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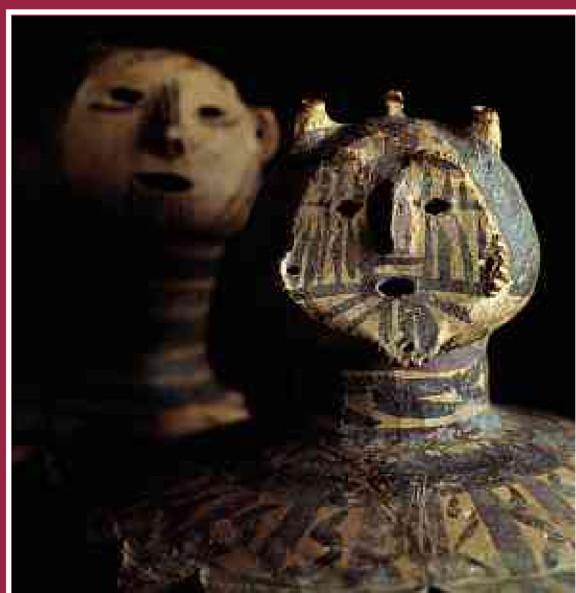
STOCKHOLM



Bulletin No. 82

100th Anniversary of the Discovery of the Yangshao Culture by Johan Gunnar Andersson (1874–1960)
Special edition

Stockholm 2021

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The two ceramic sculptures of heads depicted on the front cover form part of the collections of the Museum of Far Eastern Antiquities (in the foreground K-11038-005, in the background K-05472). K-05472 was purchased at the Banshan hills in Gansu province by Johan Gunnar Andersson during his fieldwork there 1923–24. K-11038-005 was purchased for the Museum at an antique store in Paris before 1943. They were probably intended as lids for ceramic ritual vessels. See Jada KO, this volume, regarding information about a similar piece found attached to a vessel and looted from the site Qijiaping in the 1990's.

The back cover shows K-11038-005 from the back side. A serpent, with its head between the truncated horns of the vessel lid, coils over the lid's head and neck (see Johan Gunnar Andersson. "Researches into the Prehistory of the Chinese." *Bulletin of the Museum of Far Eastern Antiquities* 15 (1943): 240–241; Magnus Fiskesjö, and Chen Xingcan. *China before China: Johan Gunnar Andersson, Ding Wenjiang, and the Discovery of China's Prehistory*. Stockholm: Museum of Far Eastern Antiquities, 2004, 142.) Photos by Karl Zetterström, National Museums of World Culture.

The dragon on the title page, the Museum's traditional logo, derives from a series of three dragons on the back of a bronze mirror of the Warring States period in ancient China, also in the collection of The Museum of Far Eastern Antiquities (K-10599-550, see Bernhard Karlgren. "Early Chinese Mirrors." *Bulletin of the Museum of Far Eastern Antiquities* 40 (1968): 85–86, plate 35.)

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Editor's Preface:

100th Anniversary of the Discovery of the Yangshao Culture by Johan Gunnar Andersson (1874–1960)

by
Eva MYRDAL

Introduction

In 2021 it is one hundred years since Johan Gunnar Andersson and his Chinese colleagues excavated a Neolithic settlement site in Yangshao, Henan Province, and a Palaeolithic cave site in Zhoukoudian, Beijing Municipality. The fieldwork was planned in collaboration with Ding Wenjiang, Director of China's National Geological Survey, and his successor Weng Wenhao and was financed by the Swedish China Committee and the Swedish state. This marks a beginning of archaeological fieldwork in China and was followed by a Chinese-Swedish agreement the 2nd of February 1925 regarding the subsequent management and publishing of the archaeological material.[1] The fieldwork became a start for both a scholarly communication over Eurasia in the field of Archaeology and the creation of a public institution for management and display of East Asian material culture in Sweden: The Museum of Far Eastern Antiquities (MFEA) in Stockholm.[2]

The material arrived in Stockholm in 1925 for registration and documentation, and the return shipments, according to the agreement, were sent in seven batches from 1927 to 1936. The material allotted to Sweden was nationalized in February 1926 by a decision in the Parliament, which also decided to create a museum for public display of the material. The MFEA was opened to the public in venues rented from the Stockholm School of Economics 1929 (the same year as the *Bulletin of the Museum of Far Eastern Antiquities, BMFEA*, was inaugurated). It was housed there until 1946 when it had to move to a temporary location at the Royal Swedish Academy of Letters, History and Antiquities (RSALHA). By a parliamentary decision in 1959, the collections were merged with the classical Asian art collections of the National Museum of Art (Nationalmuseum), and the MFEA

[1] For a background to the fieldwork in China see Magnus Fiskesjö, and CHEN Xingcan, *China before China: Johan Gunnar Andersson, Ding Wenjiang, and the Discovery of China's Prehistory* (Stockholm: Museum of Far Eastern Antiquities, 2004, English and Chinese), and Jan ROMGARD, this volume.

[2] For a background to the founding of the Museum see, for example, Eva Myrdal, "Public spaces for encounters with the world," in *Kungens gåva – Gustaf VI Adolfs gåva till svenska folket/ The King's Gift – Gustaf VI Adolf's Gift to the People of Sweden*, ed., Eva Myrdal (Stockholm: Museum of Far Eastern Antiquities Exhibition Catalogue no. 69, Swedish and English, 2013), 15–31; 173–179.

opened in a renovated historical building in 1963. With three other museums, it now forms part of the government agency The National Museums of World Culture (NMWC).

A hundred-year-history gives occasion to celebrate but also to look forward. This volume of the *BMFEA* is therefore dedicated to reflections on the Chinese-Swedish collaboration and its early results in the Chinese and Swedish contexts, respectively, as well as giving examples of subsequent developments of fieldwork in the area Andersson once worked, and in relation to research on the archaeological material managed in Stockholm.

Field archaeology is practiced all over China today and thus the few examples covered in this volume are not presented with the ambition of giving an overview of archaeology in China. Instead, the examples are presented with the hope of inspiring future collaborative research since the archaeological material managed in Stockholm opens for many questions now globally engaging the archaeological field: paleoclimate, human-induced environmental change, subsistence practices, social stratification, and the manifestation in the material culture and ecofacts of the sharing of ideas and practices.

Jan ROMGARD discusses Johan Gunnar Andersson's fieldwork in China during the 1920's within the global context of the geosciences of that time, CHEN Yantang discusses the early views on archaeological fieldwork in the Chinese context. Rowan K. FLAD et. al., GUO Zhiwei et. al. and Chenghao WEN discuss results of and perspectives on fieldwork dedicated to the Neolithic and Early Bronze Age that has been undertaken in recent years in the provinces of Gansu and Qinghai. Based on ethnographic field-research, Jada KO reflects over the concept of "indigenous stakeholders" in relation to an archaeological site on its way towards becoming a heritage site in an administrative sense (Qijiaping). Anke HEIN et. al. provide a history of research on the Neolithic and Bronze age pottery from the area, and Jennifer KEUTE et. al., and Ole STILBORG et. al. present results of new research on ceramic material managed by MFEA, while Limin HUAN critically reflects over the use of analyses of the chemical compositions of ceramic material for provenance studies of painted Neolithic ware.

In this Preface one additional aspect will be briefly discussed – the management of the collection from Johan Gunnar Andersson's work from a Swedish institutional perspective till today. To do so, a brief over-view of the scholarly, institutional, and financial framework for non-Nordic archaeology in Sweden during the first half of the 20th century will be given – a research environment in which Andersson was an active participant. The contrast between the rudimentary infrastructure of the humanities at that time on the one hand and the much more developed institutional and scholarly resources in the natural sciences (discussed by Jan ROMGARD in this volume) on the other will become obvious. Archaeological research in Sweden still has a mainly national/North European focus (not surprisingly: Sweden is a population wise small country and without a legacy comparable to former European colonial powers which built research institutions focussed on Asia parallel to the colonial expansion) and this situation is a challenge when the MFEA seeks partners for cooperation to develop cultural historic knowledge about the archaeological collections. Methods for natural sciences analyses are well integrated in the Swedish study field though, which open avenues for developing projects together with Swedish and foreign research institutions in collaboration.

Comparative Perspectives, Interdisciplinary Collaboration, and Layman Engagement: The Early Years of Archaeological Practice

Archaeology developed as a specific discipline at Swedish universities during the last decade of the 19th and the early 20th century. During the first decades of the 20th century Archaeology (Nordic and comparative archaeology) as a specific academic discipline had developed in Uppsala and Lund and at the college of Stockholm, marking the start of professionalisation of the study field.[3] Swedish antiquarian practice on an organised basis was much older, of course. The first official with overall responsibility for antiquarian matters (*Riksantikvarie*) was appointed by King Gustav II Adolf (Gustavus Adolphus) in 1630.[4]

However, from the mid-18th century antiquarian and archaeological practice had an administrative framework in the form of RSALHA. It was established with statutes with royal assent, but as with other similar Academies, gifts and legacies came to constitute its financial foundation and it had the status of an independent and prestigious learned society. This non-governmental learned society was led by a public official: the *Riksantikvarie* was appointed Perpetual Secretary to the Academy *ex officio*. The *Riksantikvarie* was also the head of the collections of what later became the National Historical Museum (NHM). In 1826 the Academy became the highest public authority for ancient remains in Sweden and came to organise exploration work as well as archaeological excavations.[5] So antiquarian practice, collection management, and field archaeology was institutionalized before the subject was represented at the universities.

If we focus on comparative perspectives within the archaeological study field the development towards professionalization in a Swedish context can be exemplified by the career of the archaeologist Oscar Montelius (1843–1921) and two of his disciples: Oscar Almgren (1869–1945) and Ture Johnsson Arne (1879–1965). Oscar Montelius was appointed to the NHM in 1863 as an assistant. He defended his doctoral thesis based on material culture within the discipline of History at Uppsala university in 1869. Between 1869 and 1885 Montelius travelled widely in Europe to study important archaeological collections and taking part in archaeological congresses and meetings.[6] He became a fellow of the RSALHA in 1877. In 1880 he was appointed first assistant at the museum. In 1888 he obtained the honorary title of professor and lecturer at the NHM which was at that time housed on the ground floor of the Nationalmuseum. He was the *Riksantikvarie* between 1907 and 1913. He became a fellow of the Royal Swedish Academy of Sciences in 1895.[7]

Between 1889 and 1893 Montelius gave lectures in "jämförande fornforskning" [com-

3 Bo Gräslund, "Academic archaeology in Sweden up to 1930," in *Die Anfänge der ur- und frühgeschichtlichen Archäologie als akademisches Fach (1890–1930) im europäischen Vergleich, Berliner Archäologische Forschungen 2*, ed., Johan Callmer, Michael Meyer, Ruth Struwe, and Claudia Theune (Rahden/Westf.: Verlag Marie Leidorf GmbH, 2006), 179–184.

4 Riksantikvarieämbetet 1. https://www.raa.se/in-english/swedish-national-heritage-board/our-history/. Accessed 2021-09-23.

5 See, for example, Riksantikvarieämbetet 2. https://www.raa.se/om-riksantikvarieambetet/riksantikvarieambetets-historia/. Accessed 2021-09-23.

6 Anders Kaliff, "Oscar Montelius (1843–1921)," in *Svenska arkeologer*, ed., Anne-Sofie Gräslund (Uppsala: Kungl. Gustav Adolfs Akademien för svensk folkkultur, 2020), 61–68.

7 Hanna Rydh, *Oscar Montelius: en vägrödjare genom årtusenden* (Stockholm: Åhlén & Söners Förlag, 1937), 88–90; 142.

parative archaeology] at Stockholm college (not yet a university), discussing the three-period system and long-distance cultural contacts.[8] Oscar Almgren attended these lectures and presented his doctoral thesis in 1897 discussing typology and prevalence of northern European fibulae during the first centuries CE, and Oscar Montelius acted as opponent. Based on this dissertation Almgren got the first ever lectureship in "Comparative archaeology" in Sweden – at Uppsala university in 1897. This year could thus be said to constitute the establishment of archaeology as a discipline at Swedish universities.[9]

Oscar Montelius' younger colleague at the NHM, Ture Johnsson Arne, is another example of an early career as archaeologist, carrying the Montelius' comparative legacy (on which also Johan Gunnar Andersson's fieldwork in China rested). He was appointed temporary Assistant (e.o. amanuens) at the RSALHA in 1902, working at the NHM. He was appointed permanent assistant antiquarian there from 1909 and became head of the Iron Age department. He held this position until his retirement in 1944, and, as will be discussed further below, he was active in both words and deeds to make room for and expand the comparative artefact collection at the NHM. He presented his doctoral thesis, "La Suède et l'Orient. Études archéologiques sur les relations de la Suède et l'Orient pendant l'âge des Vikings," at Uppsala university in 1914. Oskar Almgren acted as opponent and examinator.[10]

At the end of the 19th century, the field sciences made their breakthrough in Sweden.[11] The results and field practices came to engage also educated groups outside the academy and we see Montelius and other pioneering archaeologists playing a part in this development. They also played a role in the development of various layman's associations related to the study field of archaeology. Svenska Fornminnesföreningen [The Swedish Antiquarian Society] was founded in 1869[12] and though the Society at that time stood in opposition to his employer, Oscar Montelius agreed to become its secretary in 1874, and its chairperson in 1908 continuing in this latter capacity until 1920.[13] Oscar Almgren was a member of the board of Upplands fornminnesförening [Uppland's Ancient Monuments Association] from 1901 to 1941.[14] In 1873 Oscar Montelius helped to found the Anthropological Society in Stockholm, from 1877 called the Swedish Society for Anthropology and Geography

8 Evert Baudou, "Arkeologins socialisering och de första föreläsningarna vid Stockholms högskola [The socialisation of archaeology and the first academic lectures at the University of Stockholm]," *Fornvännen* 105:1 (2010): 30; 30–42. See also Bo Gräslund, "Academic archaeology in Sweden up to 1930," 179–184.

9 Oscar Almgren, *Studien über nordeuropäische Fibelformen der ersten nach-christlichen Jahrhunderte: mit Berücksichtigung der provinialrömischen und südrussischen Formen* (Stockholm, 1897); Fredrik Ekengren, "Oscar Almgren (1869–1945)," in *Svenska arkeologer*, ed., Anne-Sofie Gräslund (Uppsala: Kungl. Gustav Adolfs Akademien för svensk folkkultur, 2020), 99–100; 99–105.

10 Ingmar Jansson, "Ture Johnsson Arne (1879–1965)," in *Svenska arkeologer*, ed., Anne-Sofie Gräslund (Uppsala: Kungl. Gustav Adolfs Akademien för svensk folkkultur, 2020), 137; 137–146.

11 See for example Christer Nordlund, *Det upphöjda landet: Vetenskapen, landhöjningsfrågan och kartläggningen av Sveriges förflutna, 1860—1930* [*The Elevated Land: Science, Land Elevation and the Formulation of a Swedish Past, 1860–1930*] Swedish text with a summary in English, (Umeå: Kungl. Skytteanska Samfundets Handlingar nr 53, 2001), and Jan ROMGARD this volume.

12 Nils Ringstedt, *Svenska fornminnesföreningen: Historik, fonder och stiftelser, Monteliusmedaljen, övrig verksamhet* (Stockholm: Instant Book, 2017).

13 Hanna Rydh, *Oscar Montelius*, 82–86.

14 Fredrik Ekengren, "Oscar Almgren (1869–1945)," 103.

[Svenska Sällskapet för antropologi och geografi]. He also came to act as its chairperson.[15] In 1921, the same year as Ture J Arne was elected fellow of the RSAHLA, he helped to found Svenska Orientsällskapet [the Swedish Oriental Society]. The then Crown Prince Gustaf Adolf acted as its first chairperson and Arne as its secretary.[16] Thus, from the late 19th to the first decades of the 20th century archaeology was established as a discipline at the universities and it also engaged the educated elite outside of government agencies and universities. Evert Baudou has discussed this development within the social and political context of the time, in which the new bourgeoise was an exponent of a mentality striving for intellectual liberation and independent education.[17]

The professionalisation within the field of archaeology came with its establishment as a subject at the universities and in Sweden the early decisive years gave the subject a specific inclination: from the start there was collaboration between the geosciences and the first professional archaeologists; the development within the geosciences gave knowledge of the Ice Age and thus a *terminus post quem* for human life and culture in the north-western Eurasian periphery as well as an understanding of that Scandinavia was peopled by human beings who had developed technology and traditions elsewhere, making room for an interest in comparative perspectives for the interpretation of material culture, and further Stone Age archaeology and settlement archaeology came in focus with a multidisciplinary approach.[18]

Yet another perspective could be highlighted. Though it did not become dominating during the discipline's subsequent development it was there as an undercurrent – much depending on the very nature of much of the archaeological material in Sweden: representing human practice without the written word. In the early phase of his career Montelius assigned a specific role to archaeological research as a way to establish knowledge of past societies outside the traditional realms of the academic discipline of History. Evert Baudou calls our attention to a declaration made by Montelius already in the 1870's:

"It is true, that no list of monarchs, no names of heroes meet us from these earliest times. But is not the knowledge of the life of the people and the progress of cultivation more valuable than the names on fabulous heroes? And should not be donated more faith in the contemporary, unchallengeable testimonies, to which only archaeology now listens,

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15 SSAG1: https://ssag.se/om/historia/ Accessed 2021-05-07; SSAG2: https://ssag.se/wp-content/uploads/2016/07/ssag_historia_befattningshavare_2016.pdf Accessed 2021-05-07.

16 Svenska Orientsällskapet: http://runeberg.org/nfcr/0365.html Accessed 2021-05-07.

17 Evert Baudou, "Arkeologins socialisering och de första föreläsningarna vid Stockholms högskola [The socialisation of archaeology and the first academic lectures at the University of Stockholm]," 31. CHEN Yantang, this volume, discusses the first establishment of archaeology as a scientific discipline in China, which forms an interesting starting point for a comparative perspective on the development.

18 Christer Nordlund, *Det upphöjda landet*, 15–18, 23, 217, 225, 237 and there cited sources; Evert Baudou, *Oscar Montelius: om tidens återkomst och kulturens vandringar* (Stockholm: Kungl. vitterhets historie och antikvitetsakademien and Atlantis, 2012), 303; Evert Baudou, *Den nordiska arkeologin – historia och tolkningar* (Stockholm: Kungl. vitterhets historie och antikvitetsakademien, 2004), 209; Jes Wienberg, "Emil Eckhoff (1846–1923)," in *Svenska arkeologer*, ed., Anne-Sofie Gräslund (Uppsala: Kungl. Gustav Adolfs Akademien för svensk folkkultur, 2020), 69–71; 69–74. Tove Hjorungdal, and Carl Holmberg, "Georg Sarauw (1862–1928)," in *Svenska arkeologer*, ed., Anne-Sofie Gräslund (Uppsala: Kungl. Gustav Adolfs Akademien för svensk folkkultur, 2020), 84; 83–90; Evert Baudou, "Det arkeologiska året 1906. Oscar Almgren, Oscar Montelius och Fornvännen," *Fornvännen* 101 (2006): 76–79; 75–84.

than to the poetic stories that for centuries have been preserved only in the memory of the poets?"[19]

Montelius' contribution to the establishment of a chronology of the Nordic Bronze Age is well known. His comparative method required a broad geographical focus which is also present in his synthesis *Orienten och Europa: Ett bidrag till kännedomen om den orientaliska kulturens inverkan på Europa intill midten af det sista årtusendet före Kristi födelse* published in 1894–1896. The work was later published in German and partly translated into Chinese 1937.[20]

Montelius used the typological method to build sequences for a relative dating of material.[21] In an effort to arrive at absolute datings of find sequences from Scandinavia, Montelius also used comparison with material from the Eastern Mediterranean area. This approach opened the way to studies of human history in areas outside Scandinavia as is formulated in a memorandum written by Montelius in May 1920 in support of Johan Gunnar Andersson's archaeological work in China; a memorandum already observed by Magnus Fiskesjö and CHEN Xingcan and discussed in their book *China before China* in 2004.[22]

"But everyone realises of what outstanding importance it would have for the knowledge of the history of human culture if the same development as that seen in the rest of the world had indeed taken place within such a large and important area as that of the Chinese realm, within which, after all, close to one third of the entire earth's population lives.

[19] Translated by the present writer. "Det är sant, att ingen konungalängd, inga bragdrika namn möta oss från dessa första tider. Men är ej kännedomen om folkets lif och odlingens framsteg mer värd än namnen på sagolika hjältar? Och bör man ej skänka mer tro åt de samtida, ojäfvaktiga vittnesbörd, till hvilka allena fornforskningen nu lyssnar, än till de poetiska berättelser som under århundraden bevarats endast i skaldernas minne?" Quoted from Oscar Montelius, *Om lifvet i Sverige under hednatiden*, Stockholm (1873) in Evert Baudou, "Arkeologins socialisering och de första föreläsningarna vid Stockholms högskola [The socialisation of archaeology and the first academic lectures at the University of Stockholm]," 34.

[20] Oscar Montelius, *Die Älteren Kulturperioden Im Orient und in Europa, 1, Die Methode*, Stockholm, 1903. A new edition was published in Swedish in 1905: Oscar Montelius, *Orienten och Europa*, Stockholm, 1905, followed by the posthumously published: Oscar Montelius, *Die älteren Kulturperioden im Orient und Europa, 2, Babylonien, Elam, Assyrien*, Stockholm, 1916–1923. Montelius "*Die Metode*" was also translated into Chinese and published: Oscar Montelius, transl., Teng Gu 滕固, *Xianshi kaoguxue fangfa lun* 先史考古学方法论 [*Pre-historical Archaeological Methods*] (Shanghai: Shangwu yishuguan, 1937). This Chinese edition is available in the National Library of Sweden in Stockholm. See CHEN Xingcan, and Magnus Fiskesjö, "Oscar Montelius and Chinese Archaeology," *Bulletin of the History of Archaeology* 24 (2014) p.Art. 10 DOI: https://www.archaeologybulletin.org/articles/10.5334/bha.2410/ regarding how Montelius' work came to be translated to Chinese and for a discussion of Oscar Montelius' involvement in Johan Gunnar Anderssons' planning and search for funding for archaeological fieldwork in China, and Jan ROMGARD, this volume.

[21] Hanna Rydh, *Oscar Montelius*, 46; Bertil Almgren, "The development of the typological theory in connection with the Exhibition in the Museum of National Antiquities in Stockholm," in *Oscar Montelius 150 years*, Proceedings of a Colloquium held in the Royal Academy of Letters History and Antiquities, Stockholm, 13 May 1993, ed., Paul Åström (Stockholm: Kungl. Vitterhets, historie och antikvitets akademien, 1995), 33–34, 37; Mats P Malmer, "Montelius on types and find-combinations," in *Oscar Montelius 150 years*, Proceedings of a Colloquium held in the Royal Academy of Letters History and Antiquities, Stockholm, 13 May 1993, ed., Paul Åström (Stockholm: Kungl. Vitterhets, historie och antikvitets akademien, 1995), 19–20; Evert Baudou, "Det arkeologiska året 1906. Oscar Almgren, Oscar Montelius och Fornvännen," 81.

[22] Magnus Fiskesjö, and Chen Xingcan, *China before China*, 32; CHEN Xingcan, and Magnus Fiskesjö, "Oscar Montelius and Chinese Archaeology." See also Jan ROMGARD, this volume.

Or more correctly, how wonderful it would be, if China in this respect was not like other countries."[23]

Montelius' interest in the cultural history of areas outside Europe is also demonstrated in contributions to the yearly publication of the Swedish Society for Anthropology and Geography, *Ymer*, and in his correspondence with Swedes doing archaeological fieldwork in South America in the early 20th century.[24]

In the writings of Ture J Arne during the first half of the 20th century we find contributions regarding specific Asian material opening up for the broader aim of increasing the knowledge of human cultural history based on fieldwork he had undertaken in the area that is now southern Turkey, northern Syria, and north-eastern Iran, and research undertaken for his doctoral theses.[25] The expedition to Shah Tepé in Iran was initiated by Arne with a view to investigating the possibility of a connection between China's north-west and Central Asia and Southeast Europe. This initiative came about in response to Johan Gunnar Andersson's and his Chinese field-team's discoveries of painted Neolithic ceramic in China. Arne and Andersson had observed that this painted pottery from China "displayed astonishing similarity" to material from Neolithic cultures in Southeast Europe and Central Asia.[26] The aim of the journey according to Arne was "to investigate what connection there might be between those cultures…".[27]

Ture J. Arne travelled to what was then Soviet Central Asia (Kazakhstan, Uzbekistan, and Turkmenistan) in 1929. He obtained approval for a joint Swedish-Soviet archaeological expedition among regionally based researchers, but not from the central authorities in Moscow and Leningrad, and so he turned his attention towards Iran. The RSALHA asked permission from the Iranian government.[28] Iran approved the application to conduct an

[23] D. 1926.138. P.M. Oscar Montelius. Translation from the Swedish original by the present writer: "Men var och en inser, av vilken oerhörd betydelse det för kännedomen om den mänskliga kulturens historia vore, att samma utveckling som i övriga världen verkligen ägt rum även inom ett så stort och viktigt område, som det kinesiska väldet inom vilket ju nära 1/3 av hela jordens befolkning bor. Eller rättare, huru underbart det skulle vara, om Kina icke i detta avseende vore likt de andra länderna."

[24] Per Cornell, "Oscar Montelius och den svenska amerikanistiken," in *Till Gunborg: Arkeologiska samtal*, Stockholm Archaeological Reports, Nr 33, ed., A. Åkerlund, S. Bergh, J. Nordbladh, J. Taffinder (Stockholms universitet, 1997), 550–552.

[25] Ture J. Arne, "Stenåldersfynd från Nordsyrien," *Fornvännen* 3 (1908): 1; 1–13; Ture J. Arne, "Sveriges förbindelser med Östern under vikingatiden," *Fornvännen* 6 (1911): 1–66; Ture J. Arne, *Excavations at Shah Tepé, Iran.* Reports from the scientific expedition to the North-Western provinces of China under the leadership of Dr. Sven Hedin. The Sino-Swedish expedition. Publication 27. VII. Archaeology, 5 (Stockholm, 1945).

[26] Andersson's view, as well as Arne's, was based on interpretation of specific, ceramic, archaeological finds. See, for example, Johan Gunnar Andersson, *An Early Chinese Culture* (Peking: Ministry of Agriculture and Commerce, the Geological Survey of China), 24; plate XIII.

[27] Ture J. Arne, *Excavations at Shah Tepé, Iran*, 1. The diffusionist perspective was prevalent at the time. See for example Einar Gjerstad's comment regarding the Swedish expedition to Cyprus in 1927–31: "The importance of Cyprus in the history of culture consists first and foremost in the island's [sic] having constituted a connecting link between Oriental and Greek cultures." Einar Gjerstad, "Cyprus," *Bulletin of the Museum of Far Eastern Antiquities* 4 (1932): 6; 5–7.

[28] Ture J. Arne, *Excavations at Shah Tepé, Iran*, 1. This was made possible by a law permitting foreigners to excavate which was instituted in 1930 by the Reza Shah, see for example Carl Nylander, "Swedish Contributions to the Archaeology of Iran," *Fornvännen* 102:3 (2007): 168; 168–182. For an overview of the early development of archaeology in Iran see for example Mohammad Taghi Imanpour, "Political archaeology and the

archaeological excavation and Arne organised the archaeological expedition to Shah Tepé in northeast Iran in 1932–33.

The excavation of Shah Tepé however, uncovered a 4,000–5,000-year-old settlement, to be interpreted, if from a diffusionist perspective, in a regional context and lacking the wider comparative potential. So, the question remained unsolved. In Arne's words, "If one has access to only a few isolated sherds of such pottery from Yang Shao in Honan, China, and from Dimini in Thessaly, one can well imagine a close mutual relationship and contemporaneity. The relationship perhaps exists, though it is remote, and it is still difficult to throw much light on the genealogy."[29]

If we turn to the Swedish scene, we will find that it wasn't the aim to increase the knowledge of human cultural history in a global sense that gained a firm footing related to non-Swedish material from the point of view of the research community. Two main considerations become visible instead: to enhance the development of archaeology in Sweden and Swedish archaeologists' career opportunities. When, in 1925, Arne pleads the necessity of building up "comparative collections" of archaeological material, as had already been done in the field of natural history, the aim was to create a systematic comparative collection in the NHM from abroad to be used for a better understanding of the prehistoric collections from Sweden:

"Every archaeologist and ethnographer, however, knows that we cannot understand the development history of our people without extensive comparison material. Nor have we in prehistoric times led an isolated life for ourselves, even if we live out in the periphery."[30]

In his article 1936 Arne also showed an interest in the discipline of archaeology as such, with its own professional networks, hierarchies, and professional career opportunities:

"But it is, leaving aside our own country, primarily outside Europe that we can still make big contributions to archaeology and help to make our museums centres of international research."[31]

The Crown prince, later King Gustaf VI Adolf, could be seen as the "prime mover" when it comes to legitimising and funding archaeological research in Asia, North Africa

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Growth of nationalism in historiography of Iran in early twenty century: the Case of Pirniya's Ancient History," *Iranian Journal of Archaeological Studies* 5 (2015): 60–61; 57–66. https://ijas.usb.ac.ir/article_3016_bd9dcfc599fe230c023ba6e8abdb6011.pdf (English) https://iranjournals.nlai.ir/handle/123456789/343981 (Persian)

[29] Ture J. Arne, *Excavations at Shah Tepé*, 252.

[30] Ture J. Arne, "De komparativa fornsakssamlingarna i Statens Historiska Museum," *Fornvännen* 20 (1925): 19; 18–34. In a Swedish context the term "prehistoric" refers approximately up to the mid-11th century CE. Translation from the Swedish original by the present writer. "Varje arkeolog och etnograf vet emellertid, att vi ej kunna förstå vårt folks utvecklingshistoria utan ett vidsträckt jämförelsematerial. Vi ha ej heller under förhistorisk tid fört ett isolerat liv för oss själva, även om vi bo ute i periferien." See also Ture J. Arne, "De komparativa samlingarna i Statens Historiska Museum 1926–1935," *Fornvännen* 31 (1936): 109, 99–114.

[31] Ture J. Arne, "De komparativa samlingarna," 113. "[Men det är, om vi frånräkna vårt eget land, först utanför Europa som vi ännu kunna göra stora arkeologiska insatser och bidraga till, att våra museer bli centra för den internationella forskningen.]". He touched upon the subject already in 1925 when he wrote that the comparative collection should also cover areas "where we are in a position to do pioneering work within the field of archaeological research [... där vi ha möjlighet att utföra ett pionjärarbete på den arkeologiska forskningens område]." Arne, "De komparativa fornsakssamlingarna i Statens Historiska Museum," 33.

and the Mediterranean as will be discussed below, but in order to understand why these efforts were undertaken at all one has also to observe the academic environment in which researchers and students were working.

In 1932 the fourth volume of the BMFEA was dedicated to "His Royal Highness the Crown Prince Gustaf Adolf". The dedication reads:

"To His Royal Highness the Crown Prince Gustaf Adolf of Sweden we wish to present our respectful and sincere thanks in grateful recognition of the inspiring example he has set us all by his modest and careful scholarship and by his earnest devotion to the study of the ancient art of the Far East."[32]

Reading the 91 signatures one notes the names of internationally well-known scholars and connoisseurs mainly from the Western world but also of the Swedish archaeologists and art historians who at that time had worked with Asian material in the field or in Swedish museum collections, e.g., Ture Johnsson Arne, Johan Gunnar Andersson, Olov Janse, Bernhard Karlgren, Nils Palmgren, Hanna Rydh, Osvald Sirén, and Margit Bylin (Bylin-Althin by marriage), together with the then prominent Swedish collectors and patrons of archaeological fieldwork in Asia.[33] Among the latter we find Hanna Rydh's brother, C. L. Rydh.[34]

In this volume of BMFEA the antique scholar Einar Gjerstad (1897–1988)[35] contributes to the article "Crown Prince Gustaf Adolf as a Promoter of Archaeological Research." A quotation from the text helps illustrate the institutional framework in Sweden in the 1930's:

"Sweden does not as yet possess a joint institute for Nordic and foreign archaeological research, which might be able to collect the different archaeological interests around the fundamentally common goal, but fortunately we have in our Crown Prince a personality who has been willing, and able, to fulfil the task that would be incumbent upon such an institute. Through his all-round and manifold interest in archaeological research as such, no matter whether it be carried on in Sweden or abroad, His Royal Highness, in accordance with the principle that 'Union is strength', has been eager to arouse the feeling of brotherhood and unity between archaeologists, which, particularly in a small country like ours, is of the utmost importance if great scientific results are to be achieved."[36]

Johan Gunnar Andersson's motivation for starting the periodical *BMFEA* in 1929 when the Museum opened to the public explicitly addressed the need to create a research environment. In the first issue he states:

"In order to get these treasures of early Chinese art scientifically studied and described, the Museum had to call upon the cooperation of learned colleagues such as Umehara, Arne, Olov Janse, and others. In this way there has developed a small group of scholars who recognize our Museum as a centre for the study of Far Eastern Archaeology. Within this narrow circle of friends and collaborators there has been repeatedly expressed the need of a scientific organ for publishing such monographs on early Chinese bronzes

[32] *Bulletin of the Museum of Far Eastern Antiquities* 4 (1932), v.

[33] Ibid, v–viii

[34] Ibid, vii.

[35] *Nationalencyklopedin*, Einar Gjerstad. http://www.ne.se/uppslagsverk/encyklopedi/lång/einar-gjerstad. Accessed 2021-09-15.

[36] Einar Gjerstad, "Cyprus," 5–6.

and other articles emanating from this institute as could not be accommodated in the Palaeontologia Sinica. In order to meet this need, there came into being the Bulletin of the Museum of Far Eastern Antiquities, the first volume of which is herewith presented to the scientific reader."[37]

And further on in the volume he widens the circle of learned colleagues:

"When facing such an immense complex of problems I felt severely the inadequacy of my own capacity, but fortunately I was able to avail myself of the able collaboration of such distinguished colleagues as Dr. T. J. Arne, Dr. O. Janse, Dr. H. Rydh and Professor Bogajevsky of Leningrad."[38]

Interest in research into the material culture from areas to the East and South-East of Sweden (outside the Mediterranean region and apart from studies related to the Viking Age contacts in the area of present-day Russia and Ukraine) did not gain a firm footing in the Swedish research community. After WWII the comparative perspective also went out of vogue, as shown for example in an inventory of articles mentioning these eastern areas in the journal for Swedish antiquarian research, *Fornvännen*, from its inauguration 1906 up to the 21st century.[39]

During the first half of the 20th century Sweden had no scholarly, institutional basis for pursuing archaeology in non-European countries outside the Mediterranean area. Yet, a handful of archaeologists having their base in Sweden did undertake archaeological fieldwork in for example Asia. The projects were funded from Sweden, and the agreements regarding selection of sites and managements of finds were entered into by governmental bodies of the country in question and a Swedish counterpart, and through mutual agreements parts of the excavated material came into the custody of the Swedish state.

Funding of Archaeological Research in Asia in the Pre-WWII-period

Having noted the undifferentiated institutional set-up of archaeological research during the end of the 19th and early 20th century, and the many non-governmental scholarly- and lay societies with a broad geographical focus that were active, we can reflect on the social framework within which fundraising for the archaeological expeditions to Asia took place.[40]

In 1907 Ture J. Arne conducted a fieldtrip to "Asia Minor and Syria". According to his article in *Fornvännen* the following year, it was funded by the Swedish Society for Anthropology and Geography, the RSALHA, other (unnamed) institutions and (unnamed)

[37] Johan Gunnar Andersson, "Preface," *The Bulletin of the Museum of Far Eastern Antiquities* 1 (1929): 7–8.

[38] Johan Gunnar Andersson, "The Origin and Aims of the Museum of Far Eastern Antiquities," *The Bulletin of the Museum of Far Eastern Antiquities* 1 (1929): 27, 11–28. N.B. this was written before comparable research institutions had been established in China itself. See Anke et al, and CHEN Yantang, this volume.

[39] Ingmar Jansson, "Fornvännens förbindelser med Östern under 100 år," *Fornvännen* 101 (2006): 131–142.

[40] Field research in, for example, the Turkish part of the Mediterranean area came, due to its relation to Classical (Greek) archaeology, to follow a somewhat different path in Sweden regarding subsequent institution building and support as compared to field studies in other parts of Asia, and here we will concentrate on the latter.

individuals.[41] Arne's fieldwork in Central Asia was funded by a private donator (G. Wennersten) through the Swedish Oriental Society, of which Crown Prince Gustaf Adolf was chairperson.[42] The excavation of Shah Tépé was financed with the help of Dr Sven Hedin through the latter's Swedish-American patron Mr. A. Appleton. Funds were also given by the Swedish Oriental Society, the Swedish government (covering freight charges) and firms such as the Orient Line, Nordiska Kompaniet, and P.U. Bergström.[43] The results were later published within the framework of Sven Hedin's "Sino-Swedish Expedition" in 1945. According to Arne, the then Crown prince Gustaf Adolf also supported the project financially.[44]

The Crown Prince was praised as the uniting force for non-Nordic archaeology in Sweden in the 1930's as we saw above, and from the 1920's we see him leading the various fundraising committees within this field. In 1921, after the death of Admiral Louis Palander of Vega, Crown Prince Gustaf Adolf became the chairperson of the Swedish-China Research Committee.[45] He helped to form the Asine Committee (Greece) and was elected its first chairperson,[46] and he agreed to chair the newly founded Cyprus Committee in spring 1927.[47] These committees were fundraising and legitimising nodes for archaeological fieldwork conducted by Swedish archaeologists in the areas concerned. The Egypt committee was founded in 1927, with the Crown Prince as its chairperson, and for the purpose of promoting and supporting the Egyptological Museum in Stockholm, including fieldwork that could enlarge the museum's collections.[48]

As mentioned above Johan Gunnar Andersson's archaeological fieldwork in China 1921–1924 and the subsequent management of the excavated material had been financed by the privately funded Swedish China Research Committee and the Swedish state.

The concluding paragraph of the memorandum by Oscar Montelius mentioned above helps put the financing of research in Asia during the early first half of the 20th century into its contemporary social context:

"Few words are needed to convince us here in Sweden of what great importance it would have for our small people if Swedish scientists were to be recognized for spreading light over the oldest history of the ancient cultural country of China, and if their work were to have been made possible by powerful support from other open-minded Swedish men."[49]

The paragraph points to the social context within which an interest in non-Nordic material culture existed at that time: certainly, among some intellectuals and academics,

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[41] Ture J. Arne, "Stenåldersfynd från Nordsyrien," 1.

[42] Ture J. Arne, *Excavations at Shah Tepé, Iran,* 1.

[43] Ture J. Arne, *Excavations at Shah Tepé, Iran,* 1–2.

[44] Ture J. Arne, *Svenskarna och Österlandet* (Stockholm: Natur och Kultur, 1952), 307.

[45] K. Hamada, and J. G. Andersson, "The Far East," *Bulletin of the Museum of Far Eastern Antiquities* 4 (1932): 9.

[46] Nils Palmgren, "Asine," *Bulletin of the Museum of Far Eastern Antiquities* 4 (1932): 3–5.

[47] Einar Gjerstad, "Cyprus," 6.

[48] Pehr Lugn, "Egypt," *Bulletin of the Museum of Far Eastern Antiquities* 4 (1932): 7–9.

[49] D. 1926.138. P.M. Oscar Montelius. Translation from the Swedish original by the present writer: "Det behöves ej många ord, för att vi här i Sverige skola inse, av vilken stor betydelse det för vårt lilla folk vore, om man för spridande av ljus över det gamle kulturlandet Kinas äldsta historia hade att tacka svenska forskare, vilkas arbete möjliggjorts genom kraftigt understöd av andra vidsynte svenska man."

but from an economic point of view most importantly among members of the wealthy bourgeoisie, and the royal family. In this group one finds people with a genuine interest in cultural history and archaeology (such as the then Crown Prince Gustaf Adolf), but also those to whom collecting expensive and rare objects or funding field research that would, in the prestigious learned societies, be termed important, was also of interest as a means of enhancing their social prestige.

We thus see that the fieldwork conducted by Swedish archaeologists in Asia during the first decades of the 20th century was set up almost informally, not by research institutions, but by leading personalities in the Swedish academic world under the patronage of a member of the royal family who had scholarly and connoisseur interests, and with funding mainly in the form of private donations from the wealthy bourgeoisie. The fieldwork itself, however, was conducted as scientific undertakings according to the standard of the time. In terms of fundraising, we see a similarity with what happened in the field of the geosciences as is shown by Jan ROMGARD in this volume in relation to Johan Gunnar Andersson's work. But the scholarly infrastructure and expertise that existed in relation to these disciplines were not at hand when it came to archaeology in East Asia, which at that time was, globally speaking, pioneering work.

Management of Collections and Institutional Framework: A Shift of Perspective

During the decade from 1926 to 1936 a series of important decisions were taken by the Swedish parliament in terms of building museum institutions focussing on material culture emanating from outside of Sweden. The background to these decisions can be followed in two "Swedish Government Official Reports" (SGOF) presented to the Government in 1936 and 1951, respectively.[50] In both cases the starting point is the archaeological collections from abroad that had entered into the custody of the Swedish state, and that had to find a proper management. The Museum of Far Eastern Antiquities was the first to be established in 1926. The responsibility of the part of the archaeological material from China that had been allotted to Sweden was transferred from the Swedish China Research Committee to the Swedish state under the administrative umbrella of RSALHA with the promise that the collections should be scientifically studied and that a museum should be established.[51] The King thereafter appointed Johan Gunnar Andersson professor in East Asian archaeology and as director for the collections and the museum from the first of July 1926.[52] It should be noted that this professorship was not linked to any department at the university specialized in East Asian material culture.

[50] *Betänkande med utredning och förslag angående sammanförande och organisation av i Stockholm befintliga arkeologiska samlingar från Medelhavsländerna och främre Orienten avgivet av 1935 års museisakkunniga,* (Stockholm: Statens Offentliga Utredningar, Ecklesiastikdepartementet, 1936); *Betänkande med utredning och förslag angående sammanförande och organisation av i Stockholm befintliga arkeologiska samlingar från medelhavsländerna, främre orienten och Östasien avgivet av Sigurd Curman* (Stockholm: Statens Offentliga Utredningar, 1951). The SGOF represents official reports of committees appointed and convened by the Swedish government for the analysis of issues in anticipation of government propositions to the parliament.

[51] *Betänkande med utredning... avgivet av Sigurd Curman*, 48.

[52] *Betänkande med utredning... avgivet av 1935 års museisakkunniga,* 17–19.

The founding collection of the MFEA in 1926 was the Neolithic material excavated and bought by Johan Gunnar Andersson during his archaeological fieldwork in China between 1921 and 1924, but additional material from East Asia in the comparative collections of the NHM was transferred to the new institution.[53] This may be seen as a qualitative shift of perspective. In the museum specialised in East Asian material, the archaeological material from China was managed and displayed "on its own merits", and not as a comment on material from what is now Sweden. This shift of perspective was again emphasised when, in 1959, the decision was taken by the Parliament to give the MFEA a new building with more spacious galleries. It was decided that the East- and South Asian collections at the Nationalmuseum were to be transferred to the MFEA, thus creating a venue for comparative perspectives with a new and wider focus: Asia.[54]

These brief remarks regarding exhibition rooms for non-European material culture can be borne in mind when the museum career of the Johan Gunnar Andersson collection from China is discussed below.

Research on the Archaeological Material from China after 1926

Up until the inauguration of the MFEA by the Parliament in 1926, the archaeological collections from Asia were managed, as discussed above, mainly by the NHM in the Nationalmuseum, and motivated mainly in relation to their potential for comparative studies, to better understand the material found in present-day Sweden.

With the new institution, the need to have a relevant and specialised academic environment, knowledgeable in non-Swedish material, increased. During Johan Gunnar Andersson's directorship an effort was made to create an archaeological research base for Asian archaeology through the MFEA. That effort was manifested, for example, in the founding of the *BMFEA* as we saw above.

The Director taking over after Andersson 1939–59 was the internationally renowned sinologist Bernhard Karlgren (1889–1978). He had been doing research in China 1910–12 in the field of historical linguistics. His subsequent focus of research was the ancient Chinese language as manifest in the earliest inscriptions, and as a museum director he did not follow up the archaeological and settlement-site-related work of J. G. Andersson. The broadened collection bases of the MFEA after 1963, which required competence within the field of the history of East Asian art, was followed up by the subsequent museum directors 1959–81 Bo Gyllensvärd (1916–2004) and 1981–98 Jan Wirgin (1932–2020) and over the years several curators with a background in sinology and/or art history were recruited for longer or shorter periods. The sheer amount and diversity of the merged collections from China – spanning the time horizon from c. 4000 BCE to the early 20th century – would have required a far larger specialized staff of course, to ensure as great a focus on Pre- and Protohistoric archaeology as on the important collections from historical times.
So, whereas an impressive amount of the founding collection has been on display from

[53] Ture J. Arne, "De komparativa samlingarna i Statens Historiska Museum 1926–1935," 107.

[54] See for example *Betänkande med utredning... avgivet av Sigurd Curman*, 48; and Jan Wirgin, "Introduktion," *Östasiatiska museet 1963–1983. Tjugo år på Skeppsholmen. Jubileumskatalog*, ed., Jan Wirgin (Stockholm: Östasiatiska museets utställningskatalog 36, 1983), 3–7.

1929 till today with brief interludes for transfer in 1946 and 1959, and the collaboration with Chinese museums and cultural heritage authorities has continued all through the years, for example with important temporary exhibitions featuring archaeological finds from China that have been shown at the MFEA,[55] the tens of thousands of ceramic sherds and small finds from Andersson's collection laid dormant in the storage from the 1950's until 2000, when Magnus Fiskesjö was appointed director of MFEA.[56] He initiated a digital registration of the objects as well as cooperation with Chinese Pre- and Protohistoric archaeologists. In the early 2000's he worked with CHEN Xingcan from the Chinese Academy of Social Sciences, Archaeology, preparing the new, permanent exhibition 'China before China' (opened 2004) and working with archival material to shed light on Andersson's work in China and the history of the collection in Sweden.[57] In 2003 Magnus Fiskesjö organised the symposium "New Perspectives in Eurasian Archaeology – the Johan Gunnar Andersson Commemorative Symposium on the Making of China in the Context of Prehistoric East-West Eurasian Contacts," at MFEA. Papers submitted to the symposium were published in *BMFEA* vol 75. A re-connection between Swedish and Chinese archaeologists was also initiated by Fiskesjö in the early 2000's – members of the Swedish Archaeological Society made a study tour to among other sites Yangshao and Zhoukoudian in October 2004.[58] These renewed contacts enabled representatives from MFEA to attend conferences in Mianchi (2011), Lintao (2014), and Guanghe (2015) and to present papers on the history of the museum and management of the collections from an institutional point of view. Small-scale collaborative projects between government agencies such as the Swedish National Heritage Board and Uppsala University and Chinese archaeological research institutions have been set up as well, though not involving the collections at MFEA.

In order to ensure a long-term engagement with the collections (and hence up to date exhibitions) institutional collaborations have to be built in the field of documentation and digitization of the finds as well as research. Some initial steps have been taken. A physical reorganisation of the stored material according to site was started in 2015 and completed in 2016, and the Collections department of the NMWC conducted a pilot project for large-scale digitization of ceramic sherds and small finds in 2018. In both cases the work was done with assistance of MA students (from the Osteoarchaeological Research Laboratory at Stockholm university, and the Department of Archaeology and Ancient History, Uppsala University respectively) doing their internship at the MFEA. This basic work made it possible for external researchers from Oxford and Stockholm University to carry out

[55] Among the most important could be mentioned: Arkeologiska fynd från Folkrepubliken Kina [Archaeological Finds from the Peoples' Republic of China] 1974; Kejsarens armé [the Emperor's Army] 1984; and during Sanne Houby-Nielsen's time as Director of MFEA and later Director General of NMWC the temporary exhibitions Kinas terrakottaarmé [China's terracotta Army] 2010; Krigardrottningen och Kinas bronsålder [Warrior Queen and the Bronze Age of China] 2013, and Staden vid Sidenvägen [Cosmopolitan Metropolis Along the Silk Road: Luoyang During Tang Dynasty China] 2015 were shown. Within the framework of the cooperation between China and Sweden, thirteen objects from the Johan Gunnar Andersson collection were also lent to the exhibition "China and Sweden: Treasured Memories" at the Palace Museum in Beijing in 2005.

[56] The last, major documentation work was done by Bo Sommarström. See, Bo Sommarström, "The Site of Ma-Kia-Yao," *Bulletin of the Museum of Far Eastern Antiquities* 28 (1956): 55–138.

[57] Magnus Fiskesjö, and Chen Xingcan, *China before China*. Fiskesjö left his position at the MFEA in 2004.

[58] Nils Ringstedt, "Samfundets Kina-resa," *Gjallarhornet* 4 (2004): 1–2.

the pilot studies reported by Jennifer KEUTE et.al., and Ola STILBORG and Anke HEIN in this volume.

With a one-hundred-year perspective we can thus conclude that the legacy of Johan Gunnar Andersson's fieldwork in China enabled communication to continue between China and Sweden in relation to the study field of archaeology. Andersson's vision of a research centre for East Asian archaeology in Stockholm hasn't materialised but as the collection has been preserved by conservators in the various storage facilities through the years it is possible to re-connect also regarding documentation, digitization, and research related to the material. A possibility to reach out through the on-line database would be of special importance as it would allow for unlimited cross-border communication between researchers. For a museum, which constitutes a public space, it is very important that the collections are presented based on current knowledge, and hence cross-border communication and collaboration are necessary. As the present focus (autumn 2021) of the Swedish Ministry of Culture and of the Director General of the NMWC, Ann Follin, is on precisely collection management, digitization, and on-line availability we have every hope that the coming century will open for cross-border knowledge building on the material from Johan Gunnar Andersson's fieldwork in collaboration with researchers. This may happen if we acknowledge that registration is not the same as research, that the political (ministry) and administrative (authority management) level can create the conditions for research on an archaeological material (good collection management, digitization, etc.) but that the knowledge of the people who (ordered) / manufactured / used the objects, and the society in which they lived, is built in creative (preferably interdisciplinary, cross-border) research environments – and further that museums as public spaces (exhibitions) and open platforms for conversation (lectures, panel discussions, exhibition activities) provide an opportunity for the public (those who pay us) to take part in the results and to reflect on them independently. Which can enrich the public conversation with thoughts about us humans.

Finally, an editorial remark should be added in relation to the articles in this volume. Each author has decided regarding the order of hers/his 'surname – given name'. In order to clarify what is what, the surname of all authors is given in capital letters.

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From Geosciences to Prehistory: J.G. Andersson's Researches in China 1914–1924

by

Jan ROMGARD

Abstract

In 1921, the Swedish geologist Johan Gunnar Andersson (1874–1960) made the discovery of the Neolithic Yangshao Culture in Henan Province. He then set out on a two-year expedition to Gansu Province, during which he found a series of previously unknown Stone and Bronze Age cultures. These were pioneering finds of the era and Andersson's excavation reports, published by the Geological Survey of China, caught local, national, and international attention and laid the foundation for early modern Chinese archaeology. His fieldwork, however, covered a much broader spectrum of interdisciplinary research. To mark the 100th anniversary of the Yangshao find, this paper will detail the events that led to the discovery, the consequent scientific debate about the origin of China's civilisation that followed in its wake, and the intensified fieldwork that Andersson undertook to look for further traces of prehistoric cultures in the north-western parts of the country.

The results of the study will show that, contrary to what has often been assumed earlier, Andersson's archaeological discoveries were not just accidental finds that happened by chance along with the geological surveys. Instead, the archaeological researches followed closely the contemporary interdisciplinary objectives in Swedish and international geosciences, objectives that were in intense focus within Andersson's research network.

Outline

In 1921, the Swedish geologist Johan Gunnar Andersson (1874–1960) made the discovery of the Neolithic Yangshao Culture in Henan Province. He then set out on a two-year expedition to Gansu Province, during which he found a series of previously unknown Stone and Bronze Age cultures. These were pioneering finds of the era and Andersson's excavation reports, published by the Geological Survey of China, caught local, national, and international attention and laid the foundation for early modern Chinese archaeology. His fieldwork, however, covered a much broader spectrum of interdisciplinary research – he mapped fossil ecosystems, traced climate events in the Earth's history and contributed to the search for early species of mankind which led to the discovery of Peking Man. To mark the 100th anniversary of the Yangshao find, this paper will detail the events that led to the discovery, the consequent scientific debate about the origin of China's civilisation that followed in its wake, and the intensified fieldwork that Andersson undertook to look for further traces of prehistoric cultures in the northwestern parts of the country.

How did he formulate the scientific issues at hand and from where did they originate? How did he interact with the contemporary research community in Sweden, China and internationally? How was he affected by existing Swedish and international topics on the scientific agenda? How did his discoveries shape and influence the scientific debate? How did his interdisciplinary approach and theories about the finds come about and did they change, if at all, along with the data he discovered from the mid-1910s to the 1940s?

To find answers to these questions, the article will first map Andersson's Sino-Swedish research network, then trace the contemporary Swedish and international scientific issues, and then examine his contributions to them. The paper is limited mainly to the Swedish researcher's own perspective and focusses on his scientific network in Sweden, on the basis of the original correspondence and reports in Swedish archives from the 1910s to 1943.[1] Andersson's advisory work, which is another matter, will be further detailed in forthcoming publications.

Firstly, a short review of Andersson's background as a scientist will be given. Secondly, the organizational framework of the collaborations between Sweden and the Geological Survey of China is accounted for, a framework within which Andersson worked between 1916 and 1924. Thirdly, his field researches in archaeology and natural history as seen from his own correspondence and reports will be studied as well as his reactions to and interactions with contemporary scientific debates. The final part will briefly discuss his legacy in the history of science.

Student Years and Work until 1914: Polar Research and Head of the Geological Survey

Johan Gunnar Andersson from the parish of Knista in the province of Närke, central Sweden, graduated from Uppsala university in 1901 with a licentiate degree in geology, mineralogy, zoology and chemistry. Andersson had from his early days an interest in the study of geology and a connection with the Swedish Museum of Natural History (Naturhistoriska

[1] This paper is partly based on new data discovered in the current project "Swedish Science in China," headed by the author since 2018 at the Center for the History of Science at the Swedish Academy of Sciences, which extensively maps data from Swedish China travellers during Republican China. The results of the project will be presented in forthcoming works. The article is also to a large degree based on the author's previous dissertations at Stockholm and Nottingham universities on the Sino-Swedish scientific exchanges in the geosciences in the early 20th century. The two dissertations overlap by about two thirds. "Embracing Science" (Stockholm University) was first presented in 2013. "For Science and for Nation" (University of Nottingham) the following year was much expanded with new sections on earlier research, Chinese motives, extended analyses of the Sino-Swedish Expedition (1927–1935) as well as new discussions and concluding parts that further developed the Swedish motives and government foreign policy aims. Some of the information accounted for here has also been published in popular science form in the book *Polarforskaren som strandade i Kina* (The Polar explorer who ended up in China: Johan Gunnar Andersson & the Swedish Asia Expeditions, 2018) that accounts for Andersson's scientific discoveries along with the historical events witnessed by him in Republican China. Jan Romgard, "Embracing Science: Sino-Swedish Collaborations in the Field Sciences, 1902–1935" (Ph.D. diss., Stockholm University, 2013); "For Science and for Nation: Sino-Swedish Field Collaborations in the early 20th century" (Ph.D. diss., University of Nottingham, 2014); *Polarforskaren som strandade i Kina: Johan Gunnar Andersson* & *de svenska Asienexpeditionerna* (Stockholm: Fri Tanke förlag, 2018).

Riksmuseet, NRM). As a teenager he received scholarships from the NRM to do summer collection tours of fossils in Närke and on the Baltic island of Öland in 1890–1895, and in 1898, the NRM's palaeobotanist Alfred Nathorst (1850–1921) recruited Andersson for a Polar expedition to Spitsbergen, Bear Island and King Karl's Land. Andersson returned himself the following year (1899) as head of an expedition of his own to Bear Island, which resulted in the interdisciplinary dissertation Über die Stratigraphie und Tektonik der Bären Insel (1901), which earned him a doctoral degree. Andersson became famous for his participation in the dramatic events of the Swedish Antarctic Expedition 1901–1903 led by Otto Nordenskjöld, and was in 1906 appointed head of the Geological Survey of Sweden (Sveriges Geologiska Undersökning, SGU).[2] He also led the planning of the International Geological Congress in Stockholm in 1910, at that time an undertaking of national importance. The Congress is of special interest for his work in China as it reveals the most recent approaches in Swedish and international geosciences shortly before the Sino-Swedish collaborations began.

Contemporary Research Trends: The International Geological Congress in Stockholm 1910

The Swedish organising committee of the International Geological Congress 1910, co-headed by its general secretary Andersson and its president the Polar explorer Gerard De Geer (1858–1943), decided to focus on two main subjects that were particularly important in contemporary Scandinavian geology. The first topic was put forward by Andersson's geology teacher at Uppsala University, Arvid Högbom (1857–1940), who suggested a congressional survey of the world's iron resources. The idea was that each country should present a summary of their respective nation's iron resources in Stockholm as such mapping was important for the ongoing world industrialisation and economic development.[3] A purely scientific subject that was in major focus on the contemporary agenda – late Quaternary studies – was chosen as the second congress topic. It was put forward by two of Andersson's closest colleagues who suggested that a similar survey should be made of the present knowledge in each participating country "sur les changements du climat de votre pays pendant la partie postglaciaire de l'époque pleistocène," as Andersson wrote to all international delegates.[4] The up-to-date results were published in five large Congress volumes,

[2] During the winter of 1902–1903, the Expedition's ship was trapped and crushed in the Polar ice. Andersson, who had already gone ashore with two co-workers, failed to reach the isolated winter station that had been set up the previous season. He therefore had to pass the winter at what was named "Hope's Bay" before eventually being rescued by an Argentinian rescue team. Andersson has accounted for the events in various publications, among them in his autobiography *Kineser och pingviner: En naturforskares minnen från jordens fyra hörn* (Stockholm: Saxon & Lindströms förlag, 1933), 236–368.

[3] Andersson, *The iron ore resources of the world: An inquiry made upon the initiative of the executive committee of the XI international geological congress, Stockholm 1910* (Stockholm: Generalstabens lit. anstalt, 1910), vol 1, ix–xiv.

[4] The idea was proposed by his namesake Gunnar Andersson (1865–1928) a member of the 1898 Nathorst expedition (Andersson then added Johan Gunnar or J. G. to his name to distinguish himself from his namesake), and by Rutger Sernander (1866–1944) a fellow university student of the Swede in Uppsala. Andersson, *Die Veränderungen des Klimas seit dem Maximum der letzten Eiszeit: eine Sammlung von Berichten herausgegeben von dem Exekutiv-komitee des 11. Internationalen Geologenkongresses* (Stockholm: Generalstabens

three of which were edited by J. G. Andersson.[5]

Key Swedish scientists with leading roles in the Congress work would later become engaged in the scientific exchanges with China. In 1919 Andersson's namesake Gunnar Andersson became a member of the Swedish China Committee (described below) which directed funding to the fieldwork in China; the palaeobotanist Alfred Nathorst would – apart from Andersson – send his student and successor at the NRM, Thore Halle, to China. Moreover, Stockholm University College's (the predecessor to Stockholm University) Gerard De Geer presented at the Congress for the first time to an international audience his groundbreaking geochronology method that made it possible to date the retreating glaciers of the latest Ice Age.[6] His student Erik Norin went to test the model in the Himalayas, and would himself repeatedly do major fieldwork in China from 1919 until 1935.[7] The reasons for this research group's particular interest in Quaternary studies will be further elaborated below. As we shall see, the contemporary scientific objectives of this community formed the framework for Andersson's fieldwork in the coming collaboration with Republican China.

Andersson, the Mining Adviser

Through the initiative of Erik Nyström (1879–1963), a Swedish geology and chemistry professor at Shanxi University, Andersson was in 1914 hired as mining adviser to Republican China's government.[8] During the negotiations with China, headed by the Swedish envoy G. O. Wallenberg (1863–1937), it was stated that Andersson's most immediate tasks were to establish an indigenous Chinese geological survey along the "Swedish model," to develop China's mining industry and its regulations, and to set up a team of prospecting experts from Sweden to conduct geological surveys of China's natural resources.[9] The original assignment was for one year but was repeatedly renewed by the Chinese Government. However, following the opening of the Geological Survey of China in 1916, the Swedish

litografiska anstalt, 1910), ix-x. Quote from J. G. Andersson's foreword where his letter to the participants is quoted.

5 The papers delivered before the Congress were published in *The iron ore resources of the world (2 vols)*, in *Die Veränderungen des Klimas seit dem Maximum der letzten Eiszeit*, and in *Compte Rendu de la XI:e session du Congrès geologique international (Stockholm, 1910)*, (2 vols, Stockholm, 1912). Axel Lagrelius, head of Generalstabens Litografiska Anstalt (The Lithographic Institute of the General Staff) who earlier secured funding for the Antarctic expedition, published the works.

