

Periphery or land of cultural dynamics: rethinking prehistoric South China

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ABSTRACT – *South China has been viewed as a periphery in the archaeology of China. However, excavations and the application of multi-disciplinary approaches since the late 1990s facilitate a better understanding of the environment and resources, cultural chronology and diversity, and the dynamics between South China and adjacent areas, including the occurrence of pottery, the expansion of farming and the co-existence of different subsistence strategies. Prehistoric South China is a landmass where the cultures of the Yangzi River Valley interacted with local cultures; it also facilitates the cultural dynamics between the Yangzi River Valley and Southeast Asia.*

IZVLEČEK – *Kitajski arheologi so področje južne Kitajske do sedaj razumeli kot periferno območje. Vendar pa izkopavanja in uporaba več-disciplinarnih pristopov od poznih 90. let 20. stoletja omogočajo boljše razumevanje okolja in naravnih virov, kulturne kronologije in raznolikosti ter dinamičnih odnosov med južno Kitajsko in sosednjimi območji, ki se, med drugim, kažejo tudi v pojavu lončenine, širjenju poljedelstva in s soobstojem različnih subsistenčnih strategij. V prazgodovinski južni Kitajski so bile kulture iz območja doline reke Jangce v stiku z lokalnimi kulturami. Novi pristopi omogočajo tudi razumevanje kulturnih dinamik med dolino reke Jangce in Jugovzhodno Azijo.*

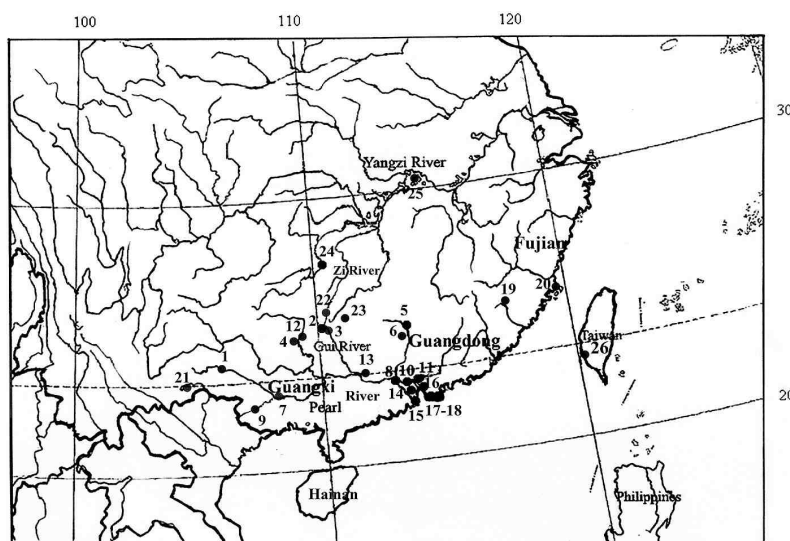
KEY WORDS – *South China; pottery; foraging; farming; cultural dynamics*

Introduction

In the literature of China's archaeology, 'South China' can refer to a landmass from the Yangzi River Valley to the South China Sea (*i.e.*, Wang 1997), and is called *Huanan* or *Zhongguo Nanfang* in Chinese, both terms literally mean 'South China'. The term 'South China' can also refer to an area ranging from sub-tropical to tropical latitudes, approximately latitudes 18° and 25°N, and longitudes 105° and 122°E, within the border of the People's Republic of China, and to the south of the Five Mountains, which demarcate the Yangzi River Valley and South China (Fig. 1). In the latter context, it is called *Lingnan* (literally, 'south of the mountains'); it is sometimes also called *Huanan* (*i.e.*, *Institute of Archaeology, Chinese Academy of Social Sciences (CASS) 2010*) in Chinese, which can be confusing. In this paper, the second definition is used.

Archaeological work in South China commenced in the 1920s. An Italian missionary Fr. Rafeal Maglioni conducted an archaeological survey in coastal Guangdong in the 1920s (*Guangdong Institute of Archaeology 2000.2*), while a British civil servant, C. M. Heanley, was collecting stone artefacts in Hong Kong at the same time (*Meacham 2009.10*). In 1928, the first archaeological team of the Central Government of the Republic of China – the Archaeological Section of the Institute of History and Philology of the Academia Sinica – was established in Guangzhou (or 'Canton' in English) (*Guangdong Institute of Archaeology 2000.1*), which still serves the same function in Taiwan today. Systematic excavations and surveys have been carried out in South China to search for prehistoric remains since the 1930s, particularly for the fossils of apes and early hominids,

Fig. 1. Archaeological sites mentioned in the text. 1 Baise (Bose). 2 Dayan. 3 Zengpiyan. 4 Liujiang. 5 Maba and Shixia. 6 Niulandong. 7 Dingsishan. 8 Yinzhou. 9 Zhiren Cave. 10 Youyugang and Xiqiaoshan. 11 Jinlansi and Wanfu'an. 12 Bailiandong and Liyuzui. 13 Fengkai. 14 Youyugang. 15 Macao. 16 Yuanzhou. 17 Xiantouling. 18 Sham Wan, Yung Long, Sha Ha and other archaeological sites in Hong Kong. 19 Zhangzhou. 20 Keqiutou. 21 Gantuoyan. 22 Xiaojin. 23 Yuchanyan. 24 Gaomiao. 25 Tangjiagang. 26 Nankuangli.



and associated archaeological remains, in order to study the origin and evolution of human beings (Zhang 1983). To date, hundreds of archaeological sites and find sites have been discovered in South China, dating from the Palaeolithic to the Qing Dynasty (AD 1644–1911). For example, archaeologists have discovered more than 100 sites where cobble implements have been found; more than 400 Neolithic sites; over 20 historic settlements dating from about 2500 to 1000 bp; about 10 ancient kilns; more than 90 cemeteries and 8 localities of ancient rock art in Guangxi Zhuang Autonomous Region (Guangxi) (Jiang 1992; Xie et al. 2011). Even in Hong Kong, which is only c. 1000km² in area, more than 200 archaeological sites dating from c. 6500 to c. 300 bp have been found (Lu 2007:36).

On the other hand, this area has been viewed as a periphery in terms of pre/historic cultural development compared to the Yellow River and Yangzi River valleys. As the earliest states and the majority of the united dynasties in ancient China established their capitals in the Yellow River Valley from approximately 4000 bp, the Yellow River Valley has been labelled as ‘the cradle of Chinese civilisations’ in antiquity, historical and archaeological studies in China. When Chinese archaeologists began fieldwork in mainland China in the 1920s with the objective of discovering the origin of Chinese civilisation in order to enhance Chinese national and cultural identities, they also focused on the Yellow River Valley (Lu 2003a). The development of archaeological studies and consequently the discovery of many prehistoric remains in the Yangzi River Valley after the 1970s have illustrated that the Yangzi River Valley was a primary centre of rice domestication in the world as-

sociated with vigorous cultural changes (Lu 2006b; 2012a), so it has become another focus of archaeological studies in mainland China since then, whereas South China has been perceived as a region occupied by hunter-gatherers, and cultural development is regarded as static in the pre-historic era. This academic mindset reflects a discourse of unilineal cultural evolution derived from Lewis Morgan (1877) and Marxism; the latter has been the dominant theoretical framework in the archaeology of mainland China since the 1950s (Lu 2003a).

Although substantial archaeological data are available, neither the chronology and cultural changes in this region, nor the cultural dynamics between South China and adjacent areas, were very clear up to the early 1990s. In 1996, the Institute of Archaeology of the Chinese Academy of Social Sciences (CASS) began to work with local and foreign archaeologists in this region. Three caves and one shell midden site located on a river terrace have been excavated or re-excavated. Supported by funds from the central and local governments of China and the Research Grant Council of the government of Hong Kong Special Administrative Region (HKSAR), multi-disciplinary approaches of floatation, pollen and phytolith analysis, zoo-archaeological and physical anthropological studies, chemical analysis of pottery, starch residue analysis and use-wear studies of stone and organic implements have been applied in order to retrieve more holistic data on the past environment, resources, the interaction between nature and human culture, and cultural changes in prehistoric South China, as well as cultural exchanges and/or human diaspora between South China and the Yangzi River Valley, particularly regarding the manufacturing of pottery,

the expansion of rice farming and the co-existence of foraging and farming societies in this area.

The nature and settlement of South China

South China consists of Guangxi, Guangdong, Fujian and Hainan provinces, as well as Hong Kong and Macao, and covers a total area of over 565 000km² (*Editing Committee of China's Physiography 1984*). The northern part of South China is mountainous, with certain limestone landscapes and many caves, providing natural shelters for prehistoric humans. Plateaus, basins and river valleys dominate the central part of South China, while small plains, river terraces and deltas are major geomorphologic features in the south. The Pearl River, the longest and biggest river in the region, is connected in its middle section to the Yangzi River by smaller rivers such as the Zi and Xiang (Fig. 1), and in its upper course to the Mekong and Hong rivers. Being a sub-tropical to tropical area, average precipitation is between 1400 and 2000mm, and annual average temperature is between 20 and 22°C (*Editing Committee of China's Physiography 1984*).

According to pollen, phytolith, faunal and chemical analyses of the limestone deposits in South China, the climate has been relatively stable for roughly the last 200 000 years. The Last Glacial Maximum (LGM) had a certain impact on South China, particularly between 25 600 and 15 800 bp, when temperatures and precipitation declined significantly (*Yuan et al. 1999*), and the sea level dropped between 155 to 80m below the present level, with the neotectonic movement being considered (*Jiao 2007.38*). After the LGM, the climate became warmer and moister, but there were cold periods between 13 000 and 12 600 bp and about 10 800 bp, when the lowest annual temperature might have dropped to 9° Celsius in northern South China, although it was not as cold as the climate during the LGM (*Yuan et al. 1999*). After 10 000 years bp, the climate became warmer again and was similar to that of the present; the sea level rose and reached the highest level at approximately 7500–4500 bp, which is probably about 2.5m higher than at present (*Jiao 2007.39; Yuan et al. 1999*). Thus the coastal area might have become uninhabitable, and the earlier archaeological remains in this area might have been destroyed. However, the sea level dropped, reaching its current level c. 4000 bp (*Jiao 2007.39*). Unfortunately, precise data on the temperature and precipitation of prehistoric climates for the whole region are not available at the moment.

