regional interdisciplinary research, involving extensive and intensive archaeological survey, geomorphological and soil investigation, DNA study of human remains, remote sensing and GIS applications, and various studies in zooarchaeology, palynology, paleoethnobotany, environmental magnetism, and ceramic petrography (Liu et al. 2001; Rapp, et al. 2000; Sino-American Huan River Valley Archaeology Team 1998).

The geoarchaeological investigation is primarily aimed at reconstructing the physical landscape in both synchronic and diachronic dimensions, and secondarily at assessing site formation processes at both the site and regional levels. The investigation has revealed the complexity of the stratigraphic sequences of the region, with the evolution of the geomorphology having been dominated by the interaction of fluvial and aeolian processes. There are two types of paleosols found in the region. There is a ubiquitous paleosol buried under the modern floodplain, which may be derived from alluvial deposits. This buried alluvial soil increases in depth from the west to the east, ranging from 2-3 m around Yinxu to over 7 m in the east. Below this is another deeply buried strong brown paleosol which was formed in the early Holocene period. The formation of these

paleosols represents prolonged landscape stability, and most Shang and other early cultural remains are associated with the strong brown paleosol.

These geological conditions explain the absence of prehistoric and early historic remains along the lower course of the Huan River, as the sediment above the buried alluvial paleosol in that area is more recent alluvium. But it does not exclude the potential of deeply buried sites there. The reconstruction of the Holocene landscape has also helped archaeologists to understand that many large and small sites may be deeply buried, and this conclusion was verified by the discovery of a major Shang walled city north of the Huan River which is buried up to 2-3 m below the surface. This discovery also challenged the traditional presumption that human settlements were always located on high ground (Rapp et al. 2000).

Archaeological survey by the Anyang project employed two methods, intensive and extensive coverage. First, based on the results of a survey program carried out by Chinese archaeologists along the Huan River region in the 1960s, the Sino-American team resurveyed and verified most of these previously recorded sites, with sub-ground coring employed at several settlements. Second, the project surveyed extensive areas that had not been investigated before. The survey teams systematically traverse the field with a spacing of 10-60 m between two surveyors. Survey has identified settlement patterns along the Huan River for each major chronological period from the Yangshao to the Eastern Zhou (ca. 5000-200 BC) (Table 1). An important aspect of this survey is to examine the archaeologically visible consequences of the emergence of the last Shang capital at Yinxu, its operation as a political and economic center, and its decline at the end of Shang dynasty (Rapp, et al. 2000; Sino-American Huan River Valley Archaeology Team 1998). About 800 square km was surveyed by the year 1999 (Rapp et al. 2000).

One of the major achievements of this project is the discovery of a walled city dating to the middle Shang period located north of the Huan River, called the Huanbei Shangcheng (meaning "the Shang city to the north the Huan River") by the project team. An intensive coring program led to the discovery of this site buried 2.5 m beneath alluvium. The Huanbei Shangcheng is the largest walled Shang city known. It measures about 470 ha in its walled area; each of the four sides of its rammed earth enclosure measures about 2150 m long; and the foundation of these walls measures up to 10 m wide. The enclosure is oriented about 13 degrees northeast, a characteristic of many other known walled Shang cities and large-scale architectural foundations. The ceramic assemblage unearthed from Huanbei indicates that the city dates to a transitional period between the Zhengzhou Shang

city (early Shang) and the Yinxu site (late Shang). Based on its large size and material finds, the Huanbei Shang city was probably a political center during the middle Shang period preceding Yinxu (Rapp et al. 2000; Tang et al. 2000). This discovery promises to greatly improve our understanding of the rise of Yin as the last Shang capital and has stimulated much discussion among Chinese archaeologists about the possible correlation between Huanbei and the various Shang capital cities that are recorded in ancient texts.

The discovery of the Huanbei Shang City has important implications for our understanding of the settlement system and political centralization before the establishment of last Shang royal capital at Yinxu. Since the Huanbei Shang city may have been the first urban settlement constructed in the region, further surveys and excavations, which have been taking place at the site, will enable archaeologists to investigate the transitional process from pre-state to state-level societies in this region, the impact of this urban development on the regional political landscape, and the dynamics of state formation in general.