6 See Gerard de Geer, "A geochronology of the last 12 000 years," in *Compte rendu de la XI:e session du Congrès géologique international*, vol. 1, 241–258.

7 Other participants later connected with the China exchanges were: Carl Wiman who led the analyses of Chinese vertebrate fossils, and two future chairmen of the Swedish China Committee (further described later in this paper) – the Swedish Crown Prince Gustaf Adolf (who delivered the opening speech) and Louis Palander af Vega, commander on the Vega expedition 1878–1880 through the Northeast Passage. The senior Swedish archaeologist Oscar Montelius (1843–1921) who would subsequently support Andersson's archaeological fieldwork in China, as we shall see, was present too, as was the American geologist Amadeus W. Grabau who from 1920 would work at the Geological Survey of China together with the Swede.

8 Jan Romgard, "Erik Nyström: The creator of the Sino-Swedish collaborations in geology in Republican China," *Ziran kexueshi yanjiu* 自然科学史研究 34.1 (2015): 88–96.

9 Romgard, "For Science and for Nation," 81–92; 105–106.

technical survey team was dissolved on Andersson's suggestion.[10] Andersson was then offered a continued adviser contract for another five years until May 1921, with the option of extension for another three years, which it was. He left his permanent position as head of the Swedish Survey (from which he had been on leave from since 1914) and now began – in addition to his adviser's duties – to build up scientific collaboration between this new institution and Swedish research institutions.[11] It is this collaboration that is covered in this paper.

The Set-up of the Sino-Swedish Scientific Collaborations

Scientific exchanges between China and the NRM had been suggested by Andersson already in 1914 but did not materialize fully until 1916 when the Geological Survey of China was formed (below called the Survey, or Chinese Survey). The Survey was first headed by the reform-minded civil servant and scientist Dīng Wénjiāng 丁文江 (1887–1936), and then by the geologist and politician Wēng Wénhào 翁文灏 (1889–1971) and these two became Sweden's main collaboration partners until the 1930s and 1940s.[12] The initial exchanges began when Thore Halle in 1916 and 1917 conducted palaeontological research in China for the NRM and the Survey, accompanied by the Survey student Zhōu Zànhéng 周赞衡 (T. H. Chou 1893–1967). From 1918 and 1919 onwards the collaborations were expanded, including also Uppsala University (UU) and Stockholm University College (below SU). The Swedish institutions and the Survey now agreed that scientific surveys in China should be financed by Sweden, that expert teams at Swedish institutions should analyse collected field material, and that specified duplicates were to be sent back to China but that the rest – including the important type specimens (which in line with scientific tradition were kept where they were first determined), were to be kept by Swedish institutions in return for their input and financial support. A vital condition, suggested by Andersson and stressed by Ding Wenjiang, was that the joint results should be published in China. The set-up was therefore believed to be beneficial to both sides. On both sides, a younger generation of researchers became activated and schooled in the project.[13] One of them,

[10] In March 1916, Andersson took Ding Wenjiang's Survey students to the Kaiping coalfields for their final examination, recommended which ones should be employed by the Survey, and declared to the ministry that the Swedish survey team was no longer needed and should be dissolved, which it was in the following year. J. G. Andersson to Chang Kuo-kan (Zhāng Guógàn 张国淦 1876–1959), Minister of Agriculture and Commerce, "Report on a visit to the Kaiping coal field March 1916 with the students of the Geological School," Peking, 7 July 1916, Museum of the Far Eastern Antiquities (MFEA) archives.

[11] Andersson's advisery work will be further examined in other publications.

[12] Ding and Weng occupied leading positions in the Republican government throughout their careers – Ding later became general secretary of the Chinese academy of sciences, Academia Sinica 1934–1936, formed in 1928, and Weng Wenhao held in succession several ministerial posts in the Nationalist Government until 1949, including that of Premier of China 1948. Romgard, *For Science and for Nation*, 210–211.

[13] Fieldwork was carried out, for instance, on the Swedish side by Thore G. Halle (NRM), Otto Zdansky (UU), Erik Norin (NRM and SU, later also at Lund University and UU), David Sjölander (Museum of Natural History, Gothenburg), Birger Bohlin (UU), and Elsa Rosenius (Andersson's co-worker and later wife). On the Chinese side, the Survey geologists Zhou Zanheng, Tán Xīchóu (S. Z. Tan) 谭锡畴, Zhū Tínghù 朱庭祜, Wáng Zhúquán 王竹泉 (1891–1975), and Yuán Fùlǐ 袁复礼 were involved in the fieldwork. Andersson's expert collectors, such as Zhāng Shìzhèng 张氏正, Liú Chángshān 刘长山, Jiǎo Zhōnghé 缴中和, and Bái Wànyù 白万玉 also contributed greatly to the enterprise. For the analyses of the material in Sweden, a further large

Zhou Zanheng, was in 1918–1922 sent for exchange studies in Stockholm on a Swedish scholarship in order to become the Survey's future palaeontology expert.

In Sweden a research board called the China Committee was formed in 1919. It ensured and distributed funding to the project and coordinated the collaboration on the Swedish side between the various institutions and the Geological Survey of China. Polar research funds for a planned South Polar expedition that had to be cancelled because of the World War were now instead redirected to the China collaboration.[14] In 1921, the Swedish Crown Prince Gustaf Adolf became the China Committee chairman, which further increased the prestige of the project and helped secure further private and state funding. As the King of Sweden, Gustaf VI Adolf remained highly active in the Committee's work until his death in 1973.[15]

To further fulfil the agreement, new scientific publications aimed at an international public were started and edited by Ding Wenjiang in Peking from 1919 respectively 1922, in which the Chinese and Swedish reports were published, and a special fund was set up in Peking by Andersson to print them as part of the arrangement.[16] Consequently, the Swedish reports were published in China until the Second World War.[17]

With the research support from the China Committee and this printing agreement, the Swedish contribution to the scientific research at the Survey became conspicuous. In the years between 1919 and 1925, 15 out of 55 articles and books (27 %) published in the Survey's *Bulletin of the Geological Survey* and in the monograph series *Memoirs of the Geological Survey of China* came to be written by Swedish contributors. Furthermore, of the articles and monographs published in the *Palaeontologia Sinica* (Zhōngguó gǔshēngwù zhì 中國古生物志) from its start in 1922 until 1928, the Swedish contributions were even more manifest: 20 out of 37 titles (54%).[18] The correspondence between the Survey and the

number of researchers and PhD students were involved.

[14] In 1913 Andersson and Otto Nordenskjöld had formed what was called the Antarctic Committee, which received government funds for a planned South Pole expedition. When Andersson left for China, he left the Committee. In February 1919, Andersson sent a "General Plan for Natural History Research in China" to Committee members pointing out the importance of the research in China, and in June suggested that the Committee should change its name and purpose, which it did. Romgard, "For Science and for Nation," 95–98.

[15] Its first chairman was, as mentioned, Louis Palander af Vega, who had commanded the ship that had sailed around the North-East passage in the Vega Expedition 1878–1880. Upon af Vega's death in 1920, the Crown Prince took over as the Committee chairman. Axel Lagrelius became its treasurer.

[16] Initially, a donation from Ivar Kreuger, the Swedish "Match King," paid for the first printing costs. However, in 1920, Andersson agreed with Ding Wenjiang to set up the fund in Peking, to which the Swede in instalments over three years donated a substantial amount of his own money from his adviser's salary (20 000 dollars are given in the original sources, probably Chinese silver dollars), which paid for the printing until 1931. Andersson estimated that his donation was equivalent to about 100 000 Swedish crowns, a considerable amount at the time. Andersson to Carl Wiman, 18 March 1920, Museum of Evolution (ME) archives, Uppsala.

[17] Andersson had brought manuscripts to the Survey for publication in 1936 when war broke out. He waited five years before suggesting to Weng Wenhao in 1941 to move the publication of the final reports to Sweden. Andersson to Weng Wenhao, November 1941, MFEA Archives.

[18] For this calculation I have only included Swedish authors, or co-authored papers with Chinese colleagues. The number would be greater if it included works by other foreign contributors, such as Schlosser and Black that also analysed data from Andersson's surveys during this time. For this compilation, I used *The National Geological Survey of China: Publication list, 1934* (Peiping: The Geological Survey and Section of Geology of the National Academy of Peiping, 1934), 1–5; 10–13; 14–24.

Swedish institutions as well as Andersson's 1920 agreement reveal that the idea of publishing the results in China was essential to Ding Wenjiang and to his successor as head of the Survey, Weng Wenhao, in their work to establish the scientific status of the Survey.[19] The archaeological reports were among the most important results published in these series.

Growth of the Research into China's Prehistory and its Relation to the History of Geosciences and Andersson's Previous Work

In their pioneering publications in 2003 and 2004, Magnus Fiskesjö and Chen Xingcan pointed out that the Swedish archaeologist Oscar Montelius influenced Andersson to investigate the archaeology of China. This is shown by a memorandum in the archives of the Museum of Far Eastern Antiquities, dated 31 May 1920, where Montelius explains the prospects of unveiling the ancient cultural history of China.[20] Perry Johansson, on the other hand, argued that Andersson must have come up with the idea earlier that year as shown by a letter from a Swedish collector of Chinese antiquities, Orvar Karlbeck, dated 15 April 1920.[21] However, newly found documents in the Lagrelius archives show that Andersson's archaeological work had already taken systematic proportions at least by 1919. In November that year, the Swede explained that he had become seriously interested in an archaeological lead and for that reason had gathered what he believed was one of the largest collections then existing of Neolithic tools from the region. Furthermore, he was searching for possible Swedish expertise to assist in determining the prehistoric data.[22] The Montelius and Karlbeck letters were therefore effects of Andersson's networking to find aid for his new line of research. As correctly noted by Fiskesjö and Chen, Montelius further used

[19] In 1920, Ding explained why: "Firstly, my desire is that the Geological Survey of China should try and establish its scientific status as well as the economic one. But the former is far more difficult to do as there is very little appreciation for purely scientific work even within the Ministry. With the arrangement I made with Dr. Andersson, however, I hope to be able to print a series of monographs which may well establish our scientific reputation." Andersson explained to Thore Halle the same year that for Ding Wenjiang, publishing the results in Peking was "propaganda work" marketing the Survey and modern science in China. See V. K. Ting to Th. G. Halle, Peking, 17 April 1920, Swedish Museum of Natural History (NRM) archives; J. G. Andersson to Th. G. Halle, Peking, 16 March 1920, China Committee (CC) archives. Andersson's letter to Halle is in English. The original internal Swedish network quotes in this article are in Swedish unless otherwise given.

[20] Fiskesjö and Chen, *China before China: Johan Gunnar Andersson, Ding Wenjiang, and the discovery of China's prehistory* (Stockholm: Östasiatiska museet, 2004), 32; Chen Xingcan, and Magnus Fiskesjö, "Mengdeliusi yu Zhongguo kaoguxue 蒙德留斯与中国考古学 [Oscar Montelius and Chinese archaeology]," in *Ershiyi shiji de Zhongguo kaoguxue yu shijie kaoguxue* 二十一世纪的中国考古学与世界考古学 [*Chinese archaeology and world archaeology in the 20th century*], ed., Institute of Archaeology, Chinese Academy of Social Sciences (Beijing: Social Sciences Press, 2003); See also Chen Xingcan, and Magnus Fiskesjö, "Oscar Montelius and Chinese Archaeology," *Bulletin of the History of Archaeology* 24.10 (2014): 1–10.

[21] Perry Johansson, *Saluting the Yellow Emperor: A case of Swedish sinography*, Sinica Leidensia 104 (Leiden: Brill, 2012), 123–124. Karlbeck refers to a letter dated 10 March, in which Andersson allegedly asked him to lead excavations that would possibly take place in Anhui Province. The November memorandum, however, rather indicates that Andersson planned his own excavations and was mainly looking for Swedish expertise that could help determine the finds unearthed. See Orvar Karlbeck to Professor Andersson, Peng Pu, 15 April 1920, CC archives.

[22] J. G. Andersson, "Promemoria rörande insamling av stenredskap i norra Kina" [Memorandum concerning stone tool collecting in northern China], Peking 1 november 1919, Axel Lagrelii Collection, Stockholm City (SC) archives.

his prestige to find additional support for Andersson for this new lead. However, the senior archaeologist was just one of many influential colleagues that did so. Nathorst, Wiman, Palander af Vega and others also spoke of the need to build up the large Sino-Swedish interdisciplinary enterprise that followed, in which all the different sciences involved were believed to complement each other.

Indeed, Andersson's archaeological and palaeoanthropological researches actually derived from the Quaternary studies and palaeobiogeographical mapping of China that he had started already in 1916. This interdisciplinary outlook was a strong part of the contemporary agenda and followed upon the 19th-century rapid development in international and domestic geosciences. To understand why Andersson became engaged in archaeology, his objectives must therefore be sought for in the professional network in which he learnt his trade, and a short background to both international and Swedish geology and to his closest research connections is therefore necessary.

The discipline of modern geology had been closely connected to palaeontology, zoology, and archaeology since its very birth. To the Swedes, the 19th-century discovery of the Ice Age was especially important in that respect. For the archaeology of northern Europe, where traces of earlier Man, if existent, had become totally erased during the latest Ice Age, late Quaternary studies were vital. Geology was therefore closely linked to the mapping of human colonization after the retreat of the ice sheet. The most important aspect of our discussion of the contemporary climate studies and palaeoanthropology/archaeology is that the Neanderthal remains, for instance, had early on turned out to be associated with extinct mammals, especially the mammoth. In 1829, 27 years before the conclusive find in Germany in 1856 that identified the species, the Belgian Philippe-Charles Schmerling (1790/91–1836) had discovered human fossils, later identified as Neanderthal, in a cave near Liège and argued that they were of the same age as the extinct fossil animal species also found at the site. The Briton Charles Lyell (1797–1875) personally went to see the cave in 1833, and then understood the relationship of the remains to the traces of the glacial period.[23] In The antiquity of Man (1863) he devoted large passages to archaeological discoveries of flint tools in cave deposits and geological strata in Europe, writing at length about their chronological link to glacial traces (although still persisting in the idea of a floating ice sea), and discussing the age of man and his "place in the creation."[24] What is essential is that his study emphasized the relationship between geological climate studies and the antiquity of mankind, and so did other studies, such as the works by the biologist and anthropologist Thomas H. Huxley (1825–1895).[25]

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[23] Although Lyell originally doubted Schmerling's view that the human remains were of the same age as the extinct fossil species, he acknowledged that observation in the third edition of *Principles of Geology: Being an inquiry how far the former changes of the earth's surface are referable to causes now in operation*, vol 3 (London: John Murray, 1834), 161. In *The antiquity of Man*, Lyell accounted for his meeting with Schmerling in 1833, giving the Belgian's views "the weight which I now consider they were entitled to," and stating that the evidences "leave no room for doubt that man and the mammoth coexisted." See Charles Lyell, *The antiquity of Man: The geological evidences of the antiquity of Man; With remarks on theories of the origin of species by variation* (London: John Murray, 1863), 68 and 62.

[24] Lyell, *The antiquity of Man*, see, for instance, Chapter 24.

[25] Edward Bailey has concluded that Lyell's "enlightened synthesis of geology with archaeology and anthropology has supplied enduring inspiration." However, Lyell's study was an amalgamation of the results made by Euro-

Although early Swedish contributions to these kinds of studies have often been ignored in the international history of science, this interdisciplinary approach was also traditionally strongly present in Sweden, especially within Andersson's research network. In 1837 Sven Lovén (1809–1895), zoologist at the NRM, had joined one of the first Swedish Polar expeditions to Spitsbergen and realized that fossil shells found in Sweden were of the same type as the living fauna he studied in the Arctic Ocean. When Louis Agassiz (1807–1873) published his pioneering theory of an Ice Age in 1840 (first presented in 1837), Lovén immediately realized that it explained his own findings. His student, Otto Torell (1828–1900), Head of the SGU 1871–1897, compared data from Scandinavia and the British Isles, and in a series of Arctic expeditions he mapped glaciation traces that proved that Scandinavia must have been covered by an ice sheet and that the ice sheet had spread southwards from the north, and not, as suggested by Agassiz, developed from several separate centres.[26] This had direct relevance to Swedish archaeology as the first human cultures in Scandinavia appeared upon the retreat of the ice and early agriculture emerged at the new and fertile lands that re-appeared above sea level as the lands rose after having been depressed by the heavy ice sheet due to a gradual "crustal rebound."

By the turn of the century practically all members within Andersson's closest research network of geologists at the Swedish Survey, Stockholm and Uppsala Universities, and the Museum of Natural History were engaged in interdisciplinary fieldwork that mapped the past climate changes, its causes and effect on the land rise and its relation to archaeology. In 1894 Andersson's geology teacher, Arvid Högbom made the pioneering observation of cyclical differences of atmospheric carbon dioxide content, which inspired Svante Arrhenius (1859–1927) to explain its relation to the retreat of the Ice Age.[27] Morever, Högbom combined late Quaternary studies with archaeology to map the development of human settlements in the Svealand region. By using linguistics (old village names), archaeology (sites in proximity to modern villages) and geology (land rise) he traced village names back to emerging Bronze Age settlements and the expansion of agriculture in the Svealand region.[28]

pean geologists, palaeontologists, biologists and archaeologists until his time. Thomas H. Huxley referred to Lyell's conclusions from the Belgian finds when stating that "there can be no doubt that the physical geography of Europe has changed wonderfully, since the bones of Men and Mammoths, Hyaenas and Rhinoceroses were washed pell-mell into the cave of Engis." See Edward Bailey, *Charles Lyell* (London: Thomas Nelson and sons, 1962), 181; 199; quote 206; Thomas H. Huxley, "On some fossil remains of Man" (1863), in *Collected essays* 7 (London: MacMillan and Co, 1894), http://aleph0.clarku.edu/huxley/CE7/FosRem.html (accessed 16 March 2012).

[26] Torell was Professor of Zoology and Geology at Lund University before assuming the post at SGU. In Torell's obituary, Nathorst pointed out that he had changed Polar research from a question of record-setting in geographical exploration towards a means of solving major scientific research questions. Tore Frängsmyr, *Upptäckten av istiden: Studier i den moderna geologins framväxt*, (Stockholm: Almqvist & Wiksell, 1976), 138–145;149–150; A. G. Nathorst, "Otto Torell: Den vetenskapliga polarforskningens grundare," *Ymer* 20 (1900): 459.

[27] Maria Bohn, "Concentrating on CO_2: The Scandinavian and Arctic Measurements," *Osiris*, vol. 26, no. 1, Klima (2011): 165–179.

[28] Although his results were criticized by contemporary colleagues, his methodology was groundbreaking, and similar approaches have been used by modern archaeologists today. Olle Franzén, "Arvid G Högbom," *Svenskt biografiskt lexikon*, https://sok.riksarkivet.se/sbl/artikel/14009 (accessed 26 December 2020); Carl Wiman, "A la mémoire de Arvid Gustaf Högbom," *Bulletin of the Geological institution of the University of Upsala* 30 (1939): 1–55.

Gerard De Geer used his geochronological timetable to date cultural strata in Scandinavia in relation to the shifting shore lines.[29] Furthermore, Rutger Sernander, who had suggested the Quaternary topic at the Congress, studied peat bog layers and deduced that these layers corresponded to colder and warmer periods that were related to different archaeological eras.[30] Following up Sernander's results, Lennart von Post (1884–1951), recruited by Andersson to the Swedish Survey in 1908, developed pollen analysis (palynology) to map and date environmental changes caused by the postglacial climate that is still a highly useful tool in archaeology today.[31] As we have seen, all these geologists belonged to Andersson's closest research associates. In fact, as early as 1906, Andersson had invited Lennart von Post and two archaeologists – Oscar Almgren and Sune Lindqvist – to his family home in Närke to conduct archaeological researches in the vicinity. In a peat bog near Frösvi, the team conducted interdisciplinary excavations and discovered what was believed to be an ancient place of worship, probably dedicated to Frö (Freyr) in Norse mythology. The team mapped the topographical conditions when the site was in use and could date it to at least the late 7th century by the find of a contemporary bronze fibula.[32] Introducing archaeology into his research was therefore natural for Andersson.

Yet, for this generation so many questions still remained unanswered. How far south did the latest Ice Age extend in the northern hemisphere? Had there been repeated Ice Ages, or just one very long one that had stretched over the entire Quaternary era – interrupted only by short periods of warmer climate? How were the shifting climates related to the evolution of plants and animals? How did mankind fit into it all, and where did mankind first evolve? How and where had the Neolithic revolution taken place and spread, and how was it linked to the Holocene climate? The list of issues to be solved for this generation of geologists, natural scientists and archaeologists from all over the world was long. What is most important for our understanding of the aims in international collecting work was that all these geoscientists knew that the only way to find new answers was through fieldwork followed by comparative and laboratory analyses of collected data.

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[29] Gerard De Geer, "Förhistoriska tidsbestämningar," *Ymer* 45 (1925): 1–34, see especially 19–34. De Geer, moreover, believed that the same time schedule deduced from *varves* in Scandinavia could be exported to date glacier changes worldwide. To prove the theory, he conducted field research in North America and sent assistants around the world to collect data. De Geer reasoned that he could see the same yearly pattern in *varves* from various parts of the world. He believed that this indicated corresponding climate conditions caused by past similarities of sun radiation. This teleconnection theory of his was disputed already during his life time. See Lennart von Post, "Gerard Jacob De Geer," *Svenskt biografiskt lexikon*, vol. 10 (Stockholm: Bonniers, 1931), 562; Romgard, "Embracing Science," 51–52; 133.

[30] Bengt Jonsell, "J Rutger Sernander," *Svenskt biografiskt lexikon*, https://sok.riksarkivet.se/sbl/artikel/5866 (accessed 26 December 2020).

[31] Jan Lundqvist, "E J Lennart Post, von," *Svenskt biografiskt lexikon*, https://sok.riksarkivet.se/sbl/artikel/7398 (accessed 26 December 2020).

[32] Also present was the linguist Jöran Sahlgren (1884–1971), who like Högbom studied Swedish place names and later criticized some of the former's findings, *id est* his dating. Sune Lindqvist, "Ett 'Frös-Vi' i Närke," *Fornvännen* 5 (1910): 119–138; Evert Baudou, "Det arkeologiska året 1906: Oscar Almgren, Oscar Montelius och Fornvännen," *Fornvännen* 101.2 (2006): 75–84. The Swedish archaeologist Ingmar Jansson (personal communication 2021) has pointed out to me that Lindqvist's (1910) interpretation of the site as a place of worship most likely still stands. The place has since ancient times been called Frösvi, which derives from the words "Frö's vi" literally meaning "The holy place of Freyr," or "The place of worship for Freyr."

What China offered to the Swedes was the possibility to fill an important gap in their and the international teams' ongoing mapping of Pleistocene and Holocene changes in the Northern Hemisphere. Originally, Andersson's work was therefore directed mainly at natural history studies but along with his early discoveries of Palaeolithic tools and his subsequent interaction with international scientists on the data, the palaeoanthropological and the archaeological researches became interrelated and increasingly important leads.

Andersson's Fieldwork in China: Natural History, Geology and Emerging Palaeoanthropology

To understand the Swedish scientific objectives, Andersson's connection to Nathorst at NRM is fundamental. The experienced palaeobotanist, who early on was Andersson's tutor, had researched fossil floras in order to map past climates in such diverse areas as Scania in Southern Sweden, Greenland and Japan.[33] Through Nathorst, and from the data gathered during the Geological Congress, Andersson understood the significance of further mapping of the Earth's palaeoclimate, especially in East Asia. When Nathorst wrote to the Antarctic Committee in June 1916, in a first attempt to direct its resources to Andersson in China, he stated:

> It should be well known to the members of the Committee that one of the major results of the Polar expeditions – to the Arctic as well as to the Antarctic – is reckoned to be the discovery of the extremely important fossil flora for estimating the Earth's past climate. Thus, among the material brought home from Bear Island, Spitzbergen, Iceland and Greenland, flora from the Devonian, Carboniferous, Triassic, Jurassic, Cretaceous, Tertiary and Quaternary periods are represented; of remarkable significance in this respect is the Tertiary flora brought home from southern Japan during the Vega expedition.[34]

The Swedes had thus previously been engaged in polar research where they collected fossils believed to give answers to crucial issues on this group's research agenda: ancient climate changes in the Earth's history, especially Ice Age studies. Nathorst himself had studied the Japanese material from the Vega Expedition and drawn two important conclusions: firstly, that "the decrease in temperature during the Ice Age stretched its influence to southern Japan" and secondly, that this was "yet another proof that the Ice Age reached all over the northern hemisphere."[35] The quotes show how polar research, Scandinavian Ice Age research, and the mapping of Asia's palaeontology were interconnected. To map the then little known geological past of China's territories was a welcome opportunity to expand

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[33] Andersson, *Kineser och pingviner*, 120; Lars König Königsson, "Nathorst, Alfred Gabriel" in *Svenskt biografiskt lexikon*, vol. 26 (Stockholm: Norstedts, 1989), 399.

[34] A. G. Nathorst to the Antarctic Committee, 6 June 1916, Archives of the Ministry for Foreign Affairs, National archives (NA), Stockholm (copy of the letter to the Antarctic Committee sent to Wallenberg, who sent it to the ministry).

[35] Nathorst, "Bidrag till Japans fossila flora," in vol. 2 of *Vega-expeditionens vetenskapliga iakttagelser: bearbetade af deltagare i resan och andra forskare*, ed. A. E. Nordenskiöld (Stockholm: F.G. Beijer, 1883), 149. Nathorst's observations were also published in "Contributions à la flore fossile du Japon," *Kungliga Svenska vetenskapsakademiens handlingar* 20, no 2 (1882–1883).

the knowledge, and Nathorst was personally interested in acquiring complementary material on the palaeontology of Asia.

When the natural history fieldwork started to develop on a firm basis from 1916 and came to include both the NRM and Uppsala University, the archival material shows that Andersson's scientific work was linked primarily to the Quaternary issues on the geoscientific agenda. In December 1918, for instance, Andersson returned from a field trip to Henan and sent the palaeozoological collection to Professor Wiman in Uppsala for determination. He then wrote:

> The youngest fossils derive from layers of gravel from the time when a recurring damper climate again gave rise to rivers which cut through the covering of loess. These are finds made thus in the gravel beds in the valleys cut out in the loess, so, as I interpret it, deposits of postglacial age. [....]
>
> The next oldest deposit with mammals is the loess, from which mammal finds I have not yet with certainty been able to identify any other than Elephas, which I believe may be the Mammoth. [...] If it is confirmed that the Elephas remains in the loess are E. primigenius [...] then I will have a fossil confirmation of my assumption, held for a couple of years, that the loess is an arid facies of the Ice Age. [....]
>
> My aim is, you know, to use these fossils for the climatic interpretation of the Tertiary and Quaternary development of the history of this area.[36]

This letter explicitly links Andersson's main research interest to the climate studies that had occupied Swedish and international geology since the mid-19th century, and in China at least since Richthofen (and his student Sven Hedin).

In early 1919, Andersson developed these research aims further in a new "General plan for natural history collections in China," which was distributed to influential colleagues, funders, and government officials in Sweden.[37] Referring to Richthofen who, in his classical studies on the Chinese loess soil, had concluded that it had been transported by winds from the deserts of Central Asia, Andersson noted that the question of the geological age of the loess was uncertain, as well as some of the climatic conditions that formed it. Andersson argued that "the Quaternary Ice Age [...] in Central Asia took the form of a cold steppe climate, with a remarkable development of the wind-carried sedimentation" and pointed out that it was "necessary to try to collect the fossil contents" to "test this working hypothesis."[38]

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[36] J. G. Andersson to Carl Wiman, Peking, 19 December 1918, ME Archives. The *Elephas* fossils found in the loess turned out not to be the mammoth. Instead, Zdansky believed that it was more likely that they belonged to the *Elephas nomadicus*, previously found in India. Yet, Andersson seems to have been on the right track to some degree, as it has since become clear that there is "unambiguous association between mammoth fossils and human artifacts in northeastern China," that is, the species was hunted by Palaeolithic man. The distribution of mammoth finds in China was further mapped in the 1950s by Péi Wénzhōng 裴文中 (1904–1982). See J. G. Andersson, *Essays on the Cenozoic of northern China* (Peking: Ministry of Agriculture and Commerce, 1923), 127; Spencer G. Lucas, *Chinese fossil vertebrates* (New York: Columbia University Press, 2001), 288; Pei Wen-chung [Pei Wenzhong], "The zoogeographical divisions of Quaternary mammalian faunas in China," *Vertebrata PalAsiatica* 1 (1957): 9–23.

[37] A first version was written and distributed in August 1918.

[38] J. G. Andersson, "Allmän plan för naturvetenskapliga insamlingar i Kina [General plan for natural history collecting in China]," Peking, 1 February 1919, 4–5; CC archives.

By this time Andersson had already collected a considerable amount of data and stated:

> […] the results surpass my boldest expectations. I have discovered numerous mammal remains, partly in the Pliocene red clays, which seem to have an incredibly vast distribution in northern China, […] partly in the loess, partly also in the gravel beds that are younger than the loess and that mark the return of a more rainy climate.
>
> To briefly summarize from the youngest to the older strata, I would like to first mention that the youngest gravel deposits are characterized by numerous deer remains as well as remnants of the wild sheep, which still survive in the north-western mountain areas.[39]

Here, Andersson is concerned with biogeography, that is, the distribution of species in relation to the changing environment. By identifying species known to exist in certain climates, the palaeoclimate could be mapped, something that in its turn could shed light on both the evolution and the migration of species as well as the geological history of the region.

Essentially, Andersson found that "much of what was design[at]ed by Ricthofen as loess," is "in reality much older deposits," and he gathered that there must have been a transitional stage before the loess was formed:

> […] in late Tertiary and most of the Pleistocene times steppe conditions prevailed in northern China [….].
>
> In Middle Pleistocene time, the region became more decidedly arid with the consequence that aerial forces became dominant and assorted and redeposited the loam according to the laws of winddrift deposition. [….] By this interpretation I do not deny the correctness of Richthofen's idea that the loess was largely derived from the interior of this continent. It has merely been my desire to call attention to the fact that such transitionary stages exist and that consequently the loess might be partly of local origin.[40]

Andersson's observations on the climate change of this period are, by and large, still valid.[41]

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[39] Ibid.

[40] Andersson, *Essays on the Cenozoic of northern China*, 124; 126; 128. Andersson later published an updated summary of his stratigraphic researches on the loess in "Topographical and archaeological studies in the Far East," *Bulletin of the Museum of Far Eastern Antiquities* 11 (1939).

[41] Andersson's dating of the loess to the Pleistocene, as first suggested by Richthofen, was correct. So also was his observation that it was related to the Ice Age. It must be understood that Andersson, like many geologists, often referred to the entire Pleistocene as the Ice Age, not just the latest glaciation period. It is believed today that the loess formation was related to the rising Tibetan plateau, which – when it reached a certain threshold in the early Quaternary – changed the region's climate conditions (and possibly of the entire Northern hemisphere), events that in turn were reinforced during glaciation periods. During periods of increased glaciation on the Tibetan plateau, the East Asian summer monsoons weakened, while instead winter monsoons were strengthened. Due to the differences between the cold, dry continental air and the warm, humid ditto over the ocean, strong winds arose that blew the arid loess away from Inner Asia to China, as Matthias Kuhle has explained. Today, Chinese researchers claim that "this rise [of the Tibetan Plateau] cut off the Chinese interior from Indian monsoonal moisture, producing very dry climates in the Tarim and Qaidam basins to the north, both of which subsided about 1,000 m during the Pleistocene." The issue of the formation of the Tibetan plateau and its connection to the climate changes of Central and East Asia was actually also detailed by the pioneering Sino-Swedish Expedition (1927–1935), although much more about this process currently is known. Romgard, "For Science and For Nation," 220–223; Matthias Kuhle, "The Tibetan Ice Sheet; its Impact on the Palaeomonsoon and Relation to the Earth's Orbital Variations," *Polarforschung* 71.1/2 (2001): 1–13, Lucas, *Chinese fossil vertebrates*, 260. Lucas refers to Z. Zhou and P. Chen, eds., *Biostratigraphy and geological evolution of Tarim* (Beijing: Science press, 1992).

Moreover, he carried out pioneering studies on the particular strata covered by the loess, which he believed was formed during the long transitionary stage towards this drier climate, and which he dated to the Pliocene. Andersson called the layer either red clay or Hipparion clay after the rich Hipparion fauna found within it and which was extensively mapped by Otto Zdansky (1894–1988).[42]

Andersson's research on the red clay fauna were already explicit in his first examination of fossils at Zhoukoudian outside Peking, in winter 1918. He then concluded:

> The general type of the fauna is rather modern, and its occurrence in a kind of cave points in [the] direction of [P]leistocene age. From geological and climatological premises I have arrived at the conclusion that the red clay is older than the loess and formed during a warm-humid climate. These considerations rather indicate [P]liocene age of the red clay. But it is possible that in this case the deposit is secondary, formed by redeposition at a much later date than the formation of the main mass of the red clay.[43]

The dating of the Zhoukoudian fauna to the Pleistocene is important for yet another reason: it covers the time span when modern humans evolved. The quote reveals Andersson's aim, as we have seen, to understand the formation of the red clay, which he had found in so many locations in northern China. At this time, he was preoccupied with this question as well as with tracing palaeoclimatic changes that could explain the distribution of the flora and fauna discovered and could date geological strata.[44]

In 1919 and 1920 Andersson made several visits to a site called Ertemte (Èrdēngtú 二登图) in Inner Mongolia, from where he gathered extensive zoological and botanical material from the era of the Hipparion fauna to the present. As he wrote to Lönnberg in 1921, the explicit aim was to "put together a comprehensive account for the topography, geology, climate, flora and fauna of the Ertemte region in comparison to the interesting climate problem, which the fossil flora offers."[45] Most important was the discovery of fossil

[42] The red clay sediments were later also mapped by Yang Zhongjian and Teilhard de Chardin in 1930. They abandoned the term *Hipparion clay* in favour of the hóngtǔ 红土 (red clay) assignation, which is still used today in the geology of the country. Teilhard de Chardin and C. C. Young [Yang Zhongjian], *Preliminary observations on the pre-loessic and post-Pontian formations in western Shansi and northern Shensi* (Peiping: Geological Survey of China and the Section of Geology of the National Academy of Peiping, 1930), 2. For the use of the term today see George Kukla, "Loess stratigraphy in central China," *Quaternary Science Review* 6 (1987): 191–219.

[43] J. G. Andersson, "Preliminary description of a bone-deposit at Chow-Kou-Tien in Fang-Shan-Hsien, Chili Province," *Geografiska annaler* 1 (1919): 268. The paper is dated Peking, 18 March, and concerns fossil birds, rodents and carnivores. The Swede deduced that "the cave was inhabited by some kind of carnivorous mammal which carried its prey into it, where the refuse from the meals accumulated together with clay washed into the cave from the slope above," ibid., 267–268.

[44] These strata were also used to define the topography of archaeological sites. Ding Wenjiang identified several typical features of geological formations, such as the *Sanmen* stage, during fieldwork along the Yellow River on the Shanxi-Henan border, and the *Fenhe* stage. During his 1914, 1918 and 1920 researches in the Western Hills, Andersson identified two stages of gravel and loess accumulation, the *Malan* (dated to Middle Pleistocene) and *Banqiao* stages (dated to the Late Pleistocene). Andersson, "Topographical and archaeological studies in the Far East," 2, 25.

[45] J. G. Andersson to Einar Lönnberg, March 5, 1921, KVA Archives. See also Andersson, "The origin and aims of the Museum of Far Eastern Antiquities," *Bulletin of the Museum of the Far Eastern Antiquities* 1 (1929): 19.

Rhinoceros, at the site, which he believed proved climate and environmental changes in this area.[46] As he was not the first to find that taxon there, the team began to collaborate with the German palaeontologist Max Schlosser (1854–1932), who had earlier determined rhinoceros fossils from that region. The German had, moreover, in 1903 published the first large-scale inventory of Chinese fossil mammals using "dragon bones" bought in drug stores in China.[47] In his "General Plan for Natural History Collecting in China" dated 1 February 1919, Andersson referred to Schlosser's study pointing out that none of those fossils had been found *in situ* and explained that this was what made the Sino-Swedish fieldwork in China truly pioneering.[48] Furthermore, he mentioned Schlosser's tooth find, stressing the prospect of finding the origin of mankind in China, which thus at this time was an explicit aim of his work.

Origin of Mankind and of Chinese Civilization

The climate studies proved even more important for Andersson's rising interest in ancient man and the prehistory of China. By the time of his funding application in early 1919, the Swede had also become aware of the American Matthew's and Osborn's theory of a Central Asian origin of mankind.[49] It was most likely a meeting in January with the explorer Roy Chapman Andrews (1884–1960) that informed him of the contemporary American theories. Andersson then stated in his "General Plan" that "The American researchers suppose that Central Asia was quite likely the home of the most primitive races of mankind, and that these ancient peoples, during their wanderings in the New World and more distant parts of the Old, followed the migrations of larger quarry."[50]

During the year, Andersson corresponded with Osborn and his colleague William Diller Matthew (1871–1930). The latter sent Andersson his essay "Climate and evolution," in which he had developed these ideas further. Although Andersson did not agree with some of Matthew's arguments, the title mirrored his own research agenda, reinforcing his certainty that he was on to something important.[51]

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[46] Torsten Ringström's PhD thesis at Uppsala University on fossil Chinese rhinoceros was published in *Palaeontologia Sinica* in 1924 as "Nashörner der Hipparion-fauna Nord-Chinas," *Palaeontologia Sinica*, series C. 1, fasc. 4 (1924): 1–156.

[47] Schlosser later described the Ertemte vertebrates as well as fossil primates found in China during the fieldwork. Two new primate species in Henan were named *Macacus anderssoni* (found in Miǎnchí 渑池 Mianchi county), and *Procynocephalus wimani* (found in Xīn'ān 新安 Xin'an county). Max Schlosser, *Die fossilen Säugethiere Chinas nebst einer Odontographie der recenten Antilopen*, (München: K. Akademie; G. Franz in Komm., 1903); Schlosser, "Tertiary vertebrates from Mongolia collected by Dr Andersson," *Palaeontologia Sinica*, series C, 1, fasc. 1 (1924): 1–133, and "Fossil primates from China," *Palaeontologia Sinica*, series C, 1, fasc. 2 (1924): 1–17.

[48] J. G. Andersson, "Allmän plan för naturvetenskapliga insamlingar i Kina," Peking, 1 February 1919, CC archives.

[49] The exact date of Andersson's first meeting with Roy Chapman Andrews is unknown to me. With regard to Osborn's and Matthew's Central Asia origin theory, Morgan and Lucas have explained that they, in turn, actually had been inspired by Schlosser's tooth determination and suggestions of this possibility in 1903. Vincent L. Morgan and Spencer G. Lucas, "Walter Granger, 1872–1941, paleontologist," *New Mexico Museum of Natural History and Science Bulletin* 19 (2002): 18.

[50] J. G. Andersson, "Allmän plan för naturvetenskapliga insamlingar i Kina," 15–16.

[51] W. D. Matthew to J. G. Andersson, New York, 6 March 1919, CC archives. Matthew opposed the prevailing

In 1919, Andersson discovered prehistoric stone tools in Inner Mongolia and Southern Manchuria in the same area where Japanese archaeologists had found similar items a few years earlier. This led him to direct his studies into the issue of the more recent spread of modern humans. In February 1920, Andersson presented a brief report on the prehistoric tools at a conference in Peking organized by the (American?) Anatomical and Anthropological Association and (Chinese?) National Medical Association. Also present was the Czech-American anthropologist Ales Hrdlicka (Hrdlička, 1869–1943) of the National Museum of Natural History, Smithsonian Institution, Washington D.C. Hrdlicka had drawn the pioneering conclusion in 1907 (?) that American Indians had migrated from Asia to America across the Bering Strait, and argued in the early 1920s for a common ancestry of mankind in Europe.[52] In a letter to Wiman, Andersson recalled the meeting:

> Here this American anthropologist Hrdlicka arrived and claimed in his recent lecture at the physician congress in the new Rockefeller Institute: The population of Asia and America is the result of a Neolithic wave from Europe, and China has not had any Palaeolithic Man; at any rate, the Palaeolithic Man who once existed has not been able to survive, but has become extinct.
>
> I immediately responded to this: I cannot judge whether this is correct, but if it is, the explanation would be that the arid loess climate of East Asia, which chronologically corresponds to the Ice Age, was so unfavourable that it kept the Palaeolithic man away, who found it easier to evolve in Southern and Western Europe at the border of the ice.
>
> All this, as you understand, is as yet very vague speculation, but it touches upon some of the greatest issues which are presently at hand.[53]

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theory developed by the Austrian geologist Eduard Suess (1831–1914) and supported by the Swedes that an ancient supercontinent in the present Indian Ocean, Gondwana, once adjoined South America, Africa, India and Australia. This idea would explain the similarity of flora on both sides of the Indian Ocean. Instead, Matthew proposed that continents and oceans had always been the same, and that the spread between the new and old worlds had bypassed the Arctic (a holo-Arctic view), and that the evolution and spread of the world's fauna were pushed by climatic variations. During cooler periods, glaciation increased, sea level decreased and flora and fauna could migrate southwards. During warmer periods, the opposite occurred, continents became isolated again and so did their biogeography. Matthew's theory was flawed, however, as he ignored data in the distribution of palaeofauna that spoke against it. The continental drift theory, proposed by Alfred Wegener in 1912, had not yet gained acceptance. The Americans Matthew and Osborn as well as Huntington, furthermore included racist views in their argumentation on the development of mankind in relation to the climate, which as far as I have seen in Andersson's reports and correspondence, he never shared. See W. D. Matthew, "Climate and Evolution," *Annals of the New York Academy of Sciences* 24 (1915): 171–318; Giancarlo Scalera, "Roberto Mantovani: An Italian defender of the continental drift and planetary expansion," in *Why expanding earth?: A book in honour of* O.C. *Hilgenberg*, ed., G. Scalera, and K. H. Jacob (Roma: Istituto Nazionale di Geofisica e Vulcanologia, 2003), 71–74; H. E. LeGrand, *Drifting continents and shifting theories* (repr. Cambridge: Cambridge University Press, 1990), 100–102.

52 See Ales Hrdlicka, *Skeletal remains suggesting or attributed to early man in North America* (Washington: Smithsonian Institution, 1907), 9; "The anthropological problems of the Far East," *Science* 52.1355 (1920): 567–574; "The peopling of Asia," *Proceedings of the American Philosophical Society* 60.4 (1921): 535–545. Although Hrdlicka suggested the American Indians' Asian origin, he was not the first to propose the idea. According to Ronald L. Ives, a German Jesuit called Ignaz Pfefferkorn suggested in the late 18th century migration across the "strait of Anian" (Bering Strait). Ives also pointed out the obvious fact that Columbus, unaware of the continent to which he had arrived, believed that "the inhabitants of the New World were Asiatics." Ronald L. Ives, "An early speculation concerning the origin of the American Indians," *American Antiquity* 21.4 (1956), 420–421.

53 J. G. Andersson to Carl Wiman, 14 March 1920, ME archives.

Hrdlicka immediately added a new line to the printed version of his lecture stating that the obstacle that should "receive the first consideration" that prevented the early migration of modern man to Asia may have been "climatic conditions, such as a possible semi-desert area over what are now the loess regions of China."[54] At first, he did not, however, give proper credit to Andersson in the paper, but later acknowledged the Swede's input to this idea, both in a private letter and in print.[55]

The correspondence with Hrdlicka shows that Andersson was thinking in terms of the western migration of modern humans into what is now China, a whole year before the discovery of the Yangshao Culture. This is important, as he would then search for evidence of a perceived migration of cultural elements from the west to east direction. Moreover, the contents of this letter predate his interest in the extension of the Holocene fauna relevant for the Yangshao finds.

Furthermore, it shows the immediate correlation between his geological, palaeoclimatic, palaeontological and palaeoanthropological researches. Andersson explained in his March 1920 letter to Wiman why studies of the recent fauna and fossil remains were so important: "This is where the greatest importance of the material lies, in my opinion, as we here are at the centre of the Pliocene-Pleistocene development of anthropoids and other mammals. [...] I am convinced that we are here touching on the greatest zoogeographical problems of our time."[56]

Indeed, from this time on, his main aim was to use his expertise as a field geologist to trace climate changes and biological evolution in the strata in order to map the possible spread of flora and fauna, anthropoids and modern humans to China. By late 1920 Andersson needed reinforcement of his team in this work and asked Carl Wiman to send a vertebrate palaeontologist to him in China. This led to the arrival of the Austrian Otto Zdansky, a previous exchange student at Uppsala University. Upon his arrival in the summer of 1921, Zdansky was immediately sent to continue Andersson's excavations in Zhoukoudian, where he soon unearthed a humanoid tooth belonging to what in 1926 was popularly named Peking Man. However, Zdansky did not inform Andersson about the discovery until five years later.[57] By that time, the Swede had already directed his research more firmly into archaeology, and studies on China's prehistory.

The Search for China's and Central Asia's Neolithic

In 1919, the Survey's Zhū Tínghù 朱庭祜 (1895–1984) conducted Swedish-funded palaeontological researches in the border area between eastern Inner Mongolia and Southern

[54] Ales Hrdlicka, as quoted in Andersson, *Essays on the Cenozoic of northern China*, 140. The information on their meeting is also given by Andersson there, as well as on the contents of the private letter from Hrdlicka dated 1 November 1921.

[55] In 1921, Hrdlicka wrote "That such a condition of these vast regions did exist during the earlier part of the Quaternary is attested by the results of paleontological and geological researches of Dr. J. G. Anderson [sic], of the Geological Survey of China." Aleš Hrdlička, "The peopling of Asia," 543n. For the letter, see the previous note.

[56] J. G. Andersson to Carl Wiman, 14 March 1920, ME archives.

[57] For a new account on Zdansky's research in China, see Jan Ove Ebbestad, and Jan Romgard eds., *Otto Zdansky – an autobiography* (preliminary title), (Uppsala: Acta Universitatis Upsaliensis, forthcoming 2021).

Manchuria, where he found stone tools that he showed to Andersson. At this time, prehistoric archaeology was practically unknown in China. The Japanese archaeologist Torii Ryūzō (1870–1953) had published in 1914 and 1915 findings of stone tools from the same area, but believed them to be of non-prehistoric, Mongolian origin.[58] Andersson and his men had soon collected a large number of stone tools from all over northern China, indicating the existence of prehistoric cultures in the country. However, these stray finds did not provide proof of any proto-Chinese cultures. A specific aim for Andersson became therefore to find that evidence, a specific site where the stone tools lay untouched in the ground on the same spot as a proven prehistoric site. In 1920, Liú Chángshān 刘长山, Andersson's trained collector, purchased hundreds of Neolithic stone tools from a single village in Henan Province, which promised a possibility of finding an actual prehistoric human habitation. On 21 April 1921, Andersson walked from the city of Mianchi to the village called Yǎngsháo 仰韶, and, when crossing a ravine south of it, discovered a cultural strata, mainly consisting of red pottery, on an eroded hill side.[59] This was the great breakthrough, and was the discovery of what turned out to be a Neolithic settlement of a tradition that was later termed the Yangshao Culture. After permissions had been given by the Minister of Agriculture Wáng Nǎibīn 王迺斌 (1870–?), the Survey, the provincial government in Henan and the local authorities in Mianchi, the excavations got under way in the autumn and lasted from 27th October to 1st December 1921.

Andersson's Studies of the Yangshao Culture

Andersson's correspondence reveals his thinking at the time, which again reflected the contemporary understanding of the prehistory of the world and – in this case – of the development and spread of Neolithic cultures. When the Swede had to write his excavation report to the Survey, he realized that he faced a huge challenge. The problem was that the discovery was so pioneering that there was virtually nothing else in China to compare the excavated Yangshao material with.

On 1 February 1922 Andersson wrote to the Swedish archaeologist Ture Johnsson Arne (T. J. Arne, 1879–1965) to discuss the problem. He explained that his instinctive reflex was to approach the Yangshao analysis like a Quaternary geologist:

> [...] the numerous remains of a culture of Neolithic type have shown a connection to geological problems of the most intriguing kind. Namely, it has emerged that the settlements that I now call "the Yang-shao culture" after the large find-site in Honan investigated by me in late autumn represent a land surface very different from the one now existing, in that the ravine topography which is such a very distinctive feature of north China came into existence after the Yang Shao period. The exceptional erosion which occurred here in the same way during the last four thousand years explains, among other things, the Yellow River's enormous deposition of sediment out on the alluvial plain. It looks as if the completion of these investigations

[58] Zhāng Hóngzhāo 章鴻釗 (H. T. Chang, 1877–1951) – believed by Andersson to be influenced by Torii – drew in 1921 in "Shíyǎ 石雅 [Lapidarium Sinicum]" conclusions similar to the Japanese, that the utensils belonged to a non-Chinese culture which remained in a Neolithic state on the outskirts of the (more advanced) Chinese empire. H. T. Chang 章鴻釗 [Zhang Hongzhao], "*Shiya* 石雅 [*Lapidarium Sinicum: A study of minerals, rocks and fossils as known in Chinese literature*]," Dizhi zhuanbao 地質專報 [Memoirs of the Geological Survey of China], series B, no. 2 (Peking: Geological Survey of China, 1927).

[59] Andersson, "An Early Chinese Culture," *Bulletin of the Geological Survey of China* 5 (1923): 17.

> can provide a framework for China's settlement history to some degree in the same way as the changes in sea and land levels did for Scandinavia. The purely archaeological work is thus a preparation for a geological study, in which I intend to use ceramics as a time-record in roughly the same way as geologists use fossils.[60]

The fact was that Andersson, with this method, would arrive at a number of revolutionary ideas about the environment around Yangshao. But this analysis would take time – he had collected both animal bones and fossil plants from the whole area around the site and had studied its topography. But his next step now, in Peking in 1922, was first and foremost to try to date the culture he had found. He declared:

> The settlement sites investigated by us [...] have a Neolithic character, insofar as they contain in effect all the usual types of late Neolithic objects, while to date not a single object of metal has been found. [....] On a preliminary basis, therefore, I would be inclined to regard Yang Shao as very late Neolithic [...].[61]

Andersson declared that "I have hardly any doubt that it is early Chinese ..." but also added that "many aspects of the old Yang Shao culture point forward to what one might call proto-Chinese". The question was simply how to define it further. Andersson pointed out that there was a type of object that predominated, for they had collected

> About a hundred boxes, of stone objects, little things of bone, harts' horns, bits of pig and mussel shells, together with an enormous but very fragmentary amount of pottery material. It looks as if ceramics will come to be the most important thing in all respects for a more intimate understanding of the Yang Shao culture [...].[62]

But the ceramics turned out to be unknown in China. Without anything at all to compare them with, it was extraordinarily difficult for him to date and place the finds. He had to turn to international reports. Searching the international archaeological literature, Andersson saw parallels in the design between Yangshao ceramics and excavated pottery from Central Asia that had been discovered by the Pumpelly expedition at Anau, in what the Swedes called Russian Turkestan (in the 1920s controlled by the Soviet Union).

As mentioned in his "An Early Chinese Culture," based on this comparison, Andersson stated in a lecture in Peking on January 24, 1922 that "[...]the general aspect of the Henan and the Anau painted ware is so strikingly similar and the instances of common ornamental elements so considerable in number that we are justified to ask whether there is not the possibility of a migration of art designs."[63] Additional international publications had been sent to him by T. J. Arne the previous summer before the Yangshao excavations began and in his February letter to him Andersson now wrote:

> Among the books that you have been so good as to send me there are two that contain interesting photographs of polychrome pottery. One of them [...] shows a vessel from the Tripolje culture in SW Russia, which corresponds so closely to a pattern included in my collection

[60] Andersson to T. J. Arne, Peking 1 February 1922, CC archives.
[61] Ibid.
[62] Ibid.
[63] Andersson, "An Early Chinese Culture," 35.

> from Honan that I have shown the two things side by side in my comparative sketch.[64]

However, Andersson pointed out that

> [i]t is now possible that an expert can immediately see that it is madness to bring together the aforementioned exhibits and draw parallels between Anau and Honan. [....] Should you feel that I have set off on a crazy course I would be extremely grateful for a pointer. For I fully understand that it is far too early to try to draw any conclusions from these supposed correspondences, but it still seems to me that a careful hint can be justified.[65]

This interesting idea in the history of science on the Near East as a source of the world's civilizations was quite common in archaeology at the time. So also in China from a mythological point of view. As early as 1894 the French historian Terrien de Lacouperie (1845–1894) had suggested that the Chinese forefather, the legendary Yellow Emperor, originally lived east of the Caspian Sea and through connections to Babylonia led his people from Babylonia to Gansu Province. Terrien's theory was soon included in Japanese history books and was read by Chinese students there. This legend was accepted by several Chinese historians, for instance the philologist and philosopher Zhāng Bǐnglín 章炳麟 (1869–1936).[66] The new and sensational thing with Andersson's observation from a scientific point of view, however, was that it was the first time that someone actually seemed to have found proof of a possible prehistoric connection between China and the classical cultures in the Near East. To Andersson, this presumed connection was related to the invention and spread of the Neolithic revolution and to the late Quaternary climate changes that he had researched in China. In 1908, as the results of the Anau excavations, his predecessor Pumpelly had made the revolutionary suggestion that Central Asia could have had the most favourable climatic and environmental conditions for key events of the Neolithic to first evolve, such as domestication of animals and grass, which then had spread to the Near East and led, as the American argued, to the very dawn of civilisation.[67]

This idea made sense to Andersson. By the time of the Yangshao excavations, he had since 1916 extensively mapped the Pleistocene-Holocene environmental and climatic changes of large parts of Northern China and therefore now argued that the Far East and China's prehistory should also be included in the equation. Early Neolithic cultures were at this time known from the Mediterranean, Near East and some from Siberia, but not from the southeastern part of the Eurasian continent. His discovery in China could therefore contribute a new piece to the puzzle of the origin and spread of the Holocene agricultural revolution.

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[64] Andersson to T. J. Arne, Peking 1 February 1922, CC archives. The Tripolje culture, as it is spelled in the Sino-Swedish reports, refers to the find site which is located in present-day Ukraine. It is called Trypillia in Ukrainian (Трипілля), which also is an increasingly used transcription in international reports today. The name Tripolje/Tripolye, derives from the Russian Триполье. To avoid confusion for readers of the Sino-Swedish reports, the same spelling of the site as given in the original sources is given in this paper.

[65] Ibid.

[66] Frank Dikötter, *The discourse of race in modern China* (Stanford: Stanford University Press, 1992), 119–123.

[67] Fredrik T Hiebert with Kakamurad Kurbansakhatov, *A Central Asian Village at the Dawn of Civilization, Excavations at Anau, Turkmenistan* (Philadelphia: University of Pennsylvania Museum, 2003), and Bruce G. Trigger, *A history of archaeological thought* (Cambridge: Cambridge University Press, 1989), 248.

During 1922, Andersson corresponded with the Swedish Crown Prince about his theory and sent him a few pottery samples to be shown to R. L. Hobson at the British Museum in London for further analysis. Hobson agreed with the similarities Andersson observed, and concluded that the findings "clearly" belonged to "the same family of design" found in the Near East, from Babylonia to Persia, Asia Minor, Anau, Tripolje and even in Thessaly in Greece. [68] As all of these references indicated advanced agriculture and as no metals had been found at Yangshao, Andersson was now convinced that he had indeed discovered a possible new Neolithic Eastern connection.

Moreover, his environmental research at the site seemed to confirm that a rapid spread of prehistoric agricultural development had taken place in the region. The question was now how to further date this spread. His studies of the topography in Henan Province and the measurements of the cultural strata indicated that the Yangshao people lived "upon the unbroken loess plain, which has here been dissected [sic] only during the last four or five thousand years."[69] As the Swede argued: if he was correct in his "conception of the rise of the Yang Shao culture as having been carried forward on a mighty wave of agricultural achievement, there may have taken place at that time a ruthless process of forest clearance in order to prepare new fields for cultivation." Thus, the removal of the protecting forests was a likely cause of the land erosion and even the change in the flora and fauna that had taken place with the rise of agriculture.[70] In fact, Andersson's geological studies in Henan revealed that the northern Chinese landscape had changed dramatically since the heyday of the Yangshao Culture. That meant that it not only was a Neolithic culture, but probably also a late one considering the influence that the Yangshao people had had on the environment. But the next important question was – when had agricultural societies in the first place begun to exist in this region? How were they related to Neolithic cultures in Central Asia and the Near East? As Andersson believed that the Yangshao Culture was the immediate predecessor of historic dynasties, and the Neolithic cultures excavated in the Near

[68] Tripoli – not Tripolje – is actually mentioned in the copy of the document preserved in the Swedish archives. However, Andersson has in handwriting noted "Apparently Tripolje in SW Russia," as he also did when publishing the statement in "An Early Chinese Culture." See "Pottery found at Yang-Shao Tsun, Mianchih, Honan," copy of Hobson's statement dated June 1922, MFEA Archives and Andersson, "An Early Chinese Culture," 38.

[69] Andersson, *Essays on the Cenozoic of northern China*, 141.

[70] Ibid, 34–41, quote 34; J. G. Andersson, "Nordkinesiska klimatväxlingar," *Ymer* 63 (1943): 86–90. Some of the finds by Andersson which indicated more recent environmental changes were discussed in *Essays on the Cenozoic of northern China*. Already then, he argued that the disappearance of the peat bogs was caused either by climate change or "Man's activity who has cut away the virginal forests," 89. He believed that both causes were relevant for the change. With regard to the elephants at Anyang, Zhang Hongzhao argued in 1926 that no evidence existed for the presence of wild elephants at the time of the Yin Dynasty. Andersson disputed that and referred to the "prominent Chinese archaeologist Lo Chen Yü" (Luó Zhènyù 罗振玉, 1866–1940), who claimed the contrary in 1914. See also the discussion on Andersson's climate studies below in this paper. "Nordkinesiska klimatväxlingar," 86; "Researches into the prehistory of the Chinese," *Bulletin of the Museum of Far Eastern Antiquities* 15 (1943): 37. Andersson's original assumption that climate change was the reason for the absence of *Hystrix* in modern northern China, is mentioned in, e.g., Andersson, *Essays on the Cenozoic of northern China*, 130 and 141. For Zhang Hongzhao's argumentation, see H. T. Chang, "On the Question of the Existence of Elephants and Rhinoceros in North China in historical times," *Bulletin of the Geological Society of China* 5.2 (1926): 97–106. Interesting is that Zhang Hongzhao mentions that the two had discussed this issue already in 1917.

East were significantly older than Chinese historical sources, he concluded that the most logical transfer must have been through Central Asia to the East. If this was true, then, naturally, proof of the transfer of technology must be found somewhere between Russian Turkestan and Henan.[71]

In 1923 Andersson set out to the north-western Gansu Province to test this theory. The expedition was originally planned to last for only one year focussing mainly on geology and natural history research and on the way to follow up the palaeoanthropological and archaeological leads.[72] However, the series of archaeological cultures that soon were discovered caused it to be prolonged with a second season.

The Gansu Expedition 1923–1924: The Discovery of China's Transition to the Metal Ages

Andersson's Gansu expedition was essentially a combination of late Quaternary studies and archaeology. His goal was to study the prehistoric climate, search for further traces of and the possible origin of the Yangshao Culture, as well as for other prehistoric cultures in the perceived transition zone for the Neolithic revolution. However, his correspondence reveals that he had not really expected to find such an abundance of traces of China's prehistory in that region as he actually did.

In July 1923, after having discovered a site with Yangshao pottery located just east of Xīníng 西宁 in present Qinghai Province, Andersson wrote to the Chairman of the China Committee, Crown Prince Gustaf Adolf explaining that the find had shocked him:

> I had at best a faint hope of finding the Yang Shao culture again, because there seemed to be a huge difference [...] between the old cultural centre in Honan, filled with all sorts of reminders of the ancient past, and these, as I thought, climatically challenged outposts on the Tibetan border.[73]

The discovery prompted additional archaeological researches and studies of the Holocene local environment. July 21 to August 12 Andersson stretched his interdisciplinary surveys further into the mountains and circled the nearby Qinghai lake where he also found prehistoric dwellings. He then mapped the lake's shores in relation to the sites and noted that "The collections from these sites are small [....] but situated only six meters above the present level of the lake [...] showing that this large salt lake has remained of nearly constant

[71] A copy of an undated internal report (probably written in 1922) by Andersson to Ding Wenjiang and Weng Wenhao in the CC archives shows that Andersson suggested three scenarios for the spread. Firstly, that the pottery design had originated in the Near East, secondly that it had originated in China, and thirdly that it had originated somewhere in Central Asia and spread to west and east from there. See J. G. Andersson to Ding Wenjiang and Weng Wenhao, "Problems of the Yang Shao culture," CC archives.