Archaeological work and data collected by archaeobotanic and zooarchaeological analyses indicate that both floral and faunal resources were very rich in this region in terms of both quantity and diversity (*Editing Committee of China's Physiography 1984*). Broadleaf evergreen trees dominate the local flora today, many of which produce edible nuts and fruits (*Editing Committee of China's Physiography 1984*). After being exploited by humans for thousands of years, there are still some two thousand species of wild plants, more than 130 species of mammals, over 150 species of reptiles, approximately 300 species of fresh-water and marine fish, and over 500 species of birds in South China today (*Editing Committee of China's Physiography 1984*), while animal remains found in archaeological sites indicate that more wild species would have been available to human beings in prehistoric periods. The seasonal stability of, and relatively easier accesses to, natural resources facilitated an affluent way of life for foraging societies in prehistoric era (*Lu 2010*).

Faunal remains found at several sites in South China provide more information on the palaeoclimates and natural resources. The *Stegodon*-giant panda fauna occupied South China in the Pleistocene and Holocene periods, consisting of several species of deer, wild boar, the Chinese bamboo rat, monkey, elephant, rhinoceros, *Tapirus*, porcupine, and chimpanzee, with a species of porcupine, bamboo rat, giant panda, rhinoceros, wild boar and several species of deer being the most frequently found remains in natural deposits and archaeological sites (*Institute of Archaeology CASS et al. 2003; Wu, Wu 1999*); many of these species are now either extinct in South China (such as the rhinoceros and elephant), or are very rare (such as deer, wild boar, primates and giant panda). Animal species of this fauna usually live in sub-tropical to tropical habitats, so it seems that the climate in South China was relatively warm and humid from the middle Pleistocene to the Holocene, although with fluctuations. Various species of freshwater shellfish have been widely found in archaeological sites dating from c. 12 000 to c. 4000 bp in South China (*Institute of Archaeology CASS et al. 2003; Lu 2010*), and marine shell fish have been found in cultural deposits in the coastal area (*Jiao 2007; Lu 2007*), indicating the abundance of water and edible resources in fresh and marine water.

To summarise, South China is a landmass with abundant sunlight, water and natural resources, an ideal habitat for humans. The peopling of South China

can be traced back to the Pleistocene era, but the precise dates of the Palaeolithic remains are still under debate. It has been claimed that two 'Acheulean-like hand-axes', along with other lithic implements, have been discovered in the Baise (or Bose) Basin, Guangxi (Fig. 1) since the 1970s, and date to 0.7–0.8 million years ago based on the date of Australasian tektites found in association with the stone tools; and that these implements illustrate the migration of *Homo erectus* from West to East Asia (Hou et al. 2000). However, this conclusion is not convincing for three reasons. First, all three 'bifacial hand-axes' (Hou et al. 2000:1624) are surface finds and none are from archaeological strata (Lin 2002:75). So far, no typical 'hand-axes' have been found in archaeological strata (Lin 2002:75), not even in the large-scale excavation in the same Basin in 2004, according to this author's observation. Further, typologically similar pebble tools were found in two cultural layers in the 2004 field season (Lu 2006a), illustrating the long existence and technological stability of the lithic industries in this area, and questioning whether typological variants alone can be used to date the stone artefacts. Second, the date of the 'hand-axes' is very problematic. While the tektite distributed in Guangxi is indeed dated to 0.7–0.8 million years ago, this does not correlate with the date of the stone implements (Koeberl et al. 2000), since people living in different periods could have selected and used it as raw material. Hundreds of small flakes of tektite and intact tektite nodules associated with pottery, stone and organic artefacts have been found in the bottom layer of Dingsishan, an open site near the present Nanning City, Guangxi (Fig. 1), and the date of this layer is about 11 000 bp (Fu 2002a).¹ The discovery at Dingsishan clearly illustrates that the Australasian tektite in Guangxi does not exclusively exist with 'Palaeolithic' tools; that the date of the tektite does not correlate with the date of the stone implements at Baise, just as the date of sandstone or flint do not correlate with the date of the associated stone implements found in other places of the world. Finally, the 'hand-axes' found in Baise are morphologically different from Acheulean hand-axes found in Europe and Africa. As pointed out by Lin and He (1995:124–131), while all the edges of Acheulean hand-axes have been modified and can be used as working edges, the bottom edges of many Baise 'hand-axes', which should be the main working edge of an axe, have not been modified at all. This morphological difference indicates that prehistoric toolmakers in South China

might have assigned different functions to this type of tool (Lu 2006a). This question requires further study, particularly use-wear analysis. Corvinus (2004) has concluded that a true Acheulean tradition has not been identified at any Palaeolithic sites in China, including South China.

This issue is not only about the earliest inhabitants in South China, but also closely related to the origin, evolution and migration of humans, to whether *Homo erectus* migrated from Africa to East Asia, or the species developed in East Asia (Corvinus 2004). It is also related to the migration of modern human beings (*H. sapiens sapiens*) to East Asia and whether the migrants replaced indigenous inhabitants (Wu 2006). To date, no human fossils have been found associated with the stone implements in the Baise Basin. The earliest human fossils found in South China to date are from Guangdong and Guangxi respectively. A fragmental human skull found in Maba, northern Guangdong Province in 1958 has been identified as archaic *Homo sapiens* and dated to approximately 120 000 bp (Wu, Wu 1999). A mandible and two teeth identified as a transitional specimen between archaic *H. sapiens* and *H. sapiens sapiens* were found recently in the Zhiren cave, Guangxi, and dated to between 100 000 and 110 000 bp (Liu et al. 2010). Another skull found in Liujiang, Guangxi has been identified as *H. sapiens sapiens* and dated to between 40 000 and 12 000 bp (Wu, Wu 1999) (Fig. 1). According to physical anthropological studies, both fossils bear some physical features of the Neanderthals, indicating a possible human diaspora and gene flow from Western Asia to South China in the prehistoric era (Wu, Wu 1999; Wu 2006).

Based on genetic studies, some geneticists have argued that *H. sapiens sapiens* migrated from Africa and entered South China between 60 000–18 000 bp, moved to North China and eventually replaced the indigenous population (i.e., Ke et al. 2000). However, the recent discovery at the Zhiren cave, Guangxi, challenges this argument. It is argued that human evolution from archaic to modern *Homo sapiens* might have been continuous in East Asia; the two species might have co-existed in South China, and Africa might not have been the only place for the origin of modern humans (Liu et al. 2011).

Geographically, South China is connected to South, East and Southeast Asia. Fossils of giant apes have

¹ In fact, tektite nodules can still be picked up, occasionally by surface collection in Guangxi.

been found in South China since the 1930s (*Wu 2006*), illustrating that this landmass was indeed a suitable habitat for primates. Although there is no evidence for the existence of *Homo erectus* in South China, future archaeological discoveries may provide more information on this issue. Recently discovered data mentioned above seem to suggest that the peopling of South China can be traced back to at least some 120 000 bp, and various species or sub-species might have co-existed in the region (*Liu et al. 2011*). Apparently, it is a very important region with regard to the issue of prehistoric human evolution and global diaspora, and should not be viewed as a periphery.

The prehistoric chronology of South China

To construct a chronology of a region is to define and divide, albeit arbitrarily, phases of cultural development in a given area within a given period of time, the division being based on certain characteristics of each phase. The purpose of building a chronology is to facilitate intra- and cross-cultural analysis, and to examine natural and human/cultural dynamics from sequential and horizontal perspectives. This has been the task of archaeologists around the world for decades. The chronological framework of South China has been discussed by several scholars (*e.g., Fu 2004; Jiao 1994; Wang 1997*). However, the task remains difficult.

The first difficulty is the application of specific terms to archaeological remains in South China. While ‘prehistory’ is usually defined as the period before the formation of the state and the invention of writing, which ended around 4000 bp in the Yellow River Valley and the lower Yangzi River Valley (*Institute of Archaeology CASS 2010.799–801*), the application of this term in South China is problematic, as no indigenous written language was invented in South China. According to a historian living in the 2nd century BC in the Yellow River Valley, no centralised polity, but various chiefdoms, existed in South China up to the 3rd century BC, and it was the First Emperor of the Qin Dynasty (221–206 BC) who dispatched 500 000 soldiers to conquer the region in 218 BC, and annexed it to the Qin Empire *c.* 215 BC (*Sima 2nd century BC 2006.662–665*). For this reason, the end of ‘prehistory’ in the archaeology of Hong Kong has been set at around 2200 years with this conquest. However, the majority of archaeologists working in South China still set the end of the ‘prehistory’ at around 4000–3500 bp (*i.e., Institute of Archaeology CASS 2010*). Although this can be criticised as viewing the Yellow and the lower Yang-

zi River valleys as a standard and core area of cultural development, and other regions as peripheries, the date of 3500 years bp will still be used in this paper in order to avoid confusion.

Furthermore, the application of the terms ‘Palaeolithic’ and ‘Neolithic’ to archaeological remains in South China also causes debate. Originating from Europe and based on the lithic industries in Europe and Africa, these terms have been used to distinguish phases of cultural development in China based on three criteria: the procurement of raw materials, techniques of core reduction and retouch, and typological variations of final products (*Gao, Norton 2002.397*). However, the prehistoric stone tools found in the landmass called China today are almost completely different from those found in Africa and Europe, so the application of these terms in China is not always suitable (*Gao, Norton 2002*). What is more, according to this author’s observation and manufacturing experiments conducted in South China since 1999, the raw materials, manufacturing techniques and typological attributes of the cobble tools dating from the Palaeolithic Baise implements to the lithics found in the Neolithic sites in South China remain quite stable. Some archaeologists judge whether stone implements can be attributed to the Palaeolithic or Neolithic according to strata and degree of weathering (*Xie et al. 2011*), but this is not very convincing. At this stage, it is almost impossible to use only these criteria to construct a chronology of an ‘early, middle and upper Palaeolithic’ in South China, and it seems that only the chronology from the Upper Palaeolithic to the Neolithic is more reliable, with cultural changes and some absolute dates, as will be discussed below.

In fact, the definition of the Neolithic in South China is no less controversial. In Western Asia and Europe, the Neolithic is characterised by the presence of sedentism and agriculture, but this is not the case in China, where pottery is produced much earlier than the occurrence of sedentism and agriculture. Pottery was manufactured *c.* 12 000 bp, but sedentism and agriculture did not appear in South China until *c.* 6500 bp (*Lu 2010*); thus, the presence of pottery is used as a defining feature of the Neolithic (*Lu 2010.37–38*).

The second difficulty is absolute dating. Absolute dates are important references for the construction of a chronology, but as many archaeological remains have been found in limestone areas in South China, where ‘dead carbon’ can contaminate radiocarbon

dating samples, the absolute dates of these assemblages are problematic, as the dates tested by radio-carbon dating can be at least one thousand years older than the actual dates (Yuan et al. 1990; Lu 2010). Therefore, the construction of a local prehistoric chronology has to rely on the presence of new artefacts and/or other cultural changes, ranging from settlement patterns to subsistence strategies, with absolute dates as references.