By studying the regional and long-term history of human settlement, the Anyang archaeological survey has provided new insights into the trajectory toward social complexity from the Neolithic to the late Shang period. The Neolithic period, represented here as the Yangshao culture (ca. 5000-3000 BC), saw the onset of human settlement in the Huan River Valley. In spite of the very long time span, the distribution of Yangshao sites is sparse, and there appears to have been no dramatic change from the early phase (12 sites, with the largest one measuring 10 ha) to the late phase (7 sites, with the largest one measuring 15 ha) during this period, during which a two-tiered settlement hierarchy is observable. During the following late Neolithic period (ca. 3000-2000 BC), which in this part of China is represented by a regional phase of the Longshan culture, the number of settlements and their geographic distribution expanded drastically. A total of 35 sites were located, including three large sites ranging between 30 and 56 ha: these three sites can each be seen to be centers of their own three-tiered settlement hierarchy. This indicates the emergence of stratified complex societies in the area. Following the expansion of Longshan settlements is a perceivable reduction in the number of sites, to 14, during what is called the Xiaqiyan period (ca. 2000-1450 BC), which is equivalent to the historic predynastic Shang and early Shang periods. All sites dated to this period are very small in size (no more than 1 ha), and no settlement hierarchy is observable.

During the middle Shang period (ca. 1420-1250 BC),⁶ settlement numbers increase again, to 19, and the Huan-

bei Shang city appears, which can be taken as an indicator of a state-level political system. However, unlike the regional settlement system associated with the earlier urban center at Erlitou, no four-tiered settlement hierarchy has been identified in the Huanbei Shang city region. During the late Shang period (ca. 1250-1046 BC), the number of sites (27) and their size (1000 ha for the primary center at Yinxu) continued to increase. During this period as well, settlements expanded across the mountainous region to the west, and a four-tiered settlement hierarchy is seen. Such a settlement pattern is apparently associated with the growth of Yinxu as the capital city of the time. After the Zhou conquered the Shang and the Western Zhou dynasty (ca. 1046-771 BC) was established, settlement patterns in the region show a profound transformation, evidenced by fewer settlements (24), a decreased settlement hierarchy (two-tiered), and reduced settlement sizes (10 ha for the largest site). By the Eastern Zhou period (771-221 BC), there seems to have been another increase in settlement number (40) and the development of a central settlement (50 ha), although settlements tend to be widely dispersed (Rapp et al. 2000) (Table 2).

As archaeological and geoarchaeological investigations continue, the history of socio-political change in Anyang is unfolding. Similar to the Yiluo Basin, the development from Neolithic pre-state societies through the late Shang period witnessed alternating fluctuations of political and economic consolidation and fragmentation through time. However, the patterns of such fluctuations in the two regions are not the same. Moreover, since the emergence of the first state-level society in the Huan River valley was not a pristine state, the dynamics of state formation here might differ from those of Erlitou. Further research is needed to explain the socio-political implications involved in the different regional settlement patterns revealed in these two regions.

PROJECTS OUTSIDE THE CENTRAL PLAINS

Two projects, sharing similar research goals, are currently taking place in areas located outside of the Central Plains, in the Rizhao area of Shandong Province, and in Chifeng in Inner Mongolia. Peoples who lived these "outer" regions during historic times were often referred to in ancient texts as *Yi*, *Di* or *Hu* "barbarians", who were seen as possessing different cultures and ethnicities than the "*Huaxia*" peoples of the Central Plains. Recent archaeological discoveries, however, suggest that the Neolithic cultures that developed in these regions were no less complex than those in the Central Plains. These two projects investigate the different trajectories toward social complexity in these regions.