[72] The Gansu expedition, like all of Andersson's expeditions, included also palaeontological and zoological survey work. In the summer of 1923, Yuan Fuli, for instance, surveyed for plant fossils that were sent to Halle, and during the search for prehistoric human habitations, both Andersson and the Chinese collector Bai discovered fossil vertebrates sent to Wiman. The collector Chen and Andersson, moreover, collected zoological specimens for Lönnberg. J. G. Andersson's field reports to the China Committee, Siningfu, 18 July 1923, and "Rapport rörande färden till Kokonor och Kueite [Report from the journey to Kokonor and Kueite]," Sining, 28 September 1923, CC archives.

[73] Andersson to the China Committee, Siningfu [Xining] 18 July 1923, CC archives.

size during the last four thousand years."[74] Surprisingly, this indicated that the climate had remained the same since the era of the Yangshao Culture. Next he moved southeast examining the Guide 贵得 basin where he found numerous Neolithic sites, which he later dated as early Yangshao.[75] Again, the studies of the basin revealed that "the present topography is in its main features much the same as at the time when the Yang Shao people inhabited the region about five thousand years ago."[76] This implied that the climate and local environment in that era indeed had enabled early Neolithic cultures to form and develop also there.

In October he returned to the Xining area where he, firstly, found a large Neolithic site at Zhūjiāzhài 朱家寨 (Chu Chia Chai), and then, secondly, made a real breakthrough: a little further to the north, he excavated a grave field at Kǎyao 卡窑 that contained a large number of small copper and bronze objects but also stone and bone items similar to Yangshao. Simultaneously, Andersson's accomplished collector Bai Wanyu – who was sent out towards the Hexi corridor and further to the Gobi Desert – also found several prehistoric grave fields especially at Shājǐng 沙井, west of the Zhenfan oasis, which revealed painted pottery and small copper objects. The design of the painted pottery that Bai Wanyu showed to him seemed to be very similar to the Neolithic cultures of the Near East.

Moreover, Bai Wanyu had made a strange find far inland on the border with Central Asia:

> [...] numerous shells of the small sea-snail Cyprea moneta, which in certain places are still used by primitive tribes as small change. The find is of great interest as it shows that a place situated near the threshold of Turkestan had trading links during this early period with the sea-coast either of South China or of India.[77]

By the end of 1923, the rich archaeological finds made Andersson convinced that his continued mapping of the prehistory of Gansu Province actually would make it possible to reveal the missing link between the Yangshao Culture and the classical Neolithic cultures further westwards. As Andersson stated in a letter to the China Committee on New Year's Eve 1923:

> 1. We have found the Yang Shao-culture far more fully developed in north-west Kansu than in the area, Honan, where we first encountered it. [....]
>
> 2. In these [...] areas we have also found grave-fields with simple objects of copper appearing together with stone- and bone-tools, like those in the genuine Yang Shao layers. [....]
>
> 3. Just as the Yang Shao culture appears abruptly as an immigrant culture from an as yet unresearched point of origin, so must the rather younger copper-bearing culture be seen as a later wave of migration, for the metal objects are, if still very simple, yet of such an advanced type that a long development of metal (working) must have preceded that stage that we have found traces of here.

[74] "Arkeologiska fynd i Kansu [Archaeological discoveries in Gansu]," Lanchow 31 December 1923 and "Archaeological finds in Kansu," copy of field report draft to Ding Wenjiang and Weng Wenhao sent to Crown Prince Gustaf Adolf from Xining, 1 June 1924, China Committee Archives. See also Andersson, *Archaeological research in Kansu*, (1925; repr., Beijing: Wenwu chubanshe, 2011), 7.

[75] Andersson, "Researches into the prehistory of the Chinese," 281.

[76] Andersson, *Archaeological research in Kansu*, 8.

[77] Andersson, "Arkeologiska fynd i Kansu [Archaeological discoveries in Gansu]," Lanchow 31 December 1923.

> 4. The finding of painted vessels with bird pictures in the copper-bearing graves shows that East Asia's painted pottery from the transition between the Stone and Metal Ages has a genetic link to the corresponding pottery in the Near East.
>
> 5. Several factors such as dwellings denoting settled agricultural villages, the presence of pig bones in cultural layers together with burial customs corresponding to those of Yang Shao Tsun [Yangshao village] and of the historical Chinese indicate that those people who were bearers of this culture were of proto-Chinese race.[78]

Andersson ended the letter with his most important preliminary conclusion so far:

> Our researches seem thus to have established that the Chinese culture, as regards its beginnings, is not the isolated phenomenon that people have assumed it to be, but on the contrary all the advanced cultures of the world can be traced back to a common origin.[79]

This highly interesting statement in the history of science shows that Andersson at the time, while still in the field, strongly believed that the rise of the entire Neolithic had originated from a common source located somewhere between China and the Near East. Yet what is striking is that he at the same time emphasized that what he had found was not some sort of Western or Central Asian civilisation, but a series of distinctively Chinese sites.

Andersson's centralistic conclusion was not only caused by the perceived similarities in some of the pottery patterns but also by his natural history studies and the contemporary views on the relation between the transitionary stage from the Pleistocene-Holocene climate and the Neolithic revolution. The Pleistocene fossil flora and fauna that he had meticulously mapped in Inner Mongolia had confirmed to him that Central Asia had had a colder climate during the Ice Age while that part of the region did not seem to have been covered by the Ice Sheet.[80] In accordance with the general consensus at the time, Andersson therefore believed in 1923 that Central Asia had been an ideal environment firstly for Palaeolithic man to exist, and secondly for the early agricultural and pastoral societies to form there.

This relationship between the late Pleistocene steppe fauna and mankind was further substantiated by Frenchmen Émile Licent's (1876–1952) and Teilhard de Chardin's (1881–1955) discovery the very same year – in the summer of 1923 – of Palaeolithic tools next to such fauna in Inner Mongolia. The extinct fauna "and its composition together with the type of the artefacts [mark] these deposits beyond doubt as belonging to the Palaeolithic era," as Andersson put it two years later, adding:

> Palaeolithic Man of the Ordos hunted a fauna of now extinct big game in a landscape, the true nature of which can only be gradually revealed by patient research because of its burial under the immense loess cover; late Neolithic Man, on the other hand, lived in a natural setting

[78] Ibid.

[79] Ibid.

[80] However, there were indications of possible increased glaciations on the surrounding mountain ranges, and early lakes in the basins, aspects which were further researched during the Sino-Swedish Expedition. Andersson's palaeontological studies had furthermore revealed first the existence of a Tertiary savanna- and later a fossil steppe fauna in Inner Mongolia, thus potentially enabling large migrations across the continent. Andersson, "Der Weg Über Die Steppen," *Bulletin of the Museum of Far Eastern Antiquities* 1 (1929): 161–163; Romgard, "Embracing Science," 241–243.

> nearly identical with that of today, apart of course, from the wholesale cutting of the forests, which still abounded in Late Neolithic time.[81]

Since the Pleistocene Ordos finds were covered by loess, he reasoned that there must have been a considerable time lapse between them and the Neolithic sites that he had found in China. He argued that when the loess was formed, the climate in northern China must have been too dry and infertile for early modern mankind to exist there. Later, however, in the late Quaternary, the climate and the environment had changed and become more humid and fertile. Therefore, he stated in 1925, "we must imagine a repeopling of the area in post-loess time," and continued: During that "repeopling" stage, "the rainfall again became abundant [and] the conditions were favourable for the occupation by Man of the revived river-courses." This era which he believed was later than the Ordos finds "correspond[s in northern China] approximately to the post-glacial time of northern Europe."[82]

From 1924 onwards, however, a new discussion also emerged as a direct result of the extraordinary development of the second year of the Gansu Expedition. While Andersson's initial studies in Henan Province had pointed to similarities in the Neolithic cultures of the Far and Near East, his further researches in Gansu Province then revealed an even larger number of prehistoric cultures dated to the early Bronze Age. These appeared initially to have similar connections to the prehistory of the Near East and Central Asia.

The Second Year of the Gansu Expedition

During the spring and summer of 1924, Andersson pursued his survey work away from Central Asia towards central China, as he then followed the river valleys of Gansu Province southwards to trace the further development of the region's prehistory. Notably, most of the cultures that he now unearthed were essentially younger than the Yangshao Culture, something that was actually contradictory to his original theory. The Xīndiàn 辛店 / 新店 (Hsin Tien) district in the Tao River Valley proved especially important. Here he discovered several prehistoric cultures spanning from the Neolithic into the Copper and Bronze Ages. At a site near Táoshā 洮沙 (T'ao Sha), he found a gravefield containing very different ceramics compared to the Yangshao culture. Andersson noted in his preliminary field report, that the painted pattern was so

> strikingly similar to the rectilinear meander of early bronzes said to date from the Shang and Chow dynasties, [sic] that there can be no doubt of a connection [...] either so that the Hsin Tien meander is the fore-runner of the decoration of the early historical bronzes, or so that the Hsin Tien culture is contemporaneous with these bronzes [...].[83]

It seemed therefore to be a link between the Neolithic and China's Bronze Age dynasties. At Huìzuǐ 会嘴/also Huīzuǐ 灰嘴 (Hui Tsui) a site was found that contained a mix of such pottery and Yangshao pottery. At Qíjiāpíng 齐家平 (Ch'i Chia P'ing) another type of pottery was unearthed with large shards of "Amphora-like" urns, by Andersson believed

[81] Andersson, *Archaeological research in Kansu*, 31; 33-34.
[82] Ibid., 35.
[83] "Archaeological finds in Kansu," copy of field report draft to Ding Wenjiang and Weng Wenhao dated Hsin Tien, May 1924, sent as attachment to Crown Prince Gustaf Adolf from Xindian, 1 June 1924, CC archives.

to be the oldest (but by Chinese archaeologists later corrected as belonging to the Bronze Age). At Mǎjiāyáo 马家窑, painted pottery in imaginative linear patterns with animal and reptile motifs, especially frogs, was found. Later, further away on top of the Bànshān 半山 mountains, grave fields were discovered which were dated to the Yangshao. All these cultures apart from Banshan had been found before the end of May.

That month, therefore, Andersson wrote a preliminary field report from Xindian to reflect at what had happened and then formulated his first attempt at a chronology of China's prehistory:

> Our failure of finding any metal object in the Yang Shao beds, in spite of several years of persistent excavations, seems to indicate that this culture is the oldest.
> The Hsin Tien [Xindian] dwelling site with a mixture of Yang Shao and Hsin Tien pottery seems to indicate that the Hsin Tien period immediately succeeded the Yang Shao stage. The scarcity of copper in the Hsin Tien sites makes it probable that the Hsin Tien culture is older than the copper bearing sites of Chenfan [Zhenfan] and Sining [Xining].[84]

The prehistoric cultures of Gansu Province thus marked a key transition period between China's Neolithic and early metal ages. Again, the unearthed material had proved to him beyond doubt that all these cultures were distinctively Chinese.

This very early attempt at a chronology was written in the field, it was highly preliminary, and would be further developed in his later reports with new discoveries that year.[85] The important thing was that, at all of these sites, he had studied the topography, measured the loess strata and collected animal bones and plants. So far, he noted, the majority of the discovered cultures were all placed in "the fertile river valleys [...] of the Kuite basin, that of the Hsining Ho and that of the T'ao Ho." The preliminary data showed that

> [a]pparently, the ancient populations, specially of the Yangshao and Hsin Tien stages, settled with preference in these beautiful valleys which at the time probably were largely wooded and abounding in game, at the same time as they offered the best opportunities for cattle raising and for the beginning of agriculture.[86]

Thus, at this time he still persisted in his belief that he had unearthed the very beginning of

[84] Already in the attached letter to Gustaf Adolf, as well as in his Survey report in 1925, Andersson also pointed out that the youngest layers were fully developed Bronze Age cultures. This implied that these layers indeed could have a direct connection with historical sources from the oldest dynasties, not least with the Shang dynasty. "Archaeological finds in Kansu," copy of field report draft to Ding Wenjiang and Weng Wenhao dated May 1924, sent as attachment to Crown Prince Gustaf Adolf from Xindian, 1 June 1924, CC archives; Andersson, *Archaeological research in Kansu*, and "Researches into the prehistory of the Chinese," 1–304.

[85] Eight weeks later, the Swede wrote an updated chronology to which further discoveries were added – especially the Banshan culture. It was sent on July 30 1924 to Ding Wenjiang and Weng Wenhao with a drawn profile of the Tao River Valley. I have not been able to find copies of this letter. It is clear that Andersson sent it to his wife in Peking, as he asked her to manually copy the profile, and then forward it with the letter to Ding and Weng. The chronology was further improved in his 1925 Survey report and in 1943. Later, of course, his chronology was improved by Chinese archaeologists such as Li Ji, Xia Nai and others along with new excavations. Andersson to Elsa Rosenius, Xindian 30 July 1924. Private collection; Magnus Fiskesjö and Chen Xingcan, *China before China*, 110–114.

[86] Andersson, *Archaeological research in Kansu*, 7.

China's Neolithic. Furthermore, despite his repeated observations that they all concerned essentially Chinese cultures, his field correspondence from Gansu shows that in 1924 he continued to uphold his theory of "some kind of migration" or "intrusion in the T'ao valley of a new tribe of men" or "adoption of a new ceramic technic [...] from a still unknown centre of creation."[87] This idea remained the predominant theory in the discussions until the early 1930s.

The Contemporary Analyses of the Fieldwork and Discussions on the Origin of China's Civilisation

The question of the origin of the Chinese people and of Chinese civilisation now also engaged Andersson's new research colleagues in Sweden, such as the sinologist Bernhard Karlgren and the art historian and archaeologist T. J. Arne. When Andersson suggested in 1924 in a review on his ongoing China research in the Swedish journal *Ymer* that the Chinese people actually could either have migrated from Inner Asia through Xinjiang and Gansu Provinces, or moved from a centre located in either Xinjiang or Gansu Provinces to Henan, his theory was criticized by Karlgren who declared that some of Andersson's deductions on possible migrations from Central Asia to China were "far-fetched," and suggested instead that[88]

> [i]f some branch of 'the people of the red and black pottery' did really penetrate, from its original home in Turkestan and Kansu, towards the East in the 3rd millennium and push on as far as Honan, which is quite possible, they did not found colonies there, bringing with themselves the proto-Chinese culture, but they found it already flourishing round the large bend of the Yellow River, and they were soon assimilated by these real Chinese, enriching them with their own art of making finer pottery.[89]

Andersson admitted Karlgren's points and republished his criticism in full in the Survey report *Archaeological research in Kansu.* Andersson still believed, however, in cultural influence from the Near East. He suggested that

> [...] it is exceedingly probable that, together with these ceramic innovations, migrated many other gifts from the high cultures of southwestern Asia, and considering that these very early leading cultures of the Near East were so predominantly agricultural, it may not be too bold to assume that one of the most valuable endowments to the peoples of the Far East was a stride forward in the perfection of agriculture. [....] [If so] then it is easy to understand that the population rapidly increased and that there were formed during a comparatively brief space of time numerous permanent settlements in nearly the same places as the villages of today.[90]

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[87] "Archaeological finds in Kansu," copy of field report draft to Ding Wenjiang and Weng Wenhao dated Xindian May 1924, CC archives.

[88] J. G. Andersson, "Arkeologiska fynd i provinsen Kansu [Archaeological discoveries in Kansu Province]," *Ymer* 1924, 34–35.

[89] Karlgren's criticism was published in the journal *Litteris* I, No 2, December 1924, 142–153. Andersson quoted the essential passages of Karlgren's article in *Archaeological research in Kansu*, 41–45 from where Bernhard Karlgren's statements here are taken.

[90] Andersson, *Archaeological research in Kansu*, 50.

Simultaneously, the initial comparative analyses done in Stockholm and Uppsala by Andersson's colleagues repeatedly seemed to confirm east-western links in the material. T. J. Arne studied, for instance, the copper and bronze finds from Shajing.[91] He concluded, like Andersson, that they were of younger age, belonging to the so-called Ordos Bronzes that were associated with Central Asian steppe nomads and pointed out similarities in design to bronzes found in Inner Mongolia, Siberia and China proper.[92]

However, when Arne was assigned to study the pottery from Henan for *Palaeontologia Sinica*, he suggested early on that there were essentially more Near Eastern than Chinese traits on the prehistoric pottery from Yangshao, which caused Andersson to react. He wrote to his colleague urging him not to make such far-reaching statements before being absolutely certain, and pointed to the extraordinary presence of tripods on many of the sites discovered by him, their rareness further westwards, and argued that the origin of the tripods probably dated much further back in time in the east than what was then currently known to archaeology.[93] Arne then studied this question in detail but only changed his view slightly. In his 1925 study, Arne compared the Henan pottery to similar finds in the Near East, Japan and Korea and concluded that tripods actually existed also at Troy, and that their eastern equivalents could have been modelled from earlier imports "from the west". He furthermore stated that "judging from the perhaps unsufficient [sic] archaeological material known to me there is but very little distinctively Chinese in the Honan culture [...]". He then went on to declare that "[a]ttempts have not been lacking to place the mark of a special race on the civilization of the late Stone Age, which is characterized by painted pottery and the first appearance of copper. It has been declared to be South Indo Germanic [...]."[94]

Bernhard Karlgren also agreed with the idea of at least a common mythological thinking in the early Bronze Age. In a highly interesting (and amusing) comparison between Gansu mortuary urns, early Chinese bronze inscriptions and Swedish prehistoric rock art (!),

[91] T. J. Arne was a specialist on Eurasian archaeology, especially ornamental metalwork, and had studied Scandinavian eastern connections in the Viking Age, about which he wrote his PhD thesis. He later conducted excavations in northern Iran in 1933, which were related to the archaeology of the Sino-Swedish Expedition. See T. J. Arne, *La Suède et l'Orient: Études archéologiques sur les relations de la Suède et de l'Orient pendant l'âge des Vikings*, (Archives d'Études Orientales 8; K.W. Appelberg, Uppsala, 1914); Arne, *Excavations at Shah Tepé, Iran* (Stockholm: Statens etnografiska museum, 1945).

[92] Some of the younger bronzes discovered by Bai Wanyu near Zhenfan in the Gobi Desert belonged to this category and were dated by Arne to "about 400 to 300 BC." Furthermore, Arne had also studied small early bronzes purchased in present Hebei Province. These were, according to Andersson in 1926, very similar to "Scytic graves in S. Russia" but also to metal objects found in Gansu Province and in Inner Mongolia: "There is evidently a very remarkable development of Scytic–Siberian types intermixed with things Chinese on the Sino-Mongolian frontier along a line extending approximately from Paoto (Baotou) to Joho (Rehe)." Andersson, "Der Weg Über Die Steppen," 143–163; Andersson to Ding Wenjiang and Weng Wenhao, March 15 1926, CC archives.

[93] Andersson to T. J. Arne, November 10, 1924. T. J. Arne's (TJA) archives, Archives of the Swedish National Heritage Board, Stockholm, Antikvarisk-topografiska arkivet, ATA. Andersson also reminded Arne that any publication of the results should be published first in China according to the agreement, and that he personally had only been given the rights to publish reports in Sweden to inform the Swedish public about the results of the collaboration. Moreover, he explained, his Swedish language publications were actually mainly translations of his original Chinese reports, which therefore always should be mentioned first.

[94] T. J. Arne, "Painted stone age pottery from the province of Honan, China," *Palæontologia Sinica*, series D, vol. 1, fasc. 2 (1925): 17–34; quotes 32–33.

the sinologist pointed out that there were strong similarities and even coexisting symbols in this era on both sides of the Eurasian continent, but no evidence of any actual direct links. However, he saw the similarities as indications of parallel belief systems.[95]

Interestingly, this view was strongly shared by Andersson's closest Chinese colleagues. Responding to the later paper, Ding Wenjiang wrote to Bernhard Karlgren in 1931 stating that

> [t]he similarity between the Swedish rock pictures and Chinese bronze inscriptions is most striking. Of late I am more and more convinced of the unity of the Eurasian cultural capital. [....] The survival of the polychrome pottery in the oracle bone stratus is highly significant. Surely it is the most natural thing to identify the Hsia with the culture of Yangshao. If so, then the Shang introduced a fullgrown bronze culture into China. No anthropologist would maintain that bronze was independently discovered twice on the Eurasian continent.[96]

However, during Andersson's continued research on the material from China, and through the accumulated new information from Chinese excavations, the Swede's understanding of what he had unearthed in China changed. From the mid-1930s onwards, Andersson had not only access to the final results of the interdisciplinary analyses of the natural history and archaeological material, but also to new data emerging from the pioneering Chinese excavations at Anyang that had begun in 1928 and revealed cultural layers from the first historical Bronze Age dynasty.[97] By then he also received information from Folke Bergman's and Huang Wenbi's researches in North-western China during the Sino-Swedish Expedition (1927–1935). The accumulated results altered Andersson's view on his own theories on the origin of China's civilisation. But that change was also related to the political development in Europe and in China, and a realization of how his theory had come to be used by contemporary archaeologists.

Important to note is that when Andersson first launched his theory on the possible Central Asian origin of China's Neolithic, he stressed that it may have resulted from impulses from the *direction* of the west, not that it came *from* the West, i.e. from the European civilisation. That is an important distinction, and a wide difference in the meaning of the concept. He based his argumentation on what was currently known in contemporary archaeology, on his own interdisciplinary surveys of northern China, and previous knowledge of the Quaternary geological development in the northern hemisphere.

While Andersson in the 1920s still strongly believed in the perceived parallels between Anau and Yangshao and even defended that in writing to Hubert Schmidt – the excavator of the Anau site – when he learnt that the German had disapproved of his theories, they would both change their minds, but in opposite ways. In 1925, Andersson declared to Schmidt that

[95] Bernhard Karlgren, "Some Fecundity Symbols in Ancient China," *Bulletin of the Museum of Far Eastern Antiquities* 2 (1930): 1–66.

[96] Ding Wenjiang to Bernhard Karlgren, 28 February 1931, MFEA archives. Cf. Fiskesjö and Chen, C*hina before China*, 70–72.

[97] The Anyang excavations were led by Lǐ Jì 李济 (Li Chi, 1896–1979) who had translated parts of Andersson's reports into Chinese and who also in the mid-1920s excavated at Yangshao. The Anyang material would prove that there really was a connection between Henan province's prehistoric cultures and one of China's first Bronze Age dynasties (the Shang) which was named in the very oldest historical sources. See Li Chi, *Anyang*, (Folkestone: Dawson, 1977), 6–31.

> [...] I feel convinced that further research will only confirm the correctness of my preliminary statement that there is a true relationship between the Aeneolithic sites of the Far and the Near East [...] for the first time exposed by me in my "Early Chinese Culture."[98]

When Hubert Schmidt and some of his countrymen then apparently began to agree with the idea, they did so in ways that went far beyond what Andersson had initially stated, which in turn caused the Swede to again react strongly. Schmidt's views came to the Swede's attention through the early works by Ludwig Bachhofer (1894–1976). In 1935, Bachhofer had revised the theory of a possible migration of techniques and/or people from a more western location, and argued that folk migrations and invasions had come into China not from the Near East, but from Europe.[99] They were supposed to have come from south-eastern parts of this continent and gone through Central Asia to China, where the new arrivals would have become a Herrenschicht (ruling stratum; ruling class). Bachhofer thought that the quality of the prehistoric pottery in both China and central Germany bore witness to something in common in both places, of traces of some form of archaeological culture that belonged to "a healthy, vigorous people" in the distant past. For there were similarities, he argued, between the pottery of the German Corded Ware culture and what Andersson had found in Gansu province in 1924. Also Hubert Schmidt had earlier argued along the same lines.[100]

This was not what Andersson had suggested. In his own parallel between the Far and Near East, the Swede never implied any valuation of Western vs Eastern civilisation. He had simply imagined that both cultures could have originated in or at least have been influenced by Neolithic innovations that presumably first had emerged in Central Asia. Andersson now had the impression that the German researchers with Bachhofer in the lead were insinuating that there should have been some kind of superior proto-European people somewhere in the area in between who had given rise to the world's civilisations. In his concluding 1943 report on his archaeological researches in China, Andersson did not mince his words regarding the Germans' reasoning: "It can safely be asked: is it after all a real service to science to advance such far-fetched constructions!" Even if Schmidt had died in 1933, and Bachhofer had already left behind what was then Nazi-Germany for the USA for political reasons (something that Andersson was unaware of) and backed off from his choice of words in 1937 and instead, in a new article, talked of some form of peaceful migration, it still appeared, according to the Swede, as if the Germans believed that some kind of master race from Europe must have come to China. But Andersson pointed out that Bachhofer was using old data. The German had referred to a preliminary analysis by

[98] Andersson also defended his work by admitting that he was not an archaeologist but kept a stratigraphic approach in his researches and that there really was "not much difference" between the training and experience of a geologist and archaeologist, and that "a man should be judged not from the label which his official positions have put on him but from the nature of his work." Andersson to Hubert Schmidt 28th February 1925, CC archives.

[99] Andersson's criticism and discussion on Bachhofer's research vis-à-vis his own is given in "Researches into the prehistory of the Chinese," 283–291.

[100] Andersson mentions in a letter to Ding and Weng March 15, 1926, that Schmidt had changed his mind regarding Yangshao and Anau and by then believed in the Neolithic pottery similarities as well, but Schmidt had actually more strongly begun to point to similarities with the Tripolje (Tripolye) Culture of Eastern Europe. Andersson to Ding and Weng, March 15 1926, CC archives.

Davidson Black from 1925 that three skeletons from the graves in Gansu looked as if they had western features, but which the author had retracted three years later.[101] Moreover, the decisive point in Black's original report was the opposite one, namely, that the greater part of the skeletons did not differ markedly from the modern population of north China. This criticism was also shared by Arne, who already in 1927 in internal letters pointed out that the Germans' reasoning – and therefore also his early view on the Yangshao pottery – had been contradicted by the anthropological data.[102] Apart from that, Bachhofer had also made use of an early field report that the Sino-Swedish expedition had found painted ceramics in Xinjiang province as proof.[103] However, the fact was that the expedition despite eight years of searching had failed to find traces of the Yangshao culture beyond Gansu Province and the Qinghai Plateau.

As Andersson explained regarding his own initial theory: "When I wrote my first paper on these problems I was only on the outskirts of the field; I knew only the Yang Shao of Honan." And he made clear that he now believed that

> [t]here is nothing to indicate that any other race participated in the making of the Honan and Kansu pottery of the Yang Shao period. [....] Everything goes to show that the Chinese were master potters from their very first appearance in the Yang Shao culture.[104]

He added:

> Only one more remark should be made with reference to Hubert Schmidt's and Bachhofer's way of discussing cultural relations between East and West.
>
> It is not only unfounded but rather disgraceful when we Europeans, working under a superiority bias that lacks proportion and perspective speak of "Herren-völker" who brought a superior culture to China.[105]

Thus Andersson was at that time a sceptic of his own initial theory and of the tendencies to draw too far-fetched conclusions from his preliminary reports. Furthermore, his statements imply that he at this stage now regarded the Yangshao culture as a purely indigenous Neolithic culture. An important reason for this new interpretation of Yangshao was the

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101 Davidson Black, "A Note on the Physical Characters of the Prehistoric Kansu Race," in Andersson, *Archaeological research in Kansu*, 51–55; Black, "Study of Kansu and Honan Aeneolithic skulls and specimens from later Kansu prehistoric sites in comparison with North China and other recent crania," *Palaeontologia Sinica*, series D, vol. 6, fasc. 1 (1928): 5, 24, 81.

102 Arne, who himself as an archaeologist among many other subjects studied the issue of possible Indo-European connections in Eurasian prehistory, disagreed with the extreme tendencies seen in contemporary European archaeology. In an undated letter, probably written May 1927, Arne criticized Schmidt and argued that all the skeletons found in connection to the prehistoric pottery in China undoubtedly were Asian. Later, in a stunning parallel to contemporary German belief in European influences in prehistoric East Asia, Arne protested against what he believed was politically motivated German claims that Swedish, Danish and Norwegian archaeological finds actually should be designated as German. Arne to Oscar Almgren undated (probably May 1927), TJA archives; "Nazis stjäl 'urgermansk' konst från oss: Vitterhets-, historie- och antikvitetsakademin reagerar – en intervju med d:r T. Arne," *Folkets Dagblad*, December 30, 1938.

103 Bachhofer as quoted by Andersson, "Researches into the prehistory of the Chinese," 283.

104 Andersson, "Researches into the prehistory of the Chinese," 287.

105 Ibid., 291.

watershed discovery in the late 1920s in Stockholm of a rice imprint on one of the shards from Henan. Botanists at the Bergianska botanical garden in Stockholm deduced in 1929 that the imprint came from husks of cultivated rice.[106] It was then not only the oldest known example of that kind, but also a typical cereal grain that rather pointed "to rainy Southern China" than to Central Asia, as Andersson himself explained in 1943. He therefore began to radically rethink his Near East connection. Indeed, as he pointed out in his criticism of Bachhofer, he had now also found a feature in the prehistoric pottery design from the Yangshao era that rather "indicate[s] that China was the giver and the West the recipient."[107]

However, the transition period from the Neolithic to the rise of China's Bronze Age societies was still another matter. Andersson's own environmental studies had proven to him that something additional must have occurred that had caused such a drastic and visible change in the Henan landscape "at the very end of the Neolithic." That is, shortly before the rise of China's first dynasties with the clearing of the forests. As he put it in 1943:

> There must have been, by some means or other – new inventions or the introduction of new ideas from abroad – a rather sudden impetus that allowed the rapid spread of a fastgrowing population.[108]

Possibly, new technique – the invention of metals – had enabled improved agricultural outcomes and a consequent increase in the population, which in turn had led to the clearing of the forests to cultivate more land. As Andersson had already noted in the field that the metal objects excavated by him in Gansu Province were "of such an advanced type that a long development of metal (working) must have preceded that stage that we have found traces of here," he was convinced that the knowledge of the new technology was imported to the region.[109] However, as he explicitly concluded in 1943: "With our present very limited knowledge it is premature to discuss where these cultural impulses first arose and how they migrated across Central Asia."[110]

Andersson's Views on the Development of Human Societies and the Climate

When evaluating Andersson's role in the early 1920s as the central figure in advocating the Central Asian origin hypothesis of Chinese civilisation, it must be stressed that he altered his view as new data was accumulated. Moreover, he never employed the kind of deterministic and racist theorizing, which otherwise was so strikingly present in his era when studying the relationship between mankind and its paleoclimate. The Americans Osborn and Matthew, for instance, employed racist arguments to claim that the climate in Eurasia was more likely to have provided for the birthplace of modern mankind than Africa,

106 G. Edman, and E. Söderberg, "Auffindung von Reis in einer Tonscherbe aus einer etwa fünftausend jährigen chinesischen Siedlung," *Bulletin of the Geological Society of China* 8.4 (1929): 363–368.

107 Andersson, "Researches into the prehistory of the Chinese," 287.

108 Ibid., 297.

109 Andersson, "Arkeologiska fynd i Kansu [Archaeological discoveries in Gansu]," Lanchow 31 December 1923.

110 Andersson, "Researches into the prehistory of the Chinese," 291.

and Huntington used similar statements for why the development of advanced civilisations must have happened in the northern hemisphere, implying that mankind had "degenerated" in other parts of the world because of warmer climate.[111] This kind of reasoning is absent from Andersson's reports. His geoarchaeological studies debate the issue of climate and environmental changes in relation to the possibility for mankind to exist and coexist with the changing environment, and mankind's effect on these changes, but do not contain discriminatory judgments in the interpretation of the palaeoanthropological and archaeological records in East Asia. That part of his research is surprisingly modern even to a present-day reader and has therefore best withstood the ravages of time.

In his final reports, Andersson underlined that the natural history material indicated that a more humid climate had prevailed in prehistoric northern China compared to today, which he believed was an essential factor in explaining the rise of the region's Neolithic and early Bronze Age societies. He based his statement on the results of his topographical researches, the natural history material analysed in Sweden and of Bernhard Karlgren's studies of Anyang oracle bone inscriptions and Zhou Dynasty annals.[112] Yet he declared that it was not possible "to prove conclusively that the climate of prehistoric and early historic China was warmer and, in particular, more humid than the climate of northern China today." However, he stressed, "the finds of southern mammals in Yang Shao deposits, in the wastes of Yin and in the peat-bogs of the Peking plain, point in that direction but that the problem is complicated through the rapid advance of agriculture and the deforestation following in its wake." The climate of prehistoric China therefore needed future "systematic" investigation to fully map the interaction between "the effects of Nature and the action of Man," as he put it. Furthermore, to find proper answers he suggested that state-of-the-art

111 W. D. Matthew, "Climate and Evolution," 212; Henry Fairfield Osborn, "Recent Discoveries Relating to the Origin and Antiquity of Man," *Proceedings of the American Philosophical Society* 66 (1922): 487; Ellsworth Huntington, C*ivilization and climate* (New Haven: Yale University Press, 1915), 33–34; 215.

112 A good example of how Andersson's interdisciplinary field studies and international networking moved his climate research forward were the lengthy discussions with Chinese and Western colleagues on the animal bones collected from Yangshao. Einar Lönnberg at the Swedish Museum of Natural History determined that rodents found by Andersson at Yangshao belonged to the *Rhizomys* lineage of bamboo rats. As this animal presently inhabits a more southern climate, it suggested that Henan had had a different environment in the Yangshao era. When this rat was also found at the pioneering Chinese Anyang excavations in northern Henan, Andersson argued that this indicated that such a climate had still prevailed during the rise of the earliest Chinese dynasties. On top of that, the discovery of elephant molars at the Anyang excavations seemed to prove this. However, Teilhard de Chardin and Yang Zhongjian disagreed and concluded that these elephants had probably been imported to the royal court of the Yin dynasty. But the Swedish sinologist Bernhard Karlgren pointed out that Anyang oracle bone inscriptions actually indicated that the royal court had hunted wild elephants. To add to this lengthy discussion, Andersson remarked that he had discovered relatively recent remains of water buffaloes and of the Chinese water deer *Hydropotes inermis inermis* in peat layers outside Peking. As the latter species are presently found in the lower reaches of the Chángjiāng 长江 [Yangtze River] and Karlgren told him that the Zhou Dynasty annals are rich in statements about swamps, the Swede believed that this was a strong indication of a more humid climate at the rise of China's Neolithic and early Bronze Age. See J. G. Andersson, "Kinas klimatväxlingar i tertiär och kvartär tid," *Ymer* 45 (1925): 316; Andersson, "Researches into the prehistory of the Chinese," 35; Teilhard de Chardin and C. C. Young [Yang Zhongjian], "On the mammalian remains from the archaeological site of Anyang," *Palaeontologia Sinica*, series C, 12, fasc. 1 (1936): 13–15; 52–53; Andersson, *Essays on the Cenozoic of northern China*, 84–92.

technology should be used such as pollen analysis.[113]

Andersson's Climate and Environmental Studies Revisited

As palaeoenvironmental studies have in recent decades again become a major theme on the international agenda, Chinese archaeologists have again reviewed the same kind of issues as in Andersson's era, which has put new light on the theories of the past and resulted in a vastly updated knowledge of the intricate connections between climate and environmental changes and the development of China's prehistory. We now know, for instance, that Palaeolithic cultures actually did exist in northern China before the Neolithic began, contrary to what Andersson and his contemporaries had argued. Moreover, it is currently believed that China's transition towards the Neolithic seemed to have been an indigenous process, which the Swede apparently argued for in his final reports. Furthermore, his main deductions regarding the local palaeoclimatic changes from the Pleistocene to the Holocene were at least largely correct, although – of course – much more refined and better understood than in his time. It is believed today that during the later millennia of the latest glaciation, "weakened continental air masses from the north" were replaced by "stronger East Asian monsoons from the ocean," which affected the climate of China. At the beginning of the Holocene, a cold and dry steppe in Northern China was replaced by a more humid era. As Li and Chen state,

> [t]he interval of peak warmth and moisture, known as the mid-Holocene optimum, occurred between ca. 8000 and 3000 BP throughout the subcontinent. During that time, seasonal contrasts waned, whereas plant and animal ranges expanded [...], and human settlements spread over much broader regions.[114]

It is during that time span northern China's Palaeolithic population turned to a Neolithic, food-producing way of living. Moreover, modern pollen analyses have – as envisioned by Andersson – shown that forests originally did exist for a period in northern China but withdrew southwards and were replaced by steppe-like conditions during a drier period, before re-appearing again during this change to a warmer and more humid era. The existing hunters and gatherers who then hunted game and collected plant food, became increasingly sedentary as plants were more systematically used, and finally settled in the river valleys, as Andersson correctly assumed in his Gansu report. However, the process towards a fully Neolithic society did not happen overnight by a sudden agricultural wave as Andersson believed – it took many hundreds of years. Interestingly, however, considering the 1929 find, among the first locally cultivated plants was indeed rice.[115]

Thus, China's transition towards the Neolithic was an indigenous process enhanced by the climatic and environmental conditions at the time. Furthermore, regarding the "external impulses" that thrust China into the metal ages, Andersson's initial theory has recently been seen in a new light. Accumulated researches into data from north-western China, including metallurgic analyses, have shown that bronze metallurgy as well as domesticated

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113 Andersson, "Researches into the prehistory of the Chinese," 41.

114 Li Liu, and Chen Xingcan, *The Archaeology of China: From the Late Paleolithic to the Early Bronze Age* (Cambridge, Cambridge University Press, 2012), 30–31; 42–44; 76–79; 123–125; quote 30–31.

115 Ibid., 42–44; 76–79; 123–125.

barley, wheat, and sheep and goat "came to China from Central Asia."[116]

Moreover, and highly interesting in retrospect, is that although Andersson himself in 1943 rejected some of his own initial ideas on the origin of China's and Europe's civilisation, similar discussions about early Bronze Age connections between Central Asia, Europe and China that occupied his earlier researches have been revived again. In the late 1990s and early 2000s, the discoveries of a series of prehistoric sites in Xinjiang Province, especially of the so-called Tarim mummies and new archaeological data from Central Asia and Russia believed to be related to them, led to an intense debate on prehistoric migrations and cultural influences across Eurasia.[117] However, the most recent studies on the possible origin of these cultures in Xinjiang point to a probable source location to the north and north-eastern parts of the continent rather than to western Central Asia.[118] What is certain, however, is that the answers are not as simple to find as they may have appeared to Andersson and his contemporaries in the 1920s. The more we unravel of the world's prehistory, the more it is clear that the development over time involved such a plethora of different cultures and a web of migrations and connections along with the local environmental changes that it is best to be humble and realize that what we believe to be facts today will always be more complicated and no doubt contradicted by the reports of tomorrow. But that is, of course, what science is all about.

Concluding Remarks

Andersson's archaeological work derived from the contemporary Swedish and international interdisciplinary agenda that centred on late Quaternary studies. His centralistic ideas of the origin of mankind and of Chinese civilisation in Central Asia were part of the contemporary belief and based on data existing at that time. They were a result of the pioneering nature of his work and what was known to him in the early 1920s, and he changed his view along with the accumulating evidence revealed by the excavated material and new data found during his lifetime. He later strongly rejected the way in which his early Near Eastern/Central Asian origin hypothesis had come to be used in its most extreme form by contemporary European and American researchers. He still persisted, however, in believing that the rise of China's earliest dynasties could have been ignited by a combination of climate changes and transfer of new technology that had enabled intensified agriculture, a local population increase and in turn led to the formation of larger sedentary societies. In

116 Ibid., 395; Mei Jianjun who has researched the early metal finds in north-western China stated, moreover, in 2003 that "It has become increasingly clear that the early development of copper-based metallurgy in Northwest China may have received impetus from the Eurasian steppe." See Mei Jianjun, "Qijia and Seima-Turbino: The question of early contacts between Northwest China and the Eurasian steppe," *Bulletin of the Museum of Far Eastern Antiquities* 75 (Stockholm, 2003): 44.

117 For a review of the contemporary international debate that these archaeological discoveries in north-western China resulted in, see Jan Romgard, "Questions of ancient human settlements in Xinjiang and the early Silk Road trade, with an overview of the Silk Road research institutions and scholars in Beijing, Gansu and Xinjiang," *Sino-Platonic Papers* 185 (November 2008): 1–123, available online at http://sino-platonic.org/complete/spp185_silk_road.pdf

118 For one of the most recent reports, see Alison V. G. Betts, Marika Vicziany, Peter Jia, and Angelo Andrea Di Castro, *The Cultures of Ancient Xinjiang, Western China: Crossroads of the Silk Roads* (Oxford: Archaeopress, 2019).

retrospect, Andersson's paleoclimate and environmental studies in relation to the prehistoric development have best stood up to the ravages of time. [119]

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From Sima Qian to Johan Gunnar Andersson – The Internal Logic and External Drive of the Birth of Chinese Archaeology

by

CHEN Yantang and CHEN Xi

Abstract

Based on the analysis of the ancient Chinese moral concept of "respecting the deceased and in memory of the ancestors", this paper holds that there is a fundamental conflict between the ethics of traditional Chinese society and archaeology characterized by field excavation. Thus, it was impossible to develop archaeology within traditional Chinese society. At the same time, the social trend of "respecting and appreciating the ancient" made ancient Chinese receptive to archaeology. Therefore, traditional Chinese history, especially through epigraphy, paved the way for the introduction of modern archaeology in China. This is the inherent logic of the birth of archaeology in China.

The May Fourth Movement was a new cultural and ideological liberation movement. Traditional social ethics were greatly weakened in the social tide of calling for science and democracy. Archaeology finally took root in China with the efforts of a group of European and Chinese scholars who had received archaeological training in Europe and America. This is the external driving force the birth of archaeology in China. Whether we take the excavation of the Yangshao or Zhoukoudian as a starting point, Johan Gunnar Andersson is a significant landmark figure in the birth of Chinese archaeology.

Keywords:

Sima Qian, Johan Gunnar Andersson, birth of Chinese archaeology, Yangshao, Zhoukoudian

Carefully Attend to the Funeral Rites of Parents and Follow them when Gone with Due Sacrifice: the Impossibility of Archaeology in Traditional Chinese Society

As is known to all, the study of epigraphy, which made great achievements in ancient China, did not develop into the study of archaeology.[1] As a discipline, modern archaeology's occurrence in China is the result of its introduction from Europe. What kind of contradic-

[1] However, Xia Nai 夏鼐 and others believe that epigraphy is the predecessor of Chinese archaeology. After the introduction of archaeology into China, epigraphy has evolved into an integral part of archaeology, and no longer exists as an independent discipline. See: Xia Nai夏鼐, "Kaoguxue考古学 [Archaeology]," and Wang Shimin 王世民, "Jinshixue 金石 学 [Epigraphy]," both in *Zhongguo dabaikequanshu kaogujuan* 中国大百科全书考古卷 [*Encyclopedia of China, Archaeology Volume*] (Beijing and Shanghai: Encyclopedia of China Press, 1986), 1; 236.

tion exists between the two, which makes the traditional Chinese historiography unable to give birth to modern archaeology? In addition to the essential differences in methodology between modern science and traditional historiography, the background of moral concepts and academic methods behind them is also worthy of attention. In particular, the ancient Chinese society's attitude towards ancestors is a factor that cannot be ignored.

In China's 3,300 years of history since written records,[2] the reverence and worship of ancestors has always been unswerving. In the oracle bone inscriptions unearthed from Yin Ruins in Anyang, there are quite a lot of contents about the sacrifices offered by Shang kings to their ancestors, that is, the past kings.[3] The purpose of sacrifice is to establish kinship, consanguinity and cultural identity by recalling and remembering the ancestors and relatives, so as to build a hierarchical royal power system of family, society and the world. This kind of special attention to ancestors is a very important concept of traditional Chinese culture, and even a source of Chinese thought in value judgment.[4] The Zhou Dynasty continued the reverence of ancestors in Shang Dynasty, and on this basis established the relevant sacrificial system and etiquette, which made the worship of ancestors rise to the height of national ideology. The Spring and Autumn period further reinforced the notion of "the important events of the state lie in sacrifice and military war."[5] Sacrifice was offered to heaven and earth, ghosts and ancestors. On the one hand, offering sacrifice to ancestors was due to the fact that the people wanted to express their yearning for their ancestors and the intention of repaying their kindness, so "the sage knows it well, the scholar and the gentleman do it regularly, the official abides by it, and the people make it a custom."[6] It can be seen that ancestor worship and related rituals have become the etiquette of regulating the whole society. This norm is not only important to family and individual, but also contains the significance of stabilizing the clan and even the country, that means, when the kinship is stabilized, people worship their ancestors which makes folks respect their clans. The solidarity of clans will reinforce the ancestral temples which, in turn, will bring peace to society. Therefore, it was promoted by the government and supported by the people.

Confucianism, represented by Confucius, developed the concept of "carefully attend to the funeral rites of parents and follow them when gone with due sacrifices" from the ancestor worship since the Shang and Zhou dynasties. Carefully attending to the funeral rites of parents is a serious and respectful attitude towards the elders who are dying and

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[2] At the end of the 19th century, oracle bone inscriptions were found in the Yin Ruins of Anyang. It is recognized by the academic circles that they were used in the late Shang Dynasty, i.e. about 1,300 B.C. This is the earliest recorded history in China. Please refer to the declaration text of the world cultural heritage of Yin ruins of Anyang.

[3] Wang Guowei 王国维, "Yin buci suojian xiangongxianwang kao, Yin buci suojian xiangongxianwang xukao 殷卜辞所见先公先王考、殷卜辞所见先公先王考续考 [Textual Research on the Ancestors and Kings in Yin Oracle Inscriptions, Supplementary Research on the Ancestors and Kings in Yin Oracle Inscriptions]," in *Guantangjilin* 观堂集林 [*Collected Works of Guantang*]， vol. 9 (Shijiazhuang: Hebei jiaoyu chubanshe, 2001); Chen Mengjia 陈梦家, *Yinxu buci zongshu* 殷墟卜辞综述 [*Summary of Yin Ruins Oracle Inscriptions*], (Beijing, Science Press, 1956).

[4] Ge Zhaoguang 葛兆光, *Zhongguo sixiangshi* 中国思想史 [*History of Chinese Thought*], vol. 1 (Shanghai: Fudan University Press, 2001).

[5] Zuo Qiuming 左丘明, "Chunqiuzuozhuan Chenggong shisannian 春秋左传·成公十三年 [Chunqiu Annotated by Zuo Qiuming, the 13th year of Chenggong]," in *Chubqiuzuozhuanzhu* 春秋左传注 [*Notes on Chunqiu zuozhuan*], ed., Yang Bojun 杨伯峻 (Beijing: Zhonghua Book Company, 2009).

[6] Xun Kuang 荀况, *Xunzi lilun* 荀子礼论 [*Xunzi, On Rites*], (Beijing, Zhonghua Book Company, 2011).

close to another world. Following them when gone with due sacrifices is an expression of nostalgia for the ancestors who have long passed away but have a clear blood relationship. Xunzi thinks that this is the only way that a gentleman and Confucian scholar should follow.[7] Therefore, for the dead ancestors and relatives, we should "act as if they are still alive". After Emperor Wudi of the Han Dynasty "proscribed all non-Confucian schools of thought and declared Confucianism the state ideology" and established Confucianism as the mainstream ideology and moral standard of the whole society, the concept of "carefully attend to the funeral rites of parents and follow them when gone with due sacrifices" was further embodied as the ethics of "three cardinal guides and five constant principles", which had an impact of more than 2,000 years. Today's intellectuals and ordinary people still regard the annual tomb sweeping ceremony as the most important family etiquette, and the state has also established the tomb sweeping day as a statutory holiday, which shows the deep-rooted ancestor worship in traditional Chinese society.

In the concept of "carefully attend to the funeral rites of parents and follow them when gone with due sacrifices", the teachings, relics and tombs of ancestors are regarded as sacred and inviolable. If the ancestral grave is dug up, it will be regarded as a great shame. Conversely, if someone digs other people's ancestral graves, it will be regarded as extremely immoral and despised by the world. The experience of Wu Zixu, a famous general of the State of Chu in the Warring States period, can be regarded as a good example of this concept in Chinese history. According to historical documents, King Ping of Chu killed Wu Zixu's father and brother unjustly. Wu Zixu fled to the state of Wu, assisted King Helü to establish a strong power, and later captured the capital of Chu. At that time, his enemy, King Ping of Chu, had died and been buried for many years. Wu Zixu, in order to vent his deep hatred, dug up the tomb of King Ping and whipped the corpse,[8] or, according to another legend, whipped the tomb of King Ping three hundred times[9] to vent his resentment. Wu Zixu's behavior, in his own view, is a way to humiliate the enemy to express his hatred. However, in the eyes of other people, especially historians, although Wu Zixu was loyal and suffered injustice, his behavior of digging a grave and whipping a corpse is "perverse," which is totally not in line with the ethics of the relationship of monarch and the minister, father and the son. It is extremely immoral and should be condemned.[10]

Excavation of tombs was regarded as an unbearable act in ancient China, a view in stark contrast to the most prominent feature of modern archaeology which is to obtain research data through field excavation. Although the objects of archaeological excavation are all inclusive, it is popularly seen as the excavation of tombs in China. Today, archaeologists are commonly known as "grave diggers", and archaeology is summed up as "grave digging". Field excavation, a unique but essential discipline attribute of archaeology, conflicts with the long-standing and deep-rooted concept of "carefully attending to the funeral rites of

7 Xun Kuang 荀况, *Xunzi lilun* 荀子·礼论 [*Xunzi, On Rites*].

8 See Sima Qian 司马迁, *Shiji wutaibo shijia* 史记·吴太伯世家 [*Historical Records Wu Taibo Family*] (Beijing: Zhonghua Book Company, 1959); Zhao Ye 赵晔, *Wuyue chunqiu helvneizhuan* 吴越春秋·阖闾内传 [*History of Wu and Yue: Biography of Helü*] (Nanjing: Jiangsu guji chubanshe 1999).

9 Lü Buwei 吕不韦, "Lüshichunqiu [Spring and Autumn Annotated by Lü Buwei]," in *Lüshichunqiu jishi* 吕氏春秋集释 [*Collection of Notes on the Spring and Autumn Annotated by Lü Buwei*], ed., Xu Weiyun 许维遹 (Beijing: Zhonghua Book Company, 2017).

10 Yang Xion 扬雄, *Fayan chongli* 法言·重黎 [*Fa Yan, Chong Li*] (Beijing, Zhonghua Book Company, 1987).

parents and following them when gone with due sacrifices" and the ethics of "father demanding obedience from his son." So it is virtually impossible to develop archaeology with the excavation of ancient tombs as its feature in traditional Chinese society.

Respecting and Cherishing the Ancient: the Implicit Desire for Archaeology in Ancient Chinese Society

However, it should not be ignored that there also has been a tendency of "respecting and appreciating the ancient" in traditional Chinese society which goes hand in hand with "carefully attending to the funeral rites of parents and following them when gone with due sacrifices". This tendency became a social trend of thought before it became part of the cultural tradition of China. The combination of respecting and loving the ancients with the highly developed historical study inevitably led to the desire to explore the past. Pangu creating heaven and earth, Nuwa mending the sky, and the legendary three emperors and five sovereigns as well as the mythical warrior Chiyou engaged in fighting against Yellow Emperor all remain in the memory of generations but their existence cannot be historically verified by mythology, legends or literature. Sima Qian's original intention of touring the whole country was to find the materials that he thought could support his theory, and to provide evidence and confidence for his writing of the history from the Yellow Emperor to the Qin and Han dynasties.

During the Spring and Autumn and the Warring States period, it had become the common pursuit of the intellectuals to respect and cherish the ancient times and to despise the present,[11] among which Confucius is the most typical representative. Confucius devoted his whole life to the restoration of Zhou rites, and thus tracing back to the study of the rites of Xia and Shang dynasties. According to his own view, "I am not born to know everything. I love the ancients, so I am keen to seek knowledge." "I only clarifies the predecessors' ideas, because I believe and love ancients things", which sounds he was a man born in the past. He was so addicted to the ancient laws and regulations, especially that of the Zhou Dynasty, that he regarded his failure of not often seeing Zhou Gong, the maker of Zhou rites, in his dreams as a sign of his aging. In order to verify and explore the ritual system of Xia and Shang dynasties, Confucius once went to the place where the descendants of Xia people lived but failed to find anything valuable because of the damage of the ancient historical sites, thus he sighed that the ritual history of Xia and Shang dynasties was insufficient.[12] In fact, this sigh implies the expectation of discovering and examining ancient objects.

Other pre-Qin scholars shared the same view of Confucius. "Mozi thought that it was not the rites of Zhou Dynasty but that of the Xia Dynasty that should be observed. He cited a more ancient Yu, one of the legendary emperors who created the Chinese state, to play down King Wen and Duke Zhou. Mencius cited even the earlier Yao and Shun to suppress

[11] Zhuangzhou 庄周, "Zhuangzi, Waiwu 庄子外物," in ***Zhuangzijishi*** 庄子集释 [*A Collection of Notes on Zhuangzi*], ed., Guo Qingfan 郭庆藩 (Beijing: Zhonghua Book Company, 2013).

[12] Confucius 孔子, "Lunyu 论语八佾第三 [The Analects of Confucius: Bayi 3]," in ***Lunyu yizhu*** 论语译注 [*Translation and Annotation of the Analects of* Confucius], ed., Yang Bojun 杨伯峻 (Beijing: Zhonghua Book Company, 2009).

Yu".[13] When the disciples of Lao Zhuang came along, they proposed the legendary figures before Yao and Shun to replace the two. Therefore, both Mencius and Xunzi advocated "the ways of former king". The so-called former King refers to the Duke of Zhou. In the Han Dynasty, Dong Zhongshu, who strongly advocated "excluding all schools of thought", "only adhere Confucianism" because he held high the banner of "revering the heaven and following the ancients".[14]

While the scholars of pre-Qin Dynasty and the Confucian scholars of the Han Dynasty paid more attention to the political aspects such as the ancient system and etiquette, the mature epigraphy of the Song Dynasty focused on the cultural and artistic contents contained in the ancient artifacts. The deep luster and mysterious patterns of Shang and Zhou bronze ware, as well as the ancient and exquisite calligraphy of Han and Tang inscriptions, all became the elegant means and aspiration for the literati of the Song Dynasty to talk with the ancients, cultivate their morality and fine sentiments. In other words, from the pre-Qin period to the Tang and Song dynasties, from respecting the ancients to imitating the ancients, and from focusing on grand themes to cultivating personal hobbies is the evolution trajectory of respecting and idolizing the ancients in ancient China.

However, whether in respect of the ancients in early times or worship of ancients in the Middle Ages, there is a constant demand, that is, the desire for the materials of the ancient times. Confucius' lament of "insufficient evidence" not only represents the feelings of all the ancient scholars, but also expresses the love and desire of the scholars for bronze ware, inscriptions and other cultural relics. However, the excavation of ancient remains by field archaeologists and its unique acquisition of relevant information is the only scientific way to satisfy this desire.

Even at the beginning of the 20th century, some scholars of the traditional Chinese historiography not only lamented "the lack of historical facts", but also questioned the time and space framework of ancient history, which has been taken for granted for a long time. This gave rise to the famous "discrimination of ancient history movement" in modern historiography. Gu Jiegang, the spokesman of this movement, put forward the famous viewpoint of "Chinese ancient history accepted as true by layers of generations". He overturned the system of Chinese ancient history constructed by the concepts of "Pangu," "three Emperors and five sovereigns," and "unified history" since the pre-Qin period, and advocated using the concept of historical evolution and the spirit of boldly questioning the history, and absorbing the ideas of modern western sociology and archaeological methods to study ancient Chinese history and classics.[15] On the surface, the confrontation between doubting the ancients and respecting the ancients is very tense but in essence, both are the call of archaeology.[16] In fact, their appeal and desire are the same, that is, to study and recreate our

[13] See Feng Youlan 冯友兰 "Zhongguo zhexueshi 中国哲学史 [History of Chinese Philosophy (I)]," in *Fengyoulan wenji*《冯友兰文集》第三卷 [*Collected Works of Feng Youlan*], vol. 3 (Changchun: Changchun Publishing House, 2017), 212.

[14] Ban Gu 班固, *Hanshu Dongzhongshu zhuan* 汉书·董仲舒传 [*History of Han Dynasty, Biography of Dong Zhongshu*] (Beijing: Zhonghua Book Company, 1985).

[15] Gu Jiegang 顾颉刚, *Gushibian* 古史辨 [*Discrimination of Ancient History*] (Shanghai, Shanghai guji chubanshe, 1982).

[16] See Chen Xingcan 陈星灿, *Zhongguo shiqian kaoguxueshi yanjiu* 中国史前考古学史研究 [*Research on the History of Chinese Prehistoric Archaeology*] (Beijing: Sanlian Bookstore, 1997); Zhao Hu 赵辉, "Zenyang

understanding of ancient society through indisputable tangible ancient material evidence, not only from the literature and myths and legends. The excavation of Yangshao village by Andersson happened just at a time when both the schools of respecting and doubting ancient times saw the hope of viewing history by authentic proof.

From this point of view, the implied desire for archaeology is the consensus of the entire intellectual community.

From Sima Qian to Qianjia School: the Preparation of Traditional Chinese Society for Archaeology

The reason why epigraphy has not been further developed into archaeology lies in the essential differences between the two domains in research objects, research methods, subjects, and ways of obtaining materials. However, after the introduction of archaeology in China, epigraphy has gradually become a part of modern archaeology, and many achievements made by Chinese traditional historiography have also been absorbed by archaeology, which shows that there is a common source among them that cannot be ignored. Since Sima Qian, the research methods and ideas of Chinese traditional historiography had been paving the way for the arrival of archaeology consciously or unconsciously.

As early as the Western Han Dynasty (the middle and late 2nd century B.C.), Sima Qian, the most outstanding historian in ancient China, carried out a on-site investigation of cultural relics and historic sites throughout the country in order to write his great work, *Historical Records*. He made on-site investigation and interview on the characters and events in historical records and myths and legends, and then summarized and collated the data obtained from the investigation, so as to get the first-hand materials for his writing. His footprints were all over the Central Plains, Shangdong, Jiangsu, Zhejiang and Yunnan provinces.[17] These tours not only made him immersed in the cultural atmosphere of Confucianism and Taoism in the central area of Chinese civilization, but also helped him gain a real understanding of the frontier cultures such as the minorities in the southwest. To a certain extent, this method is very close to or even basically the same as the early work of modern archaeology. Unfortunately, this was not developed into a fixed method that continued in the traditional Chinese historiography, and its work content is only limited to the recording of on-site and oral historical materials, which is qualitatively different from the mapping and analysis of modern archaeological fieldwork. Therefore, Sima Qian's working methods for writing historical records can only be said to have significance for the writing of historical works but is not of much use for archaeology.

In particular, it should be pointed out that ancient Chinese literati have a tradition of expressing their thoughts on ancient times by paying attention to cultural relics. But this kind of activity is not to record and measure the cultural relics and historic sites themselves, but just to take the historic sites as a kind of symbol or expressive channel of their emotions or ideas. Therefore, although some cultural relics have been collected and preserved to a certain extent, these activities are quite different from Sima Qian's on-site

kaocha xueshushi 怎样考察学术史 [How to Investigate the Academic History]," *Kaoguxue yanjiu* 考古学研究 [*Archaeological Research*] 9, (Beijing: Wenwu chubanshe, 2012).

[17] Sima Qian 司马迁, "Shiji taishigong zixu 史记·太史公自序 [Historical Records Preface]," in *Shiji wutaibo shijia* 史记·吴太伯世家 [*Historical Records Wu Taibo Family*] (Beijing: Zhonghua Book Company, 1959).

investigation and inspection for the purpose of writing historical works in terms of form, purpose and result. They are far from or irrelevant to archaeology and cannot be classified as events related to archaeological activities.

Li Daoyuan, an outstanding scholar in the Northern Wei Dynasty, went further than Sima Qian. In order to write his great book *Notes on the Waterways*, Li Daoyuan's footprints were all over North China, north of Qinling Mountains and south of the Great Wall. He not only investigated and recorded the water system, but also recorded and researched the ancient tombs, city sites, temples, inscriptions and other cultural relics and historic sites in each river basin. These are the categories of immovable cultural relics in the field of cultural heritage protection in China today. Li's investigation and textual research on these cultural relics is still an important basis for field archaeological investigation and research. His method of field investigation is similar to that of modern archaeological investigation.

If the relationship between the work of Sima Qian, Li Daoyuan and modern archaeology only stays in the early stage of field investigation and interviews, the excavation of a royal tomb in the Warring States period in Northern Henan during the Western Jin Dynasty can be regarded as the earliest and most important field excavation practice in Chinese history. This event is not only the concrete implementation of the field archaeological excavation activities, but its unearthed cultural relics also, to a certain extent, rewrite the orthodox history represented by Sima Qian's *Historical Records*, thus having important historical significance.