Based on archaeological data in Guangxi, the following prehistoric chronology in western South China has been proposed by Fu (2004):

❶ As already noted, the dating of the Upper Palaeolithic is more convincing. The local Upper Palaeolithic is characterised by the co-existence of cobble stone tools and small flakes, the latter occurring at approximately 20 000 bp at Bailiandong in Guangxi (Fig. 1). The archaeological remains from this period are found in caves.

❷ The transitional period from the Upper Palaeolithic to the Neolithic witnessed an occurrence of ground organic tools, including bone and shell tools,

and fired clay found in Dayan, Guangxi, dated to c. 12 000 bp or slightly earlier. The archaeological remains from this period are found in caves.

❸ The early Neolithic is characterised by the occurrence of pottery around 12 000 bp in Dayan and Zengpiyan near the city of Guilin city (Fig. 1), associated with the manufacture of edge-ground stone tools and intensified collection of freshwater shells. The majority of archaeological sites are in caves, but some remains are found on river terraces or open ground from c. 10 000 bp.

❹ The middle Neolithic saw appearance of ground stone implements around 8000–7000 bp, as well as ground organic tools made of shell, bone, antler and teeth, and the beginning of rice cultivation in northern South China c. 6500 bp. More archaeological sites are located on river terraces, hilly slopes and coastal areas.

❺ The late Neolithic is a period when farming expanded into South China, and the majority of deposits are open sites on river terrace, hills or seashores (Tab. 1) (Fu 2004).

Dates	Representative sites	Associated fauna	Artefacts	Subsistence strategies
Upper Palaeolithic (20 000–15 000 bp)	Phase I of Bailiandong and Dayan, and phases I–II of Dushizi caves.	Stegodon-giant panda fauna, with extinct and extant species.	Flaked pebble choppers, chopping tools and scrapers <i>etc.</i> Small flakes at Bailiandong.	Wild animal remains; no shells.
Transitional period (15 000–12 000 bp)	Phase II of Bailiandong, Dayan and Dushizi caves.	Extant species dominate with a few extinct species.	Flaked and perforated pebble tools, small flakes in Bailiandong; ground bone and antler tools, two pieces of fired clay found in Dayan.	Wild animal remains; some crushed shells.
Early Neolithic (12 000–8000 bp)	Phase III of Dayan and Dushizi, phases I–IV of Zengpiyan; phase I of Dingsishan.	Extant species.	Flaked and perforated pebble tools; ground stone tools occurred at around 9000–8000 bp; ground organic tools; pottery.	Wild animal remains, large amount of shells, remains of tubers (including taro) and (wild) rice.
Middle Neolithic (8000–5000 bp)	Phase V of Dayan and Zengpiyan, phase I of Xiaojin.	Extant species.	Flaked and perforated pebble tools; ground tools of stone and organic materials; pottery; burials.	Large amount of shells and wild animals; domesticated rice remains found at a few sites.
Late Neolithic (5000–3500 bp)	Mainly open sites but also in caves.	Extant species.	As above.	Shells and wild animals; domesticated rice and millet found at a few sites.

Tab. 1. A cultural chronology summary of prehistoric western South China (Sources: Fu 2004; Jiao 1994; Lu 2010).

Apart from the occurrence of small flakes, the transitional period from the Palaeolithic to the Neolithic in western South China also witnessed changes in subsistence strategies, particularly the collection of freshwater shells. In the Zengpiyan and Dayan cave sites in northern Guangxi, freshwater shells have been found in cultural deposits dating to c. 12 000 to 5000 bp (*Fu 2002b*). On the other hand, at the Dingsishan site in southern Guangxi (Fig. 1), freshwater shells have been found in layers dating to approximately 8000–7000 bp, but not from both the early deposit dating to c. 10 000 bp and the late cultural layer dating to c. 6000 bp (*Guangxi Team of the Institute of Archaeology CASS et al. 1998*), when rice was probably cultivated at that time by a sedentary group (*Zhao et al. 2005*), who remained hunters-gatherers, as large amounts of wild animal bone have been found in the same cultural deposit (*Fu 2004*).

The prehistoric chronologies of Guangdong, Fujian and Macao are less clear. In Guangdong, apart from the Maba skull, human teeth and artefacts have been found in Fengkai, northern Guangdong (Fig. 1), and are dated to c. 79 000 bp (*Lu Z. 2004.429*). Several cave sites have also been found in northern and central Guangdong, but the absolute dates of these sites are not clear. At approximately 7000 years bp, sand bar deposits occurred off coastal Guangdong, Macao and Hong Kong, represented by the Xiantouling site in Shenzhen (Fig. 1), where the remains of on-the-ground house and pile-dwellings, cemeteries, pottery and stone tools dating to c. 6800 to 5000 bp have been discovered (*Institute of Archaeology CASS 2010.497–500*). The white ceramics of the early phase and the painted red pottery of the late phase of the Xiantouling assemblage bear some similarities to the Gaomiao and Tangjiagang cultures in the central Yangzi River Valley respectively, in terms of colour and decorative motifs, suggesting cultural dynamics between South China and the Yangzi River Valley in the prehistoric era (*Institute of Archaeology CASS 2010.497–500; Lu 2011a*), but the details of this assemblage have not been published.

Fujian is located in eastern South China. Flaked pebble tools have been found in Zhangzhou (Fig. 1) and tentatively dated to the Palaeolithic, but the absolute date is not certain (*Lu Z. 2004.429–430*). A few Neolithic sites dated between 6000 and 5500 years were located in the 1980s, represented by the Keqiutou site (Fig. 1), where ground and flaked stone tools – many of them made of pebbles – marine shell and bone implements, as well as pottery and one piece

of a jade slotted ring have been discovered (*Institute of Archaeology CASS 2010*). However, the relation between the Zhangzhou pebble tools and the Keqiutou assemblage is not known, and the chronology in Fujian remains unclear (*Jiao 2007*). Whether the aforementioned rising and falling sea levels during the Holocene was a causal factor remains to be investigated.

Situated on the southern coast of South China, only one prehistoric site has been excavated in Macao, yielding stone implements, slotted rings and pottery; the assemblage is dated to between 4000–3500 bp (*Tang, Cheung 1996.46–104*). In Hong Kong, no reliable Palaeolithic remains have been found to date; the earliest Neolithic remains are dated to approximately 6500 bp, and the late Neolithic ends at c. 3500 bp (*Fu 2006*). As the earliest pottery found in Hong Kong is technologically and morphologically similar to the early pottery found in Xiantouling (Fig. 1), the earliest prehistoric inhabitants of Hong Kong might have come from the nearby Shenzhen area; neutron activation analysis is being carried out by the author and her team to test this hypothesis.

In summary, at present the prehistoric chronology in South China can be reliably set at the Upper Palaeolithic. The beginning of the Neolithic in Guangxi is marked by manufacture of pottery, followed by the occurrence of ground tools made of stone and organic materials, while the late phase of the middle Neolithic in Guangxi and the late Neolithic in Guangdong and Hong Kong are marked by the occurrence of plant cultivation (Tab. 1). Generally speaking, archaeological deposits from the Upper Palaeolithic to the middle Neolithic, and occasionally, to the late Neolithic, have been found in caves; archaeological remains dating from the early Neolithic onward have been located either on river terraces, seashores, or hilly slopes. Burials have been found in Dayan and Zengpiyan (Fig. 1) dating from approximately 8000 bp. Cemeteries dating to c. 8000–7000 bp have been found in Dingsishan, and those dating between approximately 5500 and 4000 bp have been found in northern Guangdong, the Pearl River Delta and coastal areas in Fujian and Hong Kong (*Fu 2004; Institute of Archaeology CASS 2010; Jiao 2007; Meacham 2009*). The earliest house remains dated to about 6800 bp have been found in Xiantoulin, southern Guangdong, while pile-dwelling remains dated to about 6000 bp have been found in Xiaojin, northern Guangxi; house remains and kilns have been found in northern Guangdong and Fujian, both dated to approximately 5000 bp (*Fu 2004*;

Institute of Archaeology CASS 2010:709–714). Whether sedentism in South China only began at *c.* 6800 bp, or whether the current archaeological data are biased due to the difficulty of identifying traces of pile dwellings during fieldwork, and the effects of the changes in sea levels between 7500 and 4500 bp on the prehistoric cultural development in South China, are questions that require much further study.

Diverse settlement patterns

As mentioned above, South China consists of limestone hills, plateaus, river deltas and seashores. To date, traces of human settlement have been found in all the geographical settings. Briefly, by 15 000 bp, prehistoric people lived in limestone caves in northern South China; by 10 000 bp, people had begun to occupy river terraces along the upper reaches of the Pearl River, represented by the Dingsishan assemblage (Fig. 2); and by 7000 bp, the Xiantouling people had reached the southern coastal area; after 6000 bp, people occupied the eastern coast and Hong Kong Island (Fig 1 and 3). However, this general picture of the peopling of South China may not be very accurate, as the marine transgression between 7500 and 6000 bp might have destroyed some coastal settlements during that period.

While the majority of settlements found after 7000 bp in the nearby Yangzi River Valley are open sites on river terraces or hills, some groups in South China still lived in caves as recent as 3000 years ago, such as represented by the Gantuoyan occupants (*Wei 2002*). In summary, between 6500 and 3000 bp, people settled in caves, on river terraces, hilly slopes and sand dunes in South China, illustrating a diverse settlement pattern, which might have related to their various subsistence strategies, but more work is required on this question.

This diversity of settlement pattern raises a question: are cave dwellers always mobile? Traditional wisdom in the archaeology of China tends to confirm this. However, caution may be required for the Gantuoyan assemblage. If they were farmers, they must have been sedentary, as rice farming requires sedentism (*Lu 2012a*). If the rice and

millet grains found in Guantuoyan were results of exchange and/or trade, as no phytolith or use-wear analysis has been conducted at Gantuoyan to prove that farming was practiced, then their degree of sedentism can be questioned, although it seems quite difficult to assume that they were mobile, judging from the very rich artefacts and moulds for bronze casting in Phase II of the Gantuoyan site (*Wei 2002*). On the other hand, it is not uncommon to find sterile deposits between cultural layers at open sites in coastal South China and Hong Kong, indicating discontinuity of settlement. The settlement patterns in prehistoric South China are apparently quite complicated, as different types of settlement co-existed.