THE RIZHAO PROJECT

The Rizhao district is situated on the southeastern edge of the peninsular area of Shandong. It has a flat

⁶ The dates given here are based on the results of the Three Dynasties Chronology Project (Xia Shang Zhou Chronology Project Team 2000: 71).

coastal plain extending from the northeast to the southwest that is bordered on the west by inland hills and on the east by the coast of the Yellow Sea. The Shandong region was referred to as the land occupied by the Eastern Barbarians (*Dong Yi*) in ancient texts. Archaeological finds made in recent decades indicate that complex societies developed there during the Neolithic period, and are known as the Dawenkou and the Longshan cultures. These cultures were characterized by elaborate burial practices and the construction of fortified towns.

The Rizhao project, launched in 1995, features a systematic full-coverage survey program, collaboratively conducted by archaeologists from the Field Museum in Chicago, Yale University, the University of California in Los Angeles, and Shandong University. It is investigating the development trajectory of social complexity in this peripheral region (Underhill et al. 1998). During the first five seasons from 1995 to 2000, the survey team covered an area of 400 square km, and located 750 sites. Among these sites, only 10 had been known prior to 1995 (Underhill et al. 1998; Sino-American Collaborative Liangcheng Archaeology Team 1997, and in press).

The archaeological chronology of the Rizhao area extends from the Longshan period to the Han dynasty (ca. 2600 BC – AD 200) (Table 1). Initial settlement occupation seems to have been considerably later than in other areas studied, perhaps due to marine transgression. However once the population began to settle in the region, there was a rapid development of social complexity and settlement nucleation, centered at the site of Liangchengzhen, during the Longshan period (ca. 2600-2000 BC). A total of 199 Longshan sites were found, forming a four-tiered settlement hierarchy. Five settlement clusters have been identified, including a central cluster where the primary center at Liangchengzhen (246 ha) is located, and four clusters on the periphery (Underhill et al. 1998; Sino-American Collaborative Liangcheng Archaeology Team 1997, and in press).

Liangchengzhen has yielded large quantities of pottery, finely made elite ceramics, jades, and stone tools (Sino-American Collaborative Liangcheng Archaeology Team 1997, and in press). It was possibly a craft production center, manufacturing both elite and utilitarian goods. This is indicated by the discovery of semi-finished jade objects (Liu 1972) and a large number of stone tools including a considerable portion of small fragments of sandstone grinding palettes (Bennett 2001). Although raw materials for stone tools are available in the region, they are situated outside of the survey area (Bennett 2001). The entire process of stone tool production, from quarrying to manufacture and distribution, remains to be investigated by future research.

The late Longshan period witnessed the beginning of

decline in social complexity, which is indicated by a reduction in the number of sites. Such a decline became more apparent during the following Yueshi culture (ca. 2000-1500 BC) and Shang (ca. 1500-1046 BC) periods. Only isolated sherds from six sites are datable to the Yueshi culture, and 18 sites belong to the Shang period. The population seems to have grown during the Zhou and Han dynasties, as indicated by the increased number of sites (409 for the Zhou and 461 for the Han). However, the total area of occupation declined (791 ha for the Zhou and 847 for the Han) compared to that of the Longshan period (873 ha). Liangchengzhen was still the primary regional center during the Zhou and Han periods, but its size (170 ha for the Zhou and 177 for the Han) was reduced considerably compared to that in the Longshan culture (Sino-American Collaborative Liangcheng Archaeology Team in press) (Table 2).

The highly developed Longshan culture has been the major focus of the project. It is particularly interesting to note that a secondary center at Dantu (130 ha) was fortified, while the primary center at Liangchengzhen was not. Since these two centers were extremely close to one another (only about 2 km apart), and contemporary during the early and middle Longshan period (ca. 2600-2200 BC) (Sino-American Collaborative Liangcheng Archaeology Team in press), their functions and interrelationships are crucial for understanding the development of this four-tiered settlement system. According to several theories discussed above (Earle 1991: 3; Flannery 1998; Peebles and Kus 1977; Wright 1977: 389; Wright and Johnson 1975), the four-tiered settlement hierarchy revealed in the Rizhao region should be evidence for the development of a state. Such a conclusion would contradict the popular interpretation that the Longshan culture was the product of chiefdom-level societies (see e.g., Liu 1996; Underhill 1994). The ongoing excavations at these two sites may provide some insights into these issues in the future.