In the fifth year of Xianning (279 A.D.) or the second year of Taikang (281 A.D.) of Emperor Wu of the Western Jin Dynasty, someone privately excavated a royal mausoleum of Wei state in the late Warring States period in Jijun (now Weihui City, Henan Province). His original intention was to excavate treasures, but he inadvertently unearthed valuable historical documents of the Warring States period. These documents were written on bamboo slips and compiled into volumes. It is very sad that the tomb robbers, in order to search for treasure in the dark chamber, lit these volumes as torches. Fortunately, the bamboo slips that had not been burned were transported to Luoyang, the capital of that time. The royal family of the Western Jin Dynasty organized prestigious scholars to study them in depth, and then they were reorganized and edited into a number of books.[18] The most important one among them was named *Bamboo Book of Jijun Tomb* or *Annuals Bamboo Books*, because it came from an ancient tomb from Jijun county, was written on bamboo slips, and the style was arranged by year. Xun Xu, a famous scholar who presided over the collation of documents, even made a criterion for examining ancient society through unearthed documents. The way in which official organizations organized scholars to sort and study the unearthed cultural relics of tombs, asking them to pay attention to the supplements and other differences between the unearthed documents and handed-down classics in the process of sorting out, and then to publish the research results to society are all academic innovations with archaeological factors worthy of special attention.

Annals Bamboo Books is an official historical work compiled by Wei historians during the Warring States period. It may also be the only general history in annalistic style that has survived the disaster of burning books and burying alive Confucian scholars by Qin Shihuang. It describes the history of Xia, Shang, Western Zhou dynasties, Spring and

[18] Fang Xuanling 房玄龄等 et al., eds., *Jinshu wudiji shuxizhuan* 晋书之武帝纪、束皙传 [*History of Jin: Emperor Wudi and Biography of Shu Xi*], (Beijing: Zhonghua Book Company, 1996).

Autumn and Warring States. There are many differences in historical facts and concepts between the records in this book and the traditional historiography since Sima Qian, but some accounts are consistent with the oracle bone inscriptions and bronze inscriptions unearthed in archaeological excavations.

Because the book was written earlier than *Historical Records*, and can be used as a cross reference with some achievements of modern archaeology, this work has high historical value, which is highly appraised by the academic circles. For example, the famous archaeologist Chen Mengjia said: "the discovery of bamboo slips in Jijun tomb and the discovery of oracle bones in Anyang are of almost equal importance in terms of ancient historical materials."[19] Wang Guowei, a famous scholar, directly linked the excavation of Jijun tomb and the collation of unearthed documents with the "dual evidence method" which he always advocated to cross reference the handed-down documents and unearthed cultural relics, and regarded this event as the early practice of this theory,[20] thus deeming the excavation of Jijun tomb and the bamboo books to be a challenge of archaeology to historical studies.

Although the excavation and collation of bamboo books, especially the research method, were of great significance, they were still isolated cases at that time. In the Northern Song Dynasty, when the study of epigraphy flourished, a paradigm with significance to academic norms was gradually formed ranging from data collection to bibliographic research, which is very scientific even from today's perspective. Liu Chang, who made great contributions to the study of epigraphy in the Song Dynasty, first put forward the research method of ancient utensils, which combines the study of history, ancient philology and genealogy. Lü Dalin's *Archaeological Map* and *Xuanhe Bogu Map* not only accurately recorded the images and inscriptions of the objects, their sizes, capacity and weight, on which certain textual research was then conducted, but also indicated the place where the objects were collected and the locations where they were unearthed. *Xuanhe Bogu Map* also noted the approximate scale of the images and the classification and naming of the bronze wares.[21] It is not difficult to see that the research methods established by the epigraphy of the Song Dynasty are strikingly similar to those of modern archaeology which naturally provided rich nutrition for archaeology.

These events in ancient China involved many aspects, such as field investigation and interviews, the extraction of cultural relics from ancient tombs, and even the collation and research of unearthed cultural relics, editing and publishing, which are similar to the basic procedures of modern archaeology. All of these make these events contain a lot of essential elements of archaeology.

In a word, driven by the social atmosphere of respecting and cherishing the ancients and the strong historical tradition, some officials and individuals in Chinese history successively carried out a series of activities, such as field investigation and excavation, sort-

[19] Chen Mengjia 陈梦家, *Xizhou niandai kao·liuguo jinian* 西周年代考·六国纪年 [*A Study of the Age of the Western Zhou Dynasty, Chronicle of the Six States*], (Beijing: Zhonghua Book Company, 2005).

[20] Wang Guowei 王国维, "Zuijin ersanshiniandai zhong zhongguo xinfajian zhi xuewen 最近二三十年代中中国新发见之学问 [New Knowledge of China in the Last 20 and 30 Years]," in *Wangguowei wenji*《王国维文集 [*Collected Works of Wang Guowei*], ed., Yao Ganming, and Wang Yan 姚淦铭、王燕编 (Beijing: Zhongguo wenshi chubanshe, 1997).

[21] Wang Shimin 王世民, Jinshixue [*Epigraphy*].

ing and research of unearthed cultural relics and publication of research results. These activities have some factors and characteristics of modern archaeology in form. The accumulation of such activities for more than 2,000 years has laid a solid foundation for the occurrence of modern archaeology in China, which is characterized by field excavation. As the culmination of these events, the Song Dynasty's epigraphy and the Qing Dynasty's textual research have been absorbed and utilized by modern archaeology, including collection, description, textual research, copying and drawing of handed-down bronze ware and inscriptions, as well as the means of data extraction and research results, so that the research on bronze ware and inscriptions as the main feature of epigraphy itself has become the organic components of modern Chinese archaeology.

As a result, the traditional Chinese society with thousands of years of history has prepared itself for the arrival of archaeology.

Verify Confucian Classics and Supplement History to Break through Barriers: The Internal Logic of Chinese Archaeology

The above-mentioned series of events and activities related to archaeology in traditional Chinese society in the past 2,000 years are similar to modern Chinese archaeology in "verifying Confucian classics and supplementing history," but in essence, it hardly has an internal logical relationship with modern archaeology. Even though Sima Qian, Li Daoyuan and others adopted the correct path and method of field investigation, archeology failed to develop into the substantive stage of field excavation. The so-called field excavation of the ancient tombs in Jijun, in addition to the disgraceful act of tomb theft, is also contrary to the scientific archaeological excavation owing to the rude and even barbaric treatment of the tomb materials.

Although Sima Qian, the scholars of epigraphy in the Song Dynasty and the Qianjia school in the Qing Dynasty carried out many activities in line with modern archaeology, such as field archaeological investigation, excavation (illegal excavation), data collation and research, and publication of results, and even developed a paradigm for the collation and research of unearthed data, they failed to move towards archaeology as a discipline in the end. The reason lies in the fact that the essence of modern archaeology is the field archaeological excavation under the guidance of stratigraphy theory and the study of classification and ranking under the guidance of typology theory. In the traditional Chinese society, which emphasized loyalty and filial piety, it was impossible for the ancient Chinese officials to legalize the excavation of tombs, which was against the traditional ethics and mainstream ideology, and it was also impossible to organize such excavation in a planned and purposeful way. Therefore, the excavation theories and techniques became as "water without a source and trees without roots", that is, just empty talk. Therefore, no matter how sufficient Sima Qian's early investigation and later textual research are, their efforts will not go to the stage of field archaeological excavation. This not only shows the limitation of the tradition of respecting and loving ancients in China, but also the destiny of ancient Chinese epigraphy.

In order to make archaeology take root in China, the premise is to get rid of the narrow notion that field archaeological excavation is only digging graves, and at the same time, it is also necessary to gradually weaken the Confucian concept of loyalty and filial piety in the mainstream ideology. The May 4th movement launched a fierce attack on traditional ideology and moral concepts and, under the banner of science and democracy, archaeology, as an advanced western science and with the mission of studying ancient society, found its way to China, which is a historical necessity.

This inevitability, first of all, is reflected in the inherent desire to understand the ancient Chinese traditional culture, as well as the fact that it is an effective way to "verify the classics and supplement the history" which had been explored by epigraphy. Secondly, archaeology showed great vitality when it first appeared in China: the excavation of Zhoukoudian makes the Chinese academia realize where the Chinese people come from, the excavation of Yangshao site makes them feel the pulse of 5,000 years of ancient culture, and the excavation of Yin Ruins makes the intellectuals see the Shang Dynasty in Sima Qian's *Historical Records* with their own eyes. This is what Chinese traditional culture wants to achieve but has not been able to prove. Therefore, the acceptance of archaeology in China was not hindered at all. Although this is closely related to the May 4th movement, it is also undeniable that the great charm of modern archaeology has conquered the Chinese intellectual circles. The vigorous vitality and fruitful excavation and research achievements of archaeology coincide with the needs of Chinese intellectuals and even the society. Thus, as a discipline, archaeology obtained a foothold in China in the early 20th century.

In this way, the ethical concepts and academic pursuits of ancient China and the academic theories and discipline of modern western countries inadvertently found a common ground. Therefore, from a macro perspective, the birth of archaeology in China is a combination of western scientific theory and Chinese historiography tradition. With the advent of the May 4th movement and the spread of democratic and scientific concepts, Chinese society began to break through the inherent barriers and constraints of traditional culture, and the western ideas were gradually strengthened. With the arrival of Andersson and other western scholars in China, archaeology with field archaeological excavation as the main technical means began to take root.[22] Pushed by Fu Si'nian, the backbone of the May 4th movement, archaeology quickly became an irreplaceable force in the study of ancient society.[23]

From Andersson to Li Ji: the West Wind Spreading to the East in the Process of the Birth of Chinese Archaeology

From the pre-Qin scholars to Sima Qian, Chinese traditional historiography constructed a continuous civilization system of three emperors and five sovereigns. Although this system is an official narrative, it can only stay in the memory and the legendary accounts of later generations, but cannot be verified. What really made Chinese feel the concrete image of ancient culture thousands of years ago for the first time was the excavation of Yangshao

[22] Chen Xingcan 陈星灿 and Zhao Hui 赵辉 have talked about the relationship between the May 4th Movement and the birth of Chinese archaeology, see Chen Xingcan 陈星灿, *Zhongguo shiqian kaoguxueshi yanjiu* 中国史前考古学史研究 [*Research on the History of Chinese Prehistoric Archaeology*]; Zhao Hui 赵辉, "Zenyang kaocha xueshushi 怎样考察学术史 [How to Investigate the Academic History],".

[23] Fu Si'nian was a student leader in the May 4th New Culture Movement, whose ideas and behaviors led the way for a while. Fu Si'nian was the first director of the Institute of History and Philology of Academia Sinica. From 1928, the Institute was engaged in the archaeological excavation of Yin Ruins in Anyang until the outbreak of the war against Japanese aggression in China. Fu Si'nian was a planner and leader of archaeology study in China before 1949.

village by Swedish scholar Johan Gunnar Andersson in 1921 in the center of Chinese civilization, on the bank of the Yellow River in western Henan Province. In addition to the exquisite painted pottery and stone tools Andersson excavated, he also concluded that it was a prehistoric site based on his academic accomplishments and knowledge. Then, he explored and excavated relics along the Yellow River, which is known as the cradle of Chinese civilization. In Gansu, Qinghai and other places, he successively excavated more ancient cultural sites characterized by painted pottery, and named this kind of culture Yangshao culture.[24] As a result, the cultural samples of 5,000 years ago in the land that is now China are presented to the Chinese people in real, concrete and vivid forms. Chinese academic circles saw their own cultural roots for the first time through real objects rather than literature or legends. *An early Chinese Culture*, written by Andersson on this basis, has long been a key for Western intellectuals to understand China. This book, together with his other book *Children of the Yellow Earth: Studies in Prehistoric China*, let the western academic circles gain a new understanding of China's ancient culture.

Since then, modern archaeology, which was formed in the middle of the 19th century, became well-known in China half a century later. Chinese academic circles were so fascinated by the charm of archaeology that Liang Qichao, a leading figure in Chinese academic circles, delivered an impassioned speech titled "On the Past, Present and Future of Chinese Archaeology," at the welcome reception in Beijing of the Swedish Crown Prince (1926). Even more representative of Liang Qichao's attitude towards archaeology is that he sent his second son Liang Siyong to Harvard University to study archaeology after Andersson discovered Yangshao culture. Liang Siyong became the first archaeologist in China who really received a professional education of Western archaeology before he returned home. His excavation of Yin Ruins in Anyang determined the relative time relationship of Yangshao culture, Longshan culture and Shang culture from stratigraphy for the first time. That is to say, he solved the key problem of the chronological sequence of Chinese ancient cultural system, which is of great significance and a great contribution to the establishment of the space-time framework of Chinese archaeology and ancient history.

Another thing that Andersson himself attached great importance to in his archaeological work in China was the discovery of the *Homo erectus pekinensis* site in Zhoukoudian in Beijing. As a geologist, he was very concerned about the fossil nature and the origin of human beings. As early as 1918, Andersson began the investigation of Zhoukoudian site. From then on, he organized scholars and raised funds to carry out the archaeological excavation of Zhoukoudian, which eventually led to the discovery of Peking Man fossils that shocked the international academic community. At the welcoming event of the Crown Prince's visit to Beijing in 1926, Andersson was very proud to announce the archaeological harvest of Zhoukoudian site to the public.

Influenced by Andersson's archaeological excavation in China, Li Ji, a Chinese scholar, excavated the site of Xiyincun in Xiaxian County, Shanxi Province in 1926. This is the first archaeological excavation project presided over by Chinese scholars, so it has pioneering and symbolic significance in the history of Chinese archaeology. Li Ji, as the first independent field archaeologist in China, became a leading figure in Chinese archaeology for

[24] Magnus Fiskesjö, and Chen Xingcan, *China before China: Johan Gunnar Andersson, Ding Wenjiang, and the discovery of China's Prehistory* (Stockholm: Museum of Far Eastern Antiquities, 2004).

a long time. He was also an archaeologist with international vision and influence, and has made irreplaceable contributions to the creation and development of Chinese archaeology.

In addition to the needs of the development of the discipline, Chinese scholars independently carried out field archaeological excavations because of the influence of Andersson, but his influence was not entirely positive or helpful. In the process of excavating and studying the Yangshao Site in the Yellow River Basin, Andersson put forward the theory that Chinese painted pottery culture was influenced by the West. Although he himself was relatively cautious about this and tended to explain the cultural exchanges between China and the West in ancient times,[25] this theory, once put forward, aroused great attention in Chinese and foreign academic circles, and in fact affected the western academic circles' understanding and judgment of Chinese ancient culture. This has greatly irritated the Chinese intellectual community, which has always been proud of its long history. In this context, Chinese archaeologists, who had just grown up, were eager to carry out independent field archaeological excavation and research with the hope of proving the original form of Chinese civilization by excavating ancient cultural relics, so as to show the unprecedented influence of archaeology in the exploration and reconstruction of Chinese ancient culture by Chinese scholars. This perspective was more or less dominant in the early archaeological excavations by Chinese researchers.

For example, after watching Li Ji's excavation in Xiyincun, Liang Qichao once wrote a letter to Liang Siyong, who studied archaeology in the United States. In the letter, he said: "in recent years, Swedish scholar Andersson excavated pottery with such patterns in Gansu and Liaoning, so he advocated the idea of Chinese culture being influenced by the West. After this excavation, they [Chinese archeologists] want to refute his idea."[26] This is enough to show that both the positive and negative influences of Andersson on Chinese scholars' field archaeological excavation in this period are enormous.

Another landmark archaeological excavation is the Yin Ruins in Anyang. In 1928, the newly established archaeological group of the Institute of History and Philology of Academia Sinica began to excavate the Yin Ruins in Anyang. This was the first field archaeological excavation planned and organized by a Chinese official professional organization with a clear academic purpose. It was the first performance of Chinese archaeologists on the archaeological stage as a team. Since then, until the outbreak of the war of resistance against Japan, the Institute of History and Philology excavated the Yin Ruins in Anyang fifteen times in ten years. A large number of exquisite artifacts such as oracle bone inscriptions, bronze wares, jades, stone tools and bone objects were unearthed, as well as large-scale noble tombs and palace sites, which vividly presented the Shang Dynasty civilization, that previously only existed in the literature of later generations, to the world. Moreover, this highly-developed civilization is fully in line with Western academic standards of civilization: the existence of writing, cities, and metal smelting technology, thus making the Shang Dynasty in Historical Records an undisputed fact. So far, quite a number of

[25] Yan Wenming 严文明, *Yangshao wenhua yanjiu* 仰韶文化研究 [*Research on Yangshao Culture*] (Revised Edition) (Beijing: Wenwu chubanshe, 2009).

[26] Quoted from Yue Nan 岳南, *Nandu beigui zhi nandu* 南渡北归之南渡 [*Go to the South and then Back* (Part I]) (Changsha: Hunan wenyi chubanshe, 2013).

Western works about Chinese civilization still take Shang Dynasty as the starting point.[27] Therefore, the archaeological excavation of Yin Ruins has a great influence.

Liang Siyong and Li Ji played an important role in the excavation of Yin Ruins. Both of them and Xia Nai were trained in archaeology and anthropology in the United States or Britain. Fu Si'nian, who presided over the comprehensive work of the Institute of History and Philology and was very keen on archaeological excavation, also received western education. His slogan of "leave no stone unturned" has become a motto used by Chinese archeologists for self-encouragement. In addition, Fu Si'nian's legendary experience in the May 4th New Culture Movement in his early years made Chinese archaeology deeply imprinted with the modern science of Europe and America in its initial period. This is not only the way for the development of the discipline, but also the great achievement of the new culture movement.

From Zhoukoudian to Yangshao: the Basic Elements that Marked the Birth of Chinese Archaeology

After the May 4th Movement, along with the awakening of scientific and democratic trends of thought among Chinese intellectuals, archaeology was introduced into China by European and American scholars. From then on, in addition to the research objects of ancient documents, inscriptions on bronzeware and stone, ancient sites and unearthed cultural relics obtained through field excavation were added to China's broad historical study system. Thus, the means of piecing together and exploring ancient society became more diversified and well-founded.

However, there are different understandings about which event marked the birth of Chinese archaeology. So far, when telling the history of the development of Chinese archeology, archaeologists have regarded the excavation of Yangshao Site in Mianchi County, Henan Province by Johan Gunnar Andersson in 1921,[28] the excavation of Xiyincun Site in Xia County, Shanxi province by Li Ji in 1927,[29] and the excavation of Yin Ruins in Anyang by the Central Research Institute in 1928[30] as the marks of the occurrence of Archaeology in China. It is undeniable that these three archaeological events are of great significance in the history of Chinese archaeology. However, from the perspective of academic history, there are obvious differences in their academic value and symbolic significance. The reason why they are all regarded as landmark events is that there is no agreement on the connotation of these early excavations.[31] In other words, the focus of the discussants is different, which leads to different opinions.

Therefore, the premise of reaching an agreement is to first define the basic connotation of each of these archaeological events as a sign of the birth of archaeology in China.

[27] Michael Loewe, and Edward L. Shaughnessy, *The Cambridge History of Ancient China* (Cambridge University Press, 1993).

[28] Chen Xingcan 陈星灿, *Zhongguo shiqian kaoguxueshi yanjiu* 中国史前考古学史研究 [*Research on the History of Chinese Prehistoric Archaeology*].

[29] Yin Da 尹达, *Xinshiqi shidai* 新石器时代 [*Neolithic Age*] (Beijing: Sanlian Bookstore, 1979).

[30] Wang Shimin 王世民, "Zhongguo kaoguxue jianshi 中国考古学简史 [A Brief History of Chinese Archaeology]," in *Zhongguo dabaike quanshu kaogujuan* 中国大百科全书·考古卷 [*Encyclopedia of China, Archaeology Volume*] (Beijing and Shanghai: Encyclopedia of China Press, 1986).

[31] Zhao Hui 赵辉, "Zenyang kaocha xueshushi 怎样考察学术史 [How to Investigate the Academic history],".

We believe that the landmark event of the birth of archaeology in China should include at least two aspects: one is the earliest introduction of the research methods and discipline logic of modern archaeology into China, accompanied by archaeological fieldwork technology; the other is that the content and object of the archaeological excavation project must be an integral aspects of the discipline system of Chinese archaeology. In other words, it should be at the beginning of the timeline of the history of Chinese archaeology, with the significance of pioneering. It also should be modern archaeology, with the significance of discipline. Archaeological events with these two basic elements can be regarded as the start of modern archaeology in China.

The first standard actually contains two aspects. First of all, it must be the earliest in terms of time, that is to say, such activities have never happened in China before. At second, in terms of excavation form, the research methods and fieldwork techniques must be those unique to the discipline of archaeology. There have been many events related to archeological artifacts, sites and monuments in Chinese history. In today's academic terms, we can even attribute them to fieldwork and archaeological excavation (although they are tomb robberies). To some extent, such activities have influenced the history of China at a certain stage, or have had a profound academic impact in some fields. However, their methods are not archaeological, and thus do not have the significance of modern archaeology. Therefore, no matter how early they are, such activities cannot be associated with modern archaeology. Naturally, they cannot be used as symbols of the birth of archaeology in China. Therefore, the landmark event of the birth of Chinese archaeology can only be found from certain events in China after the emergence of modern archaeology in Europe in the middle of the 19th century and the introduction of it to the East. However, the brutal robbery and even destruction of various ancient cultural heritages by European, American, and Japanese explorers in China cannot be regarded as the practice of modern archaeology either.

The second criteria, the research content and research object of an excavation project must be within Chinese Archaeological discipline system, must be an integral part of the Chinese Archaeological discipline system, and its research methods must be in line with the logic of archaeology itself. According to the branch of Chinese archaeology, whether it is classified by scientific research institutions or universities, it is basically the so-called "five sections", namely Paleolithic archaeology, Neolithic Archaeology, Shang and Zhou archaeology, Warring States, Qin and Han archaeology, Wei, Jin, Southern and Northern Dynasties, Sui and Tang archaeology.

If we look at the history of Chinese Archaeology in this way, we will find that apart from the previously mentioned Yangshao Site, Yixincun Site and Yin Ruins in Anyang, the excavation of Zhoukoudian Site in Beijing also has the possibility of being a symbol of the birth of Chinese archaeology.

First of all, Andersson made an archaeological investigation on Zhoukoudian Site as early as 1921, noticing quartz-flakes which indicated that human beings had been present at the site. On Andersson's initiative the excavation was continued by Otto Zdansky, an Austrian paleontologist, who excavated some fossil teeth of the Peking Man at the site in early 1923.[32] Under the guidance of the famous paleontologist Walter W. Granger, the

[32] Johan Gunnar Andersson, "Early Man in Northern China," *Bulletin of the Museum of Far Eastern Antiquities*

excavation adopted advanced field excavation technology at that time, which has a high scientific level. Therefore, it can be regarded as the origin of the formal field excavation of Paleolithic Archaeology in China, and can also be regarded as the beginning of Chinese archaeological field excavation.

In terms of chronology, the excavation of Zhoukoudian Site should be the earliest practice of Western archaeology in China. The birth of Chinese Archaeology is a process. If we have to find a milepost, the excavation of Zhoukoudian Site is a standard option, though it is more about paleontology and paleoanthropology, it is also in Paleolithic Age. According to today's definition, it also belongs to the category of Chinese archaeology. Paleolithic archaeology has its own special theoretical system and excavation method, which is significantly different from the field excavation of Neolithic archaeology and historical archaeology, but this difference is within the same discipline system rather than discipline differences. In other words, Zhoukoudian Site is archaeological in nature, which is also explained by the fact that it was listed in the first batch of national key cultural relics' protection units. Similarly, in the current teaching system of archaeology in most of China's universities, the beginning of Chinese archaeology is also from the Paleolithic Age, to which the Zhoukoudian Site indisputably belonged.

For a long time, the excavation of Zhoukoudian Site has not been regarded as a marker of the birth of Chinese archaeology. On the one hand, the complex feelings of Chinese academic circles about a series of archaeological events in Zhoukoudian, such as the first discovery by foreigners, the loss of human skull fossils in the Japanese War of aggression against China and so on, have hindered the objective recognition of this archaeological project. On the other hand, national archaeological research institutions stripped away Paleolithic archaeology for non-academic reasons, leading to a narrow construction of the discipline of Chinese archaeology. Paleolithic Age was deliberately ignored, so that the significance of the archaeological excavations at the Zhoukoudian site was artificially downplayed.

Whether the excavation of Yangshao or Zhoukoudian site is defined as the symbol of the birth of Chinese archaeology, we cannot avoid mentioning the role Andersson played. From pre-Qin scholars, Sima Qian to Andersson and Li Ji, from traditional historiography and epigraphy to modern archaeology, archaeology has finally taken root in China and become the most important force in the study and understanding of ancient Chinese society. Andersson worked hard all his life, so he is a monument in the history of archaeology.

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Preliminary Site Prospection Along the Tao River 2011-2013: Testing the Chinese Register of Archaeological Sites

by

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Abstract

The Tao River Archaeological Project (TRAP) is investigating technological changes in northwest China through focused research at previously known archaeological sites. Previously known sites in Gansu and elsewhere in China are listed in Provincial Registers of Sites, maintained by Provincial Institutes of Archaeology and Cultural Heritage. These registers are compiled of sites identified through various means, and the information contained within may not always provide verifiable chronologies or other descriptive characteristics that can be relied on for additional site-based research. This paper describes the site assessment that the TRAP team conducted at the beginning of the ongoing research project to examine the current conditions and landscape situation associated with known sites. In the process, we gathered data that can be used to assess the degree to which data in the site register are verifiable based on revisiting of site locations. The results suggest that the attributions listed are useful for identifying site locations and providing a rough idea of the chronological phase of archaeological sites but caution against the use of Register data in aggregate for broad scale comparisons of site numbers and occupancy in studies of population history and the rise and fall of cultural traditions.

Keywords:

Archaeological Site Assessment; Gansu; China; Tao River Valley; Technological Change; National Register of Archaeological Site in China

Introduction

In the region of East Asia currently within the Provinces of Gansu and Qinghai in the People's Republic of China, particularly in the Hexi Corridor and the Upper Yellow River valley and its tributaries (Fig. 1), archaeological research over the past 100 years has identified hundreds of sites dating to the third and second millennia BCE (ca. 5.0-3.0 ka). These sites provide critical data that illuminate a series of significant technological changes that impacted social changes across East Asia in ways that are fundamental to the emergence of complex stratified societies and that laid the foundations for later trans-Eurasian connections that eventually coalesced into "Silk Roads" of the historic periods.[1] Particularly important in understanding these processes of technological change are those sites associated with the advent or development of the "Qijia Culture" – a ceramic tradition that is widespread across the region during the period between approximately 4200 and 3500 years ago.[2] Bronze metallurgy became an increasingly important craft during this era, ceramic technology underwent radical changes, the use of wheat, barley, caprines, and possibly horses moved into the region from the west and north, architectural technology saw the increased use of materials such as lime plaster, and divination technologies involving the burning of animal bones start to be evident.[3] In various ways the creation and use of

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these technologies fundamentally transformed social relations across East Asia, and some technologies were active agents that played important roles in the complex polities that emerged at the core of early Chinese civilization. This paper outlines an early stage in a project aimed to explore these processes of technological change. At the same time, it presents an evaluation of widely used data on archaeological sites from a national register of cultural heritage in China.

To understand technological change in this broad region it is important that we begin to collect systematic data from specific local regions. Technologies change through innovation and / or the selective or wholesale adoption of new ways of doing things by individuals and groups at specific times and places and understanding the choices that were made about technological practices must be considered at the local scale. Here we discuss the early stages of a long-term effort to systematically investigate technological change in one local region, the Tao River Valley. This project, called the Tao River Archaeological Project (TRAP), began as a project directed by the Gansu Provincial Institute of Archaeology and developed into a collaborative effort between the Gansu Provincial Institute of Archaeology, Peking University and Harvard University. The early stage of this project presented here provides a model for initial assessment in a region where archaeological sites are known, but systematic survey has not been done, and the quality and /or detail of the existing site data is either uneven or unknown.

In this paper, we build off of data from the Third National Register of Archaeological sites for the Province of Gansu[4] and assess the degree to which our observations match those listed in this register. These data allow us to move forward on the research goals of the TRAP project through targeted research at selected sites from the existing site corpus. Registers such as this one provides datasets that are increasingly used for regional analyses, with the veracity of the data, particularly the cultural affiliations, being an important factor in arguments about population distributions and the overall trends of cultural expansion or contraction. After presenting our results from collections at sites in the Tao River, we evaluate the degree to which our finds coincide with the results from the National Register list. We find a coarse correspondence, but the degree of variation we observe calls into question any strong reliance on the National Register data to make arguments about large scale changes.[5]

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4 Zhongguo [Zhongguo Wenwu Dituji Bianji Weiyuanhui 中國文物地圖集編輯委員會], *Zhongguo Wenwu Dituji: Gansu Fence* 中國文物地圖集：甘肅分冊 [*Map of Cultural Relics in China: Volume of Gansu*], 3 vols. (Beijing 北京: Wenwu chubanshe 文物出版社, 2011).

5 See a related critique in: Yitzchak Y. Jaffe, Lorenzo Castellano, Gideon Shelach-Lavi, and Roderick B. Campbell, "Mismatches of Scale in the Application of Paleoclimatic Research to Chinese Archaeology," *Quaternary Research* (2020): 1–20.

Tao River Archaeological Project (TRAP)

The Tao River Archaeological Project aims to explore the local manifestations of technological changes associated with the development of archaeological cultures during the late prehistoric period of a single river valley. The chronological focus extends from the period of the Late part of the Yangshao culture (ca. 7.5–5.0 ka)[6] through the Xindian (3.6–2.6 ka) and Siwa (3.3–2.5 ka) culture periods, subsuming the Majiayao (5.3–4.6 ka), Banshan (4.8–4.3 ka), Machang (4.3–4.0 ka), and Qijia (4.2–3.5 ka) cultures in between (see Table 1). Preliminary work beginning in 2011 endeavored to identify known archaeological sites that are amenable to additional focused research that targets production facilities and production debris through a combination of surface collection, geophysical prospection, and small-scale excavations. After those preliminary assessments, archaeological survey was conducted by the Gansu Provincial Institute team starting in 2014, and an international collaboration involving additional survey and excavation started in 2015. Here we report the first stage of the project, which involved the evaluation of 531 Neolithic and Bronze Age sites through a combination of visual inspection on satellite imagery and over fifty site visits conducted between August 2011 and May 2013. On the basis of this preliminary work twenty sites were selected for additional future work. Some of this subsequent work has already been published,[7] while other aspects of this work is currently in the process of analysis and write up, including other articles in this issue of the *Bulletin of the Museum of Far Eastern Antiquities.*

6 Rough dates for cultural phases are given according to conventional understanding at the first mention of each cultural phase. These date ranges are all questionable to varying degrees and may not be appropriate equally in the Tao River region specifically. Few dates are published for the specific region, and prior to the TRAP project no dates were clearly contextualized in ways that help clarify the relationship between the presence of specific cultural traditions along the Tao River and the conventional date ranges for these cultural phases.

7 Andrew Womack, Timothy Horsley, Hui Wang, Jing Zhou, and Rowan Flad, "Assessing Site Organization and Development Using Geophysical Prospection at Dayatou, Gansu, China," *Journal of Archaeological Science Reports* 27 (2019/10/01/ 2019): 101964. https://doi.org/https://doi.org/10.1016/j.jasrep.2019.101964.; Womack et al., "A petrographic analysis…"; Andrew Womack, and Wang Hui, "Formation and Function of Majiayao and Qijia Pottery: Analysis of Manufacturing Marks and Use-Alteration on Vessels from the Tao River Valley," *Asian Perspectives* 59.1 (2020): 2–32; Hung Lingyu 洪玲玉, Wu Haosen 吴浩森, Ha Ke 哈克, Zhou Jing 周靜, Wang Hui 王輝, Chen Bozhen 陳伯楨, Li Shuicheng 李水城, and Fu Luowen 傅羅文. "Qijiaping: Qijia Wenhua Dianxing Yizhi Yanjiu De Xin Jinzhan 齊家坪：齊家文化典型遺址研究的新進展 [Qijiaping: Recent Developments in the Investigation of the Type Site of the Qijia Culture]." *Kaogu yu wenwu* 考古與文物 [*Archaeology and Cultural Relics*] 3 (2019): 63–74; Yitzchak Jaffe, Anke Hein, Andrew Womack, Kate Brunson, Jade D'Alpoim Guedes, Rongzhen Zuo, Jing Zhou, et al., "Complex Pathways Towards Emergent Pastoral Settlements – New Research on the Bronze Age Xindian Culture of Northwest China," *Journal of World Prehistory* (2021): TBD.; Womack et al., "Mapping Qijiaping"; Womack et al., "The Majiayao to Qijia Transition."

Table 1. *Late Prehistoric Cultural Phases in the Tao River Valley.*

Culture	Approximate Dates ka
Yangshao (YS) [Miaodigou (MDG)]	7.5–5.0 6.0–5.5
PAINTED POTTERY TRADITIONS:	
Majiayao (MJY)	5.3–4.6
Banshan (BS)	4.8–4.3
Machang (MC) Banjialin (BJL)	4.3–4.0 4.3–4.0
LATER CULTURES:	
Qijia (QJ)	4.2–3.5
Xindian (XD)	3.6–2.6
Siwa (SW)	3.3–2.5

The Tao River is located in south-central Gansu Province, and primarily runs south to north into the Yellow River, which it joins approximately 100 km upriver from downtown Lanzhou City (Fig. 1). The river begins at a source in Huangnan, Qinghai, at approximately 4000 masl, and runs through 13 administrative districts, to an elevation of approximately 1650 masl at its mouth (Fig. 2). The 531 known Neolithic and Bronze Age sites reported in the Third National Survey of Cultural Heritage completed in 2012, and considered in this research, are situated in ten counties: 49 sites in Weiyuan 渭源 County, 101 sites in Lintao 临洮 County, 45 sites in Min 岷 County, 39 sites in Lintan 临潭 County, 16 in Zuoni 卓尼 County, 109 in Yongjing 永靖 County, 12 in Luqu 碌曲 County, 54 in Kangle 康乐 County, 43 in Guanghe 广河 County, and 62 in Dongxiang 东乡族自治县 County.[8] These sites include many of the type sites for prehistoric archaeological cultures in the broader northwest region identified during early research in this region. The first of this early work was done by Johan Gunnar Andersson, the Swedish geologist often credited with founding scientific archaeology in China, who undertook archaeological reconnaissance in Gansu in

[8] Larger numbers of sites for some of these counties are included in the Third National Survey, but the additional sites are not in the Tao River drainage but instead in other hydrological systems. We restricted our consideration to sites within the Tao River system.

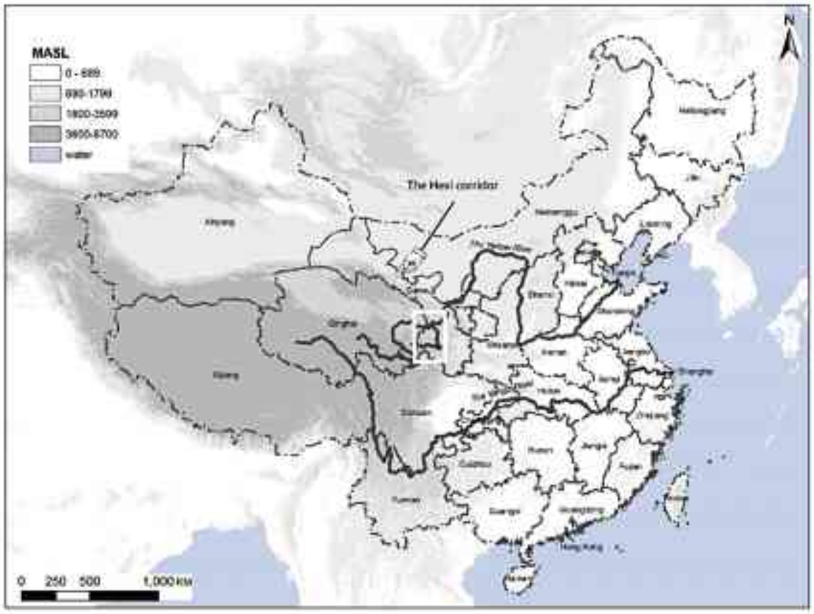

Figure 1. *Location of the Tao River (inset) tributary to the Yellow River and the Hexi Corridor in Northwest China.*

1923 and 1924 targeting, in part, the Tao River valley.[9] He came to Gansu in order to explore hypothetical connections between the ceramic assemblages discovered at Yangshao, Henan in 1921, and archaeological sites in Western and Central Eurasia.[10] He was drawn to the Tao River by locals who frequently unearthed painted pottery vessels in the area. He studied the geology of the area and also directed or commissioned excavations at several sites including Majiayao, Banshan, Qijia, and Xindian, all of which have become type sites for regional prehistoric cultures.[11] The Siwa culture type site Siwashan, also in the Tao River valley, was mentioned by Andersson in 1925, but only investigated decades later by Xia Nai in his critical evaluation of Andersson's cultural sequence.[12]

Sites listed in the register compiled during the Third National Survey include those known from published surveys, including the work by Xia Nai and others, most of which are also listed in the Gansu Province Atlas of Cultural Relics.[13] That publication is based on data from the Second National Survey. Also included are sites recently subjected to

9 Johan Gunnar Andersson, "Preliminary Report on Archaeological Research in Kansu," *Memoirs of the Geological Survey of China (Series A)* 5 (1925): 1–51; Johan Gunnar Andersson, "Researches into the Prehistory of the Chinese," *Bulletin of the Museum of Far Eastern Antiquities* 15 (1943): 1–198.

10 Johan Gunnar Andersson, "An Early Chinese Culture," *Bulletin of the Geological Survey of China* 5 (1923): 1–68.

11 Andersson, "Preliminary Report on Archaeological Research in Kansu".

12 Xia Nai 夏鼐, "Lintao Siwashan Fajueji 臨洮寺洼山發掘記 [Report on the Excavations at Siwashan in Lintao]," *Zhongguo kaoguxuebao* 中國考古學報 [*Chinese archaeological reports*] 4 (1949): 71–137.

13 Xia "Lintao Siwashan Fajueji"; Xia Nai (Shiah Nae), "New Discovery of a Ch'i Chia Culture Cemetery," *Journal of the Royal Anthropological Institute of Great Britain and Ireland* 76 (1946): 169–75; Xia Nai 夏鼐, "Qijia Qi Muzang De Xin Faxian Ji Qi Niandai De Gaiding 齊家期墓葬的新發現及其年代的改訂 [New Discoveries of Qijia Period Graves and the Revision of Their Chronology]," *Zhongguo kaoguxuebao* 中國考古學報 [*Chinese archaeological reports*] 3 (1948): 101–17; Zhongguo [Zhongguo Wenwu Dituji Bianji Weiyuanhui 中國文物地圖集編輯委員會], *Zhongguo Wenwu Dituji: Gansu Fence.*

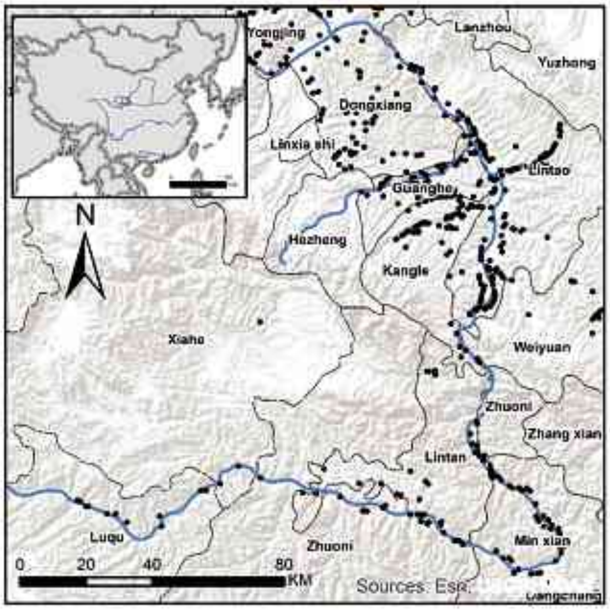

Figure 2.
Administrative districts and previously known sites along the Tao River valley.

excavation and locations that have not been closely examined but were either known to local cultural heritage professionals, otherwise came to the attention of the survey team, or were discovered during non-systematic walking surveys of possible site locations in the region. Because of the heterogeneous origins of these data, the degree to which they comprehensively and accurately represent precise locations of archaeological sites in the region is unclear. Furthermore, the degree to which assessments are accurate concerning the chronology of sites and their character, mainly whether they represent burial locations or settlements, or something else, remains unclear for most sites that have not undergone additional intensive examination. Nevertheless, since the data do include precise (if not necessarily accurate) GPS locations for all sites, and preliminary attributions to chronology and site type, our evaluation uses these as starting points for site evaluation.

Preliminary Evaluation and Site Distribution

We used the given site locations in the Third National Survey to locate the purported site locations on satellite imagery and SRTM-based elevation data for the region. This allows us to observe the general site distribution shown in Figure 2 and also get a sense of site clustering and site location tendencies. Furthermore, because many of these sites have tentative cultural affiliations, we are able to consider chronological trends in the locations of sites in the region.

Sites said to have Yangshao Culture remains are few in number. Only seven sites in the list date to this period, mostly in Min and Lintao counties (Fig. 3a). These are found around 1950 masl in the lower Tao River region around Lintao, and between 2230 and 2300 masl in the middle reaches of the Tao River in Min and Lintan counties. Painted Pottery Culture sites, including those that are associated with the Majiayao, Banshan and Machang phases, are more numerous. A total of 74 are listed in the survey (Fig. 3b). Most are distributed in the lower Tao River region, particularly in the counties of Lintao, Yongjing,

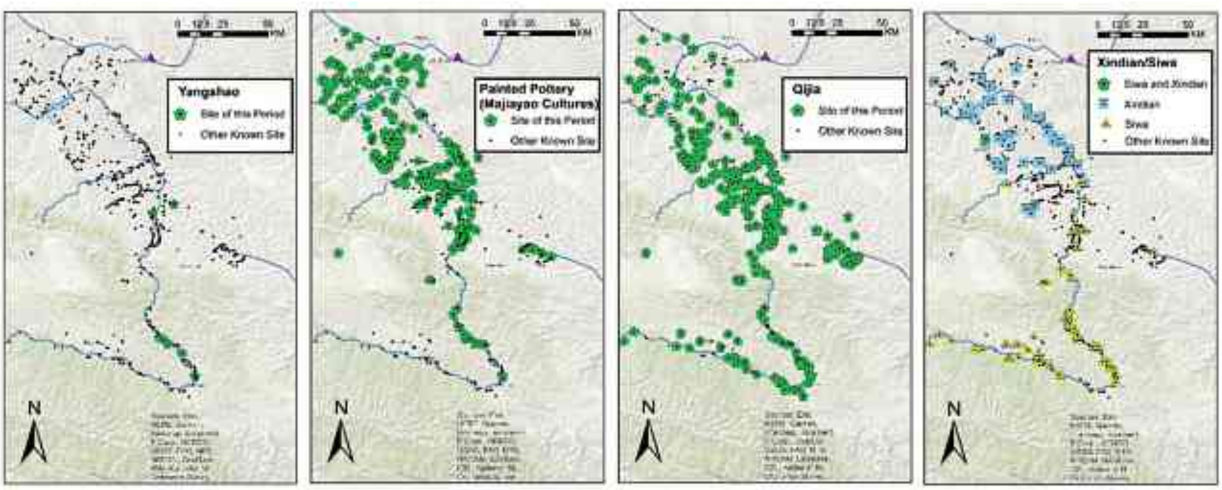

Figure 3. *Distribution of known sites from the Yangshao (3a), Painted Pottery (3b), Qijia (3c) and Xindian/Siwa (3d) cultures in the Tao River drainage.*

Guanghe, Kangle, and Dongxiang. These range in elevation from 1800 masl, with an average around 2300. Anecdotally, many of the Majiayao Culture sites located on the top of bluffs, relatively high above nearby water sources and in positions that are exposed to high winds, torrential rains, and with little tree cover, at least in recent centuries, are burial locales. Perhaps these positions were selected due to concerns about community defense.

Sites associated with the Qijia Culture number 166 and are distributed throughout the Tao River valley (Fig. 3c). There is a notable rise in the average elevation above sea level relative to earlier cultural phases, primarily due to the increased number of sites along the middle and upper reaches of the Tao River drainage (1700–2900 masl). This phenomenon is a local manifestation of the wide spread of the Qijia culture, a process that relates to the spread of new technologies across this region and other evidence for increased inter-regional interaction during this era. Conversely, during the next cultural phases, there seems to be a localization of cultural traditions. The 15 Xindian sites known along the Tao River are located in the lower reaches of the drainage between 1700 and 2100 masl, whereas sites with Siwa material (49) are mostly in the middle and upper reaches between 2000 and 2700 masl (Fig. 3d).

Our objective was not focused on assessing site size. Site sizes are not available in the list for the Third National Register for all sites, and we were not able to verify approximate site size except for those sites for which we have conducted additional stages of research. Although approximate site sizes based on published data from sites not systematically surveyed has been used by some scholars to examine site rank sizes in broad regions, the data are not available from this region and, even if they were, our assessment of some sites suggests that these approximations in this region rarely take into account the possibility that different periods at a site may reflect different areas of occupation.[14]

Our evaluation of specific site locations began with a visual assessment of the current topography and ground cover conditions for the sites based on Google Earth imagery. Sites

[14] Womack et al., "Assessing Site Organization…".

were observed to determine whether the locations were on steep slopes or were likely to be in low-visibility areas. Furthermore, extensive modern architecture or other factors that would impede geophysical prospection at sites made locations less conducive to further evaluation, and we also took into account logistical factors such as whether sites were sufficiently easy to access or were close enough to other sites to allow for the assessment of the maximum number of locations. We selected a total of 120 sites for further consideration. We then assigned a Class Rank to each site based on these factors and our impression of their suitability for further work. Class 1 sites were deemed most likely to be conducive to work; Class 2 were high priorities for further assessment; Class 3 sites presented some challenges and were therefore deemed less ideal; Class 4 sites were given initial consideration but given low priority, and Class 5 sites were initially considered due to their location but deemed most likely to be unsuitable upon further visual inspection of satellite imagery.

Our initial evaluation focused on sites in Dongxiang Autonomous County, Kangle, Guanghe, Lintao, Weiyuan, Min and Zuoni Counties. The second stage in our evaluation involve site visits to as many of the selected sites as possible during two trips in 2012 and 2013. In 2012, we visited sites over the course of five days in mid-June. In 2013, our visits took place over five days in late May. The sites in **bold** are those visited during the survey work discussed further below. We list the cultural affiliation as recorded in the Third National Survey: Yangshao (YS, sometimes further specified as "Miaodigou 庙底沟" type - MDG), Painted Pottery (i.e., "Majiayao" – MJY, sometimes further designated as Majiayao [MJY], Banshan [BS], Machang [MC] or Bianjialin 边家林 [BJL] subtype), Qijia [QJ], Xindian [XD], Siwa [SW], and Han [H]. GPS coordinates are approximate as are elevations.

Dongxiang Autonomous County included 16 sites deemed worthy of potential assessment of the total of 62 known prehistoric sites. These include one Class 2 site, seven Class 3 sites and eight Class 4 sites. We visited one site in Dongxiang during this survey (see Table 2, App A.).

Guanghe county contained 43 known sites, 20 of which were considered further. These include two Class 1 sites, ten Class 2 sites, six Class 3 sites and two Class 4 sites. We visited twelve of these sites (see Table 3, App A.).

In Kangle, 22 sites were considered further of the 54 known sites. Among these, there were six Class 2 sites, eight Class 3 sites and eight Class 4 sites. Six site visits are discussed below (see Table 4, App A.).

The list for Lintao County contained 101 known sites. Among these we considered 51: two Class 1, four Class 2; two Class 3; three Class 4; 40 Class 5. We visited 16 of these sites during the two seasons of preliminary survey, and an additional two sites in later years of the project (see Table 5, App A.).

In addition to our assessment of previously known sites in Lintao County, we have identified eight previously unknown prehistoric sites during the work of this project so far. These sites were all found during the 2019 geological survey of the Dabi River 大碧河 (traditionally known as the "river of making jade discs" 打璧河) and its Guojiagou 郭家沟 tributary. All of these locations have more than three prehistoric artifacts that were collected during initial site evaluation (see Table 6, App A.).

Forty-nine known sites are listed in Weiyuan County. Most are not in the Tao River drainage. Only two were selected for consideration, both as Class 5. Both sites were visited (see Table 7, App A.).

In Min County a total of 45 sites are listed in the county: we ranked sixteen of these as sites to consider, fourteen of which we visited. Ten sites we ranked as possible sites for future work. These ten sites include one Class 1, three Class 2, one Class 3, two Class 4, and three Class 5 (see Table 8, App A.).

Finally, in the county of Zuoni there are sixteen known sites, one of which we designated a Class 4 site, but in the end, the site was not visited (see Table 9, App A.).

Site Visits and Evaluation

Over the course of three prospection campaigns from 2011–2013 we visited 49 of the more promising sites subjected to preliminary evaluation. An additional 12 sites are listed in this register that include locations we considered but could not visit for various reasons, or sites that were discovered during reconnaissance work along the Dabi River in 2019 (Fig. 4). The objective of these visits was to assess the surface conditions and the degree to which archaeological remains were evident and potentially in situ. In most cases, site visits involved our team fanning out around the identified site location as recorded in the

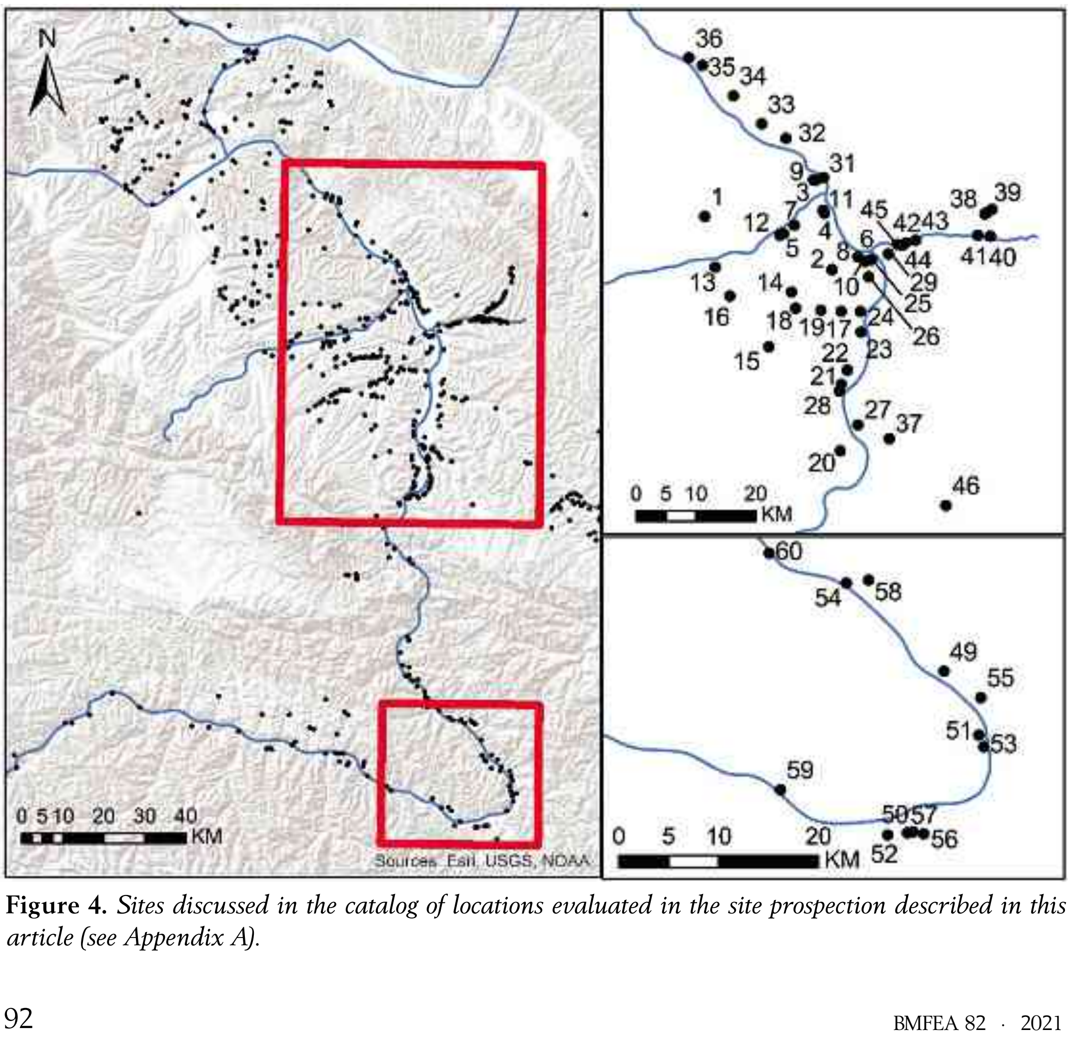

Figure 4. *Sites discussed in the catalog of locations evaluated in the site prospection described in this article (see Appendix A).*

National Survey register and looking for surface remains such as ceramic fragments and stone artifacts, as well as terrace profiles with visible cultural remains including pits, house foundations or layers with artifacts or other anthropogenic soils. Although we did not attempt in this phase to complete a comprehensive full-coverage survey of any site, some locations have already been assessed in more detail in later phases of the project and others may be further investigated in future seasons.[15]

Appendix A contains nine tables and a catalog that summarizes our evaluation of the visited sites and provides information on the archaeological remains collected at each location. The list follows the order of their listing in the county site lists of Appendix A. The preliminary work described in this appendix allows us to assess the degree to which brief data presented in catalogs such as the Third National Survey Register are replicable by archaeologists who wish to use these data for general assessments of site location and cultural affiliation.

For each location discussed in the appendix the description includes the site name transliterated and in Chinese characters, the master Site Code assigned to the location, and the individual codes used in different seasons, as well as the rough location coordinates and the Class Rank. We provide brief descriptions of the landscape around the recorded point associated with Supplementary Figures[16] that show a representative photo of the surrounding area. Supplementary Tables likewise provide all of the identification information for artifacts collected during the site visits.[17] In some cases there are several distinct loci associated with a single site name or site code. These associations are also clarified in the descriptions in this catalog.

During the survey there were several general observations that are worth mentioning. First, throughout the Tao River, all of the prehistoric sites lack any surface remains and therefore all evidence of prehistoric activity was limited to artifacts found on the cultivated surface of agricultural fields or in stratigraphic profiles exposed in terrace cuts or erosional gullies. It was sometimes the case that discussions with locals aided in the ability to pinpoint locations of artifact concentrations or visible evidence of intact stratigraphy. This was not possible in all instances, however.

In most cases, the artifacts recovered were limited to fragmentary ceramic sherds, and occasional lithic tools. The ceramics are the basis for our identification of affiliated cultural traditions. They are not the only noteworthy artifacts, however. Given our particular focus on technological practices, we were excited by the discovery of a pottery-manufacturing paddle or anvil (Fig. 5) at the site of Sunjiaping 孙家坪 (LSJ, No. 24 in Appendix A). This pottery tool was small, approximately 6.5 cm long by 5.5 cm wide and 2.5 cm thick, with a broken handle and is a surface find that points to specific activities that may be further investigated by focused survey and excavation at the site.

[15] See Womack et al., "Mapping Qijiaping…"; Womack et al, "Assessing Site Organization…"; Jaffe et al, "Complex Pathways…".

[16] Figures labelled S# are available as supplemental information in the Harvard Dataverse repository at: https://doi.org/10.7910/DVN/HN6DPY. The full citation is: Flad, Rowan (2021). Flad et al. 2021 BMFEA 82 Supplemental Files, Harvard Dataverse.

[17] Ceramic sherd and other artifact identifications and other basic descriptive information are provided in the Harvard Dataverse repository at: Flad, Rowan (2021). Flad et al. 2021 BMFEA 82 Supplemental Files, Harvard Dataverse. https://doi.org/10.7910/DVN/HN6DPY

Figure 5. *Pottery production tool found on surface at Sunjiapi*

A similar find was recovered at the site of Qijiaping 齐家坪 (GQ, No. 8 in Appendix A), although not during the initial prospection work at that site but instead during a second stage of research during which we conducted full-coverage field collections in association with geophysics and small-scale excavations.[18] Qijiaping is one of several locations visited during the initial prospection work reported in this manuscript that is a type-site for archaeological cultures in the region. Other type sites visited during the survey included Banshan 半山 (GB, No. 2 in Appendix A), Majiayao 马家窑 (LM, No. 21 in Appendix A), Xindian 辛店 (LX, No. 31 in Appendix A), and Siwashan寺洼山 (LS, No. 20 in Appendix A). Our first visit to Qijiaping, in 2012, was brief and mainly focused on observing the surface conditions and led to additional focused survey starting in 2013 (Fig. 6). Similar to many sites visited throughout this survey, much of the terrain at Qijiaping at the time of surface collection was characterized by cultivated maize fields. Fields in the region are often covered with plastic sheeting to control the growth of weeds, and rows of maize plants project through this sheeting as the plants grow. Consequently, both the sheeting, and then by June the maize plants themselves, sometime obscure the ground surface and impact visibility of artifacts during survey.

Other locations visited during the survey were places where the surface of the site was not under cultivation, but where surface disturbance of other sorts impacts the visibility of archaeological material. The Xindian type site is an example of this. Here, at the time of our first visit in 2011, the top of a bluff where research had been conducted by J. G. Andersson in the 1920s had been flattened by relatively recent land reforming (see Figure S85), while by 2017, a viewing pagoda was built on the top of this bluff (see Figure S86) and the surrounding fields were developed into covered greenhouses and fields planted with

[18] Womack, et al., "Mapping Qijiaping...,"497 and *passim.*

Figure 6. *Surface conditions at Qijiaping during surface survey in May 2013*.

trees (Fig. 7). Additional research at Xindian and the contemporary site of Huizuiwa 灰嘴屲 (LH, No. 32 in Appendix A) have revealed the nature of Xindian sites in the Tao River region under investigation in this project.[19]

As the descriptions throughout Appendix A make clear, each of the many sites visited during the initial stage of research in the TRAP project had individual factors that affect the visibility of archaeological remains in the immediate area and the potential for additional research. Based on the initial assessments, twenty sites were selected for further potential research including additional prospection and excavation from 2015–2019.

Figure 7. *Surface conditions on the bluff top at Xindian in May 2017.*

[19] Jaffe et al., "Complex Pathways...".

Excavation permission was granted in October 2015, and subsequently began in 2016 with intensive survey and geophysics that eventually took place at Qijiaping, Huizuiwa, Dayatou, Siwashan, Majiayao, and Xindian, and with excavations at Qijiaping in the summer of 2016, followed by additional excavations at Qijiaping, Huizuiwa and Dayatou.[20] The project is ongoing, and additional study of these sites and materials and others will continue as we continue to refine our understanding of Prehistoric settlements in the Tao River valley.

Testing the Register Against TRAP Survey Results

The results of our site visits provide an accounting of the assessment of less than 10% of the known and listed sites in the Tao River valley. Of the 61 sites that we discuss, 47 both occur in the National Register and were assessed by team members during our preliminary site assessment. Table 11 lists these 61 sites along with the number in Appendix A and the site code. The column "Listed Cultural Affiliation" identifies the cultural tradition from Table 1 that is associated with the site according to the National Register. The next column, "Collected Cultural Material," identifies those cultural traditions for which we were able to find evidence during our surface collection. These columns are then followed by a "Comparison," which identifies whether the collection is similar or different than the National Register designation, and a column which identifies the dominant culture in the surface collection, when multiple phases are represented but a subset of phases is most common or prevalent.

Among the 47 sites in both the National Register and the survey, the survey team found only post-Han or unidentifiable at one (Tangjiazhuang – LT). We have coded this "Unid." in Table 11. Another (Wenjiaping – LW) contained two "Neolithic sherds", which we label "YS/MJY" in this Table. Accordingly, we can compare 46 sites between the register and the survey results. Among these 46 sites, nine (20%) have the exact same cultural affiliations represented in our collections and the register (coded as "Same" in "Comparison" column of Table 11 and highlighted in green). Nine (20%) have completely different cultural affiliations in our collection and the register (coded "Different" and highlighted in pink). In seventeen (37%) locations we discovered both artifacts from the listed cultural periods as well as additional cultural material ("Same+", with the final column highlighted orange) and eight (17%) contained some but not all of the cultural materials in the registry list ("Same-", highlighted in yellow). Finally, in three cases (7%), there is some overlap with the registered cultural affiliation and what we recovered, although additional cultural traditions are present and some listed traditions are missing ("Same+/-", highlighted in blue). We also list some examples where we were unable to collect any remains "N/A" for various reasons, and the sites that were newly discovered by our survey (Nos. 38–45) are naturally not included in this comparison.

The "Same-" observations are the easiest to explain away as the result of incomplete collection on the part of our team. It is likely that in some of these cases, additional inspection may result in a "Same" situation or, in other cases, a previous locus of cultural material may have been destroyed by erosion or development. The cases of "Same+", "Same+/-"

[20] Womack et al., "Mapping Qijiaping…"; Womack et al, "Assessing site organization…"; Hung et al., "Qijiaping…"; Jaffe et al., "Complex pathways…".

and "Different", however, totaling 29 of 46 locations (63%), are cases where our collection produced a different list of collections that changes the number of cultural loci known. Based on this assessment, we might expect that more than half and perhaps as many as 2/3 of all sites in the cultural registers have errors in the listed affiliations. Some of these errors may be minor. A portion of the "Same+" sites, for example, may be primarily sites of the tradition listed in the register. Zhujiaping (LZJP; No. 27) is an example of this. It is listed in the register as a Majiayao site and most of the remains we collected indeed are from the Majiayao period. There is evidence, however, of some Siwa, Han and later material here as well, and this evidence should not be elided by designating the site only a location of Majiayao activity. In any case, the degree of difference we see in our data from the register list is enough that it should give a major pause to those who accept the National register data as a solid basis on which to make larger arguments.