Toolkits

The toolkits found in prehistoric South China are dominated by pebble tools from the Upper Palaeolithic to the Neolithic, while flakes and tools of organic materials occurred after *c.* 15 000 bp (Tab. 1). The most commonly found raw materials of pebble tools are pebbles of granite, sandstone, quartz and quartzite, and the most common types of tool are points, scrapers, drills, and choppers and chopping tools. These implements are morphologically similar to contemporaneous stone tools found in the Yangzi River Valley and Southeast Asia (*Higham 1996*), but it is not yet clear whether this is the result of similar environments and subsistence strategies, or whether prehistoric cultural and human dispersal played a role.

Although cobble tools dominate the stone industry in prehistoric South China, small stone flakes produced by direct percussion with a hard hammer have



Fig. 2. *The Dingsishan site (Courtesy of the Guangxi Team of the Institute of Archaeology of the Chinese Academy of Social Sciences).*

also been found at the Bailiandong and Liyuzui sites in Guangxi, dated to approximately between 20 000 and 10 000 bp, and the majority of flakes are chert (Tab. 1) (Fu 2004; Jiao 1994; Wang 1997). It is claimed that some small flakes found in Bailiandong might have been made by press flaking (Jiang 2009: 118). As no use-wear analysis has been conducted on these flakes, their functions remain unknown, but they apparently differ morphologically and technically from the microblades produced by indirect percussion and/or press flaking, which form part of the composite tools found in the Yellow River Valley, Northeast Asia and North America, and dated from the Upper Palaeolithic to the Bronze Age, or from approximately 22 000 years to about 4000 bp (Lu 1998a). The manufacture of the small flakes and the co-existence of cobble and flake lithic industries in South China from the Upper Palaeolithic to the early Neolithic might have related to changes in subsistence strategies, but more studies, particularly use-wear analysis, are required to address this question.

Archaeological experiments and rock studies conducted by the author in Zengpiyan also show that the prehistoric occupants of Zengpiyan had a regular behaviour pattern when making stone tools, or the *chaîne opératoire* (Grace 1997), from raw material procurement to manufacturing. Today, there are 9 types of mineral and rock cobble in the Li River near Zengpiyan, the majority of which are granite, sandstone and quartzite, with small amounts of slate, limestone, quartz and shale cobble (Lu 2003b). As the local geological structure should not have changed in the last 20 000 years, it can be inferred that the quantity and types of rocks and mineral pebbles available to the prehistoric occupants should have been similar. By comparing the quantity and types of cobbles available in the Li River and the raw materials of the stone implements found in the Zengpiyan cave, it is clear that the prehistoric occupants selected sandstone as the major raw material for making tools, and granite as the major raw material for hammers and hand-stones for tool-making. Petrologically, this selection makes perfect sense. Measured at Mohs 7, granite is harder than sand-



Fig. 3. The Sha Ha site in Hong Kong (Photo by the author).

stone, which measures at Mohs 5.5. The granite found in Zengpiyan and the Li River is a medium-to coarse-grained rock, consisting of feldspar, quartz, and amphibole, which make the rock's hardness uneven and the structure unstable when flaked (Lu 2003b). It is also very difficult to produce a sharp and relatively straight working edge when using granite, mainly due to its coarse grains and unstable structure, while sandstone is softer, and much easier to flake to produce a sharp and relatively straight working edge, as the grains are much finer and the structure more even (Lu 2003b). On the other hand, measured also at Mohs 7, quartzite is too hard to be flaked, which may explain why it was not selected by the Zengpiyan occupants (Lu 2003b). This pattern of selecting raw materials remained from phases I to V of the Zengpiyan archaeological assemblage, or from about 12 000 to 7000 bp, showing a stable human behaviour pattern in terms of exploiting the natural resources.

The techniques of producing pebble tools are not complicated, and remained relatively stable over a long period of time. Unlike the flake industry in Europe, cobbles were directly used to make tools, no 'cores' were produced, and there was no 'primary' or 'secondary reduction' (Grace 1997) in the process. According to the author's experiments in Zengpiyan and Hong Kong, cobble tools can be produced very efficiently. Each cobble tool is made from a single piece or half a piece of a pebble, and if a pebble of suitable size is procured as raw material, the tool-maker first has to decide which part of the cobble to use as a working edge; the tool-maker then uses direct percussion with a hard hammer to re-

move the cortex of that part, and after a few retouches, a cobble tool is finished. It takes only about 19 minutes to produce a hand-pick by a female, or a 'point', and about 9–16 minutes to make a chopper and chopping tool by the same person (Lu 2003b), whereas it takes several hours to produce a fully-ground stone axe (Chan 2005). As cobbles of variable sizes are so abundant in rivers and on seashores in South China, the cobble tools may look technologically 'primitive' and not standardised, but they can also be viewed as evidence of prehistoric people's efficient use of natural resources in South China and adjacent areas. The lengthy presence of the cobble tools also indicates cultural continuity in terms of stone tool making in this region.

Small flakes produced by direct percussion appeared by about 15 000 bp in Guangxi (Tab. 1). The initial results of archaeological experiments by the author conducted at Zengpiyan suggest that the techniques used to produce flakes are similar to those used for the cobble tools, but the functions of these flakes are not clear.

Ground tools made of bone, shell, antler and animal teeth were produced after 15 000 bp, followed by ground stone axes, adzes and spades by about 9000–8000 bp (Fu 2004). Archaeological experiments have been carried out in Guangxi and Hong Kong to produce replicas of the ground axes, adzes, knives, and spades since the late 1990s. The results of the experiments show that the productivity, or time spent on making one replica, depends on the maker's age, sex, build, and previous experience and skills. A middle-aged man who worked in the building industry as a labourer can produce a fully ground stepped stone adze in five to six hours, while a young female, who has been a white-collar professional, requires 8–10 hours to produce a similar product (Chan 2005). However, for prehistoric workers, the time and effort required would have been much less, because the young generation could always learn from the elders, while people making replicas today have to learn by themselves from trial and error.

According to the experiments, the manufacturing process of ground stone tools consists of the following steps:

❶ Select raw materials usually in the catchment area of the archaeological site, which is about 5km from the site, or a distance of an hour's walk. However, sometimes people could go farther. For example, the

prehistoric Sha Ha occupants preferred a type of red sandstone, and they could travel to another small island about 10km away from the site for this raw material (Chan 2005). To reach the island, some kind of boat or canoe must be used, so the presence of the unique sandstone also indicates that boats or canoes must have been made and used by 4000 bp in Hong Kong (Chan 2005).

❷ Rough out the raw materials by direct percussion with a hard hammer.

❸ Transport the rough-outs to the site.

❹ Shape the roughed out items by retouch, and finalise the product by grinding with sand and water (Chan 2005; Lai 2011).

Apart from cobble and ground stone tools, it is noteworthy that microblades and microcores identical to those found in the Yellow River Valley, Northeast China, Inner Mongolia, Japan and Northeast America between 18 000 and 4000 bp, have been found in Xiqiaoshan, which is a dead volcano located in the Pearl River Delta (Fig. 1) (Zeng 1995). The microblades in the Yellow River Valley and North China usually measure between 0.8 to 1cm wide, and less than 5cm long (Lu 1998a.86), and can be produced by press flaking, indirect percussion using a deer antler as a medium, and direct percussion using a deer antler as a soft hammer (Zhao 2011). According to archaeological experiments, it took a young person about six months to master the technique and be able to produce the tiny blades (Liu J. Z. *personal communication*), so it is not an easy technique, although a prehistoric craftsman might have been able to learn faster, as he/she could observe the master of the group, while archaeologists today can only learn by themselves.

According to Liu (1990), the *chaîne opératoire* for producing microblades starts with the selection of very fine-grained raw materials, followed by preparing the platform before knapping, and finally, direct or indirect percussion. A microblade industry has never been found in the middle and the lower Yangzi River Valley (Lu 1998a). It is still unclear how this technique and industry could have reached the heart of South China without leaving any traces on its 'migration' route, and whether this indicates migrants from the north (Lu 1998a). No composite tools with microblades have been found in South China, so the function(s) of the microblades and microcores found in Xiqiaoshan are also unknown.

The manufacturing of tools made of bone, antler, shell and teeth also indicates not only technological, but also changes in subsistence strategy in South China. Manufacturing experiments suggest that drills, needles and points made of bone were produced by direct and indirect percussion using a hard hammer, piercing, and finally, grinding; while implements made of antler, shell and teeth were produced by piercing and grinding (Lu 2003b). This process shows the application of indirect percussion and grinding as new techniques in South China in the Neolithic period. Use-wear and residue analysis has been conducted by the author on tools found in Zengpiyan, and the initial results suggest that some implements were used for collecting or processing taro (Lu 2003c). However, more studies are required on this matter.

In summary, the toolkits in prehistoric South China were dominated by cobble tools up to the terminal Pleistocene, when flakes and implements made of organic materials occurred after 15 000 bp, followed by the manufacturing of ground stone tools at around 8000 bp (Fu 2004). The results of starch residue and use-wear analyses of some stone and organic tools found in Guangxi and Hong Kong indicate that these implements served various functions, ranging from chopping, butchering, cutting, digging, collecting shells, to wood-working and taro processing (Chan 2005; Lu 2003b; 2003c; Lai 2011; Yang 2010). While all these are activities of hunter-gatherers, as well as farmers, as farming and foraging are not mutually exclusive (Lu 2006b), the exploitation of taro is particularly noteworthy, as wild taro is widely found in South China, and domesticated taro has been an important crop in this region for many years. Genetic and archaeological data suggest that taro was domesticated in Papua New Guinea around 9000 bp (Neumann 2003), but genetic studies also suggest that there are two genetic centres of taro in the world, one in the Pacific and another in continental Southeast Asia (Lebot 1999). The taro found in Zengpiyan might have been part of the Southeast Asian gene pool, thus the origin and/or development of taro's cultivation and domestication in South China are important topics for further studies.

The occurrence of pottery

Approximately 15 000 to 12 000 bp or earlier, people living in the Russian Far East, the Japanese Archipelago, North China, the middle and lower Yangzi Valley, as well as in Guangxi, South China, manufactured pottery almost simultaneously (Lu 2010.1),

and probably independently. The occurrence of pottery over such a huge landmass within so many different natural and cultural contexts is a very good example of human agency, which means the ability to make decisions and take actions to create new technologies (in this context, pottery) to suit differing natural and cultural needs, and to create a new 'institutional fact' (cited in Renfrew, Bahn 2008: 499). Further, as pottery was produced from the cold to the sub-tropical ecozones in East Asia, and served extremely diverse functions (Lu 2010; Ikawa-Smith 1976; Tsutsumi 2000), it is also a good example of how people in different environments can develop the same technology, thus disproving the idea of 'environmental determinism'.