THE CHIFENG PROJECT

Chifeng, in southeastern Inner Mongolia, is situated in the region known as the Northern Corridor. This region is positioned between two ecological zones. To the south is the Yellow River Valley, where agriculture has been the dominant subsistence strategy for thousands of years, and to the north and northwest is the steppe region, where traditionally people have been pastoral nomads. The Northern Corridor is sensitive to climatic changes, which may have affected subsistence strategies, resulting in shifts occurring from foraging to agriculture (Shelach 2000), and then to pastoralism.

The Chifeng project, initiated in 1998, is conducted collaboratively by archaeologists from the University of Pittsburgh, Hebrew University, Jilin University, and the Inner Mongolia Institute of Archaeology. The main objective of the project is to understand the process of

this region will improve our understanding of the role played by the communities of this buffer area, in terms of the interaction between the Chinese states and the northern polities during a long period of constant power shifting.

The preliminary results of the Chifeng project already show a pattern of socio-political development different from those seen in the Central Plains. Its Neolithic and early Bronze Age cultures flourished with much indigenous characteristics. This region became more integrated with, and influenced by, its neighboring political entities to both the south and the north, from the Eastern Zhou period onward.

This ongoing project has recently started a geomorphologic survey focusing on the post-depositional processes that may have affected the visibility of sites of different periods in different environments. Further research will also include test excavation and the reconstruction of the paleoenvironment (Gideon Shelach, 2001 personal communication). This project will provide invaluable data for the investigation of social transformations on a greater scale, and interregional interactions between the states in the Central Plains and the non-dynastic polities in the Northern Corridor.

OTHER PROJECTS

Four other survey projects have been conducted in the Yellow River valley, including Zhudingyuan, the Ying River region, the Shangqiu area, and the Helan Mountains region (Figure 1).

ZHUDINGYUAN

Zhudingyuan is situated on a large loess tableland in Lingbao County, western Henan. Archaeologists have found a large number of Neolithic sites in this region, most of which were dated to the Yangshao period (Yang 1991: 168-169). Zhudingyuan (literally, the tableland where the *ding* tripod vessel was cast") is believed to be the place where the mythical Yellow Emperor, *Huangdi*, cast the first bronze *ding* tripod, and a temple and tomb were built there in late historical times dedicated to him. The rich archaeological remains and legends of the region have generated great interest among scholars and locals alike.

In 1999 archaeologists from Beijing and Henan, with the enthusiastic support of the local authorities, launched a full-coverage regional survey program in Zhudingyuan. The project adopted the full-coverage survey method which has been employed in the Yiluo River survey project, representing the first regional survey project run by a Chinese archaeology team directed toward the study of settlement patterns. The survey areas were confined to two river valleys: Yangping (20 km long) and Sha (30 km long), and the field crew located 29 sites dating to the Yangshao and Longshan periods. Site density reached its peak during the mid-

Yangshao period, and settlement hierarchy appears to have been three-tiered, with the largest site at Beiyangping measuring 90 ha in area. The Yangshao culture was followed by a period of marked population decline, indicated by few sites datable to the following Longshan and Erlitou cultures. Although archaeologists have not identified particular artifacts or features suggestive of the existence of elite groups, the hierarchically organized settlement pattern seems to challenge the traditional interpretation of the Yangshao culture as an egalitarian society. The analysis of the survey data also resulted in the hypothesis that the decline of Neolithic societies in this region may have been the result of the over-exploitation of the environment (Henan Institute of Cultural Relics, et al. 1999; Henan Team et al. 1999). This proposition remains to be tested in the future.