On further examination, however, our results show that the data of the National Register remain useful for cautious aggregate assessments of prehistoric trends and for targeting sites with remains from a particular period. We can illustrate the first usefulness by examining further the 46 sites where we can compare the National Register data with our survey results. In those sites, the National register data suggests that 2 (4%) have Yangshao remains, 25 (54%) have Painted Pottery remains, 34 (74%) are Qijia sites, 9 (20%) are Xindian and/or Siwa sites, and 2 (4%) are listed as having Han material (Table 13).

It is important to remember that this is a heavily biased sample based on our choices about what sorts of sites we intended to focus on in our project, and we should not, therefore, interpret these numbers as reflective of the prevalence of occupation in the region during these time periods. For example, our project is focused on technological change in the Late Neolithic and Bronze Age, so we did not select any sites to investigate that were registered as being Han sites, and those with Han material are primarily understood to have remains from earlier eras. Nevertheless, we can compare these numbers with those from the *same* sites based on our collections to see how similar or different they are. Based on our surface collections, 3 (7%) sites may have Yangshao remains, another 29 (63%) have Painted Pottery remains, 30 (65%) are Qijia sites, 13 (28%) are Xindian and/or Siwa sites, and 17 (37%) have Han remains.

The differences between these two sets of results are significant [X^2 (4, N=164) = 11.041, p = .02610707], mainly because the Han period values are so different from one another. This may reflect a tendency of archaeologists to underreport the presence of "Han" material, in part due to its ubiquity in the landscape. If we ignore the Han data, the differences are not significant [X^2 (3, N=145) = 1.303, p = .72842082], which suggests that the presence and absence of pre-Han cultural materials might be reasonably well represented *in aggregate* in the National register data.

Furthermore, if we return to the data presented in Table 11 we can consider whether the National Register data reflect the dominant material at sites that we surveyed. It is the case that the cultural traditions present in our collections during survey include some affiliations that are based on one or two sherds. Focusing our attention on those locations where the number of collected sherds from Han and earlier is greater than 2 (listed in square brackets as "Han and Pre-Han N"), we can evaluate how reflective the National Register is of the identifiable material at the recorded location. In this comparison, we

Table 11. *Cultural Affiliation Comparison Table.*

Report No.	Site Code	Site Name	Listed Cultural Affiliation	Collected Cultural Material [Han and Pre-Han N]	Comparison	Dominant Culture(s) in Survey
01	**DF**	**Fengjiashan 冯家山**	**XD**	**MJY(BS); QJ [17]**	**Different**	**QJ**
02	GB	Banshan 半山	MJY(BS)	MJY(BS); QJ [2]	Same+	
03	GW	Wotuonanping 卧驼南坪	MJY	MJY(MJY); MJY(BS); MJY(MC); QJ; SW [58]	Same+	MJY
04	**GDJW**	**Dengjiawan 邓家湾**	**MJY; QJ**	**MJY(BS); QJ [56]**	**Same**	**MJY; QJ**
05	**GM**	**Maojiaping 毛家坪**	**MJY; QJ**	**MJY(BS); QJ [6]**	**Same**	**MJY; QJ**
06	GD	Dongping 东坪	MJY; QJ	MJY [3]	Same-	MJY
07	**GZ**	**Zuishang 咀上**	**MJY; QJ**	**MJY(MC); QJ [22]**	**Same**	**MJY; QJ**
08	GQ	Qijiaping 齐家坪	MJY; QJ	QJ [51]	Same-	QJ
09	GQW	Qiantuoluo 前陀螺	MJY; QJ	QJ [1]	Same-	
10	GQD	Quandi 泉地遗址	MJY; QJ	MJY [2]	Same-	
11	GS	Shizuitou 石咀头	MJY; QJ; XD; H	QJ; XD; SW [42]	Same+/-	XD
12	**GP**	**Pingzuizui 坪咀咀**	**QJ**	**QJ [6]**	**Same**	**QJ**
13	**GG**	**Gamozui 尕磨咀**	**QJ**	**MJY; H [6]**	**Different**	**MJY**
14	KDP	Daping 大坪	MJY(BS); QJ	MJY; MJY(BS); QJ; SW [43]	Same+	MJY; QJ; SW
15	**KH**	**Hewandi 河湾地**	**MJY(BS); QJ**	**MJY; QJ [74]**	**Same**	**QJ**
16	KDYT	Dayatan 大牙滩	MJY(BS); QJ	QJ	Same-	QJ
17	KC	Chunshu 椿树	MJY(MJY); QJ	MJY; QJ; SW; H	Same+	MJY; QJ; H
18	KG	Ganjiaya 甘家崖	QJ	MJY; QJ	Same+	QJ
19	KW	Wangjia 王家遗址	QJ; H	QJ	Same-	QJ
20	**LS**	**Siwashan/Miaoping E'ergou 寺洼山/廟坪鵝兒溝**	**MJY(BS); SW**	**MJY; SW**	**Same**	**MJY; SW**
21	LM	Majiayao 马家窑	YS(MDG); MJY; QJ; SW	MJY(MJY); MJY(BS); QJ; H	Same+/-	MJY; QJ
22	LF	Fengjiaping 冯家坪	QJ	QJ; H	Same+	QJ
23	LXY	Xiayanjia 下闫家	MJY	MJY; H	Same+	H
24	LSJ	Sunjiaping 孙家坪	QJ	MJY; QJ; XD; H	Same+	MJY; H
25	LD	Dayatou 大崖头	MJY	MJY(MJY); MJY(BS); QJ	Same+	MJY

→

→

26	LHW	Huwa 虎洼	MJY; QJ	MJY; H	Same+/-	MJY
27	LZJP	Zhujiaping 朱家坪	MJY(MJY)	MJY; SW; H	Same+	MJY
28	LT	Tangjiazhuang 唐家庄	QJ	Unid	N/A	
29	LNP	Nanping 南坪	MJY(BS)	N/A	N/A	
30	LJ	Jiucaiwan 韭菜湾	MJY(MJY); QJ	MJY; QJ; SW	Same+	MJY; QJ
31	**LX**	**Xindian 辛店村东**	**MJY(MJY); XD**	**MJY; XD**	**Same**	**MJY; XD**
32	**LH**	**Huizuiwa 灰嘴洼**	**XD**	**XD**	**Same**	**XD**
33	LK	Kan'erhongliang 坎儿红梁	XD	QJ; XD; SW	Same+	XD
34	**LSM**	**Shangmajiacundong 上马家村东**	**XD**	**MJY; QJ**	**Different**	**MJY**
35	**LSJP**	**Shijiaping 石家坪**	**QJ**	**QJ**	**Same**	**QJ**
36	LY	Yangjiazui 杨家嘴	QJ	N/A	N/A	
37	LW	Wenjiaping 文家坪	QJ; SW	YS/MJY	Different	
46	WJ	Jinjiashan 金家山	QJ	QJ; H	Same+	QJ
47	WQ	Qijiawa 祁家屲	MJY(BS); QJ	QJ	Same-	QJ
48	MZZ	Zhongzhai 中寨	SW	N/A	N/A	
49	MT	Tana 他那	QJ; SW	YS/MJY; H	Different	YS/MJY
50	MD	Dazhuang 大庄	QJ	MJY; QJ; H	Same+	QJ
51	MYZ	Yaozhuang 姚庄	QJ	QJ; H	Same+	QJ
52	**MSE**	**Sishang 寺上**	**QJ**	**H**	**Different**	**H**
53	MS	Shannashuzha 山那树扎	YS; MJY; QJ; SW	MJY	Same-	MJY
54	MZ	Zhama 扎马	QJ	YS/MJY; QJ; H	Same+	QJ
55	MXL	Xinglin 杏林	QJ	N/A	N/A	
56	MWJS	Wangjiashan 王家山	QJ	N/A	N/A	
57	MY	Yanwaping 砚洼坪	QJ	MJY; QJ; H	Same+	H
58	**MP**	**Padiping 葩地坪**	**MJY**	**QJ; SW; H**	**Different**	**QJ**
59	**MG**	**Guoha 郭哈**	**QJ**	**H**	**Different**	**H**
60	**MGJ**	**Guojiapu 郭家堡**	**QJ**	**SW**	**Different**	**SW**
61	MQJS	Qijiashan 齐家山	QJ	N/A	N/A	

discover that more than 2/3 of the sites are "Same" or "Same-" (see Table 12), an inverse of our initial assessment of the accuracy of the National Register attributions. Based on this, we see that in this sample of sites, approximately 2/3 of the time the National register information generally reflects what we discovered or might expect to discover if additional material is found. Still, however, 1/3 of sites we visited do not appear to contain material that coincides with the cultural affiliation(s) listed in the National Register data.

Conclusion

In conclusion, the prospection of sites in the Tao River valley has provided us a solid foundation for additional work in the region on questions related to technological change in the Late Neolithic and Early Bronze Age. We have combined observation of satellite imagery, a preliminary survey of known archaeological sites, and new survey in a region previously unexplored and here describe the results of collections at known and previously unknown sites from the Neolithic through Han periods. This survey has revealed that the attributions listed in the Third National Register of Cultural Heritage are useful for identifying site locations and providing a rough idea of the chronological phase of archaeological sites. This register appears to accurately list cultural affiliations that can be reproduced through surface survey 2/3 of the time, but the other third of the time the attributions cannot be verified by surface survey. Furthermore, roughly 2/3 of the time, even though the primary attribution appears to be generally correct, more minor components of sites are not listed in the National Register. This should be a caution for those who use the National Register data in aggregate for broad scale comparisons of site numbers and occupancy in studies of population history and the rise and fall of cultural traditions.

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Appendix A:

Dongxiang County Sites

1. Fengjiashan 冯家山. Site Code: DF; Season Codes: 13DF, 13DF-下. (N 35°33'35.1"; E 103°36'09.0") [RANK 2]: Visited on May 23, 2013, Fengjiashan in Dongxiang County was previously recorded as a Xindian period site. At this and other sites in the preliminary survey discussed here, we assessed where we would set up a total station to map the site in more detail and considered the surface conditions and prospects for geophysics. At Fengjiashan, the area around the GPS point was relatively flat and open (Supplementary Figures S1).[21] Corn covered most of the fields. A brief survey uncovered some ceramics (Figure S2). A total of 22 ceramics were collected (FCN 1006), but only one of these was pre-Han in date (a Banshan body sherd), and four were roof tile fragments (See Supplementary Table S1). Discussions with local farmers indicated that terraces closer to the river were more promising. There we found signs of pits and cultural levels in the main terrace profile, prompting us to designate the area "**Lower Fengjiashan** 冯家山下" (N35°33'43.8"; 103°36'04.3"; Figure S3). There we collected 24 ceramics fragments (FCN 1020; Figure S4) and a sediment sample. Among the ceramics, six were Han or later, and one was unidentifiable, but the others include one Banshan fragment and 16 Qijia culture sherds. Nearby we also observed red clay deposits in the geological section exposed by the river below the yellow loess.

Table 2. *Dongxiang County Sites.*

Site Code	Site Name	Cultural Affiliation	Easting	Northing	Elevation	Class
	Laobatuoluo 老坝坨罗	MJY	103°30'59.5"	35°43'25.9"	2400	4
	Wujiashan 五家山	MJY; QJ	103°32'59.4"	35°33'40.5"	2106	3
	Miaopingsi 庙坪寺	MJY; QJ	103°33'52.1"	35°48'11.6"	1763	3
	Zhangjiacun 张家村	MJY; QJ	103°33'33.0"	35°47'41.1"	1774	3
	Bayaping 包牙坪	MJY; QJ; XD	103°43'18.9"	35°39'24.0"	1800	3
	Huangjiaping 黄家坪	QJ	103°28'22.7"	35°32'24.1"	2131	3
	Hulangshuicha 胡浪水叉	QJ	103°33'33.6"	35°41'03.4"	2142	4
	Zhazituoluo 扎子坨罗	QJ	103°33'09.5"	35°30'40.0"	2325	4
	Tangwang 唐汪	QJ; XD	103°31'34.3"	35°47'53.1"	1857	4

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[21] Flad, Rowan (2021). Flad et al. 2021 BMFEA 82 Supplemental Files, Harvard Dataverse. https://doi.org/10.7910/DVN/HN6DPY.

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	Ganjiaping 甘家坪	QJ; XD	103°40'45.4"	35°39'59.4"	1860	4
	Changgeda 长疙瘩	QJ; XD	103°30'59.7"	35°49'44.5"	1774	4
	Zhuoziping 桌子坪	XD	103°38'35.7"	35°42'46.8"	1791	4
	Putaoshan 葡萄山	XD	103°34'30.3"	35°47'21.9"	1829	3
	Jiujia 酒家	XD	103°35'13.3"	35°33'21.8"	1997	4
DF	**Fengjiashan 冯家山**	**XD**	**103°36'09.0"**	**35°33'35.1"**	**1985**	**2**
	Puzishan 堡子山	XD	103°30'27.3"	35°33'37.3"	2160	3

Guanghe County Sites

2. Banshan 半山. Site Code: GB; Season Code: 13GB. (Sanpu Location: N 35°26'45.1"; E 103° 46'39.5"; Actual Location: N 35°28'46.1"; E 103°47'39.8") [RANK 4]: This is the type-site of the Banshan culture identified by J.G. Andersson in his collecting work in the Tao River.[22] Although long known as an important site because of this work, no systematic excavations have been reported there. On May 24, 2013 we visited the site. Our first attempt to find the site followed the GPS coordinates listed in the Third Cultural Heritage Survey of China. We now call this location "Banshan Sanpu" (半山三浦; BS(SP)) to designate it in our database. The drive up to that location was precarious and scenic. We went up a steep dirt road onto the top of a ridge and along it until we reached a small hamlet from which a small road wound downhill to the north (Figure S5). The villagers we spoke to said there were no ceramics near their village and that, in fact, Banshan was on a different ridge that they pointed out in the distance to the north (Figure S6). They also pointed out where Waguanzui 瓦罐咀 and Bianjiagou 遍家沟 were, also on the same ridge. Waguanzui was said to be next to the mosque that we could see on the distant ridge; Banshan was further east under a visible electricity pole; and Bianjiagou was even further east below a white building. These three loci were all visited by Andersson in the 20s, so it is logical that they were all in the same general area, but they were apparently nowhere near where the site list had the GPS point for Banshan. A visit to the GPS point as listed confirmed there was nothing noteworthy in the open, flat fields of corn.

Later that day we visited the pointed locations of Waguanzui, Banshan, and Bianjiagou. At Banshan village (at the "actual location" listed here) we quickly discovered some Banshan phase pottery on the village road (Figure S7). We did not collect much pottery here – only three pieces total (FCN1014), two of which date to the Qijia culture period

22 See Magnus Fiskesjö, and Chen Xingcan, *China before China: Johan Gunnar Andersson, Ding Wenjiang, and the Discovery of China's Prehistory* (Stockholm: Museum of Far Eastern Antiquities, 2004); Nils Palmgren, "Kansu mortuary urns of the Pan Shan and Ma Chang groups, China. Geological survey," *Palaeontologia sinica*, ser. d. vol. III. fasc. I. (Peiping [Peking]: Geological survey of China, 1934).

(Table S2). Villagers said there were painted pots that would come out of the fields occasionally when they were farming. We walked down the road, looking at adjacent fields, most of which were covered with plastic protecting young corn. Some of the locals said that most of the pottery was found over at Waguanzui.

3. Wotuonanping 卧驼南坪. **Site Code: GW; Season Code: 13GW (N 35°36'49.5"; E 103° 46'10.6") [RANK 1]:** We visited this site on May 25, 2013. The site is listed as a Majiayao site in the Third Survey. The listed GPS point was just to the west of a road that goes along the bottom of terraces on the west side of the Tao River. We looked on the terraces above and next to the point and did not find much of anything other than corn and some small trees (Figure S8). On the terrace on the other side of the road **(N 35°36'51.2"; E 103°46'11.6")**, however, where a backhoe digging a loess borrow pit was in the midst of destroying the terrace, we discovered ample evidence of pottery, including fragments that could be identified as Majiayao, Banshan, Machang, Qijia and Siwa. A total of 68 sherds were collected and analyzed (Figure S9). Most were identified as "Majiayao," used in this case as a generic identification for the Neolithic period including Majiayao, Banshan and Machang phases (Table S3). Several fragments could be securely identified to Banshan or Machang phases. In addition, at least two pits were visible in the profile of the loess borrow pit, and on the far east side of the terrace area we found a profile with a cultural layer visible **(N 35°36'50.6"; E 103°46'14.5")**. We took sediment samples from the cultural level and from one of the pits (H1) in the borrow pit containing black material (Figure S10), possibly charcoal **(N 35°36'51.6"; E 103°46'11.7")**. We also observed human remains that had eroded out of the wall of the borrow pit and were scattered on the bottom.

4. Dengjiawan 邓家湾. **Site Code: GDJW; Season Code: 13KD (N 35°33'51.7"; E 103° 46'58.8") [RANK 3]:** We visited this site on May 23, 2013. The locus is on top of a steep bluff overlooking the Tao River (Figure S11). The area is completely open and flat, although terraced. The bluff was littered with painted pottery. Much of this must have come from the innumerable looters' pits scattered across the top of the bluff (Figure S12). Fragments of Banshan and Qijia type pottery were present (Figure S13). Of the 56 sherds we collected, about half are Banshan and half are Qijia types (Table S4). The evidence of looting is spread across a pretty large area. The site is primarily a burial area without a clear residential component.

5. Maojiaping 毛家坪**. Site Code: GM; Season Code: 13GM-E, 13GM-W, 13GM-WM (N 35°32'02.8"; E 103°43'15.8") [RANK 3]:** Visited on May 23, 2013, the location in the list was on a big flat area and was listed as a Majiayao / Qijia period site (Figure S14). There were no clear concentrations of sherds, although we did find a Han period tomb sticking out of the profile to the west of the original GPS around N35°31'57.5"; E103°43'12.3". Conversely, the locals said there used to be lots of pottery in the fields, so perhaps more concerted interviews would point to a focal area. The location seems very similar to a site listed in the *Wenwu dituji* as "Zhalazui," which is supposed to be a provincial level protected site with a Banshan residential component. Due to the size of the site examined, we collected separate materials from East and West Maojiaping, and a third collection from near the tomb. In the East area, 13 sherds were collected (Figure S15). Four are Qijia sherds and two Banshan sherds (Table S5). In the West area, two of the ten collected sherds date to the Banshan, and two are Qijia types (Figure S16). The other collected sherds were Han or later. All of the sherds collected from the tomb area seem to be Han sherds.

6. Dongping 东坪. Site Code: GD; Season Code 13GD. (N 35°29'30.6"; E 103°50'38.1") [Rank 2]: Dongping is a locus very close to Qijiaping (GQ). We did a first visit on May 22, 2013. The area consists of several high terraces (Figure S17). The GPS point is right on the edge of a deep gully and there was little evidence of anything archaeological on the terraces, either in the way of surface remains or profiles. It does not seem like a promising site by itself, but along with Quandi (GQD) it is part of the area between Qijiaping and Dayatou (LD). The intensive TRAP survey of Qijiaping and Dayatou, described in other publications,[23] eventually covered the area of both Dongping and Quandi. The initial collection at the site recovered three Majiayao sherds (Figure S18; Table S6).

7. Zuishang 咀上. Site Code: GZ; Season Code: 13GZ. (N 35°32'49.3"; E 103°44'13.7") [RANK 3]: Visited on May 23, 2013, this is another terrace-top site, which was easy to reach along a relatively new road through a small village above a new mosque. The area is very open and flat (Figure S19). The Google earth images available in 2013, however, were very different from the current state of the place, with new houses and a new road across the area. Near the road was a cultural layer, but no ceramics were found in the profile. Some painted pottery was found on the site. A total of 28 sherds were collected (Figure S20). Six of these were Han or later, and three were identifiable as Machang type sherds (Table S7). The remainder were Qijia types.

8. Qijiaping 齐家坪. Site Code: GQ; Season Codes: 12GQ, 13GQ-Y, 13GQ-中, 14GQ. (E 103°50'00.86"; N 35°29'48.77") [Rank 1]. June 17, 2012 was the first visit to the type site of the Qijia culture by members of the team. Our primary focus during that visit was to get a sense of the crop coverage of the site. Many of the fields were growing corn. The open flat topography of the site and previous excavation and survey work there provided a solid foundation for us to conduct additional work. As described elsewhere,[24] our work at Qijiaping started with intensive surface collection and magnetometry in 2013 (Figure S21). The sherds we collected in our initial work were entirely datable to the Qijia cultural tradition (Figure S22; Table S8), and extensive additional work described elsewhere shows two main components to the site: a Qijia culture component and later, Northern Song materials. Intensive coring work done by the Gansu Provincial Institute previously provided a background with some areas thought to contain kilns or other fired features. Our first geophysics work attempted to locate some of those features (Figure S23). In one area of the site, near where cemetery excavations were conducted in 1975, three kilns were proposed by the coring team: Y3, Y4 and Y5. These are respectively located (according to the survey report) at: (Y3) N35°29'40"; E103°50'09"; (Y4) N35°29'39"; E103°50'08"; (Y5) N35°29'39"; E103°50'07". Unfortunately, these locations are pretty imprecise and were not sufficiently

[23] See Womack et al., "Mapping Qijiaping…"; Womack et al., "Assessing Site Organization…".
[24] Womack et al., "Mapping Qijiaping…".

specific enough for us to place geophysical survey areas very accurately. That said, we picked a point that seemed close to where one of the kilns should have been and put down three 20 x 20-meter geophysical prospection units – two successively from west to east and then another one to the south. The northwestern most corner of this three-square area was at N35°29'39.3"; E103°50'06.0". Elsewhere during this first work at Qijiaping we examined the Central Site Area N35°29'57.9"; E103°49'48.2". This section of the site, to the north of the village of Qijiacun, is a small flat area with vegetable fields. There was pottery visible in the fields and evidence of cultural layers and pits in terrace profiles. The coring survey report indicated house foundations and at least one kiln in this area as well. This initial visit was followed by several seasons of additional work, reported extensively elsewhere. Qijiaping remains a focus of the international collaborative project started in 2015.

9. Qiantuoluo / Qianwotuo 前陀螺 /前卧驼**. Site Code: GQW; Season Code: 13GQW. (N 35°36'53.6"; E 103°45'58.2") [RANK 4]:** Visited on May 25, 2013, this locus was listed as Qiantuoluo in the Third National survey, but locals said it was called Qianwotuo, which makes more sense given the local village name. It is listed as a Majiayao / Qijia site, but little was evident on the flat area above the village where the GPS point was located (Figure S24). Possibly this set of terraces was connected to Wotuonanping (GW) in antiquity. We collected two sherds here (Figure S25), one of which was a Qijia sherd (FCN 1029; Table S9).

10. Quandi 泉地**. Site Code: GQD; Season Code: 13GQD (N 35°29'34.8"; E 103°50'35.8") [RANK 4]:** This site was first visited on May 22, 2013, as part of the evaluation of the space between Qijiaping (GQ) and Dayatou (LD). Located next to Dongping (GD), this area would eventually be included in the intensive surface survey of the Qijiaping and Dayatou sites (Figure S26). At Quandi, two fragments of Majiayao pottery were found by the team on steep terraces above a loess borrow pit (FCN 1007; Figure S27; Table S10). There was no clear evidence of archaeological strata in the area.

11. Shizuitou 石咀头**. Site Code: GS; Season Code: 13GS, 13GS-M (N 35°34'06.8"; E 103°46'52.3") [RANK 4]:** Visited on May 23, 2013, this site is further north along the same bluff from Dengjiawan (GDJW) but was not as rich in surface material (Figure S28). This could mean it is another burial locus that has not been as extensively looted (Figure S29). One area of the bluff contained a number of concentrated looters pits where we collected some surface pottery. A total of 39 sherds were collected from near the tombs (13GS-M) and all of these are Xindian culture sherds (FCN 1027; Figure S30). An additional five sherds were collected from elsewhere at the site (FCN 1030; Figure S31). These were a mix of two recent pieces, two Qijia fragments, and two sherds identified as Siwa type (Table S11). There was no clear indication of residential remains in the area, however. The area is also covered with stepped terraces, which would make it difficult for geophysical prospection.

12. Pingzuizui 平咀咀. **Site Code: GP; Season Code: 13GP (N 35°31'52.6"; E 103°42'58.1") [RANK 4]:** Visited on May 23, 2013, this was listed as a Qijia period site. The location is on a terrace immediately above a village. There is a new cell tower next to where the GPS point is located. Surrounding this is a large area of open flat terrace (Figure S32). We found very little in the way of ceramics, aside from six Qijia sherds to the south of the cell tower (FCN 1004; Figure S33; Table S12). No visible cultural layers or pits were present. Locals said that further to the west along the same terrace there are places that ceramics have been found. This was the direction of Maojiaping (GM).

13. Gamozui 尕磨咀**. Site Code: GG; Season Code 13GG. (N 35°28'59.8"; E 103°37'06.1") [RANK 4]:** Located on the southern bank of the Guanghe River, we visited this site on May 23, 2013 (Figure S34). The landscape of the area had changed a bit from 2002, which was the date of the Google Earth images we used at the time. More houses were around the GPS point than were visible in the 2002 image. Although listed as a Qijia period site, all the prehistoric sherds we collected were identified as Majiayao types (Figure S35). In total, we collected one stone tool, five Majiayao culture sherds, and another eight sherds that are of Warring States, Han or unidentifiable time periods (FCN 1005; Table S13).

Table 3. *Guanghe Sites.*

Site Code	Site Name	Cultural Affiliation	Easting	Northing	Elevation	Class
GB	**Banshan 半山**	**MJY**	**103°46'39.5"**	**35°26'45.1"**	**2287**	**1**
	Sangeda 三疙瘩	MJY	103°47'58.7"	35°29'18.4"	2271	3
GW	**Wotuonanping 卧驼南坪**	**MJY**	**103°46'10.6"**	**35°36'49.5"**	**1810**	**2**
GDJW	**Dengjiawan 邓家湾**	**MJY; QJ**	**103°46'58.8"**	**35°33'51.7"**	**1970**	**2**
GM	**Maojiaping 毛家坪**	**MJY; QJ**	**103°43'15.8"**	**35°32'02.8"**	**1893**	**2**
GD	**Dongping 东坪**	**MJY; QJ**	**103°50'35.6"**	**35°29'34.8"**	**1879**	**2**
GZ	**Zuishan 咀上**	**MJY; QJ**	**103°44'13.7"**	**35°32'49.3"**	**1886**	**2**
GQ	**Qijiaping 齐家坪**	**MJY; QJ**	**103°49'58.8"**	**35°29'56.2"**	**1923**	**1**
GQW	**Qiantuoluo 前陀螺**	**MJY; QJ**	**103°45'58.2"**	**35°36'53.6"**	**2135**	**2**
	Houtuoluo 后陀螺	MJY; QJ	103°44'47.5"	35°36'40.1"	2149	4
GQD	**Quandi 泉地**	**MJY; QJ**	**103°50'38.1"**	**35°29'30.6"**	**1871**	**2**
	Chenjia 陈家	MJY; QJ	103°46'02.0"	35°33'55.3"	1876	3
	Gongbeiliang 拱北梁	MJY; QJ; H	103°43'18.4"	35°32'12.6"	1860	3

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GS	**Shizuitou 石咀头**	**MJY; QJ; XD; H**	**103°46'52.3"**	**35°34'06.8"**	**1921**	**2**
	Wenjiaping 温家坪	QJ	103°35'25.3"	35°28'41.3"	2065	3
	Shanchenjia 上陈家	QJ	103°45'57.1"	35°35'25.7"	1835	3
	Lijiazui 李家咀	QJ	103°44'58.7"	35°32'44.5"	1877	3
GP	**Pingzuizui 坪咀咀**	**QJ**	**103°42'58.1"**	**35°31'52.6"**	**1895**	**2**
GG	**Gamozui 尕磨咀**	**QJ**	**103°37'06.1"**	**35°28'59.8"**	**1987**	**2**
	Mashizui 麻石咀	QJ	103°44'01.9"	35°33'04.9"	1869	4

Kangle County Sites

<u>14. Daping</u> 大坪. Site Code: KDP; Season Code: 13KDP (N 35°26'46.7"; E 103°44'00.5") [RANK 3]: We visited this site on May 24, 2013 when searching for the Banshan location that turned out to be the wrong GPS point (see site GB). Daping is located upriver along a tributary to the river that flows by Kangle into the Tao. It is recorded as a Banshan and Qijia culture site. The terraces at the site are each 2-3 meters in height (Figure S36). Corn on the terraces when we visited was about 40 cm tall. We found some pottery near the GPS point, which is fairly easy to reach along a windy mountain road. In total, we collected 52 sherds (Figure S37). A plurality (n=25) are Qijia culture sherds (Table S14). Others are identified as Siwa (n=12), Banshan (n=3), Majiayao (n=1), and some that were unclear or Post-Han (n=11). Despite extensive remodification by terracing, pottery is rather abundant. We also noted the presence of tombs, one of which was looted and another of which was eroding out of a terrace edge.

<u>15. Hewandi</u> 河湾地. Site Code: KH; Season Code: 13KH (N 35°21'51.3"; E 103°41'58.8) [RANK 2]: This site was visited on May 24, 2013 even though it was not first identified on satellite images as promising. We added it to the survey because it is listed in the Third National Survey as a residential Banshan location, and we wanted to prioritize such sites for consideration. The area has changed a lot since the 2002 Google Earth images, but although there is a new, bigger road near the site, there is an open area where work could be done (Figure S38). Sherds were visible on the surface around the GPS point and on the other side (west) of the road as well (Figure S39). We collected 55 sherds in the former area (FCN 1028; Figure S40) and 31 from the West (FCN 1013; Figure S41). In the East area, four sherds were Han or later (or unidentifiable), and the rest are all Qijia type sherds (Table S15). In the latter, nine late sherds are found, and the other 22 are also Qijia sherds. No evidence of definitively Banshan material was identified in the pottery assemblage, although we did recover one sherd of painted pottery and a pottery knife.

16. Dayatan 大雅滩. **Site Code: KDYT; Season Codes: 13KDYT-上, 13KDYT-下 (N 35°26′ 25.9″; E 103°38′26.6″) [RANK 4]:** This was another locus with presumed Banshan residential remains that we visited on May 24, 2013. The hike to the GPS point was somewhat far off the road (Figure S42), and we found little material at the site location (Figure S43). A bit further away, project members found what may have been a hearth or part of a kiln / firing feature in a terrace face (Figure S44). There were also some other pottery sherds around this area (Figure S45), called **"Lower Dayatan** 大雅滩下**" (N 35°26′17.1″; E 103°38′32.0″),** but it is not a promising locus because any intact strata have probably been mostly destroyed. Locals say there used to be lots of pottery around. All of the pottery discovered by the team was identified to the Qijia period except several Han or later sherds (FCN 1012, 1015; Table S16).

17. Chunshu 椿树. **Site Code: KC; Season Code: 13KC (N 35°25′2.0″; E 103°48′31.0″) [RANK 3]:** Among the cluster of sites we visited on May 24, 2013 in the Kangle region, this was the closest to the Tao River. The location was a short hike above a village and there were no crops or only very small corn on the fields where a Majiayao / Qijia locus was listed. The terraces here are flat and there were lots of small pieces of pottery that we collected (Figure S46). Most (n=38) of the 60 sherds in our collection were Han or later in date, and an additional 13 are unidentifiable (Figure S47; Table S17). The prehistoric fragments include five Qijia sherds, two identified as Majiayao, and two as Siwa (FCN 1016).

18. Ganjiaya 甘家崖. **Site Code: KG; Season Codes: 13KG; 13KG-下 (N 35°25′17.5″; E 103°44′24.1″) [RANK 2]:** Listed as a Qijia site, the GPS point is up on a high, small terrace that did not look too promising. On May 24, 2013 we visited the site, which is located up a small, bucolic valley near a small village (Figure S48). Although not promising at first glance, as we worked our way down the terraces, we found a terrace with a pit and more ceramics on the larger, lower terraces Figure S49). We called this area **"Lower Ganjiaya** 甘家崖下**" (N 35°25′14.5″; E 103°44′20.9″).** One rim sherd from the collection in this area was not immediately familiar to Mao Ruilin, although a few days later he thought maybe it was a Majiayao type of pottery. Among the 18 sherds collected from the upper area, eight are Warring States or later fragments, while the other ten include seven Qijia sherds, two unidentifiable and one Majiayao fragment (FCN 1025; Figure S50; Table S18). Among the 74 fragments from the Lower area (13KG-下; Figure S51), almost all are Qijia sherds (FCN 1026). There are also three Majiayao fragments, and six later sherds.

19. Wangjia 王家. **Site Code: KW; Season Code: 13KW (N 35°25′07.7″; E 103°46′39.2″) [RANK 4]:** Wangjia was listed as a Qijia and Han period site. Although listed as a protected site, the location we visited on May 24, 2013 was not marked and was covered with corn and plastic sheeting as well as some small pine trees near the GPS point (Figure S52). The 14 identifiable sherds collected are all Qijia period (FCN 1017; Table S19; Figure S53).

Table 4. *Kangle Sites.*

Site Code	Site Name	Cultural Affiliation	Easting	Northing	Elevation	Class
	Shizui 石咀	MJY (BS); QJ; H	103°45'38.0"	35°24'49.8"	1981	4
KDP	**Daping 大坪**	**MJY (BS); QJ**	**103°44'00.5"**	**35°26'46.7"**	**2003**	**2**
	Xinjiaqu 辛家渠	MJY (BS); QJ	103°43'45.4"	35°24'47.0"	2013	4
KH	**Hewandi 河湾地**	**MJY (BS); QJ**	**103°41'58.8"**	**35°21'51.3"**	**2010**	**2**
	Wan'ertou 湾儿头	MJY (BS); QJ	103°42'10.6"	35°23'20.4"	2021	3
KDYT	**Dayatan 大牙滩**	**MJY (BS); QJ**	**103°38'26.6"**	**35°26'25.9"**	**2314**	**3**
	Bianjialin 边家林	MJY (BJL); QJ	103°43'39.3"	35°23'56.4"	1995	4
KC	**Chunshu 椿树遗址**	**MJY (MJY); QJ**	**103°48'31.0"**	**35°25'02.0"**	**1898**	**2**
	Puwa 堡洼	QJ	103°43'49.3"	35°26'06.5"	2001	4
	Dagouyan 大沟沿	QJ	103°48'04.4"	35°25'07.0"	1911	3
	Dujiayao 杜家窑	QJ	103°47'39.4"	35°25'08.6"	1902	3
KG	**Ganjiaya 甘家崖**	**QJ**	**103°44'24.1"**	**35°25'17.5"**	**1976**	**2**
	Kangjiatan 康家滩	QJ	103°41'31.9"	35°17'13.8"	2173	3
	Tashan 塔山	QJ	103°42'11.8"	35°17'45.5"	2207	3
	Wangjiaping 汪家坪	QJ	103°43'41.9"	35°04'20.8"	2046	3
	Xianjiawan 缐家湾	QJ	103°44'37.6"	35°00'28.2"	2129	4
	Disiping 地寺坪	QJ; SW	103°45'28.0"	35°01'34.5"	2074	4
	Dizhashan 地乍山	QJ; SW; H	103°44'19.0"	35°02'10.2"	2098	2
	Gaojiaji 高家集	QJ; H	103°44'32.0"	35°25'30.3"	1974	4
KW	**Wangjia 王家**	**QJ; H**	**103°46'39.2"**	**35°25'07.7"**	**1920**	**2**
	Zhangjiazhuang 张家庄	QJ; H	103°46'10.9"	35°25'25.2"	1943	4
	Shijiahetan 石家河滩	QJ; H	103°42'30.8"	35°05'54.3"	2096	3

Lintao County Sites

20. Siwa site cluster 寺洼山遗址群. Site Code: LS; Season Code: 12LE (E 103°48′ 23.7″; N 35°12'26.7): Our first visit to the site on June 18, 2012 brought us to the crossroads in the middle of the site where the Third National Survey site location is situated (Figure S54). The site is well known, having been researched and published by Xia Nai in 1949.[25] Our goal was to assess the suitability for larger scale surface collection and geophysics. The site is large and flat, seemingly covering over 100 ha in size. One locus where surface materials are particularly dense is called **Miaoping – E'ergou** 廟坪鵝兒溝 (E103°48'30.9; N35°12'45.9"). This locus (12LE) is marked with a plaque listing its status as a Province-level protected site. We collected 23 sherds from the area around E'ergou (FCN 0017; Table S20; Figure S55). All but one are body fragments. The one exception is a rim sherd from a Siwa culture sandy grey-ware vessel. Nine of the fragments, including this one, are similar to the Siwa culture ceramic tradition whereas 13 are similar to Majiayao culture ceramics. The affiliation of one undecorated, grey fine-ware sherd is unclear. Eight of the Majiayao ceramics are fine ware. The sandy-ware fragments are mostly undecorated, although one has cord-marking. The fine ware is mostly orange and all but one of these fragments have black pigment in strips or grids. In contrast, the Siwa pottery is all undecorated and tempered with sand and is red, grey, brown or black in color. Several are fragments of typical Siwa pottery jars with vertical handles near the rims. Starting in 2015, and finishing with a second season in 2018, the TRAP project started systematic surface collection at this site and conducted geophysical survey of sections of the site as well. These results will be reported elsewhere. The Institute of Archaeology of the Chinese Academy of Social Sciences also conducted a systematic coring campaign at Siwashan in 2018 and began excavations that year as well.

21. Majiayao 马家窑. Site Code: LM; Season Codes: 12LM, 12LM上, 13LM-W, 13LM上, 13LM-F3. (E 103°48′ 28.7″; N 35°18′ 27.8″) [RANK 2]: Also a listed protected site, Majiayao is the type site for the Majiayao culture. First investigated by Andersson, Majiayao has also been subjected to previous seasons of published research, the most recent being a multi-year excavation campaign by the Chinese Academy of Social Sciences, Institute of Archaeology. TRAP team members visited the site on June 18, 2012 to evaluate the potential of the site for large scale survey. The known site area is on a corner of a bluff, where a major tributary enters into the Tao River. Near this part of the site was a rather large pit cut away on the east side of a path (Figure S56). Here we could observe a series of ashy pits that were likely remnants of kiln debris (E103°48'23.1; N35°18'32.2"). The tops of these features were more than 2 meters below the current surface. Forty-four artifacts were collected from the area around where previous excavations took place and where the kiln debris was evident in the terrace profiles (FCN 0007; all collected sherds are listed in Table S21). One grey-ware rim fragment is from a Han or later vessel, and one undecorated fragment is difficult to associate with a cultural tradition, while the remaining objects not surprisingly fit the Majiayao tradition. Six of these fragments are rim sherds, from jars, vats, and basins. Five others are base fragments of jars, vats, or steamers. The remaining

[25] Xia, "Lintao Siwashan…".

are body fragments. Fourteen are undecorated and sixteen have cord-marking, one with appliqué as well. Nine of the sherds have black pigment, mostly in strips. One has a black painted circle motif (同心圓), and another oval paint spots (卵點紋). Seventeen of the sherds are sandy ware, most of these being brown in color, although some are red or grey. Somewhat more (n=24) are fine-ware ceramics, all but one of which are orange, brown or red in color. Finally, one object is part of a vitrified kiln section.

On the top of the terraces (Figure S59), in a locus sometimes called Wajiaping (12LM上) we collected nine additional artifacts (Figure S58). All but one of these, a Ming or Qing period roof tile, are Majiayao culture pottery. Three of the eight have cord-marking, one is painted, and the other four are undecorated. The painted fragment has black strips on both the inner and outer surfaces. There are slightly more fine-ware fragments than coarse pottery (5:3), similar to the ratio in the lower area.

On May 22, 2013, we visited the site again. In the interim, the Gansu Provincial Institute of Archaeology had conducted a coring survey at the site. This coring focused mostly on the top terraces (Wajiaping) where they identified the locations of at least three house foundations, and on a lower terrace further up-stream on the tributary to the Tao River where they found evidence of several large features containing ash layers. On the lower terrace, which we called "West" (13LM-W), we collected a total of 193 artifacts (FCN 1001). Most were identified as Majiayao fragments (n=165), with two additional Neolithic pieces identified as Banshan (Figure S60). There were 25 sherds of Warring States, Han or later dates, and one Qijia sherd as well.

In the upper area, two of the house features identified by the survey company were clearly visible in a profile (Figure S61). F1 is close to the SE corner of the terrace and F2 is a little further west, half-way between the east edge and the road up the terrace. The top of the high terrace is very flat and open. A local farmer said there used to be sherds everywhere on the terrace and that people would come up there every Sunday to dig pits and look for things. He said they found thousands of pots and that they are very valuable. Apparently, this doesn't happen as much anymore, possibly because the site has been extensively looted. We did collect some artifacts in this area (FCN1010; Figure S62). Among the 31 objects collected, one was a stone axe, while the others are all ceramic fragments. Ten of these are Qijia sherds, ten are Majiayao, and the other ten were Warring States, Han or later in date.

A third house foundation identified by the survey company (F3) is located on fields further away from the terrace edge. In this area (13LM-F3) numerous fragments of house floor plaster were found on the surface and there were many sherds visible too. We collected 115 objects in the preliminary survey (FCN 1011; Figure S63). These include a mix of Majiayao (n=35), Banshan (n=1), and Qijia n=52) types, as well as two collections of plaster floor fragments and three stone objects, one of which is a stone axe. The remainder of the artifacts are later sherds. There seemed to be more surface disturbance of the fields here than in the F1/F2 area (i.e., 12LM上 / 13LM上).

<u>22. Fengjiaping</u> 冯家坪. Site Code: LF; Season Code: 12LF (E 103°49′ 01.3″; N 35° 19′ 44.0″) [Rank 2]: Fengjiaping is another provincial protected site and we visited on June 18, 2012. The GPS point was out on a terrace edge where we managed to find evidence of a pit in oe location (Figure S64). Ceramics were present, although not particularly ubiquitous (Figure S65). We collected 17 fragments (FCN 0018). Among these, five are Han period body sherds (Table S22). The rest are Qijia sherds. One is a rim fragment of a fine-sandy orange ware vessel with scalloping on the lip. The rest are body sherds. Five of these have basket impressions while the remainder are undecorated. Most of the sherds have fine sand temper and are some shade of orange, sometimes with a grey core.

23. Xiayanjia 下闫家**. Site Code: LXY. Season Code: 12LX-E, 12LX-W (E 103°50'17.4"; N 35°23'09.6") [Rank 2]:** Xiayanjia is located out on the edge of a high bluff overlooking the floodplain (Figure S66). During our visit on January 18, 2012, we were confronted by landform change between the time of the satellite photos and our visit. A loess borrow pit had been excavated on part of the site, and the path to the site location was convoluted. Along the way, some pottery was collected here and there and this we bagged as the "west" locus (12LX-W; Figure S67). Near the original GPS point (12LX-E) we also found some sherds in the fields and more in the terrace edge / field profile, which may mark remnants of an intact cultural level (Figure S68).

The four sherds collected from the "West" locus (12LX-W) are all Han or Ming period ceramics (FCN 0010; Table S23). At the "East" locus (the original GPS point – 12LX-E), a total of 26 sherds were collected (FCN 0009). Most of these were Han or later. One grey rim sherd with fine sandy temper may be early in date but cannot be clearly associated with any particular cultural tradition. Five other sherds are most similar to Majiayao ceramics. These include one sandy-ware base with cord-marking, one undecorated orange fine-ware body fragment, and three fragments with black pigment in narrow strips.

24. Sunjiaping 孙家坪**. Site Code: LSJ; Season Code: 12LSJ, 15LSJ (E 103°50'12.6"; N 35°25'02.1") [Rank 4]:** When we visited the terraces that comprise this site on June 18, 2012, the area was planted with Sichuan peppercorn trees (***huajiaoshu*** 花椒树) and also contained numerous tombs (Figure S69). Many of the trees are fairly small, but they would certainly still pose a problem for magnetometry work in the area. They are not found everywhere, so it might still be possible to survey here, and our discovery on the surface of a pottery-manufacturing paddle/anvil reflects the potential of this site for studies of ceramic production (Figure 5). The pottery tool was small, approximately 6.5 cm long by 5.5 cm wide and 2.5 cm thick, with a broken handle.

In addition to the paddle/anvil, we also collected 22 other artifacts from this site (FCN 0022; Table S24; Figure S70), one of which was the ring base of a historic-era stoneware bowl. The rest were ceramic fragments that range widely in date. Six of these are Han Dynasty ceramics, two of which are rim sherds, while six sherds resemble Majiayao sherds, two or three seem to be Qijia material, and two resemble Xindian ceramics. The Majiayao ceramics include two cord-marked orange sand-tempered fragments, and four undecorated orange fine-ware fragments, two of which are polished. The Qijia ones include a fine-sandy grey fragment with basket impressions and a cord-marked, fine orange ware. The Xindian sherds are two fine-sandy orange fragments with cord-marking. A flat vessel base fragment could belong to either a Majiayao or Qijia culture assemblage.

Due to the interest generated by the paddle, we returned to Sunjiaping on May 26, 2015 for another brief survey, this time focusing on the top of the terrace. Previously we had started at the bottom and climbed our way up, finding pottery as we went, including the pottery paddle. One terrace, which is relatively small, does seem to have some remnants of pits or cultural levels visible in the terrace edges, and that terrace is not planted with trees (or anything really). It is two terraces below the village at the top of the geological terrace and below a big garbage dump. A few geophysics grids would be possible there. We did not collect more artifacts this season.

25. Dayatou 大崖头. Site Code: LD; Season Code: 12LD, 12LD-S (E 103°51′ 13.3″; N 35°29′ 42.4″) [Rank 1]: This site is located on a bluff near a temple where the Tao River briefly turns westward before turning back north again. This prominent bend in the river is just to the southeast of the site of Qijiaping (GQ). On our first visit to the site on June 18, 2012 we ascended via a road that starts on the southern side of the bluff. This path up to the site was littered with painted pottery, and the terrace top was also fairly densely covered with ceramics. The bluff top is relatively flat and without significant ground cover at the time of our first visit (Figure S71). Because of the density of sherds, in addition to a broader collection from across the site (12LD; Figure S72), we also collected a 1 x 1 meter sample area near the original GPS point in which we collected all the visible ceramics (12LD-S; Figure S73). Elsewhere we only selected diagnostic sherds.

In our diagnostic sample we collected 82 artifacts from the site (FCN 0003; Table S25), and an additional 14 from a 1 X 1 meter sample area (FCN 0005). All the sherds from the sample area are associated with the Majiayao culture. Three fragments are cord-marked grey ceramics with coarse sand temper. Three others are painted orange pottery with fine or fine-sandy paste, one of which has a design of parallel lines (平行弧線). The remainder do not have surface decoration. Several have burned earth adhering to the ceramics. The 82 artifacts collected across the site include one historic era porcelain sherd and one roof tile fragment, two stone artifacts, one of which is an unfinished stone chisel, and a ceramic sherd turned into a knife with a perforation. Twenty-five of the ceramic sherds are from the rims of vessels, whereas there are three base fragments, two perforated bottoms of steamer vessels, five handles or handle fragments, and 42 body sherds, two of which come from vessel necks. The most common surface treatment on the sherds collected is black pigment, which is found on 42 sherds. The painted designs include: curved lines (弧線紋), horizontal stripes (横帶紋), narrow parallel lines (窄平行線), grids (網格紋), circular dots (圓點), drooping curves (垂弧紋), slanted parallel lines (斜平行線), triangles (三角紋), sawtooth designs (鋸齒紋), and can be found on both the exterior and interior surfaces. At least eight of these sherds were rubbed smooth to create a shiny surface after painting. Some clearly indicate an affiliation with Banshan culture decorative tradition. Among the unpainted sherds, fourteen do not have surface decoration, fifteen have cord-marking, five have appliqué, one of which is on a rim and another on a handle, and several other surface treatments are present in small numbers, including line marking, basket impressions, and grid impressions. Seventeen of the ceramic fragments come from coarser sandy wares, and another seven from fine sandy wares. The majority (51 samples), however, are fine wares. Ten of these are grey wares while the rest represent oxidized colors ranging from yellow-oranges to red-oranges. Among the vessel types represented in the collection there are fragments of jars with inverted rims (斂口罐), bottles (瓶), bowls (缽), and basins (盆). Most of these 78 ceramic fragments are associated with the painted pottery traditions of the Majiayao and Banshan cultures, with a couple that seem to more closely reflect Qijia culture traditions.

Starting in 2015 we conducted a systematic survey and geophysical prospection across the site modelled on the procedure used on other sites in the collaborative TRAP project.[26] In 2018 we also started excavations here. The results of this second phase of research at Dayatou are published elsewhere.[27]

26. Huwa 虎瓦. Site Code: LHW; Season Code: 12LHW-W, 12LHW-E, 12LHW-S (E 103°50'58.1"; N 35°28'8.1) [Rank 4]: Huwa is located on the same side of the Tao River as Dayatou, a little further upstream, and we first visited it on June 18, 2012. We designated the original GPS point "West" (12LHW-W) and also found material in an area we labeled "East" (12LHW-E), which has an easting of roughly 103°50'55.6". The site was mostly flat, with some corn but not a lot of ground cover (Figure S74). This original zone was a bit difficult to reach as it has eroded to become a pillar without access paths. Only a few small sherds were recovered there (Figure S75). The East area, separated from the West by a step down to a lower terrace, contained some Banshan pottery (Figure S76). Finally, in a third zone, (which we called "south": 12LHW-S. E103°50'58"; N35°28'7"), some pottery sherds were discovered south of a gulley path (Figure S77).

Five vessel body sherds were found in the "West" zone (FCN 0012), two of which were historic ceramics, while three are similar to Majiayao culture pottery (Table S24). These include two undecorated orange body sherds, one slightly sandy tempered and the other a fine ware. The third has a grid pattern in black pigment on the exterior surface. The "East" zone contained seven sherds (FCN 0011). Two fine grey-ware fragments date to the Han period, while the other five resemble Majiayao culture pottery. All are sand tempered orange wares. Three of the five have cord-marking on the exterior. From the "South" locus (FCN 0013), only one of the four collected sherds predates the Han period. This orange fine-ware sherd has black pigment in a grid pattern on the exterior surface.

27. Zhujiaping 朱家坪. Site Code: LZJP; Season Code: 18ZJP (E 103°50′ 00.7″; N 35° 14′ 48.0″) [Rank 5]: Although this site is on our original list of places to be considered, we did not visit it until May 31, 2018. Prior to this we had conducted preliminary work and more intensive survey at the nearby site of Siwashan (LS), which is located across the Tao River from the Zhujiaping and has a history of previous research. Zhujiaping also appears to be a very large site on the top of terrace overlooking the mouth of a tributary to the Tao River. The site comprises a big area, with lots of open fields (Figure S78). Additional work is necessary to assess the site size and the degree to which it is intact. In our small preliminary collection of sherds from the site (FCN 6041), we recovered 23 sherds (Figure S79), the vast majority of which can be confidently assigned to the Majiayao period (Table S27). One collected artifact is a Siwa culture sherd, one is a Han sherd, and one is a glazed ware fragment dating to the Song period or later. The site therefore mostly has material

[26] See Womack et al., "Mapping Qijiaping…".

[27] See Womack et al., "Assessing Site Organization…".

from the Painted Pottery period of the Late Neolithic, but likely also contains later Bronze Age and dynastic material.

28. Tangjiazhuang 唐家庄. Site Code: LT; Season Code 12LT (E 103°48′ 18.1″; N 35° 17′ 51.1″) [Rank 5]: We visited this site on June 18, 2012. The site contained few sherds and many terraces (Figure S80). It is possible that the listed GPS point is not the place with the most material, and additional interviews with locals might provide more information. Among the 6 sherds collected (FCN 0033; Figure S81), none were definitively earlier than the Han or later periods (Table S28), although three undecorated grey-ware fragments could be prehistoric pottery.

29. Nanping 南坪. Site Code: LNP; Season Code: 12LNP (E 103°52′ 28.1″; N 35°30′ 56.4″) [Rank 4]: Nanping is listed in the Third National survey data as a 60-hectare Majiayao and Banshan period site with thick cultural layers. Located directly across the Tao River from Qijiaping, the site is on a high terrace above the Tao River plain (Figure S82). During our visit on June 20, 2012, we located the given GPS point along a dirt road outside a small village near the edge of the terrace. A site plaque is located at that point, but the plaque marks a small fragment of a Zhou period wall at the same locus. Despite extensive searching we found no evidence at this point of prehistoric material. Perhaps the GPS point is not correct, and the site listed is somewhere else nearby.

30. Jiucaiwan 韭菜湾. Site Code: LJ; Season Code: 18JCW (E 103°47′ 42.6″; N 35°35′ 43.2″) [Rank 5]: Although on our original list of sites to be considered, Jiucaiwan was not visited during the first seasons of preliminary survey. On May 23, 2018, however, we did visit the site after hearing about unfortunate landscape modifications in recent years. According to local officials, the site was pretty much utterly destroyed about three years ago when an agricultural initiative flattened a natural terrace into a number of big agricultural terraces. According to the locals, during the process of terracing, scores of local villagers walked around behind the large earth movers removing hundreds of artifacts from the spoil heaps. Furthermore, we were told that there were literally scores of white plaster floors visible at the site, as well as burials, pits and more. Unfortunately, little evidence of the extent and nature of the site remains. The edges of the original site expanse are now completely impossible to determine, and extensive earth moving had been done in the area (Figure S83). At the time of our visit, there were evidence of places where people have continued digging, looking for pits and artifacts. According to the rumors about the site, large amounts of jade manufacturing debris were among the debris from the site. The material we collected includes six sherds and one stone tool. The ceramics seem to reflect a mix of material from the Neolithic (probably Majiayao), Qijia, and Siwa traditions (Figure S84; Table S29).

31. Xindian 辛店. Site Code: LX Season Code: 11LX, 17LX (E 103°46′ 53.8″; N 35°37′ 07.0″) [Rank 3]: This location is the type-site for the Xindian culture, first named by J.G. Andersson based on collection and excavation he conducted at the site in 1924.[28] We visited the site for the first time on Aug 17, 2011. It comprises two sides of a

[28] Andersson, "Researches…".

small tributary to the Tao River – areas that Andersson called A and B. The GPS associated with the site is located on a loess terrace above a local temple. When we first visited, this bluff top was mostly flat (Figure S85). According to local officials, this location used to have several higher sections, some of which have been flattened in recent decades. The presumption is that the site had already been extensively damaged as of 2011. During our initial visit to the site, we observed Qijia and Majiayao material on the surface, but did not collect the sherds. Notably, there were no clear examples of Xindian sherds there. In 2017 we conducted a thorough examination of the site with systematic survey collection areas in both areas A and B. These results are published elsewhere.[29] By that year, a viewing pagoda had been built on the top of the bluff and other modifications further damaged the integrity of the bluff top (Figure S86).

<u>32. Huizuiwa</u> 灰嘴疙. Site Code: LH; Season Code 12LH, 12LH-S (E 103°43′31.0″; N 35°41′55.7″) [Rank 1]: We first visited this site on June 17, 2012. It is another site where Andersson worked in the 1920s.[30] The main portion of the existing site is on a small, high bluff with a roughly circular preserved area approximately 0.6 ha. in size (Figure S87). The top of this bluff was absolutely covered with pottery, and we found fragments of painted, typical Xindian culture material as soon as we started up the path to the bluff top (Figure S88). To get a sense of the density of this material we randomly selected a location close to where the path reached the bluff top and collected all the pottery within a 1 x 1 meter area (12LH-S; Figure S89). Lots of diagnostic pottery was collected across the surface, and there were places where it seems that a couple of tombs may have been recently looted.

Forty-four artifacts were collected from the dense archaeological remains distributed across the site (Table S30). They reflect the range of material present (FCN 0002). These include two stone artifacts: a fragment of a stone knife, and a river cobble knapped into a disk shape. Among the forty-two ceramic sherds collected, thirteen are rim sherds, one of which also has a handle. Another nine fragments are parts with handles or parts of handles. There are two vessel feet and one vessel base fragment, as well as two fragments of vessels from the crotch area between feet. The remainder are body fragments, including two from vessel neck areas and one from a vessel shoulder. Surface treatments on the sherds are mostly appliqué strips, present on five sherds on the body and another six on the rims, cord-marking on eight sherds, often in combination with other surface treatments, and painted designs, present on sixteen sherds. Most of the pigment is black stripes (條帶紋), with one example of fish-hook shaped design (併列魚鈎紋), two with water designs (水波紋) and one with an "X" shaped decoration. With the exception of five sherds that date to the Warring States or later, including the vessel base, one rim sherd, two cord-marked body sherds and a fragment with an impressed grid design, all the other ceramics collected are typical of Xindian culture artifacts. In the 1 X 1 meter sample area (FCN 0001), we collected six light brown, mottled body sherds with fine cord-marking. All have coarse sandy temper. One has thicker cord-marking than others. These are all typical Xindian ceramics as well.

[29] Jaffe et al., "Complex Pathways...".
[30] Andersson, "Researches..."; Jaffe et al., "Complex Pathways...".

<u>33. Ken'erhongliang</u> 坎儿红梁. Site Code: LK; Season Code: 12LK-E, 12LK-W (E 103° 41'19.0"; N 35°41'55.7") [Rank 2]: This site, which we visited on June 17, 2012, is located on the top of another high, terraced area and was flat and open (Figure S90). Some pottery was found to the east of the GPS point along one of the terrace edges (12LK-E; Figure S91), but on the west side of the dirt road, slightly farther away from the original GPS point (12LK-W) we found fragments of painted pottery scattered across one set of fields (Figure S92). This cluster of surface finds was close to E103°41'8.9"; N35°41'52.7".

The material from the East locus (FCN 0025) included fourteen ceramics, one of which was a later period roof tile (Table S31). One other sherd was a Han period, cord-marked body fragment. The rest are ceramics of the Qijia (n=2, undecorated), Xindian (n=6, cord-marked) and Siwa (n=3, undecorated, sandy-ware) traditions. Finally, one is a diagnostic, undecorated, grey sandy-ware rim fragment, without a clear cultural affiliation. In the West locus we collected an additional eighteen ceramic fragments (FCN 0026). These include three Han period or later objects, and one roof tile, in addition to seven Xindian ceramics and one Qijia artifact, along with six fragments for which cultural affiliation is difficult to assign. The Xindian ceramics include four with black painting on a cream-colored sandy-ware, one with black painting on a body with a red slip, and one cord-marked fragment. Two fragments from diagnostic parts, one base and one handle, cannot be easily assigned to a particular culture. The artifacts are mostly Xindian material.

<u>34. Shangmajiacun East</u> 上马家村东. Site Code: LSM; Season Code: 12LSM (E 103° 38'45.1"; N 35°44'28.9") [Rank 5]: Our visit on June 17, 2012 involved a circuitous climb to the listed GPS point. Once we finally reached the top it was a wide-open area, although there were multiple levels of terraces and there was only scattered evidence of Qijia cultural material (Figure S93). Also, there were rocks strewn all over many of the fields to facilitate melon growing. Most of the pottery was discovered close to the original point on a set of small terraces that were not particularly well suited to magnetometry work. At this site we collected one bag of artifacts (FCN 0027) containing eight ceramics and two stone objects (Figure S94): one a fragment of a stone axe and the other an unidentifiable artifact. One of the ceramic objects was a sherd that had been made into a circular object, perhaps as a token, a plug for a vessel, or an unfinished loom weight. The other ceramics included five Qijia ceramics, all with basket impressions, and two cord-marked fine-ware Majiayao sherds (Table S32). All ceramic sherds are body fragments from unidentifiable vessel types.

<u>35. Shijiaping</u> 石家坪. Site Code: LSJP; Season Code: 12LS (E 103°35'54.0; N 35°45'22.7) [Rank 5]. Also listed in our notes as Shibanwan, which is technically a site on the other side of the Tao River but for which there is confusing, perhaps inaccurate GPS information in the National Register, the Shijiaping site was visited on June 17, 2012, and consists of a series of rather small terraces on a hill slope and was covered with recent and modern tombs (Figure S95). Searching around the general area did result in some pottery being discovered, particularly a little north of the original locus at (E103°36'00.2; N35°47'11.6"). We collected a total of twenty-four sherds (FCN 0008; Figure S96). Most (21) are definitively Qijia culture ceramics, including two vessel base fragments, three rim sherds and a neck fragment, in addition to body sherds (Table S33). Seven have basket impressions (*lanwen*) characteristic of the Qijia period, whereas ten are undecorated, and four have cord-marking. Visual observation of the pottery indicates that half (13 of 24) have fine paste whereas the remainder has sandy temper, about half of which (five fragments) seems to be tempered with finer sand than the other samples.