While pottery found in South China may not be the earliest, it is the most 'primitive' in terms of manufacturing techniques, and the potsherds demonstrate a clear sequence from fired clay to earthenware, to true pottery. As noted above, two pieces of fired clay have been found in Dayan dated to the transitional period of between 15 000 and 12 000 bp (Tab. 1) (Fu 2004), showing human beings' attempt to mix clay and water in order to create a new material. Disintegrated potsherds with walls up to 2.9cm thick and mixed with crushed but unselected calcite particles as tempering agent were found in the lower layers of Zengpiyan and Dayan caves in 2003, and dated to between approximately 12 000 and 10 000 bp (Fu 2004). Some of the calcite grains are more than 0.2cm in diameter (Lu 2010). The pottery was manufactured by hand pinching, and the firing temperature was probably below 250°C, as indicated by a firing test (Wu et al. 2003: 658–659), so they are in fact earthenware. These earthenware sherds have been found in association with cobble stone tools, tools of organic materials, large amounts of shell and animal bone in both Dayan and Zengpiyan (Fu 2004).

The results of archaeological experiments indicate that freshwater gastropod shells must be cooked, so the meat of the shellfish can be released and consumed, otherwise the shell must be crushed in order to get to the meat. Baking the shellfish over a hot stone plate may serve the same purpose, but it requires much more fuel, and the amount of shells that can be placed on a flat plate is also limited. Furthermore, the cultural layers at Dayan show that shell remains found without pottery were all crushed, while those found with pottery were all intact, showing that the way of consuming shellfish changed completely after the appearance of pottery. All

these facts suggest that the need to cook shellfish was probably one of the main impetuses for the manufacture of pottery in South China *c.* 12 000 bp (Lu 2010).

The walls and decorative techniques and motifs of pottery found in Zengpiyan dating from *c.* 12 000 to 7000 bp have been carefully studied, and a series of archaeological experiments was carried out in 2003, with the objectives of understanding the production process, the tools used for production and decoration, and the intention of decoration as a cognitive aspect of prehistoric potters in Guangxi, South China (Institute of Archaeology CASS et al. 2003; Lu 2010.32–33). According to these studies, the production technique developed from hand pinching to slab building from *c.* 12 000 to 11 000 bp (Fu 2004.198), and firing temperatures increased to between 800°–840°C by *c.* 10 000–9000 bp in Zengpiyan, which are similar to the firing temperatures of contemporaneous pottery found in the Yangzi River Valley (Wu et al. 2003.658–659). Further, potsherds found in Zengpiyan have also demonstrated that cord marks, which were produced by rolling a wooden or bamboo stick wrapped with grass, were used in the early stage as a formation technique to strengthen and smoothen the walls, but it became a well-patterned decorative motif between 10 000 and 9000 bp (Lu 2010.33), and remained a common motif not only in prehistoric Guangxi, but also in other areas of South China and beyond. For example, cord-mark pottery has been found in Guangdong, Fujian and Hong Kong, and the latest pottery bearing cord-marks in Hong Kong is dated to *c.* 4000–3500 bp. The cord-mark is also the most commonly found motif in early Neolithic pottery discovered in North China and the Yangzi River Valley (Institute of Archaeology CASS 2010). However, the meanings and significance of this cultural similarity between North China, the Yangzi River Valley and South China are not clear, as similar experiments and observations have not been conducted in other areas for cord-mark pottery.

Compared to the contemporaneous pottery found in the Yangzi River Valley, the earthenware sherds found in Zengpiyan and Dayan seem to be more ‘primitive’ in terms of the thickness of the walls, coarseness of the tempering agents, and the extremely low firing temperature. The pottery found in Yuchanyan, the middle Yangzi River Valley (Fig. 1), is dated to about 15 000 years or even 18 000 bp (Boaretto et al. 2009), which is much older than the earthenware found in Zengpiyan, and is probably the oldest in

China if the dates are correct; however, the formation technique of the Yuchanyan pottery is more ‘advanced’ than that of Zengpiyan earthenware, as the body is better formed and the structure is more solid, indicating a higher firing temperature. So, was pottery manufactured in the middle Yangzi River Valley before 12 000 bp, and the idea expanded to South China? Or did the Zengpiyan potters invent pottery independently? These are questions for further studies. However, some vessels found in South China dated after 7000 bp bear technical and morphological similarities with those found in the Yangzi River Valley, illustrating cultural interaction between the two regions (Lu 2010.36).

Other crafts

Apart from pottery and tools, people living in prehistoric South China also produced other crafts. They manufactured various body ornaments, of which the slotted rings mainly made of crystal, quartz, jade, tuff, and shale are the most commonly found items. Indeed, slotted rings have been found at sites from Siberia, Northeast China, to the Yellow River Valley and the Yangzi River Valley and South China, as well as in Korea, Japan, Taiwan and Southeast Asia, and are dated from *c.* 8000 to 2000 bp. The earliest slotted ring found in South China is from Keqitoutou, Fujian, and is dated to about 6000–5500 bp; slotted rings have also been found in Shixia of Northern Guangdong, as well as several sites in Guangxi, Guangdong and Hong Kong dated to between 4500 and 3000 bp (Yang 2001). According to burials found in Tung Wan Tsai, Hong Kong, slotted rings were ear rings worn by both men and women (AMO and Institute of Archaeology CASS 1999), but at other sites in Hong Kong and in northern Guangdong, sets of slotted rings of different sizes have been discovered (Qiu et al. 2008), so they might have had other functions and/or meanings.

Another important category of crafts is textiles. There were two different types of textile in prehistoric South China – bark-cloth, and woven. Bark-cloth is a unique textile made from trees of the Moraceae family, by peeling, soaking, softening by beating, and sewing the fibres. This textile has been produced by indigenous people in South and Southwest China, Taiwan, and the Pacific region for many centuries (Ling 1960). In South China, while eyed bone needles dating to *c.* 10 000 bp in Zengpiyan are evidence of sewing activities, stone bark-cloth beaters have been found in Xiantouling (Fig. 1) dating to *c.* 6000 bp, as well as at other archaeological sites in Hong

Kong, Macao and Guangdong dating between 6000 and 4700 bp, which are the earliest bark-cloth beaters found in China to date (*Tang, Wong 1994*). However, spindle whorls have also been found in Xiantouling that date to c. 6000 bp, and in Xiaojin and other sites in South China dated between 5000–3000 bp (*Lu 1998b:62*). As the earliest spindle whorls found in the Yellow River Valley date to 7800 bp, and in the Yangzi River Valley to 7000, and the pottery of both Xiaojin and Xiantouling are technically and morphologically similar to those found in the Yangzi River Valley, it is possible that the spindle whorls, which represent the production of yarn as material, also came from the Yangzi River Valley (*Lu 1998b*).

As the bark-cloth beaters found in South China are the earliest, it is possible that the production of bark-cloth was an indigenous industry in the prehistoric era. On the other hand, yarn production also occurred at approximately the same time, possibly as the result of interaction between South China and the Yangzi River Valley. Between 6000 and 4700 bp, bark cloth and yarn-weaving co-existed in South China. After this period, it seems that bark-cloth became less popular, as the numbers of bark-cloth beaters in archaeological deposits declines.

Affluent foragers

Floatation, residue analysis, zoo-archaeology, and use-wear analysis have been carried out at a few sites in South China to examine the subsistence strategies of the Upper Palaeolithic to the Neolithic era. The floatation work at Zengpiyan collected numerous tuber remains. Although the species of the tubers cannot be further identified, the discovery indicates that tuber plants were important natural resources (*Institute of Archaeology CASS et al. 2003*).

Starch residue analysis, which was initiated by Western scholars in the 1980s (*Robins, Barton 2006:27–28*), can also provide data for subsistence strategies, and was applied to stone, shell and bone implements dating from 12 000 to 7000 bp found in Zengpiyan in 2003 (*Lu 2003c*), being the first starch residue analysis in the archaeology of China. The result indicates that a stone point, bone knife, pierced shell, stone long flake and stone chopper, dating from phases I to V of the Zengpiyan assemblage respectively, or from c. 12 000 to 7000 bp, carry abundant taro starch grains on their surface (*Lu 2003c*). Taking the large amount of tuber remains found through floatation (*Institute of Archaeology CASS et al. 2003*,

286–292) into consideration, it seems that prehistoric people in western South China had been exploiting taro for thousands of years. But as the starch of wild and domesticated taro (*Colocasia* spp. and *C. esculent* Schott, respectively) cannot be distinguished, it is not clear whether the taro found in Zengpiyan was a wild or domesticated species (*Lu 2003c*).

Use-wear analysis has been conducted on 88 cobble implements found in Zengpiyan (*Lu 2003b*), which is the first use-wear analysis on pebble tools in China. Briefly, only 9 implements had observable microscopic use-wear, and the functions of these implements include butchering (chopping bones) and flaking bones (*Lu 2003b*). More use-wear analyses have been conducted in Hong Kong by three of the author's post-graduate students, focusing on Neolithic cobble points, ground stone adzes and spades, respectively. The use-wear analysis of stone adzes found in Sha Ha, Hong Kong (Fig. 1) shows that fully ground adzes dated to c. 4000 bp were used for wood-working, chopping and butchering, and the thinner adzes were even used for mowing (*Chan 2005*). After comparing the use-wear traces of stone points found in three archaeological sites in Hong Kong, it was concluded that the pebble points were used for digging, butchering, picking oysters and other shells, and chopping (*Yang 2010*). Finally, while traditional wisdom assumed that ground stone spades were agricultural tools, use-wear analysis of the stone spades found in Yung Long, Hong Kong suggests that this tool was used for digging sand, as its use-wear pattern was not produced by digging soil (*Lai 2011*). These studies have provided more concrete and tested data not only on the functions of several types of stone tool commonly found in prehistoric deposits not only in South China, but also in the Yangzi River Valley and Southeast Asia, but also on subsistence strategies. Of course, morphologically similar tools in different cultural contexts might have different function, so the uses of these tools in South China may differ from those of their counterparts in other areas. Thus, more use-wear analysis is required for stone tools found in the inland area, as well as in many other places in China, in order to retrieve more tested information on prehistoric cultures and societies.