YING RIVER

The Ying River project was conducted by archaeologists from the Henan Provincial Institute of Archaeology and the University of Missouri in 1996. The field crew located and surveyed 25 late Longshan and Erlitou sites in an area about 100 km in length along the upper Ying River in central Henan. The project also employed GIS applications to analyze the relationship between settlement distribution and ecological conditions. Most settlements were found on terraces, about 2-8 m above the surrounding land, at the confluences of the Ying River and its tributaries. The average distance between settlements is about 4 km (Henan Institute of Cultural Relics and University of Missouri 1998). These results provide valuable information for understanding land-use patterns during the late Longshan and Erlitou periods. However, the project did not attempt a systematic full-coverage survey to record sites dated to all periods in the local chronological sequence. The Ying River valley is an extremely important area for understanding the development of cultural complexity during the critical period from the Longshan to the Erlitou and Shang periods. Unfortunately, this project has not addressed issues relating to socio-political transformation as seen in settlement patterns. It is hoped that future archaeological work in this region will produce the kind of data much needed for comparative studies with other regions, such as changes in settlement distribution, function, and hierarchy through time.

SHANGQIU

The Investigations into Early Shang Civilization Project, or the Shangqiu project, led by Kwang-chih Chang, is jointly conducted by archaeologists from Harvard University and the Institute of Archaeology of the Chinese Academy of Social Sciences. It has long been believed that the Shang people established their

dynastic reign in Shangqiu, in eastern Henan. However, this is a region that has been severely affected by the Yellow River's frequent floods. As a result, silt deposits dating just from the historical period can be 10 m or more in some areas. Finding early cities there has proved to be extremely difficult, and deeply buried sites cannot be found by current full-coverage survey methods.

The Shangqiu project, launched in 1991, has as its objectives the reconstruction of the Holocene landscape in this part of eastern Henan, the investigation of Neolithic and Bronze Age sites to better understand the cultural chronology in the area, and to search for sites of the predynastic and early Shang periods that are believed to have been located here, including the predynastic ritual and administrative center known as Dayi Shang, or "Great City Shang" (Murowchick 1997; Zhang and Chang 1997; Chang and Zhang 1998). The project began with geoarchaeological investigations in order to understand the stratigraphic and geomorphic contexts of ancient settlements in the region and to predict and detect buried sites, particularly large settlements (Jing and Rapp 1995, 1998; Jing et al. 1997). Three types of coring techniques were employed over six years (1991-1996), comprising the Dutch auger, the Luoyang spade (a traditional tool used to detect buried cultural sediments in China), and a truck-mounted percussion rig. After drilling over 700 cores, the geoarchaeological team detected a major walled city buried approximately 12 m below ground surface. It was an Eastern Zhou city, almost certainly the city known as Song which according to ancient texts was first established in the early Western Zhou period by the descendants of the Shang royal house, in the area where their sacred Great City Shang had originally been located (Jing et al. 1997; Sino-American Collaborative Team 1998). This discovery has convinced many that the predynastic and early Shang will indeed be found in Shangqiu. However, site detection and excavation through the deep sediments of this region are both technologically and financially challenging, and future work will hinge upon sufficient funding and technological developments.

THE HELAN MOUNTAINS

The Helan Mountains project was an exploratory survey program carried out over a period of three years after 1989 along the margins of the Helan Mountains in Ningxia. The project was designed to obtain insights into the adaptive behavior of hunter-gatherers during the Pleistocene-Holocene transition in central northern China, in order to compare it with data from a similar environment in the Great Basin of western North America. Helan is an isolated mountain range situated to the west of the great bend of the Yellow River (Figure 1) with a variety of geographical settings. The survey team investigated twelve areas, involving sand

dunes, alluvial fans, stream margins, and lake-marsh shorelines. Forty-seven localities were recorded, but no surface collections were made, in order to keep with government's new regulations. Assessments were, therefore, based on direct field observations (Madsen et al. 1996).

Based on survey data and environmental studies, the investigators of the project proposed a settlement framework for this region. The Late Pleistocene hunter-gatherers, with a high degree of localized residential mobility, resided in areas of high local environmental diversity, high productivity, and high resource rank. With the change to warmer and wetter conditions at the terminal Pleistocene, a continuing high degree of residential mobility spread over a large area; while residential bases may have reduced in number, population in some areas may have increased. During the early to middle Holocene, as environmental conditions began to degrade and hunter-gatherers were forced to broaden their diet and to develop higher-cost extraction techniques with which to process food, residential mobility decreased. This led to Neolithic adaptive intensification and complexity. Finally, as agriculture developed during the Middle to Late Neolithic, and as conditions gradually became more arid, two adaptations emerged: full-time farming on locations where water was available, and pastoralism relying on the use of domesticated animals in arid areas. In short, the early development of plant husbandry may have been related to a trend towards decreased residential mobility associated with increasingly intensive and specialized use of seed resources in this region (Madsen et al. 1996).