36. Yangjiazui 杨家嘴. Site Code: LY; Season Code: 12LY (E 103°34'45.3"; N 35°47'52.1") [Rank 5]: Our first visit to the site on June 17, 2012 involved a climb up onto the tertiary loess terrace. According to the data from the Third National Survey this site is a Qijia locus. When we got to the location of the GPS point, although the terrace was a large flat area, potentially conductive to magnetometry work, we were unable to locate archaeological remains on the surface but instead found large numbers of river cobbles (Figure S97). Many terraces in this part of the Tao River were covered with rather thick layers of cobbles and sandy soil to facilitate the growth of melons. No artifacts were collected at this site.

37. Wenjiaping 文家坪. Site Code: LW; Season Code 12LW (E 103°52′ 50.2″; N 35° 13′ 33.8″) [Rank 5]: On June 20, 2012 we visited the area near this site. It is a very difficult point to access from the road cut and we were only able to examine nearby parts of the loess terraces where we were able to collect some pottery (Figure S98). The two fragments collected (FCN 0032; Figure S99) are prehistoric, but their cultural affiliation is not certain (Table S34). There was no clear evidence of a cultural level in the exposed terrace profiles.

38. Zhangguojia 张郭家. Site Code: LZGJ; Season Code: 19LZGJ (E 104°01'28.5"; N 35°33'39.7") [Guojiagou Survey]: This site was discovered on June 3, 2019 during survey of the Guojiagou valley. The site is located just over 5km upstream from where Guojiagou meets the Dabihe. The site is situated on a large terrace rising around 7m above the north bank of the stream just to the east of the modern village of Zhangguojia (Figure S100). Scatters of pottery were found over a 275m stretch of terrace (FCN101), and some human remains, including an intact skull, were discovered as well. The pottery (FCN7027) dates almost entirely to the Qijia period and is made up of a mixture of plain (30), cord-marked (21), and basket-marked (12) sherds that are similar to Qijia material recovered from sites in the northern Tao River Valley (Table S35). Additionally, some Han and later ceramics were also found. Cultural layers and ash pits were clearly visible in the terrace profiles. This is currently the closest known large prehistoric site to the jade quarry that lies upstream on Maxianshan.

39. Zhangguojia Bei 张郭家北. Site Code: LZGJB; Season Code: 19 LZGJB (E 104° 02'5.8"; N 35°34'13.5") [Guojiagou Survey]:

This site was discovered on June 3, 2019 and is marked by a small scatter (3) of Qijia period pottery located approximately 1km upstream from Zhangguojia (Table S36). The pottery (FCN7033) was all found on a terrace that is around 7m above the north bank of the river. Several bones were found alongside the pottery, but cultural layers were not visible in any of the nearby terrace profiles. It seems likely that this material is related to that found at Zhangguojia, and perhaps a northern extension of the same phenomenon.

40. Jijiazhuang 吉家庄. Site Code: LJJZ; Season Code: 19LJJZ (E 104°01′54.7″; N 35° 31′48.7″) [Dabihe Survey] : On June 1, 2019 this site was discovered on the north bank of the Dabihe on terraces above the very eastern end of the village of Jijiazhuang (Figure S102). Fourteen sherds dating entirely to the Qijia period were scattered over 35m along the terrace edge 4–5 terraces above the town (FCN7225; Figure S103). The terrace was partially covered with corn and plastic sheeting, while the eastern portion was empty, making it much easier to detect archaeological material. While it was clear that some material was coming from the terrace profile, due to it being embedded in large clods of dirt, it was not possible to determine exactly where it was coming from as there were no apparent cultural layers visible. Investigation of the next terrace up revealed several more pieces of Qijia period pottery. The majority of the pottery (8) was cord-marked in typical Qijia style, while one piece of basket-marked pottery was also found (Table S37). This is currently the easternmost known Qijia site in the Dabihe; it is located 2.4km downstream from major stone outcrops.

41. Shuiqiang 水强. Site Code: LSQ; Season Code: 19LSQ (E 104°00′50.5″; N 35°31′54.8″) [Dabihe Survey]: This site was discovered on June 1, 2019 on the north side of the Dabihe to the northeast of the village of Shuiqiang. It is located 150m directly north of the road that runs through the valley, on a terrace that was unplanted and clear aside from several modern grave mounds (Figure S104). A total of 14 sherds were found (FCN7221; Figure S105), 12 of which dated to the Qijia period, the rest of which were from the Han Dynasty (Table S38). The Qijia sherds were a mixture of cord-marked (4), polished (4), plain (3), and basket-marked (1). They were all found directly around the modern grave, perhaps indicating that the grave was dug into a Qijia period layer. No cultural layers were visible in nearby profiles and lower terraces were covered in grass, making any material there difficult to detect. Small numbers of Qijia sherds were also found on north-bank terraces 375m east (1) and 770m northwest (2).

42. Dianjiahe 田家河. Site Code: LTJH; Season Code: 19LTJH (E 103°54′19.4″; N 35°31′ 13.0″) [Dabihe Survey]: On May 29, 2019 this site was discovered on an outcrop of land overlooking the south bank of the Dabihe (Figure S106). The outcrop is flanked on the north side by the Dabihe and south side by a steep valley that has been carved by another portion of the river, leaving the outcrop isolated on all sides. It is approximately 15m high and is planted with corn on top. The top of the outcrop can be reached only by a single steep path running up the south side. Sherds were immediately apparent on the terrace (Figure S107), including 8 dating to the Qijia period and 1 dating to the Banshan subphase of the Majiayao culture (FCN7208; Table S39). Among the Qijia sherds four are plain and four are cord-marked, while the Banshan sherd has typical red and black paint. This was the only sherd definitively dating to any subphase of the Majiayao culture found during our survey of the Dabihe.

43. Daliulingou 大柳林沟. Site Code: LDLLG; Season Code: 19LDLLG (E 103°55′11.8″; N 35°31′25.2″) [Dabihe Survey]: This site was discovered on May 30, 2019 on a low terrace 100m south of the Dabihe near the village of Daliulingou. The terraces in this area were largely covered with grass and trees, making detection of archaeological materials difficult. At this site we found several sherds coming out of a terrace edge and on the ground below (FCN7214; Figure S108). Five of the sherds date to the Qijia period, including three plain and two cord-marked sherds (Table S40). Two other sherds, dating to the Han Dynasty and Song Dynasty or later periods, respectively, were also recovered. One addition Qijia sherd was recovered around 100m west of this site.

44. Xiayangwa Dong下阴凸东. Site Code: LXYWD; Season Code: 19LXYWD (E 103° 54′2.4″; N 35°30′57.5″) [Dabihe Survey]: This site was discovered on May 29, 2019 around 650m southwest of Tianjiahe just south of a southern facing bend in the Dabihe. It is located on a terrace 25m south of the river at around the same height as Tianjiahe and southeast of the village of Xiayangwa. The site is made up of terraces planted with corn as well as one unplanted terrace (Figure S109), where the majority of the pottery was found. In total four sherds were recovered (Figure S110), all of which date to the Qijia period (FCN7207; Table S41). Two sherds are plain and two are polished. The relationship between this site and Xiayangwaxi, located 750m downstream, is unclear.

45. Xiayangwa Xi 下阴凸西. Site Code: LXYWX; Season Code: 19LXYWX (E 103° 53′33.0″; N 35°31′3.7″) [Dabihe Survey]: This site was discovered on May 29, 2019 on the north bank of the Dabihe near the village of Xiayangwa. The site is located on a terrace overlooking the river and the sherds were discovered in the profile of this terrace. In total three sherds were recovered at a single findspot (Figure S111), all of which date to the Qijia period (Figure S112; Table S42). They consist of two cord-marked and one basket-marked sherd (FCN7108).

Table 5. *Lintao Sites Table*

Site Code	Site Name	Cultural Affiliation	Easting	Northing	Elevation	Class
LS	**Siwashan / Miaoping E'ergou 寺洼山/廟坪鵝兒溝**	**MJY(BS); SW**	**103°48′23.7″**	**35°12′26.7**	**2000**	**2**
LM	**Majiayao 马家窑**	**YS(MDG); MJY; QJ; SW**	**103°48′28.7″**	**35°18′27.8″**	**1923**	**3**
LF	**Fengjiaping 冯家坪**	**QJ**	**103°49′01.3″**	**35°19′44.0″**	**1970**	**2**
	Simen 寺门	**YS(MDG)**	**103°56′10.4″**	**35°21′11.1″**	**1949**	**5**
LXY	**Xiayanjia 下闫家遗址**	**MJY**	**103°50′17.4″**	**35°23′09.6″**	**1936**	**2**
LSJ	**Sunjiaping 孙家坪**	**QJ**	**103°50′12.6″**	**35°25′02.1″**	**1911**	**4**
LD	**Dayatou 大崖头**	**MJY**	**103°51′13.3″**	**35°29′42.4″**	**1874**	**1**
LHW	**Huwa 虎洼**	**MJY; QJ**	**103°50′58.1″**	**35°28′08.1″**	**1892**	**4**
	Woxiangtai 卧香台	QJ	103°56′43.1″	35°21′29.5″	1998	5

→

	Zhaojiaping 赵家坪	QJ	103°54′34.7″	35°21′36.4″	1976	5
	Yangwashan 阳洼山	MJY; QJ	103°52′22.0″	35°18′36.3″	2015	5
LZJP	**Zhujiaping 朱家坪**	**MJY(MJY)**	**103°50′00.7″**	**35°14′48.0″**	**1973**	**5**
	Luojiapu 骆家堡	QJ	103°50′04.7″	35°16′08.0″	1959	5
	Renjiaping 任家坪	MJY; QJ; SW	103°52′43.7″	35°23′26.3″	1924	5
	Zhangjiayao 张家窑	MJY	103°50′02.4″	35°15′06.0″	1999	5
	Yueyawatou 岳崖洼头	MJY; QJ	103°51′12.1″	35°14′54.2″	2014	5
	Lamohe 拉磨河	MJY; QJ	103°51′11.2″	35°14′48.2″	1968	5
	Gaojiayanchuan 高家崖川	MJY; SQ	103°50′21.2″	35°13′32.7″	2027	5
	Lijiaping 李家坪	MJY; QJ	103°52′06.1″	35°14′22.4″	2044	5
	Yaopo 窑坡	MJY; QJ	103°52′27.9″	35°13′56.6″	2043	5
	Xiazhangjiaping 下张家坪	MJY	103°51′07.2″	35°10′55.1″	2043	5
	Qijiaping 祁家坪	QJ	103°51′07.2″	35°09′58.7″	2068	5
	Siping 寺坪	QJ; SW	103°50′20.0″	35°08′54.1″	2059	5
	Doujiaping 窦家坪	QJ	103°50′01.4″	35°08′47.7″	2054	5
	Chenjiaping 陈家坪	QJ	103°51′17.5″	35°10′04.5″	2085	5
	Gezhiping 格致坪	MJY(MJY); QJ; SW	103°48′14.2″	35°08′42.9″	2046	5
	Taxiawangjia 塔下王家	MJY; QJ	103°46′05.6″	35°07′41.7″	2084	5
	Jinjiaping 靳家坪	MJY	103°48′34.3″	35°09′31.9″	1999	5
	Dagudui 大固堆	MJY; QJ	103°48′38.3″	35°09′33.6″	1998	5
	Fangtoushang 房头上	MJY; QJ	103°48′35.9″	35°10′04.2″	2002	5
	Zuiliujia 嘴刘家	QJ	103°49′05.4″	35°11′29.5″	2003	5
LT	**Tangjiazhuang 唐家庄**	**QJ**	**103°48′18.1″**	**35°17′51.1″**	**1948**	**5**
LNP	**Nanping 南坪**	**MJY(BS)**	**103°52′28.1″**	**35°30′56.4″**	**2050**	**4**
	Yanggwaping 阳洼坪	MJY(BS); QJ	103°55′03.9″	35°35′04.8″	2119	5

	Yingpandi 营盘地	MJY	103°48′38.0″	35°33′42.8″	1844	5
	Yawan 崖湾	QJ	103°50′04.5″	35°32′43.2″	1866	5
	Yangliumiao 杨柳庙	QJ	103°48′37.5″	35°35′14.5″	1879	5
	Kangjiayamiaozui 康家崖庙嘴	MJY	103°47′54.6″	35°35′34.5″	1882	5
LJ	**Jiucaiwan 韭菜湾**	**MJY(MJY); QJ**	**103°47′42.6″**	**35°35′43.2″**	**1869**	**5**
LX	**Xindiancundong 辛店村东**	**MJY(MJY); XD**	**103°46′53.8″**	**35°37′07.0″**	**1857**	**3**
	Dashuigouzui 大水沟嘴	MJY(MJY); XD	103°36′42.9″	35°37′50.9″	1841	5
	Zhangjiaka 张家卡	QJ	103°45′36.6″	35°38′52.1″	1855	5
	Beixiajiaping 北夏家坪	QJ	103°45′28.1″	35°39′23.2″	1865	5
LH	**Huizuiwa 灰嘴洼**	**XD**	**103°43′31.0″**	**35°40′39.4″**	**1859**	**1**
LK	**Kan'erhongliang 坎儿红梁**	**XD**	**103°41′19.0″**	**35°41′55.7″**	**1843**	**2**
LSM	**Shangmajiacun 上马家村东**	**XD**	**103°38′45.1″**	**35°44′28.9″**	**1846**	**5**
LSJP	**Shijiaping 石家坪**	**QJ**	**103°35′54.0″**	**35°45′22.7″**	**1777**	**5**
LY	**Yangjiazui 杨家嘴**	**QJ**	**103°34′45.3″**	**35°47′52.1″**	**1785**	**5**
	Majiaping Guanzizui 马家坪冠子嘴	QJ	104°01′33.9″	35°20′15.3″	2049	5
	Panjiajixiajie 潘家集下街	MJY(BS); QJ	103°44′32.8″	35°14′24.4″	2041	5
LW	**Wenjiaping 文家坪**	**QJ; SW**	**103°52′50.2″**	**35°13′33.8″**	**2047**	**5**

Table 6. *Lintao New 2019 Sites Table.*

Site Code	Site Name	Cultural Affiliation	Easting	Northing	Elevation	Class
LZGJ	Zhangguojia 张郭家	QJ	104°01'28.5"	35°33'39.7"	2200	N/A
LZGJB	Zhangguojiabei 张郭家北	QJ	104°02'5.8"	35°34'13.5"	2200	N/A
LJJZ	Jijiazhuang 吉家庄	QJ	104°01'54.7"	35°31'48.7"	2100	N/A
LSQ	Shuiqiang 水强	QJ	104°00'50.5"	35°31'54.8"	2100	N/A
LTJH	Tianjiahe 田家河	QJ	103°54'19.4"	35°31'13.0"	2000	N/A

→

LDLLG	Daliulingou 大柳林沟	QJ	103°55'11.8"	35°31'25.2"	2000	N/A
LXYWD	Xiayangwadong 下阴屲东	QJ	103°54'2.4"	35°30'57.5"	2000	N/A
LXYWX	Xiayangwaxi 下阴屲西	QJ	103°53'33.0"	35°31'3.7"	2000	N/A

Weiyuan County Sites

<u>46. Jinjiashan</u> 金家山. Site Code: WJ; Season Code: 12 WJ (E 103°57′ 57.8″; N 35° 07′ 32.6″) [Rank 5]: We visited this site on June 20, 2012. It was one of two targeted sites in Weiyuan County. The location is listed as a Qijia site in the Third National Survey records and the associated GPS point was on top of a terrace overlooking a gully where a modern village sits. The top of the terrace was covered with very thick plant cover – mostly wheat – and it was nearly impossible to see the ground surface across much of the area (Figure S113). We found some pottery on the walk up, and a gully that cut into the terrace contained some Qijia sherds. In total, we collected eight pottery fragments (FCN 0034; Figure S114). Two have unclear cultural affiliation, and one likely dates to the Han period (Table S43). The other five are Qijia culture sherds. They are all body sherd fragments.

<u>47. Qijiawa</u> 祁家屲. Site Code: WQ; Season Code 12WQ (E 103°54′ 32.5″; N 35° 13′ 08.6″) [Rank 5]: This is the second of two sites in Weiyuan county we visited on June 20, 2012. According to the Third National survey data, this site was supposed to contain Banshan pottery, as well as Qijia material. We did not find much pottery on the top of the terrace that we visited. Instead, we walked through fields with some fairly high terraces at one end, that were planted with corn and tall beans (Figure S115). The location had a sign that identified it as a site called Shuijiayao 谁家窑, but information about this site is not found in the Wenwu dituji. The site could be considered if we brought with us local archaeologists who could point us to the locus where the archaeological materials were originally found. We collected five sherds at this site (Figure S116), all of which lack surface treatment and three of which can be confidently assigned to the Qijia period (FCN0028; Table S44).

Table 7. *Weiyuan Sites Table*

Site Code	Site Name	Cultural Affiliation	Easting	Northing	Elevation	Class
WQ	**Qijiawa 祁家屲**	**MJY(BS); QJ**	**103°54'32.5"**	**35°13'08.6"**	**2053**	**5**
QJ	**Jinjiashan 金家山**	**QJ**	**103°57'57.8"**	**35°07'32.6"**	**2253**	**5**

Min County Sites

48. Zhongzhai 中寨. Site Code: MZZ; Season Code: 12MZZ (E 103°58′ 03.0″; N 34° 39′ 08.5″) [Rank N/A[31]]: We evaluated this site on June 19, 2012. The site is near Padiping (MP), but more difficult to reach. After assessing the landscape around the site we decided it was not sufficiently accessible to be considered for further work. The location was not visited and no artifacts were collected from this site.

49. Tana 他那. Site Code: MT; Season Code 12MT (E 104°02′18.8″; N 34°33′ 56.7″) Rank N/A]: When we visited on June 19, 2012, the site was located a bit of a distance from the road, on tertiary terraces above a large loess borrow pit. The bluff top slopes upwards and contains many small terraces, low crops and very few sherds (Figure S117). We failed to find anything noteworthy, and questions of the locals working the fields whether they had seen any broken pottery nearby met with no response. We collected a total of nine sherds (Figure S118), all of which were fine-ware body fragments of Neolithic date (FCN0031; Table S45). The other four ceramic fragments were Han or later in date.

50. Dazhuang 大庄. Site Code: MD; Season Code: 12MD (E 104°00′ 20.3″; N 34°25′ 12.1″) [Rank 2]: We visited this site June 20, 2012. Dazhuang is cut into by a road making its way up a gulley to the terraces (Figure S119). It is easy to reach the top of the terraces where we found some artifacts. In a smaller gulley that provides a path up onto the terrace some evidence of cultural layers were visible in the terrace profile. In one place it seems that some later material (perhaps of Han date) was present about 70 cm below the current surface and Qijia material was found around 150 cm below surface. In total we collected 23 sherds at this site (FCN 0014; Figure S120). Four of these were Han period sherds (Table S46). Fifteen were Qijia objects. The remaining four sherd include one Majiayao ceramic fragment and three more generic "Neolithic" sherds. The Qijia sherds include one rim and one base. The rest are body fragments.

51. Yaozhuang 姚庄. Site Code: MYZ; Season Code: 12MYZ (E 104°04′ 12.4″; N 34°30′ 30.7″) [Rank N/A]: When we visited the site on June 20, 2012, we had to wind our way through a small village that was full of dead ends. Once we reached the GPS point we found terraced fields behind the village that were fairly flat and open, with long rectangular fields growing wheat and beans (Figure S121). There were few sherds here and a fair amount of rocks (many of which look deceptively like sherds). Since the Third National Survey report listed this as a Qijia site, and we already visited more appealing sites of this period, we decided to scratch Yaozhuang from the list of sites for further research. We collected seven sherds (FCN 0019; Figure S122), six of which are Qijia culture sherds (Table S47). These are all body sherds and include cord-marked and basket impressed fragments.

[31] Not all sites visited were given an initial rank during the assessment of sites through satellite imagery. These sites, marked as Rank "N/A," were selected for visits during the survey based on proximity to other sites being considered and reassessment in the field of possible locations for future work.

52. <u>Sishang</u> 寺上/ <u>Si'ershang</u> 寺儿上. Site Code: MSE; Season Code: 12MSE, 12MSE上 (E 103°59′ 16.1″; N 34°25′ 05.6″) [Rank 2]: Our visit on June 20, 2012, started next to a ather new mosque (Figure S123). The fields below this mosque were pretty much empty of all archaeological material (Figure S124), but we found more sherds in a flat open area a bit further to the east, and area we called "upper" Sishang (12MSE 上: E 103°59′ 33.8″; N 34°25′ 11.6″). This upper flat terrace area is sufficiently open to allow for further research, but the 11 sherds (FCN 0020; Figure S125) collected are all Han or later in date, or of unidentifiable cultural affiliation (Table S48). In the "upper" area we collected one stone tool and nine sherds (FCN 0021; Figure S126), one of which is an ambiguously "Neolithic" undecorated body fragment, and the rest of which are Han or unidentifiable fragments.

53. <u>Shannashuzha</u> 山那树扎. Site Code: MS; Season Codes 11MS, 12MS, 13MS (E 104° 04′ 29.1″; N 34°29′ 52.5″) [Rank 1]: Our first project visit to this site was on Aug 18, 2011. Remains from this site have been the subject of some recent focused analyses.[32] During our initial visit we marked the GPS locations of several visible features. Near the middle of the site was an exposed ash layer and on the surface we observed a fair amount of Majiayao ceramics. The site stretches least 250 m parallel to the riverbank in a roughly North-South direction, and it is at least as long from E-W up towards the steeper terraces and hills to the west (Figure S127). A high-speed railroad connecting Lanzhou to Chongqing is going directly over the site, but in 2011, the middle of the site was being protected in order to allow for excavation prior to construction.

On June 20, 2012, we returned to the site. By this time, part of terrace on the northern part of the site had been ripped away by earth moving equipment in preparation for the construction of large concrete railroad supports, exposing some trash pits with ash and artifacts. A drilling team was working in the area to check the sub-surface situation for the footings of these supports (Figure S128). We collected several sherds to provide us with a basic assessment of the represented chronological phases (FCN 0004; Figure S129). All 54 of the collected sherds date to the Majiayao period (Table S49). They include 30 fragments of painted pottery, mostly with black pigment but several with brown pigment. Twenty-seven of the fragments are rim sherds and most are fine-paste ceramics. This collection reflects the chronology of the site, which is early Majiayao in date.

The chronology of the site is a main focus of excavations that were conducted at the site by the Gansu Provincial Institute of Archaeology in 2012 to 2013 in advance of the completion of the railway project. We visited this excavation on May 21, 2013. Unfortunately, some of the major construction work took place prior to excavations, considerably damaging parts of the northern section of the site. According to the lead excavator, Zhao Xueye, their assessment of the site indicates that is covers an area extending about 1 km north to south. The excavations focused on excavating six 10 x 10-meter units in 2012, and another 8 units in 2013 (Figure S130). The approximate location of the excavation units is (N 34°29.651'; E 104°4.559'). On the southern end of the excavation area they uncovered a kiln, and other areas revealed several hearths that probably sat within houses but are

[32] Chen Ningbo, Lele Ren, Linyao Du, Jiawen Hou, Victoria E. Mullin, Duo Wu, Xueye Zhao, et al, "Ancient Genomes Reveal Tropical Bovid Species in the Tibetan Plateau Contributed to the Prevalence of Hunting Game until the Late Neolithic," *Proceedings of the National Academy of Sciences* 117.45 (2020): 28150–59.

badly disturbed. All the materials lie around 1 meter below the current ground surface. According to the preliminary impression of the excavators, all artifacts recovered from the site date to the Late Yangshao and early Majiayao culture. Some contexts have both Late Yangshao and Majiayao mixed together. Excavations also recovered lots of animal bones, as well as stone knives, knives with bone handles, and some objects that were used to hold colorant for painting with the remnants of red pigment inside. Research on these materials is still ongoing.

To the east and west sides of the 2013 excavation areas more work could be done, although the west side could be more disturbed by the railway construction. Unfortunately, to the north of the excavation area, all the way to where we found abundant surface remains and evidence for a pit in the wall of a terrace during previous visits, in advance of building additional supports for the raised high-speed rail line, the train construction team imbedded columns of concrete in the ground at a very fine interval, destroying parts of the site.

54. Zhama 扎马. Site Code: MZ; Season Code: 12MZ (N 34° 38′ 39.2″; E 103° 57′ 02.8″) [Rank N/A]: This site, which we visited on June 19, 2012, was not on a terrace at all but instead sits on the floodplain next to the road (Figure S131). We found eight small ceramic fragments in the nearby fields (FCN 0035; Figure S132). These have a mix of attributions (Table S50). Three are Qijia sherds, one is "Neolithic," and the rest are Han or unidentifiable. Based on the structure of the fields in the area, it is probable that there has been considerable flattening here, possibly truncating the original ground surface. There are a lot of rocks and pebbles across the area as well.

55. Xinglin 杏林. Site Code: MXL; Season Code: 12MXL (E 104°04′ 18.9″; N 34°32′ 32.3″) [Rank N/A]: We attempted to visit this site both on August 19, 2011, and June 19, 2012. The site is discussed in a publication in 1985,[33] but it is difficult to access. The GPS point is located behind a village and past a locked gate near a temple. We did not collect any material from the site.

56. Wangjiashan王家山. Site Code: MWJS; Season Code: 12MWJS (E 104°00′ 53.9″; N 34°25′ 22.7″) [Rank N/A]: We attempted to reach this site on June 20, 2012, while investigating Yanwaping (MY) but it was difficult to access, and closer examination of the Google earth image suggested that the original point was too close to village buildings to be an appropriate site for research. No artifacts were collected from this site.

[33] Gansu [Gansu Minxian Wenhuaguan 甘肅岷縣文化館], "Gansu Minxian Xinglin Qijia Wenhua Yizhi Diaocha 甘肅岷縣杏林齊家文化遺址調查 [Survey of the Qijia Culture Site of Xinglin in Min County, Gansu]," *Kaogu* 考古 [*Archaeology*] 11 (1985): 977–79.

57. Yanwaping 砚洼坪**. Site Code: MY; Season Code: 12MY-**上**; 12MY-**下 **(E 104°00′ 39.1″; N 34°25′ 15.8″) [Rank 2]:** At Yanwaping, which we visited on June 20, 2012, we were able to find materials on several levels of terraces (Figure S133), including a "lower" area (E 104°00′ 39.1″; N 34°25′ 13.3″), and some cultural material in a terrace profile (E 104° 00′ 22.9″; N 34°25′ 22.7″), where a ceramic sherd could be seen about 2 meters below the top of the terrace. We also observed a stone that seemed out of place in the loess at about 3 meters below the surface (Figure S134). Materials collected from the original site area (FCN0023) include one Majiayao fragment, two generic "Neolithic" sherds, and two fragments of vitrified kiln debris, as well as five Han and unidentifiable sherds (Table S51; Figure S134). The "lower" area collection (FCN 0024; Figure S135) included one Qijia and one Majiayao sherd, and three Han fragments.

58. Padiping 葩地坪 **. Site Code: MP; Season Code: 12MP, 12MP**下 **(E 103°58′ 13.3″; N 34°38′ 53.6″) [Rank 4]:** On June 19, 2012, we visited Padiping, where a winding, eroding dirt road led up to the top of a bluff where a number of terraces contained ceramic fragments. Many of the terraced areas were rather small, and most were covered with low crops such as beans (Figure S135). One location with several sherds in a visible section was separately collected as the "lower" locus (E103°58'13.2"; N34°38'54.2"), where there was a site marker recording the site as a protected location. Around the original location we collected approximately 20 sherds (FCN 0015; Figure S136). These include two Han period fragments and one Siwa culture body sherd (Table S52). The rest are all Qijia sherds – mostly body sherd fragments and one base. At the lower locus (FCN 0016), we collected nine fragments (Figure S137). One is a Siwa sherd, and two are unidentifiable. The rest are Qijia sherds.

59. Guoha 郭哈**. Site Code: MG; Season Code: 12MG (E 103°53'27.9"; N 34°27′ 33.3") [Rank 3]:** This site, which we visited on June 20, 2012, is situated in a rather broad, flat expanse of fields. It is one of very few sites in the list that we have which is located on a primary terrace, not far above the river course (Figure S138). Consequently, there were few places in the vicinity where profiles were accessible that could be investigated. There were not many sherds on the surface, and those we did collect (FCN0030; Figure S139) are all Han period or unidentifiable (Table S53). The lack of surface material might reflect a rather well-preserved site that has not been impacted much by agriculture or digging, or it may mean that there is not much there.

<u>60. Guojiapu / Guojiabao</u> 郭家堡. Site Code: MGJ; Season Code: 12MGJ (N 34° 40'22.4"; E 103°52'54.4"). [Rank N/A]. Guojiapu, which we visited on June 19, 2012, is located across the Tao from the large cemetery site of Mogou.[34] The base of the site was easy to reach by car, but the path up to the GPS point was quite steep. During our visit, the site was covered by low, unobtrusive plant cover, but we found little on the surface or in the exposed profiles at the site (Figure S140). A total of five sherds were collected from this site (FCN 0029; Figure S141), and only two of these five were early sherds, both identified as Siwa culture fragments (Table S54). These were both grey-brown, undecorated, sand-tempered body sherds.

<u>61. Qijiashan</u> 齐家山. Site Code: MQJS; Season Code: 12MQJS (E 103°54′ 36.2″, N 34° 27′ 37.2″). [Rank 4]. This site is located on a high terrace above the Tao River. We considered but did not visit this site in 2012 based on the difficulty of access. Nevertheless, the site remained one under consideration for the project. No artifacts collected.

[34] Gansu & Xibei [Gansu Sheng Wenwu Kaogu Yanjiusuo 甘肅省文物考古研究所, and Xibei Daxue Wenhua Yichan yu Kaoguxue Yanjiu Zhongxin 西北大學文化遺產與考古學研究中心], "Gansu Lintan Mogou Qijia Wenhua Mudi Fajue Jianbao 甘肅臨潭磨溝齊家文化墓地發掘簡報 [Preliminary Report on the Excavations of the Qijia Culture Cemetery at Mogou in Lintan, Gansu]," *Wenwu* 文物 [*Cultural Relics*] 10 (2009): 4–24; Gansu & Xibei [Gansu Sheng Wenwu Kaogu Yanjiusuo 甘肅省文物考古研究所, and Xibei Daxue Wenhua Yichan yu Kaoguxue Yanjiu Zhongxin 西北大學文化遺與考古學研究中心], "Gansu Lintan Mogou Qijia Wenhua Mudi Fajue Jianbao 甘肅臨潭磨溝齊家文化墓地發掘簡報 [Preliminary Report on the Excavations of the Qijia Culture Cemetery at Mogou in Lintan, Gansu]," *Wenwu* 文物 [*Cultural Relics*] 10 (2009): 4–24; Qian Yaopeng 錢耀鵬, and Mao Ruilin 毛瑞林, "Gansu Lintan Mogou Qijia Wenhua Mudi Fajue Ji Zhuyao Shouhou 甘肅臨潭磨溝齊家文化墓地發掘及主要收穫 [Main Results of the Qijia Culture Cemetery Excavation at Mogou in Lintan, Gansu]," in *Kaoguxue Yanjiu (9) -- Qingzhu Yan Wenming Xiansheng Bashi Shouchen Lunwenji* 考古學研究（九）——慶祝嚴文明先生八十壽辰論文集 [*Archaeological Research (9) -- a Collection of Essays in Celebration of Yan Wenming's 80th Birthday*], ed., Beijing Daxue Kaogu Wenbo Xueyuan 北京大學考古文博學院, and Beijing Daxue Zhongguo Kaoguxue Yanjiu Zhongxin 北京大學中國考古學研究中心 (Beijing 北京: Wenwu chubanshe 文物出版社, 2012); Qian Yaopeng 錢耀鵬, Zhou Jing 周靜, Mao Ruilin 毛瑞林, and Xie Yan 謝焱, "Gansu Lintan Mogou Qijia Wenhua Mudi Fajue De Shouhuo Yu Yiyi -- 2008 Niandu Quanguo Shida Kaogu Xinfaxian Zhi Yi 甘肅臨潭磨溝齊家文化墓地發掘的收穫與意義——2008年度全國十大考古新發現"之一 [The Results and Significance of the Excavations of the Qijia Cemetery at Mogou in Lintan, Gansu – One of the Top Ten Archaeological Discoveries of 2008]," *Xibei daxue xuebao (zhesheban)* 西北大學學報（哲社版） [*Journal of Northwest University (Philosophy and Social Science)*] 39.5 (2009): 5–10.

Table 8. *Min County Sites Table.*

Site Code	Site Name	Cultural Affiliation	Easting	Northing	Elevation	Class
MZZ	**Zhongzhai 中寨**	**SW**	**103°58′03.0″**	**34°39′08.5″**	**2372**	**N/A**
MT	**Tana 他那**	**QJ; SW**	**104°02′18.8″**	**34°33′56.7″**	**2294**	**N/A**
MD	**Dazhuang 大庄遗址**	**QJ**	**104°00′20.3″**	**34°25′12.1″**	**2328**	**2**
MYZ	**Yaozhuang 姚庄**	**QJ**	**104°04′12.4″**	**34°30′30.7″**	**2298**	**N/A**
MSE	**Sishang 寺上**	**QJ**	**103°59′16.1″**	**34°25′05.6″**	**2338**	**2**
MS	**Shannashuzha 山那树扎**	**YS; MJY; QJ; SW**	**104°04′29.1″**	**34°29′52.5″**	**2290**	**1**
MZ	**Zhama 扎马**	**QJ**	**103°57′02.8″**	**34°38′39.2″**	**2231**	**N/A**
MXL	**Xinglin 杏林**	**QJ**	**104°04′18.9″**	**34°32′32.3″**	**2308**	**N/A**
MWJS	**Wangjiashan 王家山**	**QJ**	**104°00′53.9″**	**34°25′22.7″**	**2350**	**N/A**
	Dexi 的西	QJ; SW	104°04′53.1″	34°28′29.1″	2311	5
MY	**Yanwaping 砚洼坪**	**QJ**	**104°00′39.1″**	**34°25′15.8″**	**2361**	**2**
	Chalugou 茶路沟	QJ	104°02′21.1″	34°23′27.4″	2385	5
	Caotan 草滩	SW	103°59′49.6″	34°34′34.0″	2293	5
MP	**Padiping 葩地坪**	**MJY**	**103°58′13.3″**	**34°38′53.6″**	**2305**	**4**
MG	**Guoha 郭哈**	**QJ**	**103°53′27.9″**	**34°27′33.3″**	**2353**	**3**
MGJ	**Guojiapu 郭家堡**	**QJ**	**103°52′54.4″**	**34°40′22.4″**	**2266**	**N/A**
MQJS	**Qijiashan 齐家山**	**QJ**	**103°54′36.2″**	**34°27′37.2″**	**2442**	**4**

Table 9. *Zuoni Sites Table.*

Site Code	Site Name	Cultural Affiliation	Easting	Northing	Elevation	Class
	Yizhichuan 一支川	QJ; SW	103°47'59.9"	34°45'59.8"	2251	4

Supplementary Information

The dataset permanent URL is: https://doi.org/10.7910/DVN/HN6DPY. The full citation is: Flad, Rowan (2021). Flad et al. 2021 BMFEA 82 Supplemental Files, Harvard Dataverse.

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Remembering Qijiaping, Forgetting Qijiaping: Archaeological Experience as Shared Heritage

by

Jada KO

Abstract

As we remember an archaeological site, what do we forget about the place that holds and symbolizes a reconstructed past? Archaeological research all over the world has increasingly emphasized community-based practices to evaluate the impacts of archaeology and heritage creation on descendent and indigenous stakeholders who often have been removed from the narrative archaeology helps reimagine. This article centers on the archaeological site of Qijiaping in the Tao River Valley in Gansu Province, China. At Qijiaping, local ethnic Dongxiang Muslim residents, who arrived relatively recently, do not identify as being ethnically or culturally linked with the archaeology, but their connection to archaeological activities makes them stakeholders who have likewise been elided as the archaeological site is remembered. This article uses results from ethnographic research conducted at and around Qijiaping since 2014 to examine the "archaeological experience" of how the archaeological site of Qijiaping came to be. This "archaeological experience" is defined by the sum of all the lived experiences in the process in which an archaeological site is created, from surveys and excavations to the subsequent reconfigurations of the landscape by the needs to reconstruct an ancient story. By viewing the "archaeological experience" as part of the heritage that defines Qijiaping, the Qijiaping Dongxiang group does not have to identify with the archaeological culture to be considered stakeholders of archaeological and heritage concerns.

Unpublished Stories in Dusty Envelopes

In June of 2017, I sat in a crowded storage room in the Gansu Provincial Institute of Archaeology. In front of me was a stack of dusty envelopes, measuring 0.5m in height, containing fieldnotes, maps, and monochrome photographs that documented the 1975 excavations at Qijiaping, a small village situated on the top of a terrace west of the Tao River in Guanghe County, Gansu Province, China (Fig. 1).

The 1975 excavations of several 4000-year-old human burials, house foundations, ritual deposits, and middens by the Gansu Provincial Museum were to carry on the research legacies of Swedish Geologist-turned-Archaeologist Johan Gunnar Andersson. Andersson contributed to the founding of scientific archaeology in China and is often credited with being the first to recognize the significance of archaeological evidence for substantiating

Figure 1. *Map of the Tao River Valley with an emphasis on the locations mentioned in the article.*

a prehistoric occupation of the Chinese landscape.[1] In 1924, Andersson, together with his collaborators Yuan Fuli 袁复礼, Chen 陈氏,[2] Liu 刘氏, Zhuang Yongcheng 庄永成, Jin 靳氏, and Bai Wanyu 白万玉,[3] embarked on a journey to Gansu. During the trip, Andersson discovered and studied double-handled plain pottery urns impressed with exquisite basket and comb patterns at Qijiaping, which were unprecedented to any archaeological cultures previously studied.[4] Subsequent investigations carried out by Chinese archaeologists of the Qijiaping materials and their chronology, including the 1975 excavations, have established Qijiaping as the type site of a "Qijia culture",[5] bringing fame to what the village once was. Today, the Tao River Archaeological Project (TRAP), a joint project of the

1 See, for example: Magnus Fiskesjö, and Chen Xingcan, *China before China: Johan Gunnar Andersson, Ding Wenjiang, and the Discovery of China's Prehistory* (Stockholm: Museum of Far Eastern Antiquities, 2004), 18–20; Magnus Fiskesjö, "Andersson, Johan Gunnar," *Encyclopedia of Global Archaeology* (2014).

2 The Chinese character 氏 indicates "surname."

3 Fiskesjö and Chen (2004), *China before China*, 57–58.

4 Johan Gunnar Andersson, "Preliminary Report on Archaeological Research in Kansu," *Memoirs of the Geological Survey of China. series A*, no. 5. (1925): 3; Johan Gunnar Andersson, "Researches into the Prehistory of the Chinese," *Bulletin of the Museum of Far Eastern Antiquities* 15 (1943): 78–83; Johan Gunnar Andersson, *Children of the Yellow Earth* (Cambridge, MA: The MIT Press, Reprint of the 1934 edition, 1973), 262–263.

5 Pei Wenzhong 裴文中, "Gansu shiqian kaogu baogao 甘肃史前考古报告 [Archaeological Report on Prehistoric Gansu]," in *Pei Wenzhong shiqian kaoguxue lunwenji* 裴文中史前考古学论文集 [*Collected Papers on Prehistoric Archaeology by Pei Wenzhong*], ed., Pei Wenzhong 裴文中 (Beijing 北京: Wenwu Chuban-she 文物出版社, 1987), 236, 246; GWGW (Gansusheng Wenwu Guanli Weiyuanhui 甘肃省文物管理委员会 [Gansu Province Cultural Relics Management Committee)], "Gansu Lintao, Linxia liangxian kaogu diaocha jianbao 甘肃临洮、临夏两县考古调查报告 [A Brief Report on the Archae-ological Surveys in Two Counties in Gansu, Lintao and Linxia]," *Kaogu* 考古 [*Archaeology*] 9 (1958): 36–49; Xia Nai 夏鼐, "Qijiaqi muzang faxian ji qi niandai de gaiding 齊家期墓葬的新發現及其年代的改訂 [New Discoveries of Qijia Period Graves and the Revision of Their Chronology]," *Zhongguo Kaogu Xuebao* 中國考古學報 [*Chinese Archaeological Reports*] 3 (1948): 101–117.

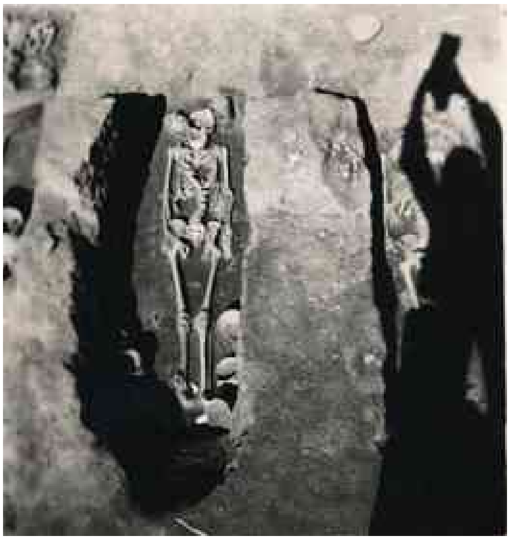

Figure 2. *Plan-view of M111. Courtesy of the Gansu Provincial Institute of Archaeology and Cultural Relics.*

Figure 3. *Plan-view of M59. Courtesy of the Gansu Provincial Institute of Archaeology and Cultural Relics.*

Gansu Provincial Institute of Archaeology, Peking University, and Harvard University, in which I have participated since 2013, continues to unmask the ancient mysteries at Qijiaping, and has brought me to these envelopes.

The first documents I extracted from the pile of archival documents were two creased, weathered and slightly torn maps each measuring almost 1X1m. The first one contained the profile drawings illustrating the stratigraphic layers within T1 (*tanfang* 探方 or excavation pit number 1) of excavation Area B. The second was a plan-view of the entire excavation area of Area A, indifferently marking the burials of the dead each with a circle and a cross representing the head and the body. The second map has now been digitized into a clean and shrunken version printed on multiple documents, which has become an iconic representation of Qijiaping's past.

I left the maps unfolded and started pulling out the photographs from the envelopes. Each of the photos, taken from a different cardinal direction, documented the different stages of the excavation.

M111 (M indicates *Mu* 墓 or Burial) (Fig. 2): the excavator's back faces the sun as he looks down onto the excavation pit. He extends his arms and raises the camera high above the pit in order to take a good overhead photo of the burial. He presses the shutter and does not seem to realize that his shadow will forever be tattooed onto the skeletons of this individual who passed away four millennia before his birth. M59 (Burial 59) (Fig. 3): the excavation of a double burial is complete. As the archaeologist places his trowel, small picks, and brush at the edge of the excavation unit, he climbs up from the burial pit and takes a photo of two incomplete skeletons exhumed by him and his team. There are ten more envelopes containing photographs of a similar nature. One after another I opened them as if I were watching a silent motion picture of the 70s excavations - anticipating one artifact and body after another being discovered in awe, bringing to life the map of Area A

Figure 4a. *A snapshot of F2. Courtesy of the Gansu Provincial Institute of Archaeology and Cultural Relics.*

Figure 4b. *A snapshot of F2. Courtesy of the Gansu Provincial Institute of Archaeology and Cultural Relics.*

beside me. I only recognized a few of these photos as published in papers and documents regarding the 1975 excavations, most depicting the overall landscape, the burials, and the artifacts of Qijiaping. Others are not published mostly likely because of their aesthetic qualities and accidental "pollution" by shadows, unorganized placement of tools, and by-standers.

I next removed the photos from an envelope labelled F2 (F indicates *fang* 房 or House). They are a series of photographs constituting a panoramic view from the center of F2: the first photograph encapsulates a corner of the house foundation, and on the top left-hand corner two men are standing against the stratigraphic profile with a shovel beside them, their upper bodies amputated by the edges of the photo frame. The second photograph reveals an additional pair of legs. As snapshots after snapshots were taken, the series of photos revealed that the excavation unit was surrounded by women, men, and children in baggy winter clothing, and some of the women were wearing hijabs (Fig. 4a, 4b, 4c).

I will never forget the adrenaline rush seeing the faces of the individuals captured in these photographs. Are they the parents and grandparents of the Qijiaping villagers that I have been working closely with and alongside since 2013? Do I know any of these children? I started laying out these photographs for a closer examination. To make way for them, I folded up the huge map of Area A, then that of Area B. My attention was then caught by some faint pencil marks at the back of the Area B profile drawings. These are not just random markings, but portraits of women, men, and children in the same baggy clothing depicted in the F2 photos most likely drawn by an archaeologist (Fig. 5). Located in a corner at the back of the graph paper, the smudged and faint portraits were destined to slip away from the story of how Qijiaping is remembered. Yet, the discovery of these drawings and photographs marks the beginning of a story of how Qijiaping is forgotten.

Figure 4c. *A snapshot of F2. Courtesy of the Gansu Provincial Institute of Archaeology and Cultural Relics.*

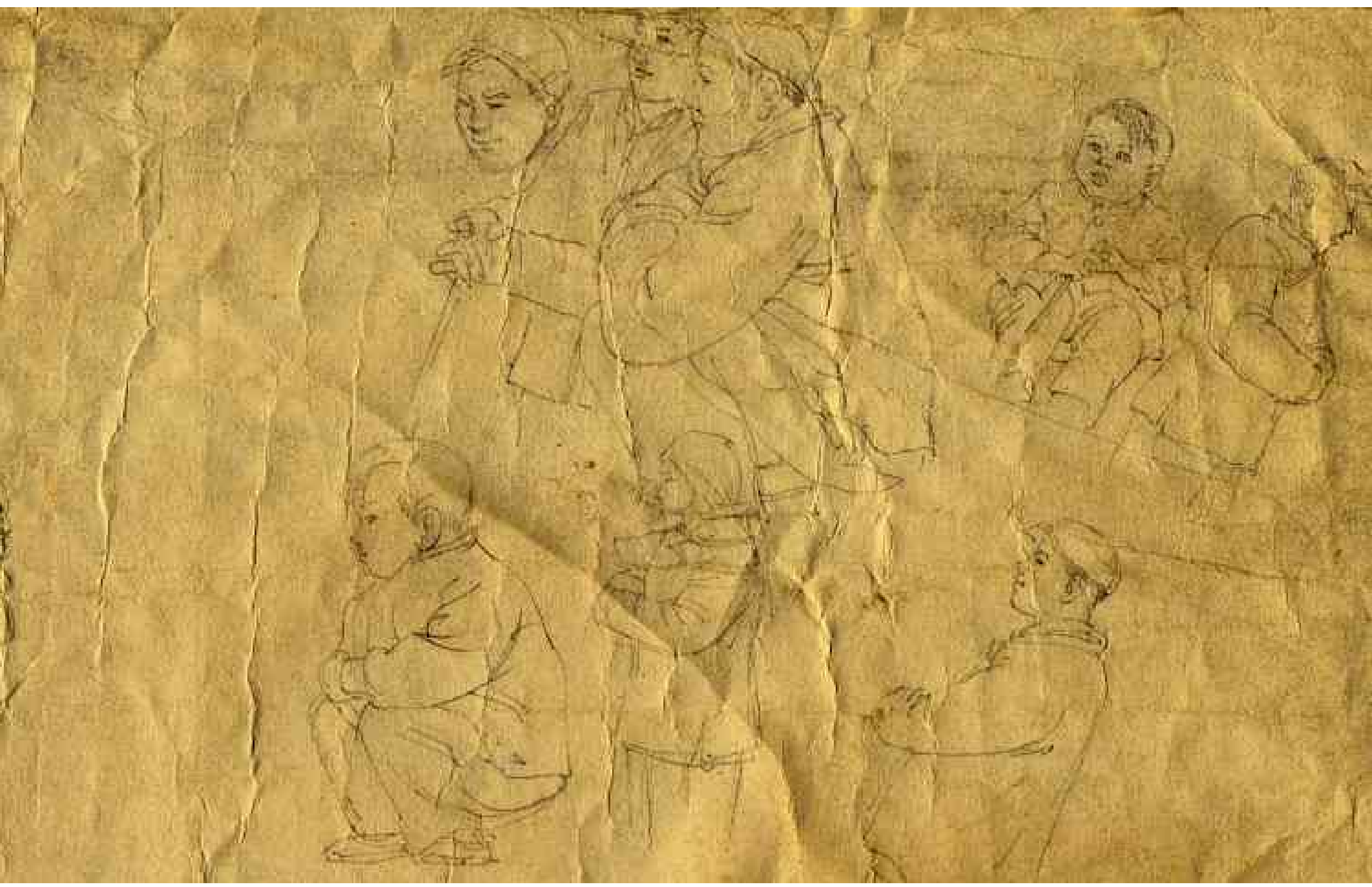

Figure 5. *Portraits of local people drew on the back of Area B Map. Courtesy of the Gansu Provincial Institute of Archaeology and Cultural Relics.*

To Remember an Archaeological Site

How is an archaeological site remembered? And what is to be remembered about a site? The answers to these questions are never simply shaped by the materiality discovered. If we consider the second-hand digestion and conceptualization of a site through excavation and survey reports, articles, dissertations, documentaries, government documents, museum exhibits, and even on-site tours, what a site is and represents are often the results of an interplay between scientific authority and national priorities.[6] On one hand, the narratives that are chosen to be presented reflect what is deemed meaningful to the archaeologists,[7] dependent on academic interests and expertise, and the available research resources and tools. On the other hand, this research inclination does not function in a vacuum. Rather, its co-dependence with the state defines its legitimacy and even impacts what is being excavated in the first place.[8] In the end, an archaeological site becomes similar to what Pierre Nora termed *lieux de mémoire*, or sites of memory,[9] a place of history that is "no longer."[10] The non-neutral narrative latches onto the site, consumed and remembered as a piece of historical information detached from lived experiences and temporal continuity to an individual. The narrative is not intended to be forgotten; rather, its presence is crystalized and constantly declared through the erection of visible or sensual monuments, ritualized to be commemorated as a common narrative that celebrates and defines scientific accomplishments and an aspect of a nation's past, present, and future.[11]

Meanwhile, a site is also remembered through fieldwork. This process of transforming a place with extant living expressions into a site constituting a polished and romanticized historical narrative built upon fragmentary remnants, is almost exclusively experienced by archaeologists and those who are enlisted into the archaeological field projects. Unfortunately, the memory of such experience is often not the main emphasis of the archaeological discourse. The nature of such documentation is often subsumed under ethnographic or anthropological studies.[12] While these experiences are still recorded by archaeologists in field diaries or other forms of prose, and sometimes a glimpse seen between lines of articles

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6 See Philip L. Kohl, and Clare Fawcett, eds., *Nationalism, Politics and the Practice of Archaeology* (Cambridge: Cambridge University Press, 1996); Patricia Rocabado, "Patrimonialización y Arqueología Multicultural en San Pedro de Atacama (norte de Chile) [Patrimonialization and Multicultural Archaeology in San Pedro de Atacama (North of Chile)]," *Estudios Atacameños* [*Atacameños Studies*] 49 (2014): 69–94; Bruce G. Trigger, "Alternative Archaeologies: Nationalist, Colonialist, Imperialist," *Man* 19.3 (1984): 355–70.

7 See Lynn Meskell, "Goddesses, Gimbuta and 'New Age' Archaeology," *Antiquity* 69 (1995): 74–86.

8 See, for example: James F. Goode, *Negotiating for the Past: Archaeology, Nationalism, and Diplomacy in the Middle East, 1919–1941* (Texas: University of Texas Press, 2007); Ulrike Sommer, "Archaeology and Nationalism," in *Key Concepts in Public Archaeology*, ed., Gabriel Moshenska (London: UCL Press, 2017), 166–186.

9 The French term *lieux de mémoire* has also been translated to "realms of memory" and "places of memory" to indicate that it does not have to be a physical space but can also refer to something symbolic or functional, see Stephen Legg, "Contesting and Surviving Memory: Space, Nation, and Nostalgia in Les Lieux de Mémoire," *Environment and Planning D: Society and Space* 23.4 (2005): 482. "Site" is taken here from Pierre Nora, "Between Memory and History: Les Lieux de Mémoire," *Representations* 26 (1989): 7–24, to echo the underlying physicality of an archaeological site.

10 Nora, "Between Memory and History," 8.

11 Ibid., 19; Nancy Wood, "Memory's Remains: Les Lieux de Mémoire," *History and Memory* 6.1 (1994): 126–131.

12 Ian Hodder, "Archaeological Reflexivity and the 'Local' Voice," *Anthropological Quarterly* 76.1 (2003): 57.

and reports or in documentaries, they are usually not published or publishable, and often from the perspectives of the archaeologists. These shared experiences are mostly just remembered, and eventually neglected and even forgotten.

A gradual shift in archaeology concerning the process of remembering and the "becoming" of an archaeological site marks the urgency of a self-reflexive exercise necessary to decolonize archaeology, and often science itself.[13] This shift is mainly rooted in the recognition of the roles of archaeology in heritage creation, specifically concerning the needs to address ownership and access, and the authoritative univocal interpretation of the legacies of living cultures and communities by archaeologists, often foreign to the archaeological sites and cultures under consideration.[14] As a result, archaeological work is increasingly contextualized within the relationships between archaeologists and immediate stakeholders, with an emphasis on the collaboration between science and local or indigenous values.[15] These stakeholders are often descendant and local communities of the excavated cultures[16] living around or at an archaeological site whose lands get excavated on, who are sometimes hired as excavation labors, and who identify themselves with such heritage. Yet, these communities are marginalized by the appropriation of the state sponsored archaeological discourses that focus on a reimagined past of a place in relations to the modern national priorities while undermining or intentionally erasing the "others" who do not fit into this narrative.[17] Increasingly, many archaeologists see the need for a "paradigm shift"[18] towards research that is more inclusive and community-based. The reconstruction of archaeological narratives-cum-heritage should then be made into a process representative of the participation of different immediate stakeholders rather than a fossilized product hegemonized by the ambitions of science and the state.[19]

[13] See, for example: Claire Smith, and H. Martin Wobst, *Indigenous Archaeologies: Decolonising Theory and Practice* (London and New York: Routledge, 2005); Stephen W. Silliman, *Collaborating at the Trowel's Edge: Teaching and Learning in Indigenous Archaeology* (Arizona: University of Arizona Press, 2008); Matthew Liebmann, and Uzma Z. Rizvi, *Archaeology and the Postcolonial Critique* (Lanham: Altamira Press, 2008); Sonya Atalay, *Community-Based Archaeology: Research with, by, and for Indigenous and Local Communities* (Berkeley and Los Angeles: University of California Press, 2012), 9; Maxine Oland, Siobhan M. Hart, and Liam Frink, *Decolonizing Indigenous Histories: Exploring Prehistoric/Colonial Transitions in Archaeology* (Arizona: University of Arizona Press, 2012); Linda Tuhiwai Smith, *Decolonizing Methodologies: Research and Indigenous Peoples* (London: Zed Books Ltd., 2012).

[14] See, for example: Sonya Atalay, "Indigenous Archaeology as Decolonizing Practice," *American Indian Quarterly* 30.3 (2006): 280–310.

[15] Patricia Ayala, "The Indigenous Other in Atacameño Archaeology," *Indigenous Peoples and Archaeology in Latin America* 4 (2011): 109–130; Anna Stroulia and Susan Buck Sutton, "Archaeological Sites and Local Places: Connecting the Dots," *Public Archaeology* 8.2–3 (2009): 124–40.

[16] See Yvonne Marshall, "What Is Community Archaeology?" *World Archaeology* 34.2 (2002): 216. For a definition of "a community" in relations to discussing an archaeological and heritage site, see also Atalay (2012) *Community-Based Archaeology*, "Chapter Four: Connecting with Community Research Partners," 89–127.

[17] See, for example: Lynn Meskell, "The Intersections of Identity and Politics in Archaeology," *Annual Review of Anthropology* 31 (2002): 288; Doreen Massey, "Places and Their Pasts," *History Workshop Journal* 39 (1995): 182–192.

[18] Atalay (2012) *Community-Based Archaeology*, 3.

[19] See, for example: Dylan J. Clark and David S. Anderson, "Past Is Present: The Production and Consumption of Archaeological Legacies in Mexico: The Production and Consumption of Archaeological Legacies in Mexico," *Archeological Papers of the American Anthropological Association* 25.1 (2015): 1–18.

But what if we are presented with an archaeological site like Qijiaping, where the local communities are not considered “indigenous,” not thought to have ethnic affiliations, or even cultural or historical connections to the heritage brought to existence by archaeological endeavors in the same landscape that they call home? How do we define them as stakeholders, if we are to, of the archaeological culture and constructed heritage? Why does it matter to bring attention to these communities in discussing an archaeological site?

Approximately five decades prior to Andersson’s discovery of the “Qijia” pottery in 1924, the ancestors of the current Qijiaping inhabitants migrated to and populated Qijiaping from a few villages 40 km in the north. Today, members of this group identify themselves as the Dongxiangzu 东乡族 (Eastern Township ethnic group),[20] one of the ten officially recognized Muslim minorities in China, whose ancestry is believed to have ties to Mongol language groups brought into or entered China as foreign merchants, artisans, scientists, and military groups a millennium ago.[21] While the group self-identify as Dongxiangzu today, the ethnonym “Dongxiang” or Eastern Township was officially designated by the Chinese Government after the founding of the People’s Republic of China based on the geographic location where this group is concentrated, which is in the eastern prefecture of Linxia; they previously (and some still do) referred to themselves as the Santa.[22] At the time when Andersson conducted his scientific research in the region, the forefathers of the current Qijiaping Dongxiangzu, together with the many “Mohammedans” Andersson described that he encountered at and around Qijiaping, had been driven mostly to the western bank of the Tao River, away from the dominant Han ethnic group residing on the eastern bank.[23] This was mostly due to an effort executed by the preceding Qing (A.D. 1636–1912) imperial court in response to the long-term conflicts between the Han and the Muslims.[24] The Qijiaping Dongxiangzu therefore is not indigenous to Qijiaping, nor do they belong to a cultural or ethnic group that has close ties to the archaeological Qijia culture.[25] It is also questionable how closely they associate themselves with what the state defines as “Chinese,” particularly when hostility still exists between the Han and the Mu-

[20] A few individuals self-identified as Hui.

[21] See, for example: Michael Dillon, *China’s Muslims* (Oxford: Oxford University Press, 1996), 12–13; Jonathan N. Lipman, *Familiar Strangers: A History of Muslims in Northwest China* (Seattle: University of Washington Press, 1997), 32. Yet, no reliable sources can yet confirm their actual origin, see Dai Yujing 戴玉景, and Yang Dongya 杨东亚, “Gansu Dongxiangzu tizhi tezheng yanjiu 甘肃东乡族体质特征研究 [Research on the Physical Characteristics of Dongxiang Nationality in Gansu Province, Northwest China],” *Renleixue Xuebao* 人类学学报 [*Acta Anthropologica Sinica*] 10.2 (1991): 127.

[22] Dru C Gladney, *Muslim Chinese: Ethnic Nationalism in the People’s Republic* (Cambridge, MA: Harvard University Press, 1991), 19–20, 34; Lipman, *Familiar Strangers*, 149. After the establishment of the People’s Republic of China, the Chinese State began to demarcate different ethnic groups (*minzu* 民族) under the umbrella of the Chinese national ethnic group (*zhonghua minzu* 中华民族).

[23] Andersson, *Children of the Yellow Earth*, 256, 261.

[24] See section 6 in this paper for a more detailed discussion of demographic changes in the Tao River Valley.

[25] In fact, “descendant communities” of archaeological cultures are usually not relevant in the discussion of prehistoric or early dynastic archaeological sites in China due to the long history of dynastic changes that involved the ruling of different ethnic groups in addition to population movements throughout history due to dynastic changes, wars and conflicts, and rural-urban migration.

lims,[26] and when the State has generally equated the idea of being "Han" with "Chinese".[27]

Since 1924, the Qijiaping Dongxiangzu and other local Muslim groups[28] have extracted the ancient materiality from the fields both unintentionally (through agricultural labor) and intentionally to satisfy archaeo-scientific pursuits and the antique markets in exchange for short-term economic relief, and later mobilized into the protection and excavations of China's past. They directly and indirectly participated in the destruction, protection, and creation of national heritage, in manners that inextricably connected them to Chinese archaeology and the commemoration of a piece of Chinese history.