Zoo-archaeological studies have been carried out at Zengpiyan, Niulandong, Dingsishan, and several other sites, but only the data from Zengpiyan have been fully published. A total of 108 species have been identified from Zengpiyan, consisting of 37 species of mammal, 47 species of freshwater shell-

fish, 20 species of bird, with fish, alligator, soft-shell turtle and crab making up the remainder (*Institute of Archaeology CASS et al. 2003.276–281*). The remains of seven species of deer, one species of pig (probably a wild species) and fish, and tens of species of shellfish dominate quantitatively within the zoo-archaeological assemblage, clearly indicating that these animals were the major food items of prehistoric Zengpiyan residents (*Institute of Archaeology CASS et al. 2003.334–341*), and showing the diversity and abundance of animal resources for prehistoric foragers.

Based on the results of the aforementioned studies, it seems that foragers in prehistoric South China were quite affluent, as they could exploit a great variety of wild plants, shells, fish and other species of animal, with tuber plants (including taro), shellfish, fish and deer being the major food items. The result of foraging experiments conducted in Guangxi in 1999 suggests that foragers living on shellfish, bamboo roots and tuber plants needed to spend only 2–3 hours daily to gather sufficient food for survival (*Lu 2006b.143*), and another 2–3 hours of work would be sufficient to collect food for another family member, to feed a child, for example. As tubers, shellfish, fish and deer are available all year round, it is unlikely that the affluent prehistoric forager would have had a lean season. The abundance and stability of natural resources for foraging, on the other hand, might have been one of the causal factors hindering the origination and development of farming in South China.

The expansion of farming to South China

The term 'farming' is used here instead of 'agriculture', for agriculture includes the husbandry of animals, but it is still unclear whether animals were domesticated in prehistoric South China. In the 1970s it was argued that the pig remains found in Zengpiyan, Guangxi could be identified as a domesticated species, but this conclusion was falsified in 2003 (*Institute of Archaeology CASS et al. 2003*). Therefore, only farming activities will be discussed in this paper.

Among the wild plants in South China, one of the most important species is wild rice (*Oryza rufipogon*), the progenitor of domesticated rice (*O. sativa*). According to a national survey conducted in the 1980s, South China is an indigenous habitat of perennial wild rice (*The National Survey Group of Wild Rice 1984*). To date, phytolith remains of the rice ge-

nus (*Oryza sp.*) have been found at Dayan, Zengpiyan, Dingsishan and Xiaojin in Guangxi, the Niulan Cave in Guangdong, the Xiantouling site in Shenzhen, and the Sha Ha site in Hong Kong, respectively; rice grains have been found at Xiaojin in northern Guangxi, Gantuoyan in western Guangxi, Shixia in Northern Guangdong, and Sha Ha in Hong Kong, while grains of foxtail millet have been found at Gantuoyan (Fig. 1). The data of Dayan and Xiantouling have not been published, so they cannot be discussed here. Data from other sites are listed in Table 2.

It should be pointed out that the data in Table 2 may not accurately reflect the exploitation of wild rice and other plants; nor can they comprehensively reveal farming activities in South China, for two reasons. First, the majority of South China is covered by red soil, which is relatively acid. For example, the pH value of the soil at several archaeological sites in Hong Kong is between pH 5 and pH 6.5, according to the author's fieldwork. Thus, it is extremely difficult for organic materials to survive, including remains of animals and cereals. Second, the research methods of floatation and phytolith analysis have been applied to only a few archaeological assemblages after the late 1990s. Floatation was applied to the Dayan excavation work in 1999 by Dr. Zhao Zhijun of the Institute of Archaeology CASS, which was the first floatation work in archaeology of China; and the phytolith analysis in Niulandong in 1998–99 is the first application of this approach in the region. Because many archaeological sites in South China have been excavated without floatation, phytolith and pollen analyses, the data retrieved today may not be accurate or comprehensive.

Nevertheless, these data illustrate, although only in a preliminary way, the appearance and expansion of farming in South China. Small amounts of rice phytolith have been found in Dayan, Zengpiyan and Niulandong caves in northern South China, all dated to 10 000 bp. Whether rice phytoliths can be used to distinguish wild and domesticated species is still open for debate, but those found in the three caves are probably phytoliths of wild rice, collected, probably unintentionally, as fuel or for other purposes. The reasons for this argument are as follows:

❶ The amount of rice phytolith within a phytolith profile is very small, or below 1%, while the proportion of rice phytolith found in Dingsishan and Sha Ha is much greater. If rice was cultivated, it is unlikely that so little phytolith would have been found (*Lu 2006b*).

Site	Date	Archaeological assemblages	Remains of rice and/or millet	References
Zengpiyan cave	12 000–7000 bp	Cobble tools, tools of organic materials, pottery, large amounts of wild animals, shells and plants, including tubers (taro); a few burials and hearths; no traces of sedentism.	Phytolith grains of rice husks have been found in deposits dated from 11000 to 7000 bp at between 0.094%–0.559% of the phytolith profile; some phytolith grains darkened.	<i>Institute of Archaeology</i> CASS et al. 2003; Lu 2009
Niulandong cave	16 000–8000 bp	Cobble tools, tools of organic materials, pottery, and large amount of wild animals, shells and plants; one rubbish pit and one possible hearth.	Four phytolith grains of rice husk found in layers dated to between 10900–8300 bp.	<i>Yingde Museum</i> et al. 2009
Xiaojin, on a hilly slope	6500–3000 bp	Remains of houses, kilns, rubbish pits, burials, pottery of various types, some were painted; flaked and ground tools, the latter dominate; spindle whorls.	A large amount of grains of two sub-species of domesticated rice (<i>O. sativa japonica</i> and <i>O. sativa indica</i>) found in phases II and III.	Archaeological Team of Guangxi and Office of Heritage Management of the Ziyuan County 2004.
Dingsishan, at river terrace	10 000–6000 bp	Cobble tools, tools of organic materials, pottery, a large amount of wild animals, shells and plants, cemeteries.	Phytolith grains of rice and gourd found in the final phase (layer 1) dated to about 6000 bp.	Zhao et al. 2005
Shixia culture, about 17 sites on river terrace, hills, and caves	5000–4000 bp	Over 100 burials showing disparity between rich and poor; pottery of great variety, including coarse and fine pottery, some on a wheel; ground stone tools and weapons (arrowheads), jade rings, slotted rings and discs etc.	A large amount of grains of the two sub-species of domesticated rice (<i>O. sativa japonica</i> and <i>O. sativa indica</i>), as well as rice husks and stalks have been found.	<i>Institute of Archaeology</i> CASS 2010; Zhu 2001
Gantuoyan, cave	3800–3100 bp	Ground stone and bone tools, pottery of great variety; spindle whorls, jade implements.	A large amount of rice and foxtail millet (<i>Setaria sativa</i>) grains have been found.	Wei 2002
Sha Ha, sandbar site	4000–1000 bp	Pile-holes, ground stone tools, coarse and chalky pottery of considerable variety, burials.	Phytolith of the grains of domesticated rice and gourd found in deposits dated to 4000 bp; gains of domesticated rice (<i>O. sativa</i>) dated to 1700 bp.	Lu et al. 2006

Tab. 2. Archaeological sites where remains of rice and millet have been discovered².

² There is another site called Guye in the Pearl River Delta where rice grains have been found; but the date of the grains is not certain, so data from this site are not included.

② The rice phytolith found in Dayan and Zengpiyan are from hearths, and no rice grains have been found in either Dayan or Zengpiyan (floatation was not carried out in Niulandong) (Lu 2009).

③ Based on the author's cultivation experiments and ethnographic studies in South China, rice cultivators must be sedentary, as they must tend the plant, control the water in the paddy field, and protect the crop from being stolen when it ripens. Regular and consistent water control is crucial for successful rice cultivation (Lu 2012a). As sedentism is a crucial factor in rice farming, and it took decades, even hundreds of years to domesticate wild species, it is unlikely that mobile foragers could have been regular rice farmers (Lu 2012a).

While rice phytolith found in archaeological sites in South China dated to about 10 000 bp indicates the availability of (wild) rice for prehistoric foragers in this area, the appearance of rice farming seems to have been the result of cultural impact from the Yangzi River Valley. Grains of domesticated rice appear at Xiaojin by c. 6500 bp, at Shixia at c. 5000 bp, at Gantuoyan at c. 4000 bp, and at Sha Ha between 4000 and 2000 bp (Tab. 1). Phytolith of rice leaves has also been found in Xiaojin and Sha Ha, as well as in Dingsishan at c. 6000 bp³. As rice farming was well-developed in the Yangzi River Valley by 7000 bp, and rice grains could be transported to other places for trade and/or exchange, the co-existence of both rice grains and the phytolith of rice leaves is an important indicator of rice farming activities. Thus, the data in Table 2 show a clear pattern of rice farming expanding from the north to the south of South China. In addition, the pottery assemblages of rice farmers at Xiaojin and Shixia are morphologically and technically similar to pottery found in the Neolithic Yangzi River Valley (*Institute of Archaeology CASS et al. 2003; Fu 2004; Lu 2011b*), clearly manifesting interaction between peoples in prehistoric South China and their neighbours to the north. However, it is not clear whether these exchanges were brought by migrants or merely a result of an exchange of ideas, as no genetic studies have been conducted comparing prehistoric farmers in the Yangzi River Valley and South China, primarily due to the very poorly preserved, or absence, of human bones found at archaeological sites in both regions.

After adopting rice farming by 6500 bp, prehistoric peoples in South China still maintained hunting, ga-

thering and fishing as important subsistence strategies, as illustrated by the substantial remains of wild animals and plants found at archaeological sites (Tab. 2), and historical records (*Sima 2nd century BC 2006*). Prehistoric farmers co-existed with foragers in South China after 6500 bp, and archaeological data now show that it took at least more than two thousand years for farming to reach the southern edge of South China (Lu 2011b). Farming did not become the dominant means of subsistence until after 218 BC, when the First Emperor of the Qin Dynasty (221–206 BC) dispatched 500 000 soldiers to conquer South China and established it as part of the Qin Empire.

If the initial appearance of domesticated rice found in Xiaojin, Guangxi (Fig. 1) indicates the first wave of farming expansion from the Yangzi River Valley into South China, abundant archaeological remains and historical documents illustrate the second wave after 218 BC. After the war, the soldiers of the Qin army settled in South China, bringing with them not only farming techniques and ideas, but also tools (including the ox plough) and cultivars (Lu 2012b). With hundreds of thousands of migrants pouring into South China, the local population increased significantly, and farming quickly spread and became an important economic activity. This is manifested by the discovery of cereal remains, fired models of rice fields, iron agricultural tools, bamboo sticks from burials listing cereals among the grave goods, as well as historical documents showing the importance of the ox and plough for the local economics in the 3rd and 2nd centuries BC (Lu 2012b). They were so important that when the contemporaneous Changsha Kingdom in the middle Yangzi River Valley refused to sell oxen and iron tools to the Nanyue Kingdom (203–111 BC), which was the polity in South China established by officers of the Qin Army, a war broke out between them (*Sima 2006*).