This project is different from all others in methodology, and it is the only systematic and comparative study focusing on the origins of food production. The model for the transitional process from foraging to agriculture proposed by this project should be compared with other areas in China when more data become available in order to understand the diversity of human adaptations in relation to environmental change.

These four projects have produced invaluable information for further study into the relationships between environmental change, human adaptations, land use, and the development of social complexity.

TRAJECTORIES TO SOCIAL COMPLEXITY

Although still preliminary, these investigations, especially the four systematic regional survey projects, have produced much useful data for analyzing and comparing the various developmental trajectories in different regions. We now can compare the archaeological sequences from the early Neolithic period to the Eastern Zhou period in four regions (Table 1). Based on the data generated from the survey projects, fluctuations in three variables of settlement patterns that are indicative of the degree of social complexity—site number, size of

the largest site, and settlement hierarchy—are present in all regions, but each appears to have its unique cycles of social development and decline (Table 2). Many social and environmental factors may have been responsible for the social changes, and interregional interaction also played an important role.

During the early Neolithic (the Peiligang period in the Central Plains and the Xinglongwa-Zhaobaogou period in Chifeng), environmental conditions may have been the main factors to affect settlement patterns. Since the early Neolithic period, subsistence strategies were likely to be a combination of hunting, gathering, and food production, and the emergence of small settlements in the Yiluo River Valley and Chifeng during the sixth millennium BC may relate to the environment in these two regions being able to provide ample natural resources for these subsistence strategies.

The first period of population growth occurred in Yiluo, Zhudingyuan, and Chifeng during the fifth and fourth millennia BC, during the Yangshao and Hongshan culture periods, coinciding with the mid-Holocene climatic optimum (Shi, et al. 1992). It provided perfect conditions for the development of agriculture, which may have been one of the factors allowing the growth of population and the expansion of settlements over larger regions. The reasons for the relatively low density of sites in the Anyang region and the absence of sites in the Rizhao region are not entirely clear and may be attributable to multiple factors. The Rizhao region in particular is situated near the coastline and may have been affected by marine transgressions, since the sea level may have been some 4 m higher than at present during the pre-Longshan periods. Such conditions may have limited the scale of human inhabitation (Underhill et al. 1998: 457-458).

The third millennium BC (the Longshan period) witnessed the development of complex societies in some regions (Yiluo, Anyang, and Rizhao), but marked population decline in others (Zhudingyuan and Chifeng). The causes cannot be explained solely by climatic fluctuation, and social factors need to be taken into account. These issues remain to be investigated in future research, particularly the excavation of selected sites found during the regional surveys.

We begin to see different trajectories between the Central Plains and the surrounding regions during the second millennium BC. In the Yiluo Basin, the first settlement nucleation and the emergence of urbanism took place during the Erlitou period, and such a development continued, although declining somewhat, in the early Shang period. At the same time, the Anyang region witnessed a dramatic population decline during the Xiaqiyuan period. This polarized scenario became completely reversed when primary centers were established in the Huan River Valley during the middle and late Shang period. Such demographic changes may

have resulted from the formation and shift of political centers to different locations during the early dynastic Shang period. With the establishment of the Shang dynasty, for the first time a settlement system became politically integrated at an interregional level in the Central Plains.