Owing to the subsequent surge in archaeological pursuits in the Tao River Valley, Qijia and other archaeological cultures such as Majiayao and Banshan in the region have rapidly risen to fame on national and international platforms. As a result, the presence of the Chinese state on the western bank of the Tao River has become increasingly conspicuous as they assert claims over this Chinese heritage. Whereas the west bank of the Tao River contains numerous mosques with tall minarets and domes many of which have been funded in the past by Saudi financial support, since 2010, increasingly new monumental structures and sculptures highlighting Han traditional architecture and beliefs have been erected in the eastern bank. Meanwhile, the recent state efforts of cultural assimilation and religious sinicization in the region, an example of which is demonstrated by the removal of "Saudi" architectural styles and replacing them with a more Chinese style appearance,[29] have also contributed to a reconceptualization of the landscape and the relationships between the ethnic minorities and the land. Given the exertion of national narratives about the past and the present on how the Tao River Valley should be re-imagined and re-remembered, the physical and symbolic disjuncture between the Muslim and Han ethnic groups carved by the meandering of the Tao River has become increasingly ambiguous. This poses a challenge to how local ethnic minorities conceptualize and should conceptualize themselves in a landscape they have been familiarized with for generations.

Indigeneity to Archaeological Experience

Anchoring our discussion on archaeology, specifically at Qijiaping, how then do the local Qijiaping villagers fit into the archaeological narrative? Do they have (the rights to) access to the heritage being created and if so, in what ways? What does access to this heritage mean to them? Rather than fitting this discussion into the framework of an approach to public archaeology that aims at making relevant the archaeological knowledge and communicating the knowledge through outreach and education,[30] I take an approach drawing on community-based archaeology in which archaeological work becomes and is viewed as

[26] Based on ethnographic interviews and observations.

[27] Gladney, *Muslim Chinese*, 81.

[28] Also Han groups.

[29] See, for example: Alice Su, "China's New Campaign to Make Muslims Devoted to the State Rather than Islam," *Los Angeles Times* (November 20, 2020) https://www.latimes.com/world-nation/story/2020-11-20/china-muslim-minorities-hui-dongxiang-secularization-gansu; Emily Feng, "Afraid we will Become the Next Xinjiang': China's Hui Muslims Face Crackdown," *NPR* (September 26, 2019) https://www.npr.org/2019/09/26/763356996/afraid-we-will-become-the-next-xinjiang-chinas-hui-muslims-face-crackdown.

[30] See, for example: John H. Jameson, and Virginia Horak, *Presenting Archaeology to the Public: Digging for Truths* (Walnut Creek: Altamira Press, 1997); Akira Matsuda, "A Consideration of Public Archaeology Theories," *Public Archaeology* 15.1 (2016): 40–49.

a collaborative process with local stakeholders. Nonetheless, my goal is not to emphasize the collaborative interpretation and management of the archaeological culture and site per se, nor the de-alienation of participants from[31] and creation of an alternative or multi-perspective past of excavated materials.[32] Instead, I propose the idea of looking at the archaeological experience as a shared heritage, reflecting on the collaborative process within the context of a larger social, cultural and historical backdrop in which Qijiaping became and is becoming the Qijiaping many people know of today. By doing so, access to heritage does not have to be defined by the identification with the heritage or *lieux de mémoire* in and of itself, but by the experience of creating it. While the Qijiaping Dongxiangzu have no cultural or ethnic connections to Qijiaping's ancient past, they are indigenous to the archaeological experience that helped reimagine it. This experience is defined by not only the memories they shared with archaeologists in excavation and survey projects, but also the subsequent changes in the physical landscape and atmosphere of Qijiaping brought about by archaeological discoveries that influence how the village is conceptualized and reconceptualized. In this sense, the Qijiaping inhabitants are similarly stakeholders of the archaeological research, and they should be taken into consideration concerning how Qijiaping is viewed and transformed into Chinese heritage.

Unfortunately, up to this moment, not only have the Qijiaping villagers benefited the least from the archaeological research, but their definitions of what is home (and their relationships with their landscape) for at least six generations are also imminently jeopardized by the national priority to create a pristine image of an imagined Qijiaping. Similar to many archaeological and heritage sites around the world where local communities living at and around these sites are evicted or displaced for "better" management and filtered presentation of the "integrity" of the past, and for presenting a gentrified image of the present,[33] Qijiaping is scheduled for a similar kind of "spatial cleansing," in which its "former residents [are seen] as intruders"[34] and have to be "relocated by 2026–2035"[35] or even earlier.

[31] Allison Mickel, "Essential Excavation Experts: Alienation and Agency in the History of Archaeological Labor," *Archaeologies* 15.2 (2019): 181–205.

[32] See, for example: Ian Hodder, "Developing a Reflexive Method in Archaeology," in *Towards Reflexive Method in Archaeology: The Example at Çatalhöyük*, ed., Ian Hodder (Ankara, Turkey: British Institute at Ankara, McDonald Institute for Archaeological Research, 2000), 3–14; Qiaowei Wei, "Community Archaeology and Alternative Interpretation of the Past through Private Museums in Shanghai, China," *Archaeologies* 11.2 (2015): 204–219; Junko Habu, Clare Fawcett, and John M. Matsunaga, eds., *Evaluating Multiple Narratives: Beyond Nationalist, Colonialist, Imperialist Archaeologies* (New York: Springer, 2008).

[33] See, for example: Michael Herzfeld, "Engagement, Gentrification, and the Neoliberal Hijacking of History," *Current Anthropology* 51, Supplement 2 (2010): S259–267; Chiara De Cesari and Michael Herzfeld, "Urban Heritage and Social Movements," in *Global Heritage: A Reader*, ed., Lynn Meskell (Hoboken: Wiley-Blackwell, 2015), 171-195; Anne-Laura Kraak, "World Heritage Conservation and Human Rights in Bagan, Myanmar: Ambiguity and Complexity," *Historic Environment* 29 (2017): 84–96; Anne-Laura Kraak, "Human Rights-Based Approaches to World Heritage Conservation in Bagan, Myanmar: Conceptual, Political, and Practical Considerations," *International Journal of Cultural Property* 25.1 (2018): 111–133.

[34] Michael Herzfeld, "Spatial Cleansing: Monumental Vacuity and the Idea of the West," *Journal of Material Culture* 11 (2006): 142.

[35] GRZ, SGYGJYZ, GWKY, GWGY and QYG (Guanghexian Remin Zhengfu 广河县人民政府 [Guanghe County People's Government], Shaanxisheng Guji Yizhibaohu Gongcheng Jishu Yanjiu Zhongxin 陕西省古迹遗址保护工程技术研究中心 [Shaanxi Province Monuments Site Protection Engineering Technology Research Center], Gansusheng Wenwu Kaogu Yanjiusuo 甘肃省文物考古研究所 [Gansu Provincial Insti-

As we celebrate the legacies of Andersson's work at Qijiaping and at other locations alike, it is therefore important to ask: what other and whose narratives are we subverting, and what are the impacts of letting these narratives slip into oblivion, if we are to view these archaeological sites as palimpsests of the past? This article attempts to answer these questions by anchoring on the memories related to local villagers' involvement in the archaeological past of Qijiaping, particularly the participation in the 1975 excavations. These memories are drawn upon the ethnographic interviews that I have conducted at and around the village with both Han identified and non-Han identified, and female and male identified informants since 2014 as part of a sub-project of TRAP aiming to study the relationships between archaeology/archaeologists and local villagers in the Tao River Valley (all these have either been voice or video recorded). My informants are divided into three age groups namely 70–90 years old (Group A), 40–65 years old (Group B), and 28–35 years old (Group C), who have had different relationships with Qijiaping, archaeology, and the state.[36] The identities of my informants are anonymized.

As we will see throughout this article, the neglected narrative about Qijiaping reflects the impacts of not only the monumentalization of the archaeological past of Qijiaping, but also the processes of de-monumentalization of different layers of the village since the Qijiaping villagers settled in the landscape. These impacts do not only affect the Qijiaping villagers, but also the integrity of the archaeological past that is of utmost concern of science and the state.

This is by no means the whole story of what is forgotten as Qijiaping becomes Qijiaping. This is just the prologue to a much more convoluted discourse concerning the past, present and an uncertain future of a living community and the archaeological site brought alive by their experiences.

How Qijiaping became Qijiaping

> I left Lanzhou and headed south to the Tao River Valley. The flat and fertile valley is home to the villagers who support themselves by cultivating wheat which we see blooming in the fields today. Apart from wheat, opium poppy is grown in some areas as an order by greedy officials, so much that there did not remain sufficient ground for the cultivation of the necessary cereal crops. The discovery of the abundant ancient painted pottery in this area has convinced me that important prehistoric treasures in Gansu only awaited someone to discover them.
>
> Johan Gunnar Andersson[37]

During my first visit to the Tao River Valley in 2013, the flowery smell of opium poppy and grassy smell of wheat have long been replaced by the aura of fresh budding maize. As the TRAP team conducted archaeological surveys in the region, often scouring for and collecting pottery sherds churned up from their ancient contexts by local villagers when

tute of Archaeology], Guanghexian Wenhua Guangbo Yingshiju 广河县文化广播影视局 [Guanghe County Culture and Broadcast Film and Television Department], Qijiaping Yizhi Guanlisuo 齐家坪遗址管理所 [Qijiaping Management Center]), *Qijiaping yizhi baohu guihua* 齐家坪遗址保护规划 (2016-2035) [*Report on Preservation Plans at Qijiaping (2016-2035)*] (2015), 18.

[36] A total number of 26 informants are represented in Group A, 19 in Group B, and 10 in Group C.

[37] Paraphrased from Andersson, *Children of the Yellow Earth*, 252 and 257.

they attended to their lands, we occasionally encountered curious or sometimes offended individuals to whom we had to explain the nature of our work. As we introduced ourselves as archaeologists, the most frequent response word we heard from them was "*guan guan*," which means pottery urns. Not only did *guan guan* become one of the major defining concepts local people have of archaeology, but the painted *guan guan* in specific also defined the ancient past of the Tao River Valley and had led Andersson to the discovery of the plainware at Qijiaping.

In 1922, after Andersson excavated at the Yangshao village in Henan Province, where he discovered the exquisite Neolithic painted pottery that resembled the Anau and Tripolje pottery from Inner Asia and Ukraine, he traveled West to Xining in Qinghai and discovered similar materials at the site of Zhujiazhai. This eventually led him to Gansu Province in search of the potential connections between these material cultures and the development and spread of the painted pottery technology. When he arrived in Gansu, he came across some painted pottery collected by a British missionary George Findlay Andrew (1887–1971) that echoed those in Henan and Qinghai whose origin he eventually traced to the Tao River Valley. During his surveys and excavations along the Tao River, Andersson not only discovered the site of Majiayao, where the painted pottery culture was found, but he also uncovered the double handled plain pottery at Qijiaping. Andersson did not recover any painted pottery nor bronzes in his excavations at the village, which led him to postulate a Western origin of the painted pottery technological culture where it spread from Inner Asia to Qinghai, then to Gansu (replacing the Qijia plainware "backward" technology) and eventually to Henan.[38]

Two decades later in the 1940s and 50s, the attention given to the "prehistoric treasures" by Andersson attracted a successive lineage of archaeologists to the Tao River Valley. These subsequent archaeological undertakings did not only focus on the study of the cultural materiality but were also in response to the skepticism towards the western origin of the painted pottery culture of Yangshao.[39] Chinese archaeologists including Xia Nai 夏鼐 from the Institute of History and Philology, Academia Sinica 中央研究院历史语言研究所, Pei Wenzhong 裴文中 and Mi Taiheng 米泰恒 from the Central Geological Survey 中央地质调查所, and Zhang Xuezheng 张学正 of the Gansu Cultural Heritage Management Committee 甘肃文物管理委员会 led brief surveys and excavations at different times at and around Qijiaping, eventually overturning Andersson's hypothesis and verifying that

[38] For detailed description and summary see, for example, Andersson, *Children of the Yellow Earth*, Chapters 12–17; Magnus Fiskesjö, "Science Across Borders: Johan Gunnar Andersson and Ding Wenjiang," in *Explorers and Scientists in China's Borderlands, 1880-1950*, eds., Denise M. Glover, Stevan Harrell, Charles McKhann, and Margaret Swain (Seattle: University of Washington Press, 2011), 248–256; Fiskesjö, and Chen, *China before China*, 34–62.

[39] Margit Bylin-Althin, "The Sites of Ch'i Chia P'ing and Lo Han T'ang in Kansu," *Bulletin of the Museum of Far Eastern Antiquities* 18 (1946): 383–498, Plates 1–56; G.D. Wu [Wu, Chin-ting], *Prehistoric Pottery in China* (London: Published on Behalf of The Courtauld Institute of Art, University of London, 1938), 104–105; Xu Bingchang 徐炳昶, "Shaanxi zuijin faxian zhi xinshiqi shidai yizhi 陝西最近發現之新石器時代遺址 [Newly Discovered Neolithic Archaeological Sites in Shaanxi]," *Guoli Beiping Yanjiuyuan Yuanwu Huibao* 國立北平研究院院務彙報 [*Bulletin of the National Academy of Peiping*] 6.7 (1936): 208; Liu Yao 劉燿, "Longshan wenhua yu Yangshao wenhua zhi fenxi 龍山文化與仰韶文化之分析 [The Analysis of Longshan Culture and Yangshao Culture]," *Tianye Kaogu Baogao* 田野考古報告 [*Field Archaeology Report*] 2 (1947): 276–282.

the Qijia phase came later than that of the Majiayao culture.[40] At this point, Qijiaping nonetheless did not become a centerpiece of the archaeological work in the Tao River Valley. Rather, spiralling out from the site was the "Qijia phenomenon." An increasing number of archaeological sites yielding material cultures pertaining to the Qijia style were discovered, allowing for the understanding of the origins, distribution, chronology, and cultural significance of the "Qijia culture." In archaeological terms, Qijiaping transformed into the "type site" of the Qijia Culture.

There had been no large-scale excavations at the village up until 1975, when the Gansu Provincial Museum 甘肃省博物馆 and Dunhuang Cultural Relics Research Institute 敦煌文物研究所 (the previous name for the present Dunhuang Research Academy 敦煌研究院) sent in seven archaeologists[41] twice in the year (June to July and October to November) to excavate in what the reports labeled Area A and Area B. A total of 22 9X9m trenches were excavated where human burials, ritual features, middens, and house foundations were unveiled, yielding artifacts including stone and bone tools and ornaments, pottery, turquoise, and bronzes.[42] The "Qijiaping Cemetery" thereafter became the symbol of Qijiaping.

As the Qijia phenomen grew, more isolated surveys and augering were carried out at the village. Meanwhile, more Qijia archaeological sites spanning Gansu, southern Ningxia, eastern Qinghai, and the middle, southern, and western Inner Mongolia Autonomous Region were discovered.[43] Given that many of these sites are cemeteries and therefore provide a lopsided understanding of Qijia mortuary practices, subsequent interests have shifted to the study of Qijia habitation and production traditions and technology. TRAP's recent surveys and excavations at Qijiaping reflect such a shift in interest.[44]

While this long archaeological history in the region has been recorded in articles and books, what are standing as testimonies in the land itself to the story of how the Qijia *guan guan* became part of Chinese heritage?

[40] Xia (1948), "Qijiaqi muzang..."; An Zhimin 安志敏, "Huanghe shuiku kaogu diaocha de shouhuo ji qi zhanwang 黄河水库考古调查的收获及其展望 (The Results and Prospect of the Archaeological Surveys in the Yellow River Valley)," *Kexue Tongbao* 科学通报 *(Science Bulletin)* 11 (1956): 66–68; Pei (1987), "Gansu shiqian...," 229–250; GWGW (1958), "Gansu Lintao..."

[41] The information is based on the primary documents I accessed at the Gansu Provincial Institute of Archaeology

[42] Chen Pin 陈玭, "Qijiawenhua de fenqi yu yuanliu: yi Qijiaping yizhi wei zhongxin 齐家文化的分期与源流: 以齐家坪遗址为中心 (The Periods, Origins and Development of Qijia Culture: Focusing on the Qijiaping Site)" (Ph.D. diss., The School of Archaeology and Museology, Peking University, 2013).

[43] Chen Honghai, "The Qijia Culture of the Upper Yellow River Valley," in *A Companion to Chinese Archaeology*, ed., Anne P. Underhill (Chichester, UK: John Wiley & Sons, Ltd., 2013), 106.

[44] Andrew Womack, Yitzchak Jaffe, Jing Zhou, Ling-yu Hung, Hui Wang, Shuicheng Li, Pochan Chen, and Rowan Flad, "Mapping Qijiaping: New Work on the Type-Site of the Qijia Culture (2300–1500 B.C.) in Gansu Province, China," *Journal of Field Archaeology* 42.6 (2017): 488–502; Hung Lingyu 洪玲玉, Wu Haosen 伍浩森, Ha Ke 哈克, Zhou Jing 周静, Wang Hui 王辉, Chen Bozhen 陈伯桢, Li Shuicheng 李水城, and Fu Luowen 傅罗文 "Qijiaping: Qijia wenhua dianxing yizhi yanjiu de xin jinzhan 齐家坪:齐家文化典型遗址研究的新进展 [Qijiaping: Recent Developments in the Investigation of the Type Site of the Qijia Culture]," *Kaogu yu wenwu* 考古与文物 [*Archaeology and Cultural Relics*] 3 (2019): 63–74.

Monumentalizing Qijiaping

Prior to 2018, one did not have to open his or her eyes in a long and bumpy car ride from Lanzhou to learn that one had arrived on the western bank of the Tao River. Instead, the chanting of the Koran could still be heard through the loudspeakers in the local mosques welcoming the southbound traveler. This soundscape together with the protruding minarets carved out the silhouette that characterize the western bank of the Tao River, a bank populated by ethnic minorities that practice different sects of Islam. Today, the speakers have all been taken down as an order by the State Administration for Religious Affairs, but one can still see the constant gathering and parting of hijabs and taqiyahs against the exoskeleton of an increasingly sinicized Islamic landscape.

Meandering up the roads to Qijiaping, passersby, visitors, and inhabitants of nearby villages are greeted by a huge arch looming over the two-way road with three banners attached that reads:

"齐家文化是人类灿烂的文化瑰宝
领略齐家文化神韵
探索华夏文明源头"
"Qijia culture is the gem of the resplendent human culture
Appreciate the charms of Qijia culture
Explore the origins of the Chinese culture"

Passing through the arch one enters the town of Qijia (Qijiazhen), where the first thing that one sees is the Paiziping[45] mosque. Depending on the time of the day, one either drives by men going in and out of the mosque or school children going in and out of the adjoining Paitzeping Primary School, which has been standing there for as long as the oldest 90-year-old inhabitants of the Qijiaping village could remember. Continuing up the narrow roads, as the bleating of sheep fades in and children chatter fades out, one finally arrives at the central plaza of Qijiaping. Immediately, one is greeted by a small sign attached to a flimsy and mobile metal stand that says "Qijiaping Yizhi 齐家坪遗址 [Qijiaping Site]" and the same characters, but enlarged ten times, followed by the slogan,

"悠久历史
发扬光大"
"Long-standing history
Enhance and glorify"

are engraved on the walls outside of one of the houses adjacent to the plaza. The occasional shuttling in and out of cars and motorbikes, between screaming children and their concerned mothers, and through groups of men playing cards, camouflage the Qijiaping signs in the banality of a familiar landscape to the Qijiaping villagers. As one continues to drive southeast, a once-dirt path leads to the largest and most representative structure on Qijiaping - the Qijiaping Management Center. Constructed in 2008, and covered by concrete since 2015, this path now provides officials and site visitors a smooth ride

[45] The name of a village in the town of Qijia.

to the Management Center, where they park their cars in the large concrete laden open space connected to the structure. The gate to the Management Center is almost constantly locked. The key keeper, usually tending to his crops and livestock, will be called to open the gate when archaeologists or government officials visit Qijiaping. The Center is treated as a workstation by us archaeologists, where our equipment and excavated and collected artifacts are temporarily stored. And when government officials are at Qijiaping, they usually visit the exhibition hall at the back of the center. Only a few artifacts including stone tools and pottery sherds are on display in this small exhibition space; the walls in the hall are mounted with boards printed with words and photos that present the archaeological narrative of Qijiaping.

Before leaving the Management Center, the designated event for the officials is usually the taking of a group photo with the marble slab outside the exhibition hall that reads:

"全国重点文物保护单位
齐家坪遗址
中华人民共和国国务院
一九九六年十一月十日公布
广河县人民政府立"
"Major Historical and Cultural Site Protected at the National Level
Qijiaping Relics
State Council of the People's Republic of China
Announced on 10 October 1996
Erected by the People's Government of Guanghe County"

The photo acts as a testimony to the celebration of the site, kept as an official record, sometimes exhibited in provincial museums where Qijiaping artifacts are displaced, or displayed.

During Ramadan, or other special occasions such as weddings and funerals, cars are usually replaced by young men gathering and playing basketball in the "parking lot." After the concrete open space superimposed onto the Qijiaping terrain in 2015, young men from the village purchased a basketball hoop from Taobao[46] and turned the space into a basketball court.

Exiting the Qijiaping Management Center, one continues down the path southeast downhill. This path is still covered in dirt, and on both sides are large areas of maize fields. A few minutes' walk leads to an outcrop barred by barbed wires with a sign standing next to it. For the trained eyes, one can spot the profile of a lime plaster house floor on the outcrop. The sign next to it reads "1924 Andersson's excavation area."

Unlike Roman architecture or pyramids around the world, Qijiaping's ancient past, like most early archaeological sites in Northern China, was built upon loess where no stone structures remain. The only visible remnants are mostly the profiles of plastered floors or pottery sherds revealed on the outcrops and sherds lying on the ground. If one walks around when maize stalks are not yet grown to their mature height, or are just being harvested, one will see rectangular holes scattered across the maize fields that are sometimes a meter

[46] A Chinese online shopping website.

deep, loosely filled with weeds; sticking out from them are disarticulated human remains, pottery sherds, and chipped stones. These are looter's pits. Apart from what were being extracted by looters, the artifacts and ecofacts from excavations and surveys have been taken out of their original contexts and transported into glass cases in provincial, national, or even oversea museums such as the Museum of Far Eastern Antiquities in Sweden, or into boxes stacked in dusty and crowded storage rooms.

To then reimagine what is "no longer" at Qijiaping, the process of monumentalization of the "past" with signs, slabs, and modern architecture is necessary. Currently, the monumentalization at the village is not yet complete. In fact, this "site" is not yet officially opened to the public, which explains why the Management Center is constantly locked. With an increasing recognition of Qijiaping as a heritage site, the area delineated by government planning documents as the site parameters, including where the current Qijiaping inhabitants are residing and where their crops fields are, is scheduled to be turned into a site museum latest by 2035.[47] What is eventually left of and erected at Qijiaping might be things that no longer belong to the past.

What is the past that these no longer belong to? That past is not only the past that the newly erected monuments intend to give a voice to, but also the past that has been defining the historical, ethnic and religious landscapes of Qijiaping, and most of the Tao River Valley today, before the exhumed *guan guan* were attributed with values.

Before the *Guan Guan*

> "The province of Kansu occupies an important place in the history of the Chinese Empire, having been the scene of much fierce fighting and the home of many strange peoples. From here, it is commonly believed, went forth the Huns... Here the Chinese have struggled for long years with the Tibetans and Mongols... Here also, during later years, Chinese and Moslem have met in mortal combat, striving for the supremacy either over other. Blood has flowed like water throughout the province, and the struggle is at present suspended rather than ended. Some day it will be resumed with an even greater ferocity, be that possible."
>
> – George Findlay Andrew[48]

Long before the monumentalization of Qijiaping and the prehistoric *lieux de mémoire*, the history we know of about Gansu has been dominated by narratives associated with conflicts and violence between ethnic groups, particularly between the imperial courts or the Han, and *waizu* (foreign tribes) as reflected in Andrew's quote above. This region has historically been inhabited by groups, tribes, and polities whose origins are to the west or the north of the heartland of the states that controlled most of the geographic area of what is today considered China. Frequent conflicts between and among ethnic groups have led to violence and bloodshed that resulted in demographic fluctuations over short periods of time.[49]

[47] GRZ et al. (2015), *Qijiaping yizhi...*

[48] George Findlay Andrew, *The Crescent in North-West China* (London: China Inland Mission, 1921), 7.

[49] GBW (Guanghexianzhi Bianzuan Weiyuanhui 广河县志编纂委员会 [Guanghe County Gazetteer Compilation Committee]), *Guanghe Xianzhi* 廣河縣志 [*Guanghe County Local Gazetteer*] (Lanzhou: Lanzhou Daxue Chubanshe 兰州大学出版社 [Lanzhou University Press], 1995), 72–79.

Since the Song Dynasty (A.D. 960–1279), especially during the Yuan (A.D. 1279–1368) and Ming (A.D. 1368–1644) Dynasties, Gansu was progressively populated by ethnic groups who practice Islam or later converted to Islam. This rise in Muslim population was most noticeable in Hezhou 河州 (today's Linxia 临夏), which is strategically located as the crossroads between Central Asia and the heartland of China, and between Mongolia and Tibet.[50] It was in Linxia that the first mosque was believed to have been built as early as the Song Dynasty. This distinction, together with the substantial economic and social influence Muslim populations have in Linxia, eventually earned the region the title of "Little Mecca" of Gansu.[51] Despite a change in demographics since the first Muslim group settled in Gansu, conflicts and wars continued to define lived experiences in the region. As the "Little Mecca" of Gansu, Hezhou was rendered one of the major battlegrounds.[52] The Tao River Valley, acting as the eastern borderline between Linxia and the Chinese heartland to the east, therefore became a forefront of violent clashes.

During the Qing Dynasty, historical narratives recorded increasing instances of large-scale Muslim uprisings and conflicts with the Qing court, caused by both religious and secular causes,[53] that resulted in numerous deaths and large-scale migrations. Particularly during the Dungan Revolt (A.D. 1862–1877) when large-scale Muslim uprisings took place in the northwestern part of China, the population of Hezhou was reduced by at least 56% over 12 years following the beginning of the battles as a result of deaths and migrations.[54] The chaos led the Qing court to remove the Muslim populations from within the walled cities in most towns in Hezhou[55] and to relocate the Muslims living on the eastern bank of the Tao River to the western bank,[56] progressively shaping the demographic landscape in the Tao River Valley we see today.

Most of what we know is from the narratives put together by the imperial courts and intellectuals from the dominant Han ethnic group. Little is known about the lives and experiences from the perspectives of the Muslim communities given the lack of a tradition in history recording and even written language in some cases.[57] This lack of written history by the Muslim communities has led to generalizing of Muslims into a homogenized group of "Mohammedans," "Hui" or "Hui-Hui," or "Moslems." In fact, Muslims across China belong to a variety of ethnic groups, practice different cultural customs, speak different languages, see each other differently, and even practice different sects of Islam. Fortunately, oral history is still passed down from one generation to the next in these different Muslim groups. Much of which, however, is forgotten, misrepresented or misremembered over time; including the narrative at Qijiaping.

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[50] Lipman, *Familiar Strangers*, 8.
[51] Ibid., 21, 30.
[52] Lipman, *Familiar Strangers*, 125–129.
[53] Ibid., 104.
[54] GBW, *Guanghe Xianzhi*, 72–73.
[55] Lipman, *Familiar Strangers*, 22.
[56] GBW, *Guanghe Xianzhi*, 73.
[57] Lipman, *Familiar Strangers*, xxx.

Home-Making at Qijiaping

"My *taitai* (great-grandfather) said they were among the earliest to move into Qijiaping" (Group A).[58]

In the 1880s, a decade after the Qing's effort to relocate the Muslim groups to the West of the Tao River, a group of Dongxiangzu living at Heishishan (Fig. 1) left their village to escape the constant destruction of their crops by the merciless Tao River.

"The western bank was always flooded by the Tao River, they had no option but to move and search for a more habitable place to survive" (A, B). The group dispersed, and eight *hu* (households) traveled on foot south. At first, they set up dwellings near today's Huangjiawan (Fig. 1), right next to the Tao River course.

"The Tao River still did not have mercy on us" (A).

That was why they moved up to Qijiaping, where they bought lands from local Han people. Later in the 1970s, when the river revetment was built along parts of the Tao River, some families moved back down to Huangjiawan.

"Before the Han, there were the *dazi*. The older people said so. They were the ones who made the *guan guan*" (A).

Some of my older informants referred to the pottery unearthed at Qijiaping as *dazi guan* (urns of the *dazi*). They did not exactly know who the *dazi* were, only that they belonged to an ethnic group who were not Han inhabiting Qijiaping and the nearby region. Historically speaking, *dazi* 韃 (达) 子 was a derogatory term used by the Han ethnic group during the Ming and Qing Dynasties to refer to ethnic minorities from the north such as the Mongols.[59] Animosity existed between the Han and the *dazi*, and eventually the Han killed and drove them away.

"The Han, the Qi family, sold their lands to our *tai tai* and moved across the Tao River to Lintao and Taishi (Fig. 1). They came back every year to *shangfen* (deposit dirt onto their ancestors' tomb mounds), to pay respect to their ancestors" (A). Pointing to the large barn, my informant continued, "there, they call it the *houfentan* (back burial ground). After the leveling of the lands in 1958 destroyed the tomb mounds, the Qi people never came back again" (A).

A Han temple with green bricks used to stand near today's central plaza, but it was torn down around the same time when the Han tomb mounds were flattened. No traces of the temple could now be found and where it once stood is now the back garden of one of the houses.

"Our ancestors built a mosque here" (A), my informant said while pointing at a construction zone where a house is currently being built. It was torn down in the 50s or 60s after the Ahong was taken away.

[58] This citation is to indicate that the quote was taken from interviews with Group A informants, the age group ranging between 70 and 90 years old. Hereafter, the letter A, B, or C will be put into parenthesis, e.g. (A), after a quote to indicate which age group the quote is referenced. If the quote was taken from two or three age groups, a comma will be used to separate the two letters, e.g. (A, B).

[59] Xi Zhiqun 郗志群, and Zhao Yujie 赵玉洁, "Dazi Kao 达子考 [The Study of Dazi]," *Beijing Shehui Kexue* 北京社会科学 [*Social Science of Beijing*] 8 (2014): 89–94.

"Later the praying took place at home or simply on the ground outdoors, if we had time away from our duties in the fields. It was not until Deng Xiaoping that there was a unified construction of mosques. People at Qijiaping now use the one here or the one in Huangjiawan" (A, B).

Houses were more scattered over Qijiaping in the past. Now they are centralized in one area. Abandoned houses and collapsed house walls can still be found on the margins of the village while an increasing number of houses were being built in the centralized zone around the time I started conducting the interviews. I was told that the leader decides who has successfully been "lifted out of poverty [*tuopin*]" by looking at who has newly constructed houses.

"We are provided with a set amount of subsidy for the construction of houses, but it is not taken into consideration how much we have to spend for the actual construction nor our economic status. The costs are usually more than what they pay us. Many of us are still peasants and can only rely on our crops and livestock to survive" (B).

Their crops used to include wheat, beans, potatoes, and maize. Now they mainly grow maize which provides a higher yield. The Qijiaping villagers have escaped the flood waters, but by moving uphill they have fallen into the adversity of frequent fluctuations between droughts and torrential rains in the higher elevation.

"We are not as hardworking as the Han people. There is more work if we grew wheat and other crops. Especially wheat. They sprout quickly when there is rain, and you need to harvest them immediately. For maize, you do not need to tend to them so often" (A, B).

They therefore started to rely on the more drought-enduring maize. During the 50s and 60s, water storage pools were constructed to store large amounts of water to ensure higher crop yields. Later water channels were built to draw water from the Tao River up for irrigation and daily consumption, but even the Tao River is drying up.

"There used to be so much water in the Tao River" (A, B, C).

In the early 2010s the Tao River Water Diversion Project [*yintaogongcheng*] has since diverted much of the water to Dingxi 100km east of Qijiaping. Meanwhile, many told me that the water in the Tao River is getting more and more polluted by factories and hospitals, and that their children have stomach problems all the time because of the water. Only for a very short period of time were they able to transport the clean spring water from Hezheng (Fig. 1).

"They did not have enough water for all of us" (A, B, C).

The Tao River led the Dongxiang people to Qijiaping and has flowed alongside the eight families that settled down in the village and those who have later joined them from nearby villages including Ketuo and Shuiquan (Fig. 1) through familial or marriage ties. The collapsed walls, newly erected concrete structures, water channels, *dazi guan*, even grains of dirt have stood in witness to the history of the Qijiaping Dongxiangzu in conceptualizing and making sense of what is in their landscape, in making the village home, in their struggle to survive, and in perpetuating their identities through rituals, stories and shared experiences. At the same time, strangers from foreign lands were brought to the Tao River Valley and into Qijiaping on rafts and roads along the Tao River in search of "ancient treasures."

Strangers at Qijiaping

"My grandfather, when he was alive, said a *huanghuzi* (yellow beard) or *baihuzi* (white beard) foreigner came to Qijiaping many years ago. At that time, there was a small flea market at Chenghuangmiao (City God Temple) in Lanzhou. Some *guan guan* people churned up from their lands were sold there, very cheaply and mostly for storing water. He heard that was how this foreigner traced the *guan guan* to the Tao River. My grandfather was then very young, he saw this big beard foreigner traveling on a *yangpifazi* (sheepskin raft) on Tao River, and eventually came to Qijiaping. He said the foreigner did not do much but walked and randomly dug around for pottery. It was a very short visit" (B).

It is impossible to verify whether Andersson grew a beard when he excavated at Qijiaping. Even if he did not shave his beard when he was in the Tao River Valley, it also could have been some of the missionaries stationed in the Tao River Valley that Andersson mentioned in his diary,[60] who might have been interested in pottery urns. George Findlay Andrew and Neilage Sharp Brown (1879–1944) also carried out reconnaissance work in search of painted pottery in the Tao River Valley.[61] I could not find anyone old enough to remember the visitor, but Andersson did talk about his experience in Gansu and the Tao River Valley in his diary. His experience laid the foundation to the changes in how people in the preceding generations would conceptualize the Tao River Valley and what the landscape has to offer.

> "You know that these urns had no value till I came here. Nobody before me asked for them, and if I go away from Lanchow the demand will soon disappear, for the people in the town only buy them because I am interested in them."
>
> -- Johan Gunnar Andersson[62]

After Andersson initiated a market for the painted pottery, many people took advantage of the economic opportunity and began to remove the urns from their original depositional contexts. Many ancient cemeteries were thus sabotaged including the one located on Banshan hilltop, just 5km away from Qijiaping. Realizing the damages the market had done to the reconstruction of the past, Andersson urged the local authorities to take measures in preventing further extraction of ancient relics.[63] Whether or not the measures were effective or measures were taken at all to prevent looting, no one can confirm, at least in the short-run.

Given the close proximity to where large cemeteries with painted pottery were extracted, Qijiaping might also have been subjected to damages, especially when painted pottery were also found at the site, as claimed by a few of my informants who recalled painted pottery urns being dug up in the village prior to the 2000s.[64] Looting in the Tao River Valley continued after Andersson left, but at least at Qijiaping, the oldest villagers did not recall any large-scale looting when they were young until much later after the 1975 excavations.

[60] Andersson, *Children of the Yellow Earth*, 257.

[61] Arthur de Carle Sowerby, "The Neolithic Pottery of Kansu, Burial Urns and Other Vessels in the N.S. Brown Collection," *The China Journal* 22 (1935): 300–303.

[62] Andersson, *Children of the Yellow Earth*, 255.

[63] Andersson, *Children of the Yellow Earth*, 257.

[64] Andersson only excavated a small section of the site and it is not surprising that he did not find any painted pottery.

Unfortunately, the first visits by the stranger on a sheepskin raft nonetheless created an unintended legacy in commodifying what is beneath the landscape (see Access to *Wenwu* in this article for further discussion).

A Haunted Past

While most of my Group A and Group B informants participated in one way or another in the 1975 excavations as excavators, bystanders, or by otherwise interacting with the archaeologists, almost all of them said the same thing when asked what they remembered about the experience.

"My brain does not work now. I am getting old. It was so long ago" (A, B).

What they recalled about the archaeological work were isolated snapshots, adding to the monochrome photographic collections I pulled out from the dusty envelopes at the Gansu Institute of Archaeology.

According to my Group A and B informants,

"The archaeologists from Lanzhou, consisting of both women and men[65] came here to excavate the skeletons of dead people [*wa siren de gutou*].

They first used a wooden stick with a small spade at the head[66] to auger the ground. When they took the spade out there were chunks of dirt. If there were any changes they would use chalk powder to circle the area. Then they pulled out their tapes, measured the area they needed to excavate, and then started to dig.

They were very meticulous in their work. They used writing brushes [*maobi*] and small brushes to brush off the dirt off the skeletons. They used sharpened chopsticks to remove the dirt on the bones, even the dirt on the ribs.

Have you been to the provincial museum? Are they exhibiting the photos? They took so many of them. When the skeleton was exposed, they took photos of the remains. They took photos of everything.

There were burials with just one individual, some with a few. There was this largest one! It had twelve or ten skeletons placed in a row. There were also three layers of burials in a meter-deep pit. When they excavated the one with the most skeletons, so many people from all over the place came over to watch, so many people!

These dead people were so brutal. One person died and the rest of his family were buried alive, you can see the struggle. The most pitiful [*zui kelian*] was the child [*wawa*] buried alive. The mother had to wrap her body around the child. *Zhen kelian* (how pitiful)!

The archaeologists told us that those who did not obey had their heads or bodies chopped off. The bodies that had a huge slab of rock stacked on top of their bodies were *zhenya de ren* (people who were suppressed). Both men and women were buried.[67] The buried people were *dahan* (big men), their leg bones were very long. Some rich people were buried with red pottery urns [*hongni guanguan*], the poorer or the suppressed were buried with black and grey urns, stone tools and big slabs of stones.

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[65] Some informants recalled more than ten of them, some nine, others seven to eight.

[66] Some of my informants were able to point out the name of the spade as *luoyangchan* or luoyang spade.

[67] The archaeologists even taught some of the children how to differentiate between male and female using the shape and size of the pelvic bones.

The archaeologists did not excavate much 'good stuff' [*hao dongxi*]. The most resounding [*zui xiangdangdang*] find was a bronze axe-like artifact. They were digging every day from early morning to when it got dark at night, unless it rained. After they discovered this, they packed (*dabao*) everything, took them away, and never came back again.

They filled three trucks with all the skeletons and *guan guan*, and never came back again" (A, B).

The discovery of the bronze axe-like artifact marked the end of the 1975 excavations and their ephemeral interactions with the Lanzhou archaeologists.

When my informants were recalling the memories of the 1975 excavations, it was not so much about the archaeological dig itself that propelled their stories, but rather the specters of the traumatic experiences leaking from the cracks between the isolated archaeological snapshots that monumentalized that episode of their lived experiences.

"The excavation. It was during Old Mao's period [*laomao de shihou*]. It was during the period of the production team [*shengchandui*].

Every day the team leader gave orders for us to perform different *laodonghuo* (physical chores). You were not allowed to say no. At that time some of our children were able to attend school, but previously our leader prohibited us from going to school. The cook at the communal kitchen would not give us soup to drink if we went to school, he would say, 'Who is going to cook for you if you do not do your chores?' We worked collectively at that time. Now, you can work if you want to work, and not work if you don't desire. At the time, just like today, we were mostly tending to crops. During the production team period, we earned *gongfen* (work points) in exchange for food, how much you ate depended on how much you worked.

One day the team leader assigned the archaeologists to stay at the houses of a few families. Twenty to thirty of us were sent to work in the archaeological pits each day. More than half of those who dug in the pits have now passed away. When we were done with one pit we moved on to the next one. We were just responsible for doing the physical chores, we scooped the dirt on the top layers and the archaeologists did the meticulous work. To be honest, it was less work than tending to the crops. It was just that the sun was very bright.

Every day, the production team would push a cart of food including wheat and flour up to the house of the production team accountant [*huiji*]. The accountant's wife would cook the meals for the archaeologists. They had noodles, potatoes, buns, and *jiangshui* noodles. They had much better food than most of us, they even had eggs and sometimes mutton.

We had *baogumian* (maize soup) and sometimes potatoes. If we were lucky, when a cattle became sick we were allowed to slaughter it; but if it died we could not eat it because of religious reasons.

It was during the production team period. It was very difficult.

We did not have enough to eat. In 1958 (all of my Group A informants remembered this year) we had *daguofan* (communal pots) for a couple of years. Each of those pots contained maize soup, most of the times it was made with the corncob, without kernels. The maize soup was as clear as a mirror and we could see our own faces. We even had to steal the seeds of the crops to eat.

During winter, the ground on Qijiaping were particularly bare. Everyone fought to sweep all the leaves on the ground to make a fire to keep warm. Each family only had a straw mat and a thin blanket. There used to be a lot of elm trees [*yushu*]; we ate all the leaves and the barks on the trees to survive.

See, we had to produce for the country. All our crops were sent to the storage house, first to the country and then the rest distributed to us. How much we gave to the country depended on how much we could produce. The team leader would come up here and use a tape to measure the height of a few stalks. Then he made an estimate of the amount we could potentially produce. He did not take into consideration the actual harvest, the drought and the rain. He exaggerated our yields. We even had to pay the country more than the villages downhill that are closer to the Tao River. The false reporting [*xubao*] of our yield made all of us starve, we gave all our yields to the country. Quite a few starved to death here.

We were doing a bit better in the 70s, but some other villages still did not have much to eat. Some relatives living near Lanzhou at that time were having a wedding and did not have anything to serve the family. The archaeologists helped us smuggle some of our food to them. The roads were still very narrow up here at that time, so the trucks were parked downhill and we put everything on the wagon carts [*jiaziche*] and transported them down to the trucks, including the skeleton, *guan guan*, and the 50 *jin* of wheat ground into flour. We placed the bag of wheat under our feet and we were so scared. They had a car inspection at Zhongpu (Fig. 1), and the archaeologists said they were with the archaeological team and everything was skeleton. So they let us go.

It was difficult during the production team period. When Deng Xiaoping took over, we could finally fill our stomachs" (A, B).

As Above, So Below

My informants felt that from the Great Leap Forward (1958–1962) onwards until the 60s and even into the 70s, they lost pieces of themselves and experienced permanent scarring. Despite the changes in the collective experiences throughout the two decades, my informants have lumped their experiences into a single era as the "production team period [*shengchandui de shihou*]" during which everyone, even those who said they were party members [*dangyuan*], struggled to survive. Drawing upon Derrida's idea of "specters",[68] helps us understand that the experience my informants had during the "production team period" is no longer experienced in the present. Instead, the memories can be evoked and experienced as distressing glitches in the present moment. To compartmentalize these specters of the past that are "non-present," "non-objects," and "almost unnamable", [69] my informants attributed this past with a name, "*shengchandui de shihou* (production team period)" and marked the end to this haunted episode as "*Deng Xiaoping de shihou* (Deng Xiaoping period)." By using words, emotions, and gestures at the same time when giving this past a name and marking its beginning and its end, my informants were able to objectify and monumentalize the traumatic experience, thus gaining control over it, perhaps as a

[68] Original text in French published in 1993 and translated into English in 1994.

[69] Jacques Derrida, *The Spectres of Marx: The State of the Debt, the Work of Mourning and the New International*, trans. Peggy Kamuf (New York and London: Routledge, 2006), 5.

form of defense mechanism to protect themselves from post-traumatic stresses.[70]

Taboo over the recalling and communication of this past, together with a physical monumentalization at Qijiaping that emphasizes an archaeological narrative, has actively challenged the self-monumentalization of this haunted episode of the "production team period" by those who experienced it. Ironically, this episode is also rooted in the archaeological history of the landscape in which it took place, including the memories of the 1975 excavations. But this haunted episode of excavation marked the beginning of and laid the foundation for a large-scale and long-term de-monumentalization of physical layers in the village that are integral to the understanding of the prehistory at Qijiaping.

"The fields here used to be undulating" (A, B, C).

As we walked through the flat maize fields, my informants told me that the lands were leveled during the 50s land reforms. They were given missions [*renwu*] every day by the team leader,

"Today you level eight *fang*,[71] tomorrow ten" (A).

Flatlands were needed to increase crops yield, and later they started constructing the water storage pools [*shuichi*]. This was the period when the Han tombs, Han temple, and mosque were destroyed.

"This was when the most *guan guan* were dug out; we even found some jade *bi* (disk); that was why later when the large-scale lootings took place, one only needed to remove a thin layer of dirt to find the artifacts" (A, B).

I asked if the large-scale looting took place immediately after the 1975 excavations,

"No. After that when people were tending to their fields and constructing houses, they continued to find many *guan guan* and other artifacts; but at that time the artifacts did not worth much" (A, B).

I then asked what happened to the *guan guan*,

"When the leveling of the land took place the *guan guan* were smashed. They belonged to the dead people. It was a kind of superstition [*shi yizhong mixin*]" (A, B).

My informants then brought me to the margins of the village. We stood at the center of four collapsed mudbrick walls,

"My brothers and I used to live here, but the production team leader moved us up to the centralized area. It was for easier management of labor and quicker access to the communal kitchen [*shitang*] where we had *daguofan*. We were not allowed to start a stove to cook our own meals; we had to eat together. They then removed all the wooden structures of the house and used them for fuel" (A).

After the 70s, people started to build more houses. Crops were privatized, and people had a bit more earnings. Many *guan guan* were dug up then and most of them were sold to the dealers in Sanjiaji (Fig. 1) for a few dollars.

"We are peasants. We sell a dollar, earn a dollar" (A, B, C).

For the pottery that were not sold, many used them to contain water or food for chickens and dogs.

[70] For a detailed discussion on hauntology and its application in Anthropological research, see Byron J. Good, "Hauntology: Theorizing the Spectral in Psychological Anthropology," *Ethos* 47.4 (2020): 411–26.

[71] One *fang* = one 1X1X1m unit.

In 1996, Qijiaping was declared Major Historical and Cultural Site Protected at the National Level. Three guards were hired to protect the site until 2008 when the Management Center was constructed. The guards were given 20 *kuai* a month; but after two to three months, they were no longer paid.

"If people dug out artifacts from their fields they had to report to us. And if we saw anyone loot we had to report to the leader [*lingdao*]. We did not have to report much" (A).

All of my informants recalled that sometime between 1996 and 1997 was when the large-scale lootings began to take place.

"Everyone was excavating. Day and night. The looting pits [*daodong*] were so densely packed. Some people just scooped a thin layer of dirt and found the treasures" (A, B, C).

They recalled people finding pottery in the shape of a bird or chicken, red pottery urns, ceramic bowls with a frog-like motif painted on the interior surface,[72] and even one with a head on the top of a jar [*rentou guan*].[73]

"There was a coffin with a child in it that was made of *guan guan*" (C).

People also found bronzes, turquoise and jade. Many said that the ancient people must have believed this to be a precious *fengshui* ground.

"People smashed the black and grey urns, they only worthed a few *kuai*. See," as one of my informants picked up pottery sherds after pottery sherds, "people broke the *guan guan*" (A, B, C).

They sold most of the artifacts, and some of them claimed that they kept some of the artifacts but dared not to take them out "because it is now illegal."

"We are minorities [ethnic group *shaoshu*], we do not have culture [*mei wenhua*]. We did not know that they are cultural relics [*wenwu*]. Now we know to protect them" (B, C).

Many people from outside of their village also came to extract a piece of Qijiaping. There were both amateur and professional looters. My informants showed me these tiny holes less than half a centimeter in diameter.

"Some looters are really professional. They poke this long iron stick into the ground. If they hear the sound '*dong*,' '*dong*,' it means they poked the *guan guan*. Look, these holes are everywhere" (C).

Andersson also mentioned in his trip to the Tao River that "[the] cunning Mohammedans had made yard-long iron probes, with which they had dragged the ground and with striking accuracy localized every burial urn which was not more than one meter below the surface."[74] These probes are considered one of the professional tools used by looters all around China.

"When outsiders came to loot, they always destroyed our crops. It affected our yields so much" (A, B, C).

My informants then pointed to the huge holes, some measuring a meter wide and a meter deep, on the outcrop beneath some maize stalks.

[72] The frog or toad motif is frequently seen painted on Majiayao pottery.

[73] I showed my informants the ceramic lid in the shape of a person's head that was purchased in Gansu by Andersson that is now housed at the Museum of Far Eastern Antiquities. They said the one recovered from Qijiaping is similar but attached to a jar. For a detailed description of the "shaman head" lids and their disappearance, see Magnus Fiskesjö, "The Reappearance of Yangshao? Reflections on Unmourned Artifacts," *China Heritage Quarterly* 23 (2010).

[74] Andersson, *Children of the Yellow Earth*, 268.

"We had to fill these holes with big bags of dirt and grass to prevent the irrigation water from leaking and the crops from collapsing" (A, B, C).

There were a few times when they caught the looters and beat them up. They let them go after.

"The large-scale looting continued until 2011 when the heritage protection policies tightened up. Occasionally outsiders still sneak in at night" (A, B, C).

Access to Heritage

Living directly above the Qijia *guan guan* and other buried treasures, do the Qijiaping Dongxiangzu have access to a share of Chinese heritage? To consider this, we must first understand, what exactly is heritage? How is Qijiaping defined as Chinese heritage? Who gets to decide?

If we travel back to the Qijiaping Management Center and look at the ceremonial slab that was erected in 1996, one of the lines reads, "Major Historical and Cultural Site Protected at the National Level." This English translation is provided on the website of the National Cultural Heritage Administration 国家文物局.[75] The English translation is slightly different from the literal translation of the Chinese characters, *Quanguo Zhongdian Wenwu Baohu Danwei* 全国重点文物保护单位, which is translated as The National Major Cultural Relics Protection Unit/Site. The major difference lies in the presence of the term "Cultural Relics."

The *Law of the People's Republic of China on Protection of Cultural Relics* 中华人民共和国文物保护法 states that any "immovable cultural relics [*buke yidong wenwu* 不可移动文物]," including structures and ancient tombs, found to have historical, artistic, scientific, and cultural values should be declared a *Quanguo Zhongdian Wenwu Baohu Danwei*. Damages and removal of any parts of the *Danwei* are deemed illegal within its designated parameters. This *Baohu Danwei* (protection unit) is delineated as a space, on the basis of the archaeological concept of *yizhi* 遗址 (ruins or sites), as in *Qijiaping Yizhi* (Qijiaping Site), for which fluid boundaries exist. The *yizhi*, together with the ancient material cultures contained within it become a sum total of the *Baohu Danwei*. This materialistic nature of the *Baohu Danwei* is emphasized by officially labeling it with the term *wenwu* 文物, with an emphasis on *wu* 物, a physical object, as opposed to *yichan* 遗产, the latter literally means the assets [*chan* 产] left behind and handed down. The official English translation of *yichan* is "heritage".[76] A site is officially labelled as an *yichan* only if it is listed as a UNESCO World Heritage Site [*Shijie Wenhua Yichan* 世界文化遗产]; *yichan* is also used to refer to the intangible cultural practices such as the *ganzhan* 擀毡 rug-making traditions of the Dongxiangzu, which is officially labelled as *Guojiaji Feiwuzhi Wenhua Yichan*

[75] This is the link to which the translation is provided: https://web.archive.org/web/20120501152230/http://www.sach.gov.cn/tabid/311/InfoID/383/Default.asp. I have also referenced the English translation provided by the website www.lawinfochina.com. As stated on the official Standing Committee of the National People's Congress website (http://www.npc.gov.cn/englishnpc/index.shtml), the English translations of the laws and regulations are "for reference only," and that the Chinese version should have ultimate authority.

[76] As seen in the Chinese Academy of Cultural Heritage [*Zhongguo Wenhua Yichan Yanjiuyuan* 中国文化遗产研究院]. It is also confusing when *Guojia Wenwuju* 国家文物局 is named National Cultural Heritage Administration rather than National Cultural Relics Administration.

国家非物质文化遗产 (National Intangible Cultural Heritage). Otherwise, *yichan* is used as a generic term in official narratives denoting and demonstrating how groups of *wenwu* or *Wenwu Baohu Danwei* can be passed down as a "splendid historical and cultural legacy of the Chinese nation 中华民族优秀的历史文化遗产".[77]

What Chinese heritage is, as a result, is not straightforward and sometimes confusing. At the same time, heritage should also not be viewed only as a final product. It also encompasses the value-adding processes that transform an object or a group of objects to *wenwu*, from *wenwu* to *Wenwu Baohu Danwei*, and eventually to *yichan*. This *chaîne opératoire* of how *yichan* comes to be allows for the discussion of at least three different kinds of access to Qijiaping as heritage which have different impacts on the Qijiaping Dongxiangzu, namely 1) access to *wenwu*; 2) access to *yichan*; 3) access to the process of how *wenwu* transformed to *yichan*.

Access to *Wenwu*

Recalling what my informants said earlier regarding the extraction of ancient materials from the ground, many people did not know the remains were considered *wenwu* (cultural relics); but they now claim they do. What they know, in fact, is more closely associated with the legal consequences of the extraction and subsequent trading of materials beneath their village that do not belong to them, than the actual meaning of *wenwu*.

At the national level, the definition of *wenwu* is not clear-cut and is not well-communicated to the public. The broad definition of *wenwu*, according to the *Rating Standards for Collections of Cultural Relics* 文物藏品定级标准, is any material object that possesses "historical, artistic and scientific values" relevant to China.[78] *Wenwu* are not homogeneous but are categorized by their qualities such as physical traits, provenance, or craftsmanship they reflect; they are also classified into "grades" namely "especially important values 特别重要价値," "important values 重要价値," "relatively important values 比较重要价値," and "certain values 一定价値," all of which are judged and determined by the efforts of specialist appraisers designated by the Ministry of Culture, replaced in 2018 by the Ministry of Culture and Tourism. This top-down delimitation of what *wenwu* is, therefore, is inherently ambiguous.[79] To further complicate things, different archaeological sites have different definitions of what constitutes *wenwu*, as designated by local authorities and specialists involved in the archaeological work.

Qijiaping, like any other archaeological site in China, is under the jurisdiction of the Ministry of Culture and Tourism.[80] The direct execution and management of the archae-

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[77] The Chinese characters are directly from the law provided by the Standing Committee of the National People's Congress: http://www.npc.gov.cn/wxzl/gongbao/2015-08/10/content_1942927.htm, and the English translation is referenced from https://web.archive.org/web/20120501152230/http://www.sach.gov.cn/tabid/311/InfoID/383/Default.asp.

[78] For a detailed analysis of the Cultural Relics grading system in China, see Timothy Lau, "The Grading of Cultural Relics in Chinese Law," *International Journal of Cultural Property* 18.1 (2011): 1–35.

[79] Robert E. Murowchick, "'Despoiled of the Garments of Her Civilization:' Problems and Progress in Archaeological Heritage Management in China," in *A Companion to Chinese Archaeology*, ed., Anne P. Underhill (Chichester, UK: John Wiley & Sons, Ltd, 2013), 22.

[80] Which is under the State Council of the People's Republic of China.

ological and heritage sites are nonetheless the responsibilities of a local *danwei*[81] further removed from the hierarchical position of the State Council and Ministry of Culture and Tourism. In the case of Qijiaping, the local *danwei* is the Guanghe People's Government 广河县人民政府. In 2016, the Guanghe People's Government formed the "Qijiaping Site Protection Regulations 齐家坪遗址保护规则" in accordance with the laws and regulations established by the People's Republic of China, including The *Law of the People's Republic of China on Protection of Cultural Relics*. In this document, examples of what *wenwu* are within the parameters of the Qijiaping site are divided into immovable features such as burials, middens, house foundations, and hearths, and movable artifacts such as the Qijia plainware, stone and bone tools, and bronzes. [82] All the examples are based on published archaeological and survey reports, mostly from the 1975 excavations and the 2008 augering surveys at Qijiaping. Not only the values of these *wenwu* are added by the archaeological work in the region, but the identification of such *wenwu* also relies heavily on the expertise of the archaeologists. This document is not published, so it is not entirely clear how or whether the idea of this official version of *wenwu* is communicated to the public or specifically to the Qijiaping inhabitants.

After the 1975 excavations, many Qijiaping villagers learned that objects yielded from underneath their houses and crops fields are valuable in the sense that these materials represent the "Qijia culture" and they belonged to the archaeologists and the government. A few of my informants recalled an incident that happened in 1975:

"At that time someone living near Qijiaping stole a pottery urn that was placed at the excavation site. The archaeologists notified the police. The police condemned the theft and made an announcement to the villages nearby and said whoever stole the urn should return it so no charges will be pressed against him/her. The urn sat back at its original location the next day. No one was charged" (A, B).

Many villagers understood the legal consequences pertaining to the theft of objects from the archaeologists. It is likely that they understood the excavated objects as "someone else's possessions," rather than how these objects bore the values of *wenwu*. It was only later when more archaeological monuments were erected at Qijiaping and more attention was given to the site by an influx of local and national officials and foreign archaeologists, that the idea of *wenwu* was repeatedly announced and illustrated through on-site tours by experts, archaeologists, or trained tour guides.

What is labelled *wenwu*, as an object itself, therefore has no intrinsic nor fixed values. Some ancient materials yielded at Qijiaping that have historical values to certain groups, such as the mortuary items from the Han tombs of the Qi people, are not considered *wenwu*. Instead, they can be categorized as *gudong* or *guwan*, loosely translated as antiques or old trinkets, which many can be deemed legal by the state to be circulated in the market.[83]

[81] This "*danwei*" is different from the "*Danwei*" used earlier that indicate a unit/site. Here *danwei* (distinguished with a lowercase "d" hereafter) means "a hierarchy of state-owned workplace units," see Xiaobo Lü, and Elizabeth J. Perry, *Danwei: The Changing Chinese Workplace in Historical and Comparative Perspective* (New York: M.E. Sharpe, Inc., 1997), 3.

[82] GRZ et al., *Qijiaping yizhi*..., 3–4.

[83] Zheng Li 郑理, "Chengnan Guwan Shichang Yu Beijing Wenhua Zhongxin 城南古玩市场与北京文化中心 [The Antique Market in Chengnan and the Cultural Center in Beijing]," *Beijing Shehui Kexue* 北京社会科学 [*Social Science of Beijing*] 4 (2004): 53.

At Qijiaping, anything that is from the ground, not buried by the Qijiaping Dongxiangzu, is made to be perceived as *wenwu*. This is because of the inherent ambiguity of what *wenwu* is and the lack of archaeological expertise of local people in identifying certain less commonly discussed artifacts.

Moreover, how *wenwu* is defined and accessed in China is markedly different from that of what is equivalent to *wenwu* in certain contexts within countries like Australia and those in the Americas. In the latter countries, there is a need to consider the repatriation of certain excavated objects to descendant communities who have close ties to the archaeological culture, but who have long been silenced by the colonial effects of archaeology and science.[84] Not only at Qijiaping, but in the majority of archaeological sites in China, indigenous rights or claims are never a question as the Chinese identity is made into an indigenous concept. As is true in many countries in Africa and Eurasia, every piece of *wenwu* is subsumed under the State's patrimony and asset (despite housed in local institutions). The Qijiaping Dongxiangzu therefore do not have any legal rights to claim the *wenwu* personally (although they have the right, or might even be encouraged, to identify themselves with the State narratives these *wenwu* represent). Given that the Qijiaping Dongxiangzu are not Han and do not explicitly claim to be part of what it means to be Chinese (as further discussed in Access to Yichan in this article), the Qijiaping *wenwu*, to them, do not belong to their past nor their identities. Even after the State's efforts to monumentalize Qijiaping as an archaeological site, and to reinforce the idea of *wenwu*, the concept of what the objects underground mean for local villagers is still driven mostly by the history of how these objects are commodified. Every time when the *guan guan* and other artifacts were brought up during the interviews, my informants lament the fact how the objects could have been sold for a higher price now rather than a few *kuai* previously.

"The pots were sold for a few *kuai*. Today they would have been worth hundreds and thousands of *kuai*. A person living in a nearby village sold the artifacts he dug up and had enough money to go for a pilgrimage in Saudi Arabia" (A, B, C).

Many still treat these underground objects as commodities rather than *wenwu*, commodities that can provide a gateway to alleviate poverty. However, these commodities are non-renewable, and the access to them only provide short term non-sustainable economic relief that comes with severe legal aftermath.

Access to *Yichan*

The transformation of *wenwu* to *yichan* can be conceptualized as the transformation of a local object into a State narrative. Among the very first steps of this transformation, the planning and execution of archaeological work, at the local level, is already imbued with bureaucracy and embedded within a political framework that feeds into nationalism.[85]

[84] See Rennard Strickland, "Implementing the National Policy of Understanding, Preserving, and Safeguarding the Heritage of Indian Peoples and Native Hawaiians: Human Rights, Sacred Objects, and Cultural Patrimony," *Arizona State Law Journal* 24.1 (1992): 180; Joe Watkins, "THROUGH WARY EYES: Indigenous Perspectives on Archaeology," *Annual Review of Anthropology* 34.1 (2005): 429–449.