The lengthy co-existence of foraging and farming in South China is related to the seasonal stability, abundance and diversity of natural resources in South China. As already mentioned, foraging is much more efficient than harvesting wild rice (Lu 2006b). Although we have no demographic data on prehistoric South China, ethnographic data from around the world have shown that the population size of people living mainly on foraging tends to be small (*Kelly 1995*). The possible lack of population pressure and abundance of natural resources may explain

3 Phytolith analysis has not been carried out at Shixia and Gantuoyan.

why farming did not originate in South China, although wild rice was indigenous to this area. This also shows that efficiency could have been one of the criteria for the selection of subsistence strategies.

Another cultivar, the foxtail millet, has been found only in Gantuoyan to date. Foxtail millet is a cultivar in temperate ecozones, and was domesticated in the Yellow River Valley and north China by c. 8000 bp (*Lu 2006b*). It is not clear whether the foxtail millet found in Gantuoyan resulted from trade or exchange, or cultivated locally. More data are required for this question.

Burials

The method of burying the dead in South China is also diversified, and some burials are quite unique. Four burials have been found in Zengpiyan, two dated to 8000 bp and another two dated to 7000 bp; all the bodies are in a crouched and upright position, each placed in a burial pit (*Institute of Archaeology CASS et al. 2003.130*). One buried body dated to 8000 bp was covered by 9 limestone slabs, another one dated to the same period was covered by two big shells at the head; one of the burials dated to 7000 bp was covered by 10 stone slabs, but the situation of the last burial is not clear (*Institute of Archaeology CASS et al. 2003.130–149*). This custom of covering the dead with stone slabs has only been reported in Guangxi so far.

In another site, at Dingsishan, 149 burials dated between 8000–7000 bp have been found. Details of the Dingsishan assemblage have not been published, but according to the brief report, 16 burials were found in Phase II of the Dingsishan assemblage and dated to c. 8000 bp, many without grave goods, and a few tombs containing one or two stone or bone or shell implements (*Guangxi Team of the Institute of Archaeology CASS et al. 1998.14*). The positions of the dead range from flexed and supine, to flexed and prone, to flexed and lying on one side, and crouched; stone slabs have also been found in some tombs (*Guangxi Team of the Institute of Archaeology CASS et al. 1998.14*). Another 133 burials have been found and dated to Phase III of the Dingsishan assemblage, or c. 7000 bp, with only a few or no grave goods, but stone slabs commonly found in the tombs (*Guangxi Team of the Institute of Archaeology CASS et al. 1998.18–22*). In addition to the four types of position found in Phase II, a disarticulated burial style has been found in Phase III, which means that bodies of this type of burial were disarticulated

before being buried (*Guangxi Team of the Institute of Archaeology CASS et al. 1998.18–22*) (Fig. 4). As all the small bones of the bodies were *in situ* when excavated, it is highly unlikely that they are secondary or disturbed burials. This type of burial has not been reported from any other places in China, or as far as we know in other places of the world. The disarticulated bodies are both male and female; the ages range from teenage to middle-age individuals (*Guangxi Team of the Institute of Archaeology CASS et al. 1998.18–22*). As no clear patterns in terms of gender or age of the disarticulated dead can be identified, the function(s) and meaning(s) of this burial style is still a puzzle.

As the soil in South China is often quite acid, human bones cannot be preserved well at many archaeological sites. However, some burials such as the aforementioned show the uniqueness of burial customs and beliefs as well as changes. The big stone slabs or shells covering the crouched bodies in Zengpiyan (*Institute of Archaeology CASS et al. 2003.130*) may indicate local beliefs and/or customs that cannot be understood today. The burials found at Dingsishan, which date to c. 8000–7000 bp, still contain stone slabs, showing the remains of this burial custom. On the other hand, stone and organic tools became grave goods in Dingsishan at c. 8000 bp, showing that tools were perhaps owned by individuals or small social units.

With the introduction of rice farming, it seems that burial customs also changed. At Xiaojin, three tombs dated to c. 6000–4500 bp have been found, two of which were furnished with pottery; another three burials dated to 4000–3000 bp have also been found, two of which were furnished with pottery and spindle whorls (*Archaeological Team of Guangxi and Office of Heritage Management of Ziyuan County 2004.14–22*). As already noted, some pottery of the above two phases of Xiaojin bear technical and typological similarities with contemporaneous ceramics found in the middle Yangzi River Valley, and show both cultural influence from the north and cultural localisation (*Archaeological Team of Guangxi and Office of Heritage Management of Ziyuan County 2004.27–29*), including the use of pottery as grave goods.

The burials of farming societies in Shixia, northern Guangdong, show even more significant changes. Details of the Shixia assemblage have not been published, but it has been reported that a total of 102 burials were found, including large tombs furnished

with over 100 items, many of which are jade artefacts, while the medium-sized tombs contained only tens of items without jade implements (Zhu 2001).

Based on data published to date, it seems that the majority of burials dated at c. 8000 bp or earlier in Guangxi do not contain grave goods except stone slabs, and occasionally, big shells. Grave goods occur in tombs dated after about 8000 bp, but the quantity is very limited, and the most common items are stone and organic tools such as those found in Dingsishan. Burials of the Xiaojin assemblage dated after 6500 bp were furnished with pottery (Archaeological Team of Guangxi and Office of Heritage Management of Ziyuan County 2004), but the quantity and quality of the grave goods have not been published. However, the disparity in terms of tomb dimensions and quality and quantity of grave goods occurred after 5000 bp in some farming societies, as represented by the Shixia assemblage (Zhu 2001), clearly shows the social segmentation within the society.

Discussion

Primarily due to the acid soil as an unfavourable natural context for archaeological remains, limited archaeological data and the insufficient application of multi-disciplinary research methods, prehistoric cultures and societies in South China are still poorly understood. However, research conducted after the late 1990s does provide some new and concrete data on the diversity of local cultures, particularly on subsistence strategies and social structures, as well as on interactions between South China and the Yangzi River Valley.

The co-existence of foraging and farming

As I have suggested, the early farmers of South China might have been migrants from the Yangzi River Valley, or local groups receiving cultural influences from their neighbours to the north, as indicated by the similarity of pottery found in Xiaojin and Shixia in northern South China. However, the majority of people in South China between 6500 and 3500 bp, particularly in the Pearl River Delta, remained foragers. Full reports of the archaeological sites in the Pearl River Delta are not available, but large amounts of shells and

wild animals, net sinkers and cobble tools have been found at these sites (Lu 2011b.95–96), and there is no strong evidence of social segmentation. In Hong Kong, isotopic analysis indicates that people from c. 4500 bp to the early 19th century lived on farming and fishing, and prehistoric societies remained quite egalitarian until the 2nd century BC (Lu 2007).

In fact, it is not easy to clearly distinguish sedentary from mobile foragers. To date, archaeologists tend to consider shell midden sites in South China as being occupied by hunters, fishers and gatherers, and sites with little shell remains and traces of sedentism as being occupied by farmers. However, archaeological and ethnographic data from North China, the Yellow River and the Yangzi River Valley and South China have demonstrated that foraging and farming are not mutually exclusive; in fact, the two subsistence strategies often co-existed (Lu 2006b. 149). In Zengpiyan and Dingsishan, where various research methods have been applied to retrieve as much data as possible, although no shells have been found in the last phase of Dingsishan when rice phytolith became very abundant (Zhao et al. 2005), a substantial amount of wild animals has been found (Fu 2004), indicating hunting activities. In Shixia, social segmentation and sedentism are very apparent, but it is not clear whether foraging disappeared, as details of the site are not available. Furthermore, many other archaeological assemblages in South China have not been subjected to comprehensive and multidisciplinary examination, so it is not certain whether the occupants of these sites were foragers with farming as a supplementary economy, or *vice versa*, or foragers only. At this stage, we can



Fig. 4. Disarticulated burial at Dingsishan (Courtesy of the Guangxi Team of the Institute of Archaeology CASS).

only say that the cultures in South China between 6500 and 3500 bp were very diverse.

The prehistoric occupants of Xiaojin, Shixia and phase IV of the Dingsishan assemblage dated to between 6500 and 3000 bp were rice farmers with pottery similar to those found in the Yangzi River Valley in the cases of Xiaojin and Shixia, or pottery different from other sites in the case of Dingsishan (Lu 2011b). The culture of this group clearly shows influences from the Yangzi River Valley. Whether the Gantuoyan occupants were farmers is not certain, but the prehistoric Sha Ha occupants of Hong Kong, dated to between 4000 and 2000 bp, were farmers using localised pottery vessels and toolkits. It is impossible to identify whether the Sha Ha residents had any genetic connection with the Xiaojin, Dingsishan and Shixia residents, so we can only say that the expansion of rice farming to the Pearl River Delta by 4000 bp seems to have been a localisation process, rather than being driven by new waves of migrants and/or cultural influences from the Yangzi River Valley, which occurred after 218 BC.

Other groups, possibly living mainly on foraging, are represented by the Kequtou culture in Fujian, dated between 6000 and 5500 BP, characterised by localised pottery vessels dominated by coarse wear and fired at low temperatures, ground and flaked tools, large amounts of wild animal and shell remains, and a few jade items (*Institute of Archaeology CASS 2010.503–504*), the Jinlansi and Wanfu'an sites dated between approximately 6200 and 4800 bp, and the Yinzhou, Yuanzhou and Youyugang sites dated between 5000 and 4000 bp in Guangdong (Zhu 2001.26–39), as well as the Yung Long and the early deposit of the Sham Wan sites in Hong Kong (Fig. 1), both dated to between 6000 and 5000 bp (Lu 2007). The majority of pottery vessels of these groups differ from those found in the contemporaneous Yangzi River Valley, particularly those dated after 5000 bp. For example, the pottery, burials and toolkits of the Youyugang, Yizhou and Yuanzhou assemblages differ significantly from those of the contemporaneous Shixia (Zhu 2001.39). Zhu (2001.39) has argued that the Pearl River Delta people at Youyugang, Yinzhou and Yuanzhou were foragers; but after the discovery of rice and gourd remains in Sha Ha, Hong Kong, caution is required for this conclusion, as floatation and phytolith analyses have not been carried out for these sites in the Pearl River Delta.