During the second millennium BC, the Central Plains periodically experienced political solidarity and integration, when a large urbanized political center first emerged at Erlitou and then developed at Zhengzhou and Anyang. In contrast, complex society in the Rizhao region disappeared; several regional centers of the Yueshi culture (c. 2000-1500 BC) in Shandong were relatively small in size, some were fortified, pointing to a decentralized political system (Liu 2000: 29; Luan 1996: 288-338; Ren 1991). After the Yueshi period, the indigenous culture in Shandong gradually assimilated by the Shang and Western Zhou cultures (Gao 2000; Luan 1996: 339-368; Xu 1994). In the north, a new wave of population increase and construction of fortifications on hilltops, possibly indicating inter-group conflict, characterized the Lower Xiajiadian period in Chifeng. The forms of socio-political organization in the east and north of the Central Plains during this period were complex in their own right, but it is clear none of these two regions experienced the development of state-level society comparable to that of the Erlitou.

The first millennium BC witnessed fundamental socio-political transformations in the Central Plains, as centralized Western Zhou dynastic power fragmented going into the Eastern Zhou period. Settlement patterns in the Yiluo River Valley and at Anyang reflect these changes, while the appearance of Zhou material culture in the Rizhao region reflects the expansion of Western Zhou power. However, the flourishing of the Upper Xiajiadian culture in Chifeng, with increasing pastoralist characteristics, indicates a regional development that may have been independent from, but parallel to, the agricultural cultures of the Central Plains.

Only during the Qin and Western Han period at the end of first millennium BC did these three regions eventually become integrated into the powerful central empire, forming core-periphery relationships. After the Western Han, while the Shandong region became an essential element of Chinese dynastic traditions, the Chifeng region became part of the area of the outer northern polities, such as the Xianbei and Qidan, who were ethnically and economically distinctive from the Central Plains cultures.

CONCLUSION

The concept of settlement archaeology has come a long way in Chinese archaeology since it was first introduced to China nearly twenty years ago by Professor Kwang-chih Chang. The results of recent survey projects are beginning to provide a more comprehen-

sive picture of the different trajectories to social complexity in several regions closely related to the development of early Chinese civilizations. In addition to monitoring long-term changes in settlement patterns, the interdisciplinary approaches employed in these projects have produced, and continue to produce, information on paleoenvironment, subsistence economy, craft production, trade, demographic change, and site formation processes. Some projects have already begun, or will begin, to excavate important sites in order to address more in-depth research questions concerning social formation. These projects have also demonstrated the strength and fruitfulness of international collaborative research, a strategy which will contribute to greater knowledge of Chinese archaeology.

Despite the great achievements that have been made, many methodological and theoretical questions remain to be resolved. Refined chronological control over archaeological remains in each survey region has always been a challenge to all projects. Such refined chronology with data produced by interdisciplinary research in different regions need to be comparable in order to understand social changes occurring across a broad region during a short time period. Also, the theoretical interpretation of sociopolitical change at the interregional level will require the exchange of ideas among investigators engaged in different projects. It is hoped that this preliminary review article will stimulate greater collaborative research strategies among archaeologists working in different regions in China. □

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Interaction Spheres and the Development of Social Complexity in Northeast China

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The time has come for the social scientists to take the Chinese experience into account in formulating and/or testing their generalizations (Chang 1989:161).

China is generally recognized as an important area for the study of the development of social, political, cultural, and economic complexity, and classic interpretations of the Chinese sequence have been important to the formulation of general models of social evolution (see Lattimore 1940; Wheatley 1971; Wittfogel 1957). Ironically, however, with the great developments in Chinese

archaeology over the last twenty years, archaeologists and other social scientists still have rarely taken up K.C. Chang's call of more than a decade ago. To give just one example, scarcely anything to do with China is even mentioned by the contributors to one important recent and otherwise exceedingly broad and comprehensive collection on early states (Feinman and Marcus 1998).

Disregard of Chinese data by archaeologists working in other parts of the world is one side of this coin. But the main fault may lie in the fact that few attempts are made by Chinese archaeologists and by Western archaeologists working in China to address general anthropological models. Because Chinese archaeology has been, until recently, a sub-discipline of history and was mainly viewed as a method to confirm and illustrate known historical events (Chang 1981; Falkenhausen 1993; Olsen 1987; Thorp 1991), the data generated by Chinese field projects are not suitable to