Ethnographic data may also give us some ideas. There is a community on an outlying island in Hong

Kong. According to historical documents and the oral history of the local people, members of the community migrated from the Pearl River Delta and settled here c. 200 bp. Before the 1960s, some community members lived on rice farming, others on fishing, and still others on small-scale manufacturing and trading (Lu 2012c). All members of the community were sedentary, and many lived in pile-dwelling houses as architecture adapted to the environment, where sea levels fluctuate and tides can occasionally be very high (Lu 2012c). Clearly, there are various subsistence strategies within the community, and the way of life can be much more complicated than we think. Would it be possible that similar complexity existed in prehistoric South China? Much more work is required before we can draw a conclusion.

As discussed above, foraging was the dominant subsistence strategy in South China prior to 6500 bp, when farming began. However, foraging and farming co-existed, both inter- and intra-group, for thousands of years before the Qin conquest in 218 BC, and remained so in some island areas up to the 1960s (Lu 2007; 2012c). Compared to the cultural development in the contemporaneous Yangzi River Valley, where rice farming originated and spread after 8000 bp, and farming societies had occupied most of the region c. 6000 bp (Lu 2012a), subsistence strategies in prehistoric South China are more diverse.

This diversity might have related to the abundant and rich floral and faunal resources, which facilitated very efficient foraging, and made farming a less attractive economy. There is no strong evidence for substantial population growth, which could not be sustained by foraging, until BC 218, when half a million Qin soldiers marched into the area. In other words, though farming was introduced from the Yangzi River Valley c. 6500 bp, the richness of the local resources and the ways of life of the local people did not facilitate its rapid expansion. It seems that both nature and culture played important roles in this process.

Social structure

The study of social structures has been a topic of archaeology for many decades, with tools, pottery, exotic crafts and burials being the most frequently used evidence (Renfrew, Bahn 2008). As many assemblages have not been fully published to date, a discussion of social structures in prehistoric South China can be based only on a few studies in Hong Kong and Guangxi, and is very preliminary.

One of the study criteria is to examine whether there were items for the prestige group or just for the common and daily usage within the toolkits found in prehistoric South China. Use-wear analysis of some of the pebble tools found in Zengpiyan dated from 12 000 to 7000 bp, and three sites in Hong Kong dated from about 5000 to 4000 bp, indicates that they were used for daily activities such as foraging and tool-making in prehistoric era (Lu 2003b; Yang 2010), and are not prestige technologies. Use-wear analysis of the ground adzes and spades found in Hong Kong dated to approximately 4000–3500 bp suggests that these items were also used for daily activities such as woodworking, butchering, cutting, and digging sand (Chan 2005; Lai 2011), so they do not seem to have been prestige items either.

It is worth mentioning a ‘manufacturing workshop’ at Xiqiaoshan, Guangdong province (Fig. 1). Discovered in the 1950s and excavated in several seasons since then, thousands of semi products and a few final products of ground stone adzes made of a very fine-grain tuff have been found in 18 localities, associated with microblades and microcores, as well as shells and coarse pottery (Zeng 1995). As no remains of houses have been found, the majority of the stone artefacts are not final products, and ground adzes of the same rock have been found in many contemporaneous archaeological sites in the Pearl River Delta, it has been proposed that prehistoric people from different regions came to Xiqiaoshan to use the fine-grained tuff and rough out the artefacts, then took the semi products home for final production (Zeng 1995). Dated to between 6000 and 3000 bp, the huge amount of semi products of ground adzes found in Xiqiaoshan indicates centralised production in the prehistoric Pearl River Delta, and shared information, ideas and techniques at the inter-group level.

Ground stone tools, particularly the axes and shouldered and stepped adzes, have been found in many archaeological sites in South China, and sometimes associated with rough-outs and debitage, such as those found at Sha Ha and So Kwuan Wat in Hong Kong. As the raw materials used in different sites in Hong Kong for making ground stone artefacts also differ, it seems that the ground stone tools were produced by people living in different prehistoric settlements, and there is no evidence for the centralised production of stone implements in this region, although people did share ideas and techniques, as the ground stone adzes, axes, spades and slotted rings found in contemporaneous prehistoric sites in Hong Kong are technically and morphologically similar.

As the full reports of the majority of sites in South China have not been published, it is unclear whether the situation was similar in other regions.

The social context of the occurrence of pottery in South China has been discussed (Pearson 2004). As discussed, the early potters were mobile hunter-gatherers, and archaeological data to date do not indicate distinguishable social segmentation before 5000 bp (Lu 2010.36; Pearson 2004). Furthermore, the typological variety of early pottery found remained quite limited, with the cooking cauldron *fu* being the most prevalent vessel from 12000 to 8000 bp, while the sedentary farmers in the middle Yangzi River Valley began to produce new types of vessel, such as pots, bowls and plates, from about 9000–8500 bp (Institute of Archaeology CASS 2010.167–169; Lu 2010.35). Therefore, early pottery does not seem to have been a prestige technology (Pearson 2004). It is not certain whether cooking shellfish was an important social event (Pearson 2004.826), as no special contexts have been found in the remains from Zengpiyan and Dayan.

Nonetheless, pottery was a new implement, an ‘institutional fact’ (cited in Renfrew, Bahn 2008.499), not only because pottery provided a new facility for the extensive consumption of shellfish, which became an important subsistence strategy after 12 000 bp (Lu 2010) and remains an economic activity today, but also because it created a new section of craftsmanship and a new basis for specialisation. When pottery was found as grave goods at Xiaojin as mentioned above, it is clear that pottery was not only for cooking purposes, but also symbolised the ownership of private property, either on the individual level or of small social units, although we do not know whether ‘families’ existed. This is another change that seems to have resulted from the cultural influence of the Yangzi River Valley. A clear disparity of social segments is illustrated by the Shixia assemblage (Zhu 2001), but the social structure does not seem to have become as complex as those in the contemporaneous Yangzi River Valley, where specialisation and group conflicts occurred at 6000 bp, and professionalization and powerful individuals appear around 4500 bp (Institute of Archaeology CASS 2010; Lu 2012a).

Conclusion

The data shows that prehistoric cultures in South China were very diverse. Before 12 000 bp, affluent foragers occupied the landmass, living in caves on

abundant and seasonally stable natural resources. Some also manufactured pottery *c.* 12 000 bp to facilitate the more extensive collection of shells, as well as other social needs, but it is not clear whether the occurrence of pottery in the middle Yangzi River Valley had any impact on pottery in South China.

An apparent cultural influence from the Yangzi River Valley occurred after 7000 bp, represented by the Xiantouling site at Shenzhen, as the white pottery found bears very close similarities to those found in Gaomiao, in the middle Yangzi River Valley (Fig. 1). As no evidence of farming has been found in Gaomiao, it is not known why and how the cultural influence could have reached coastal South China, and whether this was caused by human dispersal. Nonetheless, by 6500 bp, rice farmers, and/or the idea of rice farming, had crossed the Five Mountains again and reached South China, first at Xiaojin, then other sites (Fig. 1). The two cultural phases of the Xiaojin assemblage, one dated to about 6000–4700 and another dated to 4000–3000 bp, both having pottery similar to those found in the Yangzi River Valley, but not exactly the same (*Archaeological Team of Guangxi and Office of Heritage Management of Ziyuan County 2004*), clearly illustrate that both the cultural influences from the north and cultural localisation were continuous processes. However, foraging and farming co-existed for a very long period, until after 218 BC, when another big wave of migration and power from the Yellow River Valley brought significant changes.

In addition to the co-existence of foraging and farming, bark-cloth and yarn manufacturing also co-existed for quite a long period, although the latter became more predominant after 4000 bp. A similar change can be observed in burials. Burying the dead with stone slabs seems to have become an indigenous custom by 8000 bp, which gradually disappeared after 6000 bp and was replaced by the custom of burying the dead with grave goods such as tools and pottery. The latter has been commonly found in the Yangzi River Valley among farming societies after 8000 bp, and is related to the appearance of private property (*Lu 2012a*).

Apparently, there were two clusters of cultures in prehistoric South China, the first being the indigenous foraging culture, characterised by mobility, foraging, limited craft production, and an egalitarian social structure; while the latter is the farming culture from the Yangzi River Valley, characterised by sedentism, farming and foraging, increased craft

production, and eventually, social segmentation. The farming culture entered northern South China at *c.* 6500 bp, but did not quickly replace the local cultures. It took a long time and gradually expanded to other areas, where foragers managed to continue their life style after the arrival of farming groups, and some cultural elements such as pottery were also localised in this process. Thus the period from *c.* 6500 to 3500 bp saw the arrival of cultural influences, with or without human dispersal, from the Yangzi River Valley, the development of the local foraging cultures, and the interaction of the two. The rich local resources enabled people to live on both foraging and farming. As farming did not develop to the same degree as in the Yangzi River Valley, social structure in South China, with the exception of Shixia, remained relatively egalitarian. Consequently, no centralised polity was formed, and the region was ruled by chiefs until 218 BC, when the Qin Army arrived (*Sima 2nd century BC 2006*).

The trajectories of cultural change in prehistoric South China apparently differ from those in the Yellow and Yangzi River valleys; one of the most important causal factors for this difference is the less developed farming economy, which leads to a division of labour, specialisation, social segmentation and many other changes in the Yangzi River Valley (*Lu 2012a*). It is hard to say how much of the lengthy co-existence of foraging and farming was due to the rich natural resources and how much to prehistoric human choices, and much more study of this issue is required.

The prehistoric cultures in South China illustrate another mode of life, another type of interaction between nature and culture, and another type of interaction between different cultures, particularly between the Yangzi River Valley and South China. While it is not clear whether South China always ‘received’ cultural influence from the Yangzi River Valley, it seems quite clear that cultures in South China also influenced other regions in the prehistoric era. For example, the big and round-bottom pots, cups with stands and lids found at the Nankuangli site in Southern Taiwan, dated to about 4800–4000 bp (*Tsang 2005*), are morphologically similar to those found in contemporaneous South China, and the production of bark-cloth and slotted rings in South China might have influenced Taiwan and Southeast Asia (*Tang, Wong 1994*). In short, prehistoric South China is an area where different cultures interacted, assimilated, localised and developed, and is unique in this cultural diversity and dynamics.

Many questions remain, of course. The prehistoric chronology, the diversity of settlement patterns, interaction between farmers and foragers, and social structures in most areas all await further and many more studies. But it is important to view the region not as a periphery of the archaeology of China, but as important and unique, so that more human and other resources can be used to facilitate further and more in-depth studies.

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