[85] See, for example: Erika E. S. Evasdottir, *Obedient Autonomy: Chinese Intellectuals and the Achievement of Orderly Life* (Hawaii: University of Hawaii Press, 2004), 98–136; James Leibold, "Filling in the Nation: The Spatial Trajectory of Prehistoric Archaeology in Twentieth-Century China," in *Transforming History*, eds., Brian Moloughney and Peter Zarrow (Hong Kong: The Chinese University of Hong Kong Press, 2012), 342;

What is to be excavated not only relies on luck in finding a site, but also dependent on resources, most importantly State funding and support. To obtain necessary funding and support, and to ensure the sustainability of such resources, local *danwei* are encouraged to choose to excavate at sites that can potentially generate more valuable and higher grading *wenwu*, attract interests and attention of national and foreign scholars, and allow for future development in tourism, thus increasing its competitiveness with local *danwei* from other regions (e.g. provinces) for State recognition,[86] such as excavating a site that is being nominated as a "Top Ten National Archaeological Discoveries".[87] Most importantly, the choice of a site is highly favorable if its reconstructed narrative can promote the State's ambitions and interests, align with the State's definition of *yichan*, and demonstrate the region in which the local *danwei* oversees has a potential to expound on the nation's history and what it means by Chinese.

The concept of Chineseness, what the Chinese State represents, and the image of China within the country and on international platforms are constantly built and rebuilt in accordance with the contemporary State's policies and requisitions. Despite its plasticity, the overall historical narrative reconstructed is required to demonstrate the idea of China as a continuation of an ancient past,[88] thus fostering a sense of national identity and patriotism among Chinese people in defining a shared consciousness of belonging of what it means to be Chinese.[89]

The need for such a Sino-centric narrative dates back to the Qing Dynasty, during which the perception of the nation as the *axis mundi* by the imperial court, ruled by the Manchurians (currently an ethnic minority), was shattered by a series of defeats in wars with foreign aggressors such as the Opium Wars in 1839–1842 and 1856–1860 and the Sino-Japanese war in 1894–1895.[90] The coercive agreements to post-war unequal treaties and the destruction and plundering of its past treasures, including architecture and art, really had acted in ripping off the garments with which China adorned her civilization.[91]

This led to an immediate urge to rebuild itself through nationalistic narratives to unite China against foreign oppression. Nonetheless, the continual failure of the Qing

Lothar von Falkenhausen, "The Regionalist Paradigm in Chinese Archaeology," in *Nationalism, Politics and the Practice of Archaeology*, eds., Philip L. Kohl and Clare Fawcett (Cambridge: Cambridge University Press, 1996), 198.

86 Evasdottir, *Obedient Autonomy*, 116–120.

87 An award that was initiated by the State in 1990. See Cao Bingwu 曹兵武, "Quanguo shida kaogu xinfaxian pingxuan huodong shitan 全国十大考古新发现评选活动试谈 [A Discussion on the Selection of the Top Ten New Archaeological Discoveries in China]," *Zhongguo Lishi Wenwu* 中国历史文物 [*Journal of National Museum of Chinese History*] 5 (2004): 82–88.

88 Elie Kedourie, ed., *Nationalism in Asia and Africa* (New York: World Publishing Company, 1970), 64; Magnus Fiskesjö, "Politics of Cultural Heritage," in *Reclaiming Chinese Society: The New Social Activism*, eds., You-tien Hsing, and Ching Kwan Lee (London: Routledge, 2009), 227.

89 Marc Andre Matten, "The Worship of General Yue Fei and His Problematic Creation as a National Hero in Twentieth Century China," *Frontiers of History in China* 6.1 (2011): 74; Tze-Ki Hon, "National Essence, National Learning, and Culture: Historical Writings in Guocui Xuebao, Xueheng, and Guoxue Jikan," *Historiography East and West* 1.2 (2003): 242–286.

90 Tracey L-D Lu, *Museums in China: Power, Politics and Identities* (London: Routledge, 2014), 3.

91 Frederick McCormick, "The Desecration of Chinese Monuments," *Journal of the American Asiatic Association* 14.3 (1914): 78–80, quoted in Murowchick, "'Despoiled of…,'" 22.

court to maintain and restore itself, to protect its national treasures, to reform, and to protect its national pride and even citizens, bestowed onto itself a backward and vulnerable image that eventually sparked the 1911 *Xinhai* Revolution by a group of Han Chinese intellectuals who believed that the Manchus could not, since the beginning, rule China.[92] This revolution brought about a series of reforms especially on education. The past was used at this point onwards to educate Chinese people and thereby "modernize" China through museum exhibitions of *wenwu* from excavations and collections.[93] The past was no longer only used for "symbols of wealth, power, and special relations with the gods and ancestors"[94] established by Chinese intellectuals interested in the study of ancient Chinese art since the Song Dynasty;[95] rather, it becomes the Chinese heritage to remind people of their past accomplishments and mistakes. It becomes a *lieux de mémoire* to enlist and empower Chinese people, to propel them forward as a united entity. Chairman Mao famously remarked in a letter to a student from the Central Conservatory of Music in response to the problems with the glorification of Western Capitalistic art, "Let the past serve the present 古为今用, let foreign things serve China 洋为中用".[96] This remark reflects an emphasis of the Chinese State in the "opposition of pure academic pursuits 反对搞纯学术;" instead, one must learn from historical heritage 历史遗产 and use it to affirm the Communist Party's authority, extol the proletariat, and celebrate Marxism.[97] This has laid the foundation to how *yichan* is served as a tool to the Chinese State in the present.

The site of Qijiaping precisely features a narrative, whether about the ancient culture itself, or regarding the nature of archaeological research, that almost perfectly demonstrates how the past can be used to "serve the present." Meanwhile, the discovery of representative *wenwu*, especially a bronze mirror in the 1975 excavations, now referred to as "the first mirror of the Chinese nation 中华第一镜," has consolidated the status of the site as a valuable *yichan*. Today, a replica a hundred times the original size of the mirror with the label "中华第一镜" is on display at the entrance of the Qijia Culture Museum in Guanghe County 40 km from the site of Qijiaping.[98]

When Andersson deduced his controversial Western origin hypothesis of Yangshao painted pottery based on his discoveries (or to be more precise, what he did not find) at the site of Qijiaping, China as a country was still under the menace of Western Imperialists, and the country's development was held up by a backward feudalistic vision. Archaeo-

[92] Matten, "The Worship of...," 82.

[93] Lu, *Museums in China*.

[94] Jian Li, Hui Fang, and Anne P. Underhill, "The History of Perception and Protection of Cultural Heritage in China," in *Finding Solutions for Protecting and Sharing Archaeological Heritage Resources*, eds., Anne P. Underhill, and Lucy C. Salazar (Cham: Springer International Publishing, 2016), 2.

[95] K. C. Chang, "Archaeology and Chinese Historiography," *World Archaeology* 13.2 (1981): 156–169.

[96] Sun Guolin 孙国林, "Guweijinyong yangweizhongyong wenyi fangzhen shi zenyang dansheng de 「古为今用, 洋为中用」文艺方针是怎样诞生的 ['The Past Serves the Present, the Foreign Serves the Chinese' How did this Literary Policy come into Being]," *Wenyi Lilun Yu Piping* 文艺理论与批评 [*Theory and Criticism of Literature and Art*] 4 (2010): 67–70.

[97] LYB (Lishi Yanjiu Bianjibu 历史研究编辑部 [Editorial Department of Historical Research]), "Wei gonggu wuchanjieji zhuanzheng er yanjiu lishi 为巩固无产阶级专政而研究历史 [Studying History for the Purpose of Consolidating the Proletariat]," *Lishiyanjiu* 历史研究 [*Historical Research*] 1 (1974): 4.

[98] See the official website of the museum for a virtual tour of the museum: http://www.qijiamuseum.com/

logical work was therefore also operating under the (direct) influence of Western Imperialism and Capitalism.[99] Andersson's work, at this point supported by Swedish funding,[100] also with Andersson himself being a Westerner, undeniably was treated by many as a form of Western Imperialist colonialist undertaking.[101] Some argued that it was due to "constraints of that period",[102] wherein there was not only a prevalent Western egoistic ideal, but also an "almost complete absence of hard evidence for China's prehistory"[103] which limited Andersson's methodological breakthroughs in understanding beyond a Western framework. Regardless of Andersson's actual intentions, later when the Qijia cultural materials discovered at the site of Yangwawan by Xia Nai overturned the Western origin hypothesis,[104] the authority of scientific archaeological research was reinforced by its ability to combat Western repression and to demonstrate the "long standing and well established superiority of the motherland's (China) culture 祖国文化的流源长远及其优越性".[105]

Meanwhile, successive archaeological research revealed that the late Neolithic cultures in the Gansu-Qinghai region, dating to around 5500–5000 BP, began to follow independent cultural development trajectories from that of the Central Plains in China; Qijia Culture, immediately following this period, was therefore formed under the basis of the independent cultural system.[106] In addition, the development of the Qijia Culture is characterized by an influence of and interaction with Central and Western Asia, most prominently due to the presence of non-local domesticates such as wheat, barley, and sheep/goat, adopted at Qijia Cultural sites.[107] Not only does Qijia culture reflect a multilinear development of cultures in China, but it also manifests itself as the pioneer of the Silk Road.[108]

As the type site of the Qijia Culture, the site of Qijiaping as a matter of course acts as a symbol of how a "East meets West" narrative began. On one level, the site sparked the collaboration between Western and Eastern scholars that has spanned over almost a century (from Andersson to TRAP). This collaboration fully lives up to Mao's remarks of "Let the past serve the present, let foreign things serve China," where Western science is adopted to study the past of China thereby reconstructing a *yichan* deemed favorable to

[99] Xia Nai 夏鼐, "Kaogu gongzuo zai xinzhongguo de pengbo fazhan 考古工作在新中國的蓬勃發展 [The Prompt Development of Archaeology Under New China]," *Ke Xue Tong Bao* 科學通報 [*Science Bulletin*] 5.10 (1954): 30.

[100] Fiskesjö, and Chen, *China before China*, 54–55.

[101] See, for example: Per Högselius and Yunwei Song, "Extractive Visions: Sweden's Quest for China's Natural Resources, 1913–1917," *Scandinavian Economic History Review* 69.2 (2020): 1–19; Fiskesjö, and Chen, *China before China*, 34.

[102] Chen Xingcan 陈星灿, "Antesheng yu Zhongguo shiqian kaoguxue de zaoqiyanjiu 安特生与中国史前考古学的早期研究 [Andersson and the Early Research on Prehistoric China]," *Huaxia Kaogu* 华夏考古 [*Huaxia Archaeology*] 1 (1992): 86.

[103] Fiskesjö, and Chen, *China before China*, 14.

[104] Xia, "Qijiaqi muzang..."

[105] Xia, "Kaogu gongzuo...," 32.

[106] Wang Hui 王辉, "Ganqing diqu xinshiqi-qingtong shidai kaoguxue wenhua de puxi yu geju 甘青地区新石器-青铜时代考古学文化的谱系与格局 [Archaeological Study of the Structure and System of the Neolithic through Bronzes Age Cultures in the Ganqing Region]," *Kaoguxue Yanjiu* 考古学研究 [*A Collection of Studies on Archaeology*] 9 (2012): 210–243.

[107] Chen, "The Qijia Culture of..."; Womack et al., "Mapping Qijiaping...," 491.

[108] Hung et al., "Qijiaping...," 64.

the State. On another level, the archaeological culture at Qijiaping as a "pioneer of the Silk Road" reflects two developmental ideals of the Chinese State. First, the "Theory of Unity of Pluralistic Society of Chinese Nation 中华民族的多元一体格局" advocated by *Fei Xiaotong* 费孝通 in 1988 that acknowledges ethnic differences but at the same time defines the Chinese nation or Chinese race as an assimilation of differences through extensive adoption of the Mandarin language and other "traditional Chinese" ideals.[109] The other is "The Silk Road Economic Belt and the 21st-century Maritime Silk Road" (The Belt and Road Initiative or *Yi Dai Yi Lu* 一带一路 for short). Thus, it is no surprise that Qijiaping is highly regarded as *yichan* by the State's increasing attention, funding, and support given to the local *danwei* in bolstering the site's image and symbol through the construction of the Qijia Culture Museum in Guanghe, the convening of international conferences such as the International Seminar on Qijia Culture and Huaxia Civilization 齐家文化与华夏文明国际研讨会, and, most importantly, through transforming Qijiaping into a site museum.

Given a general foreign origin of the Muslims in the Tao River Valley, this East-West narrative of Qijiaping seemingly fits into the current situation at the village and in the Tao River Valley. Nonetheless, as we will see below, although the Qijiaping Dongxiangzu have access to *yichan* through their access to the physicality of the site of Qijiaping, they still see the State heritage as something they do not have access to.

Almost all of my informants living at and around Qijiaping who do not identify themselves as Han (ethnic group) mark themselves with these following terms: "*Dongxiang*," "*Hui*," "*shaoshu* (ethnic minorities)," or "*nongmin* (peasants)," as opposed to my Han informants who identify themselves as "*Han ren* (Han person)," "*Zhongguoren* (Chinese)," and sometimes also "*nongmin*." My Han informants, when referring to the Muslim ethnic groups, generalized them as "*Hui*" and emphasized that they are "different from us" in terms of their cultural and education background, and their diet (mostly they do not eat pork), and that they are the ones who loot. The Han see the "*Hui*" as the "Others." Interestingly, many of my informants who belong to the Muslim ethnic groups, including the Qijiaping Dongxiangzu, said similar things about themselves.

When specifically asked if they interacted with any visitors (especially the officials) other than some archaeologists, the Qijiaping Dongxiangzu would say,

"We are *shaoshu*. We do not know anything (*shenme dou budong*). The visitors usually only go to the Management Center and go downhill to look at the lime plaster house floor. They do not look at anything else" (A, B, C).

The Qijiaping villagers would gather around as observers if a group of officials came to visit. In this way, they see themselves as the "Others" in the celebration of Qijiaping as a State's *yichan*. The narrative is not communicated to the local villagers, and therefore Qijia Culture and the site of Qijiaping, to the villagers, are mostly associated with the valuable *wenwu* and the monumentality erected at the village as reinforced by visits of outsiders. Moreover, they also see themselves as "not allowed" to contribute or even discuss what

109 Fei Xiaotong 费孝通, "Zhonghua minzu de duoyuanyiti geju 中华民族的多元一体格局 [Theory of Unity of Pluralistic Society of Chinese Nation]," in *Zhonghua minzu duoyuanyiti geju* 中华民族多元一体格局 [*Theory of Unity of Pluralistic Society of Chinese Nation*], ed., Fei Xiaotong 费孝通 (Beijing: Zhongyang Minzu Xueyuan Chubanshe 中央民族学院出版社 [Minzu University of China Publishing House]), 1989), 1–36.

they know about the site when the officials or outsiders visit. Qijiaping as a *yichan*, to the villagers, is something that belongs to the cultured [*youwenhua*], the non-*shaoshu* and non-peasants.

Although the State sometimes encourages local ethnic minorities to identify themselves with the narratives of early archaeological sites in the region including that of Qijiaping, it is questionable whether this is effective. My informants did not tend to see any connections with the Qijia culture. Further studies have to be conducted to understand the various relationships between ethnic minorities (of different social and economic background, and whether or not they are *danwei* officials) and different cultural heritage created by archaeological research in China. At present, in the case of Qijiaping, it does not seem like the narrative is restricted to the locals; yet, it is perceived as restricted to them. By perceiving themselves and being perceived as "outsiders" of the Qijiaping site, they are "not allowed" to add values to the narrative of the *yichan* nor identify themselves with the reconstructed past of the nation.

Access to how *Wenwu* Becomes *Yichan*

There are many layers to the process by which *wenwu* get transformed into *yichan*, including the bureaucratic systems and procedures. I focus specifically on how these layers unfold at the local level as experienced by those living at the site where the transformation takes place.

This process precisely reflects what I mentioned earlier in this article about the archaeological experience, viewing archaeological field work as the starting point in the making of *yichan*, and the subsequent effects on and the conceptualization of the associated landscape.

While archaeologists can work at a site and write extensively about our experiences with the artifacts, features, landscape, and the living communities at and around an archaeological site, our stay (at least for most of us) is transient. Archaeologists stay at a site for a few days, weeks, or months (sometimes on and off for a few years). When the excavations and surveys are complete, we leave. The next steps in which the monumentalization of our work and the results of our work take place are mostly out of our hands. Entrusted by the State, the local *danwei* becomes responsible for the administrative decisions and processes in transforming the site into *yichan*. The only witness to how the whole process takes place, therefore, are those living at the site.

Throughout this article, the interviews with my informants have demonstrated that as the Qijiaping Dongxiangzu live out their experiences at Qijiaping in the midst of constant social and political changes, they also have to continually adjust to changing concepts of and relationships with what is lying beneath and erected above their lands, and how their village is sculpted by visitors coming in to celebrate a nation's past. A large portion of their lived experiences at Qijiaping, particularly those pertaining to the landscape, is contextualized within a discourse concerning the destruction, protection, and creation of Chinese heritage.

This archaeological experience, lodged within a bigger social narrative, challenges how the Qijiaping Dongxiangzu perceive themselves as belonging to Qijiaping. In addition to being perceived as an outsider to the Qijiaping site, they also face imminent relocation because of the construction of a site museum. In response to relocation, none of the Qijiaping villagers I interviewed demonstrated a willingness to leave, although their reservations were for various reasons. Unfortunately, as a few of my informants put, they are "incapable of action [*wunengweili*]."

"We are *shaoshu*. We are not allowed to resist [*buneng fankang*]" (A, B, C).

Since a few years ago, the villagers have been told by their village leader that they will be relocated. Yet, no actions have yet been taken, so the villagers continue to construct new houses, hoping that they can remain at Qijiaping. They remain uncertain of the specifics of plans and have no access to the government document that I have been citing in this article.[110]

The younger informants (Group C and some of Group B) envisage benefiting from local tourism where they can set up local agritainment [*nongjiale*] businesses including diners and souvenir shops at or near the site museum. Unfortunately, if they are to be removed from the village, it is questionable how far from Qijiaping they will be relocated, and whether or not they will be situated in a new community where "buffer-zones" of the Qijiaping heritage site can potentially be set up. Either with the collaboration with local *danwei* or self-defined, such zones potentially allow surrounding communities to benefit from economic development stemming from the site.[111]

As for the older informants (Group A and some of Group B), many referred to where they will be relocated as "new village [*xinnongcun*]," in which they have to adapt to a new environment. Some are even concerned about the accessibility,

"I have seen many of these *xinnongcun*. They are not good for older people like us. Many of the buildings are six or seven stories high. We cannot walk up there" (A).

When asked what they thought if they were to be relocated to the city, one of my informants said,

"The air in the village is fresher. The living costs in the city are too high. Here, we can plant our own crops. We do not have to spend too much money here" (A).

Many also said it will be a challenge for the elderly to get used to the city life,

"Those elevators. Older people do not even know how to press the button to go up and down in an elevator. Many of them have never used or seen an elevator before" (A, B, C).

One of the biggest concerns is finding a job,

"Of course, it would be good for younger people to move to the city, if they can find a job outside. For older people like us, who cannot find a job, will become a burden" (A).

Currently, many young men from Qijiaping have left the village (semi-permanently, only coming back during important festivals, celebrations or mourning) to work [*dagong*] in the city. This rural-urban migration has been a trend stemming from the period immediately after the establishment of the People's Republic of China in 1949 when there was an influx of rural population (usually in the west) to the urban region (usually in the east) to fill up the job opportunities provided by the post-war construction and reconstruction of infrastructure.[112]

110 GRZ et al., *Qijiaping yizhi*...

111 Masanori Nagaoka, "Buffering Borobudur for Socio-Economic Development: An Approach Away from European Values-Based Heritage Management," *Journal of Cultural Heritage Management and Sustainable Development* 5.2 (2015): 130–150.

112 Li Zhang, Richard LeGates, and Min Zhao, *Understanding China's Urbanization: The Great Demographic, Spatial, Economic, and Social Transformation* (Cheltenham: Edward Elgar Publishing Limited, 2016), 14.

This has been considered a relief for many young and able-bodied to leave the villages for more financial opportunities, and increasingly, villages are considered backward and uncivilized.[113] To ensure balanced resource distribution and the control of rural-to-urban (west-to-east) migration in the midst of economic development in the east, the *hukou* (household registration) system was set up in 1958, which subsumes the rural migrants as second-class citizens, denying them of the urban pension system including government housing, health care, and education system for their children.[114] Constrained by their rural identities and depending on to which cities they emigrate, the once-peasants might end up paying a lot for their travels and accommodation, not knowing the exact wage levels, and being non-competitive in the job market due to lack of education and industrial knowledge.[115] The Qijiaping villagers have also been facing the same situation. With a rural *hukou*, many of them could only find low-income jobs even with a university degree, unless they are lucky enough to become a civil servant or work for a *danwei*. If the Qijiaping villagers were to be relocated to the city, there is still going to be very little fluidity in their *hukou* status.

The *hukou* status has a huge impact especially on the elderly population. Nearly 90% of my Group A (and quite a few from Group B) informants are battling different kinds of illnesses, the most common being cancer, ulcers, and diabetes. The costs of obtaining medication, seeing a doctor, and performing surgery have surged in recent years. Despite an access to medical insurance, many do not even have the 200RMB/year (increasing each year) to pay for the insurance. They do get a subsidy each visit to the doctor, but the costs of traveling, especially for older people who cannot drive to the hospital, are expensive. Moreover, they can only go to designated hospitals in Guanghe county.

"The medication does not work. A few times my wife took the medicine they prescribed and had stomach problems for a few days and could not get out of bed" (A).

The Qijiaping elderly usually end up buying their own medicine at a local store.

Once the Qijiaping villagers are to be relocated, even though they will be compensated with a "fair" amount as determined by the local *danwei* (as negotiated with the village leader), they have to face many unforeseeable challenges that not only require a reconstruction of their homes (physically or conceptually), but also an increase in living costs financially and socially, the latter associated with the need to integrate into new community.

Even if none of these matters concern us as an audience of a celebrated past of the Qijiaping site, the concern should be the loss of an extensive piece of history of how Qijiaping came to be. The Qijiaping Dongxiangzu are the record keepers of this archaeological

[113] Ann Anagnost, "Chapter 3: Constructions of Civility in the Age of Flexible Accumulation," in *National Past-Times* (Durham: Duke University Press, 1997), 75–97.

[114] Hong Zhang, "The New Realities of Aging in Contemporary China: Coping with the Decline in Family Care," in *The Cultural Context of Aging: Worldwide Perspectives*, vol. 3, ed., Jay Sokolovsky (Westport/CT: Greenwood Publishing Group, 2009), 196–215; Fang Cai, John Giles, Philip O'Keefe, and Wang Dewen, *The Elderly and Old Age Support in Rural China: Challenges and Prospects* (Washington D.C.: The World Bank, 2012); Meine Pieter van Dijk, "A Different Development Model in China's Western and Eastern Provinces?" *Modern Economy* 2.5 (2011): 757–768.

[115] Xin Meng, "Regional Wage Gap, Information Flow, and Rural-Urban Migration," in *Rural Labor Flows in China*, eds., Loraine A. West and Yaohui Zhao (Berkeley: Institute of East Asian Studies, University of California Berkeley, 2000), 251–277.

experience which even archaeology cannot reconstruct. While this is different from the situation present in many archaeological sites in the world, where local and indigenous groups claim their rights to the past and hence the rights to the lands or what is within the lands as an act to honor their ancestors, and as a responsibility to take care of their legacies,[116] I argue we must see the Qijiaping Dongxiangzu as indigenous to the Qijiaping archaeological experience. The issue is not to discuss the "rights" to land, but rather to appreciate how the Qijiaping Dongxiangzu makes the Qijiaping site alive. By removing the villagers and their stories, Qijiaping truly becomes fossilized history solely based on a re-imagination of the past.

The Portrait

When I showed my informants the portraits drawn at the back of the Area B profile drawings, many recalled that one Lanzhou archaeologist who came to Qijiaping in 1975 loved to draw.

"He drew a portrait of the agricultural cooperative accountant" (A).

I asked if it was a gift. The 90-year-old then-accountant told me that the portrait was a testimony [*jianzheng*] to the excavations at Qijiaping. The archaeologist took away the portrait and never came back. This is just like the nature of archaeology. Archaeologists go into a site to extract, construct ephemeral relationships with local villagers, pack the artifacts and almost never to return again.

As discussed earlier, archaeologists in China are mostly just responsible for the first steps in adding values to *wenwu* and in defining an archaeological site. We play a less visible role in the later monumentalization of the site into a heritage. That being said, our work holds the potential to add values to what is usually absent in the reconstructed narrative of heritage, which is, "the present."

In recent years, public archaeology has received increasing attention in the field of Chinese archaeology in an effort to connect the past with the present by popularizing archaeology and on "reaching out" to the public through media, outreach activities, and exhibitions.[117] Undeniably, such efforts have had positive impacts on a public understanding of archaeology and the protection of *wenwu*. Meanwhile, this article has demonstrated that it is also necessary to self-reflexively evaluate the impacts of our work on our immediate stakeholders. While Qijiaping might be unique in its composition of archaeological history, local cultures and customs, religious background, and social developmental history, it is not unique as an archaeological site where those who are indigenous to an archaeological experience, regardless of their connections to the archaeological cultures, are deemed disposable from the State's *lieux de mémoire*.

116 Hodder, "Archaeological Reflexivity..."; Rebecca Tsosie, "Indigenous Rights and Archaeology," in *Native Americans and Archaeologists: Stepping Stones to* Common Ground, eds., Nina Swindler, Kurt E. Dongoske, Roger Anyon, and Alan S. Downer (Walnut Creek: AltaMira Press, 1997), 64–76.

117 See, for example: Gao Menghe 高蒙河, *Kaogu Haowan* 考古好玩 [*Archaeology Is Fun*] (Shanghai: Fudan Daxue Chubanshe 复旦大学出版社 [Fudan University Publishing House], 2011); Gao Menghe 高蒙河, and Zheng Hao 郑好, "Lun Zhongguo gongzhong kaogu bushi xifang bolaipin 论中国公众考古不是西方舶来品 [Chinese Public Archaeology is not an Imported Theory]," *Dongnan Wenhua* 东南文化 [*Southeastern Culture*] 6 (2013): 24–29.

To truly safeguard the integrity of the past and the integrity of the relationships between the land and its people, not only do archaeologists have to engage in public outreach and education, but we also have to conduct ethnographic research to appreciate the values of local voices.[118] By striking a balance between the importance of archaeological pursuits and local ways of life, archaeologists or archaeo-ethnographers can take the first steps, regardless of the eventual decision of the State or local *danwei*, to bringing awareness to what it means for an archaeological site-cum-heritage to become and stay alive.

Just as we sketch out the wrinkling contours of local people and the landscape that defines the essence of who they are, it is important not to simply take, pack and leave. Instead, if we begin sharing this archaeological experience with local communities affected by us removing dirt from the land they define as home, by first listening to their stories in this experience, and then identifying the impacts of our work on their lives, it is possible for archaeologists to take a huge leap forward in adding a layer to what heritage is and will be defined. In this way, archaeology is not just a field of practice, but the platforms it constructs can enhance human interactions and connections.

As I pass around the copies of the 1975 monochrome photographs, one of the 65-year-old informants points to a small figure accidentally captured in one of the photos,

"This is my son! My son!" (A). His eldest son was hired to excavate with us the previous year. Who would have known that the following year the life of this young man would be taken away in a fatal car accident? Now this 65-year-old widower lives alone. His daughter comes back from the city, more often now as her son also passed away in the same car accident. And as the old man's younger son has been sentenced to life imprisonment a few years earlier, the daughter has become the sole supporter of the family.

This old man's family was among the first to settle at Qijiaping. Apart from his daughter, he relies on his close family and friends, and the Muslim community living in and around the village (including Huangjiawan and Paiziping). The everyday praying sessions at the Qijiaping or Huangjiawan mosque, visiting each other's houses, and hanging out in the central plaza, have rooted him and the rest of the community into the village and its landscape. Would they all face the disintegration of this network of support?

Since my first visits, during successive visits to the Group A informants, many of them say to me, "When will Miss Ko come here [*gao xiaojie shenme shihou lai*]? We are afraid we will not be able to see her before entering our graves" (A). Every year I return to the Tao River Valley, I listen to their stories, share with them tears and laughter, take photos of and with them, and give them a copy of the photos I took the previous year (many place the photos in photologs or together with their family photos on display in their rooms). Each year, I also show them the film footage I collected the previous year.

Many of these stories are not only brought out by, but also entangled with the archaeological experience. They might not be central to the understanding of an archaeological past, might be traumatic, might be delightful, might be trivial, and might not even align with the State's narrative. Yet, what they stand for is a collective experience in defining a group establishing a relationship with a landscape, and they deserve to be considered when constructing a State's heritage. These stories are the living testimonies of the sum of everything sketched out in the landscape.

[118] Hodder, "Archaeological Reflexivity..."

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Huangniangniangtai: A Qijia Gateway Community in the Hexi Corridor

by

Chenghao WEN

Abstract

It is widely accepted that Northwest China has been recognized as an important intermediary area, a link between the more westerly inland of Central Eurasia and the East Asian heartland to the east. Taking the Huangniangniangtai site in the Hexi corridor as a point of departure, this study aims to develop a synthesis of cultural interaction in the form of economic exchange, or trade in goods and personnel in light of new archaeological data in the past two decades. Under the conceptual framework of the gateway community, the Qijia community is defined as a gateway community actively participating in the interregional trade of precious goods between the central Gansu and the Hexi corridor. Recognizing this is the key to developing a nuanced understanding of the endogenous socio-economic dynamic in the Bronze Age Northwest China.

Introduction

The Qijia culture, one of the six major cultural phases in Northwest China first recognized and defined by Andersson[1] according to the pottery assemblage found at Qijiaping (Fig. 1:13), is an important archaeological culture widely distributed along the upper Yellow River valley and its tributaries, even further reached the eastern Hexi corridor from the end of the third to the early second millennium BCE.[2] In the past decades the research on the Qijia culture has reconstructed its cultural-historic framework based on the typolo-

[1] J. G. Andersson, "The Ch'i Chia P'ing pottery," *Bulletin of the Museum of Far Eastern Antiquities* 15 (1943): 78–82, plates 36–39.

[2] Chen Honghai, "The Qijia Culture of the Upper Yellow River Valley," in *A Companion to Chinese Archaeology*, ed., A. P. Underhill (West Sussex: Wiley-Blackwell, 2013), 105–124.

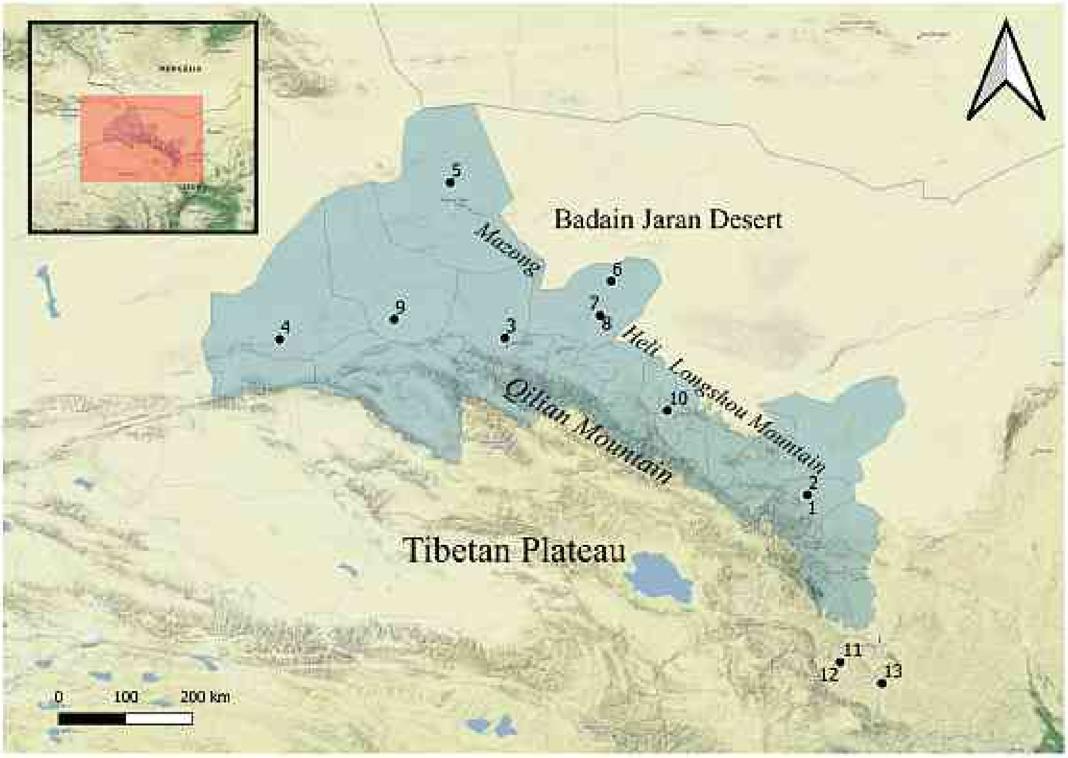

Figure 1. *Hexi corridor (light blue area) and the locations of archaeological sites mentioned in the text. 1. Huangniangniangtai; 2. Haizangsi; 3. Huoshaogou; 4. Xitugou; 5. Mazongshan; 6. Baishantang; 7. Huoshiliang; 8. Gangganggwa; 9. Hanxia; 10. Xichengyi; 11. Dahezhuang; 12. Qinweijia; 13. Qijiaping.*

gy of pottery[3] and its cultural connections with neighboring regions.[4] Temporally, the Qijia

[3] Chen Pin, "*Qijia Wenhua de Fenqi yu Yuanliu* 齐家文化的分期与源流 [Periodization and Developmental Trajectory of the Qijia Culture]" (Ph.D. diss., Department of Archaeology, Peking University, 2013); Ren Ruibo, "*Xibei Caitao Wenhua Yanjiu* 西北彩陶文化研究 [Study of Painted Pottery Cultures in Northwest China]" (Ph.D. diss., Department of Archaeology, Jilin University, Changchun, 2015); Shui Tao, "Ganqing diqu qingtong shidai de wenhua jiegou he jingji xingtai yanjiu 甘青地区青铜时代的文化结构和经济形态研究 [Study of the Cultural Structure and Economic Patterns in the Bronze Age Gansu-Qinghai Region]". In *Zhongguo Xibei Diqu Qingtong Shidai Kaogu Lunji* 中国西北地区青铜时代考古论集 [C*ollected Papers on the Archaeology of the Bronze Age Northwest* C*hina*], ed., Shui Tao (Beijing: Kexue Chubanshe. 2001), 193–327; Zhang Zhongpei, "Qijia wenhua yanjiu 齐家文化研究 [Study of the Qijia Culture]". *Kaogu Xuebao* 考古学报 [*Acta Archaeologica Sinica*] 1 (1987): 1–18; 2 (1987): 153–176.

[4] Chen Xiaosan, "*Hexi Zoulang Jiqi Linjin Diqu Zaoqi Qingtong Shidai Yicun Yanjiu – yi Qijia, Siba Wenhua wei Zhongxin* 河西走廊及其邻近地区早期青铜时代遗存研究-以齐家、四坝文化为中心 [Study of Early Bronze Age Remains in the Hexi Corridor and Neighboring Regions—Centered upon the Qijia and Siba Cultures]" (Ph.D. diss., Department of Archaeology, Jilin University, Changchun, 2012); C. Debaine-Francfort, *Du Nèolithique à l'Âge du Bronze en* C*hine du Nord-Ouest: La culture de* Q*ijia et ses connexions*, Mèmoires de la Mission Archèologique Française en Asie Centrale, volume VI (Paris: Éditions Recherche sur les Civilizations, 1995); L. G. Fitzgerald-Huber, "Qijia and Erlitou: The question of contacts with distant cultures," *Early* China 20 (1995): 17–67; L. G. Fitzgerald-Huber, "The Qijia culture: Paths East and West," *Bulletin of the Museum of Far Eastern Antiquities* 75 (2003): 55–78; Wang Hui, "Ganqing diqu xinshiqi-qingtong shidai kaoguxue wenhua de puxi yu geju 甘青地区新石器—青铜时代考古学文化的谱系与格局 [Genealogy and Patterns of the Neolithic-Bronze Age Archaeological Cultures in the Ganqing Region]," in *Kaoguxue Yan-*

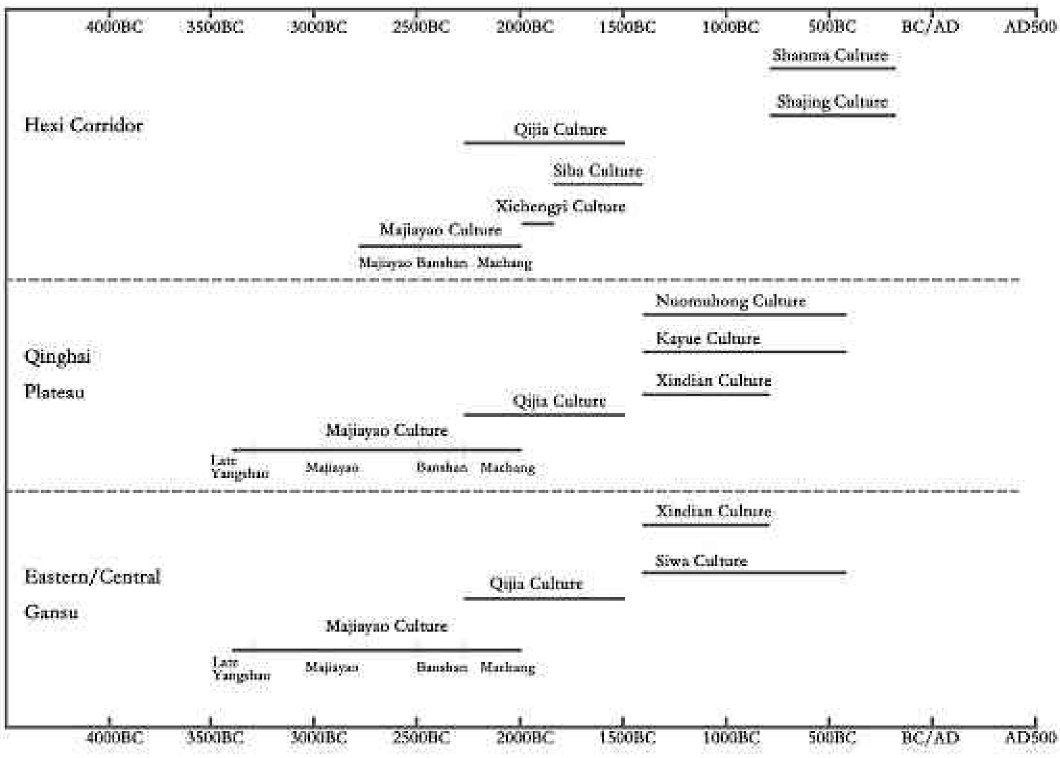

Figure 2. *Chronological framework of archaeological cultures in Northwest China.*

culture (2300–1500 BCE[5]) coexisted with the final phase of the Majiayao culture (the Machang Phase, 2300–2000 BCE), the Xichengyi culture (2050–1650 BCE), and the Siba culture (1750–1350 BCE) in the Hexi corridor (Fig. 2). Hence, the intermediary position of the Qijia culture—both spatially and chronologically—naturally makes it a hotspot of the discussions on the so-called East-West cultural exchange evidenced by the transcontinental transmission of innovative copper metallurgy as well as exotic crops and domestic animals during the early second millennium BCE.[6]

jiu (9) 考古学研究（九）——庆祝严文明先生八十寿辰论文集 [*A Collection of Studies of Archaeology (IX): Festschrift in Commemoration of Prof. Yan Wenming's 80th Birthday*], ed., Beijing Daxue Kaogu Wenbo Xueyuan, and Beijing Daxue Zhongguo Kaoguxue Yanjiu Zhongxin (Beijing: Wenwu Chubanshe, 2012), 210–243.

5 All dates given in this paper are calibrated AMS radiocarbon dates on plant seeds from archaeological contexts. For the most updated radiocarbon dates of archaeological cultures in the Hexi Corridor please see Yang Y., Zhang S., C. Oldknow, Qiu M., Chen T., Li H., Cui Y., Ren L., Chen G., Wang H., and Dong G. "Refined chronology of prehistoric cultures and its implication for re-evaluating human-environment relations in the Hexi Corridor, northwest China," *Science China Earth Sciences* 62.10 (2019b): 1578–1590.

6 K. Brunson, Ren L., Zhao X., Dong X., Wang H., Zhou J., and R. Flad, "Zooarchaeology, ancient mtDNA, and radiocarbon dating provide new evidence for the emergence of domestic cattle and caprines in the Tao River Valley of Gansu Province, northwest China," *Journal of Archaeological Science: Reports*, 31 (2020): 102262; Chen Guoke, "Xichengyi-Qijia yejin gongtongti – Hexi zoulang diqu zaoqi yejin renqun ji xiangguan wenti chutan 西城驿-齐家冶金共同体：河西走廊地区早期冶金人群及相关问题初探 [Xichengyi-Qijia Metallurgical Complex: Preliminary Discussion of Early Metallurgical Communities in the Hexi Corridor and

One of the most critical issues involving the Qijia culture is the origin, development, and transmission of metallurgy in early China. The discovery of early copper objects from the Huangniangniangtai cemetery (Fig. 1:1) in late 1950s and other Qijia sites made the Qijia culture the primary candidate for comparison with the metallurgic production at the site of Erlitou, the presumed first political center of the Bronze Age China. Thus, the Qijia culture is assumed to be one important intermediate which links the Central Plains and Eurasian Steppe and Central Asia, and even the major donor of metallurgical knowledge that played crucial role in the statecraft of early Chinese civilization.[7] In late 1970s the mass discovery of early metals at the Huoshaogou cemetery (Fig. 1:3) and the systematic analysis on the early metal objects from the Hexi corridor have to some degree changed the dynamics of interpretations on early metallurgy in NW China and its adjacent areas: NW China is now seen not as a passive receiver and intermediate of early metallurgy, but as in other areas in the world, exhibited active agency to develop local repertoires based on its own cultural agenda.[8] Nevertheless, due to the absence of a technological-system perspective among those earlier discussions, the misconception that copper objects are equal to metallurgical production is taken for granted, and thus the role of the Qijia culture in early metallurgy and the cultural interactions at large is basically misunderstood. I argue that a thorough understanding of the Qijia culture, and northwest China more extensively, must be placed in the perspective of economic process including production, redistribution and circulation, and consumption.

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[7] An Zhimin, "Shilun Zhongguo de zaoqi tongqi 试论中国的早期铜器 [Experimental Discussion of Early Copper-based Artifacts in China]," *Kaogu* 考古 [*Archaeology*] 12 (1993): 1110–19; L. G. Fitzgerald-Huber, "Qijia and Erlitou: The question of contacts with distant cultures," 17–67; L. G. Fitzgerald-Huber, "The Qijia culture: Paths East and West," 55–78.

[8] Chen Kunlong, Mei Jianjun, and Wang Lu, "Zhongguo zaoqi yejin de bentuhua yu quyu hudong 中国早期冶金的本土化与区域互动 [Localization and Regional Interactions of Early Metallurgy in China]," *Kaogu yu Wenwu*考古与文物 [*Archaeology and Cultural Relics*] 3 (2019): 114–121; Li Shuicheng, "Xibei yu Zhongyuan zaoqi yetongye de quyu tezheng ji jiaohu zuoyong 西北与中原早期冶铜业的区域特征及交互作用 [Regional Patterns and Interactions of Early Metallurgy between Northwest China and the Central Plains]," *Kaogu Xuebao* 考古学报 [*Acta Archaeologica Sinica*] 3 (2005): 239–278; Li Shuicheng, and Shui Tao, "Siba wenhua tongqi yanjiu 四坝文化铜器研究 [Study of the Copper-based Artifacts of the Siba Culture]," *Wenwu* 文物 [*Cultural Relics*] 3 (2000): 36–44; Mei Jianjun, "Qijia and Seima-Turbino: The questions of early contacts between Northwest China and the Eurasian Steppe," 31–54.

I propose that the high mobility of the Qijia communities resulted from its social marginality in relation to the pre-existing Majiayao communities (the Machang Phase). A high uniformity of material culture and burial practice indicate a strong social cohesion was maintained effectively within the Qijia communities during the mobility (probably by a drinking ritual represented by the omnipresent and stylistic unique amphora beakers). The social marginality promoted the Qijia communities to dwell in some ecological peripheries, which then became the frontier in the new epoch of mobility in Eurasia. By taking advantage of its social marginality, the Qijia communities dispersed with strong strategic considerations by means of occupying the nexus of exchange of population and goods and actively engaged in the trade of rare resources and goods (e.g., copper/bronze, jade). Just to be clear, the Qijia communities was not involved in the production process of copper/bronze, but mainly participated in the redistribution and circulation of metal products including semi-products (ingots) and finished products. In light of updated archaeological data on craft production (e.g., metallurgy, lapidary) in the Hexi corridor in recent decade, I will reconsider the economic role the Qijia communities play through the case study of the Huangniangniangtai site under the conceptual framework of gateway community[9] so as to develop a nuanced understanding, not only on the role of the Qijia culture in its regional context, but also on the whole of Northwest China at a much broader scale.

Hexi Corridor: A Strategic Passageway

The Hexi corridor mainly designates the funnel-shaped depression sandwiched between the Tibetan Plateau in south bounded by the Qilian-Altyn Mountains and the Alashan Plateau in north bounded by the Mazong-Heli-Longshou mountain range (Fig. 1). It extends in the directionality of northwest-southeast, starts in the south at the northwestern slope of the Wushao Mountain and ends at the Kara Nur near the borderline between Xinjiang and Gansu. The total length of corridor is about 1020 km; the width on average is 50–60 km. The Qilian Mountains with an average elevation of 3000–4000 m covered by perennial glaciers provide the source of water for all river systems (e.g., Shiyang River, Hei River, and Shule River) in the Hexi corridor.[10] A number of oases accompanying most archaeological sites usually have their source at the foothills along the Qilian Mountains, where the rivers flow out onto the plain. For example, the Huangniangniangtai site is located right at the edge of the largest oasis in the Hexi corridor—the Wuwei oasis fed by the Shiyang River.

As a part of the Silk Road in historical periods, the Hexi corridor is also a strategic passageway linking the China proper to the east and Central Asia to the west in prehistory.[11] Through this pivotal route West Asia-originated crops (e.g., wheat, barley),[12] domestic

[9] K. G. Hirth, "Interregional trade and the formation of prehistoric gateway communities," *American Antiquity* 43.1 (1978): 35–45.

[10] Chen Xi, *Zhongguo Ganhanqu Ziran Dili* 中国干旱区自然地理 [*The Physical Geography of the Arid Zone in China*] (Beijing: Kexue Chubanshe, 2010).

[11] Chang Kwang-chih, "Kaoguxue Suojian Handai Yiqian de Xibei 考古学所见汉代以前的西北 [Pre-Han Northwest China in Archaeology]," *Bulletin of IHP* 42.1 (In Honor of Dr. Wang Shih-Chieh on His 80th Birthday) (1970): 81–112; Gansu Sheng Wenwu Kaogu Yanjiusuo (GSWKY), and Beijing Daxue Kaogu Wenbo Xueyuan (BDKWX), *Hexi Zoulang Shiqian Kaogu Diaocha Baogao* 河西走廊史前考古调查报告 [*Report on the Prehistoric Archaeological Survey in the Hexi Corridor*] (Beijing: Wenwu Chubanshe, 2011).

[12] J. R. Dodson, Li X., Zhou X., Zhao K., Sun N., and P. Atahan, "Origin and spread of wheat in China," *Qua-*

animals (e.g., cattle, sheep/goat, horse),[13] innovative technologies (e.g., copper-based metallurgy, horse-riding and chariot),[14] and valued objects (e.g., gold, silver, cowries, steatite/carnelian beads, mace heads/scepters) passed.[15] Reciprocally, East Asia-originated millets

ternary Science Reviews 72 (2013): 108–111; Dong G., Yang Y., Han J., Wang H., and Chen F. "Exploring the history of cultural exchange in prehistoric Eurasia from the perspectives of crop diffusion and consumption," *Science China Earth Sciences* 60.6 (2017): 1110–1123; Dong G., Yang Y., Liu X., Li H., Cui Y., Wang H., and Chen F., "Prehistoric trans-continental cultural exchange in the Hexi Corridor, northwest China," *The Holocene* 28.4 (2018): 621–628; R. Flad, Li Shuicheng, Wu Xiaohong, and Zhao Zhijun, "Early wheat in China: Results from new studies at Donghuishan in the Hexi Corridor," *The Holocene* 20.6 (2010): 955–965; Liu X., D. L. Lister, Zhao Z., C. A. Petrie, Zeng X., P. J. Jones, R.A. Staff, A. K. Pokharia, J. Bates, R. N. Singh, S. A. Weber, G. M. Matuzeviciute, Dong G., Li H., Lü H., Jiang H., Wang J., Ma J., Tian D., Jin G., Zhou L., Wu X, and M. K. Jones, "Journey to the east: Diverse routes and variable flowering times for wheat and barley *en route* to prehistoric China," *PLoS One* 12.11 (2017): e0187405; Liu X., P. J. Jones, G. M. Matuzeviciute, H. V. Hunt, D. L. Lister, An T., N. Przelomska, C. J. Kneale, Zhao Z., and M. K. Jones, "From ecological opportunism to multi-cropping: Mapping food globalisation in prehistory," *Quaternary Science Reviews* 206 (2019): 21–28; Yang Y., Ren L., Dong G., Cui Y., Liu R., Chen, G., Wang H., S. Wilkin, and Chen F., "Economic change in the prehistoric Hexi corridor (4800–2200 BP), north-west China," *Archaeometry* 61.4 (2019a): 957–976.

[13] Cai D., Tang Z., Han L., C. F. Speller, Yang D., Ma X., Cao J., Zhu H., and Zhou H., "Ancient DNA provides new insights into the origin of the Chinese domestic horse," *Journal of Archaeological Science* 36.3 (2009): 835–842; Cai D., Tang Z., Yu H., Han L., Ren X., Zhao X., Zhu H., and Zhou H., "Early history of Chinese domestic sheep indicated by ancient DNA analysis of Bronze Age individuals," *Journal of Archaeological Science* 38.4 (2011): 896–902; Cai D., Sun Y., Tang Z., Hu S., Li W., Zhao X., Xiang H., and Zhou H., "The origins of Chinese domestic cattle as revealed by ancient DNA analysis," *Journal of archaeological science* 41 (2014): 423–434; R. K. Flad, "Zooarcheological evidence for animal domestication in northwest China," in *Late Quaternary Climate Change and Human Adaptation in Arid China* (*Developments in Quaternary Sciences, Volume 9*), ed., D. B. Madsen, F. H. Chen, and X. Gao (Amsterdam and Oxford: Elsevier, 2007), 167–203; Lü P., K. Brunson, Jing Y., and Li Z., "Zooarchaeological and genetic evidence for the origins of domestic cattle in ancient China," *Asian Perspectives* 56 (2017): 92–120.

[14] J. Dodson, Li X., Ji M., Zhao K., Zhou X., and V. Levchenko, "Early bronze in two Holocene archaeological sites in Gansu, NW China," *Quaternary Research* 72.3 (2009): 309–314; Mei Jianjun, "Qijia and Seima-Turbino: The questions of early contacts between Northwest China and the Eurasian Steppe," 31–54; Mei Jianjun, Yongbin Yu, Kunlong Chen, and Lu Wang, "The Appropriation of Early Bronze Technology in China," in *Appropriating Innovations: Entangled Knowledge in Eurasia, 5000–1500 BCE* , ed., Philipp W. Stockhammer, and Joseph Maran (Oxford and Philadelphia: Oxbow Books, 2017), 231–240; A. Sherratt, "The Trans-Eurasian Exchange: The Prehistory of Chinese Relations with the West," in *Contact and Exchange in the Ancient World*, ed., Victor H. Mair (Honolulu: University of Hawai'i Press, 2006), 30–61; Yang Y., Dong G., Zhang S., Cui Y., Li H., Chen G., J. Dodson, and Chen F., "Copper content in anthropogenic sediments as a tracer for detecting smelting activities and its impact on environment during prehistoric period in Hexi Corridor, Northwest China," *The Holocene* 27.2 (2017): 282–291.

[15] Ai Wanqiao, "Qinghai Gonghe pendi shiqian shiqi zhuangshipin chuyi 青海共和盆地史前时期装饰品刍议 [Initial Discussion of Prehistoric Ornaments in the Gonghe Basin, Qinghai]," *Sichuan Wenwu* 四川文物 [*Sichuan Cultural Relics*] 4 (2020): 26–39; L. Janz, A. Cameron, D. Bukhchuluun, D. Odsuren, and L. Dubreuil, "Expanding frontier and building the Sphere in arid East Asia," *Quaternary International* 559 (2020): 150–164; Li Shuicheng, *Yaowu Yangwei: Quanzhang Yuanliu Kao* 耀武扬威：权杖源流考 [*The Origins and Dispersal of Mace Scepters*] (Shanghai: Shanghai Guji Chubanshe, 2021); Ma Jian, "Huangjin zhipin suojian zhongya caoyuan yu Zhongguo zaoqi wenhua jiaoliu黄金制品所见中亚草原与中国早期文化交流 [Early Cultural Exchange between Central Asian Steppe and China as Reflected by Gold Artifacts]," *Xiyu Yanjiu* 西域研究 [*Western Regions Studies*] 3 (2009): 50–64, 137; Peng Ke, and Zhu Yanshi, "Zhongguo gudai suoyong haibei laiyuan xintan中国古代所用海贝来源新探 [New Exploration into the Source of Cowrie Shells Used in Ancient China]," in *Kaoguxue Jikan* XII考古学集刊 (12) [*Archaeological Collectanea*, vol. 12], ed., Kaogu Editorial Board (Beijing: Zhongguo Dabaike Quanshu Chubanshe, 1999), 119–147.

were also dispersed via the Hexi corridor to Central Asia and even further to West Asia.[16] In recent decade great progress has been made by archaeologists in understanding this culturally important region. The most noteworthy archaeological discoveries are the metallurgical site at Xichengyi (Fig. 1: 10) and the jade mining sites at Mazongshan and Hanxia (Fig. 1: 5, 9).

Xichengyi: Northwest China Metallurgical Focus

The Xichengyi community, as the first people who acquired the metallurgical know-how in Northwest China, had developed a quite sophisticated metallurgical industry. So far, the earliest archaeological evidence of metallurgy in the Hexi corridor has been identified at the sites of Xichengyi in Zhangye,[17] Ganggangwa and Huoshiliang in Jinta[18] (Fig. 1: 7, 8), and Xitugou in Dunhuang (Fig. 1: 4).[19] Amongst these early metallurgical sites, only the Xichengyi site has been systematically excavated from 2010–2016. The metallurgical remains such as copper ores, furnace and crucible fragments, bellow nozzles, slag, and metal

[16] M. D. Frachetti, R. N. Spengler, G. J. Fritz, and A. N. Mar'yashev, "Earliest direct evidence for broomcorn millet and wheat in the central Eurasian steppe region," *Antiquity* 84.326 (2010): 993–1010; E. Lightfoot, Liu X., and M. K. Jones, "Why move starchy cereals? A review of the isotopic evidence for prehistoric millet consumption across Eurasia," *World Archaeology* 45.4 (2013): 574–623; N. F. Miller, R. N. Spengler, and M. Frachetti, "Millet cultivation across Eurasia: Origins, spread, and the influence of seasonal climate," *The Holocene* 26.10 (2016): 1566–1575; G. Motuzaite-Matuzeviciute, R. A. Staff, H. V. Hunt, Liu X., and M. K. Jones, "The early chronology of broomcorn millet (Panicum miliaceum) in Europe," *Antiquity* 87.338 (2013): 1073–1085; R. N. Spengler III, N. Ryabogina, P. E. Tarasov, and M. Wagner, "The spread of agriculture into northern Central Asia: Timing, pathways, and environmental feedbacks," *The Holocene* 26.10 (2016): 1527–1540; Wang T., Wei D., Chang X., Yu Z., Zhang X., Wang C., Hu Y., and B. T. Fuller, "Tianshanbeilu and the Isotopic Millet Road: reviewing the late Neolithic/Bronze Age radiation of human millet consumption from north China to Europe," *National Science Review* 6.5. (2017): 1024–1039; Zhou X., Yu J., R. N. Spengler, Shen H., Zhao K., Ge J., Bao Y., Liu J., Yang Q., Chen G., P. W. Jia, and Li X., "5,200-year-old cereal grains from the eastern Altai Mountains redate the trans-Eurasian crop exchange," *Nature plants* 6.2 (2020): 78–87.

[17] Bejing Keji Daxue Yejin yu Cailiaoshi Yanjiusuo (BKDYCY), and Gansu Sheng Wenwu Kaogu Yanjiusuo (GSWKY), "Zhangye Xichengyi yejin yizhi diaocha baogao 张掖西城驿冶金遗址调查报告 [Report on the Survey of the Metallurgical Site at Xichengyi, Zhangye]," *Kaogu yu Wenwu* 考古与文物 [*Archaeology and Cultural Relics*] 2 (2015): 27–35; Gansu Sheng Wenwu Kaogu Yanjiusuo (GSWKY), Beijing Keji Daxue Yejin yu Cailiaoshi Yanjiusuo (BKDYCY), Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo (ZSKKY), and Xibei Daxue Wenhua Yichan Xueyuan (XDWYX), "Gansu Zhangye Shi Xichengyi yizhi 甘肃张掖市西城驿遗址 [The Xichengyi Site in Zhangye City, Gansu]," *Kaogu* 考古[*Archaeology*] 7 (2014): 3–17; Gansu Sheng Wenwu Kaogu Yanjiusuo (GSWKY), "Gansu Subei Xian Mazongshan yukuang yizhi 甘肃肃北马鬃山玉矿遗址 [Jade Mine Site at Mazongshan in Subei County, Gansu]," *Kaogu* 考古 [*Archaeology*] 7 (2015): 3–14.

[18] J. Dodson, et al, "Early bronze in two Holocene archaeological sites in Gansu, NW China," 309–314; Yang Yishi, and Chen Guoke, "Ganggangwa yizhi 缸缸洼遗址 [The Ganggangwa Site]," in *Gansu Zhongyao Kaogu Faxian (2000–2019)* 甘肃重要考古发现（2000–2019) [*Major Archaeological Discoveries in Gansu from 2000–2019*]," ed., GSWKY (Beijing: Wenwu Chubanshe, 2020a), 168–171; Yang Yishi, and Chen Guoke, "Huoshiliang yizhi 火石梁遗址 [The Huoshiliang Site]," in *Gansu Zhongyao Kaogu Faxian (2000–2019)* 甘肃重要考古发现（2000–2019) [*Major Archaeological Discoveries in Gansu from 2000–2019*]," ed., GSWKY (Beijing: Wenwu Chubanshe, 2020b); 172–175.

[19] Xibei Daxue Kaoguxi (XDK), Gansu Sheng Wenwu Kaogu Yanjiusuo (GSWKY), and Dunhuang Shi Bowuguan (DSB), "Gansu Dunhuang Xitugou yizhi diaocha shijue jianbao甘肃敦煌西土沟遗址调查试掘简报 [Brief Report on the Survey and Trial Pit Excavation at the Xitugou Site in Dunhuang, Gansu]," *Kaogu yu Wenwu*考古与文物 [*Archaeology and Cultural Relics*] 3 (2004): 3–7; Chen Guoke, "Xichengyi-Qijia yejin gongtongti – Hexi zoulang diqu zaoqi yejin renqun ji xiangguan wenti chutan," 37–44.

scraps found in those sites always coexist with the typical Xichengyi painted pottery assemblage. Therefore, the Xichengyi community was probably the major agent responsible for the formation of the Northwest China Metallurgical Focus, which was an organic component of the Eurasian Metallurgical Province.[20]

The Xichengyi site is located in the middle Hei River valley. Consecutive excavations at this site from 2010–2013 uncovered various features ranging from houses, adobe walls, midden pits, hearths, and tombs, along with a large number of artifacts made of pottery, stone/jade, bone, as well as metallurgical remains indicating a whole technological process: copper ores, furnace fragments, bellow nozzles (tuyeres), smelting slag, stone bi-valve molds for casting mirrors and mace heads, and finished objects (e.g., awls, knives, ornamental rings, buttons, and tubes) (Fig.3).[21] AMS radiocarbon dating of charred crop seeds, including wheat, barley, and millets, suggests that the site was occupied without gaps from 2135–1530 BCE,[22] covering the cultural periods from the late Machang (2135–1890 BCE), Xichengyi (1880–1620 BCE) until the early Siba (1745–1530 BCE). Zooarchaeological study of faunal remains from the Siba period at the Xichengyi site reveals an agro-pastoralist economy dominated by sheep (MNI percentage: 52%; meat weights dietary contribution: 29.2%), cattle (4%; 29.2%), and pigs (16%; 34.77%). The kill pattern of sheep suggests that secondary products (e.g., wool, milk) is probably preferred to the meat.[23] Floatation results indicate a millet agriculture supplemented by wheat and barley during the Xichengyi and Siba periods.[24] Stable isotopic analysis of human and domestic animal bones also shows the same dietary pattern dominated by C4 plants (millets).[25] Exogamy might be practiced by the Xichengyi community, as evidenced by the strontium isotope analysis of an intramurally buried young female's (20–25 years old) teeth and femur samples.[26] Thin section and chemical analyses of the typical Qijia-style fine pottery suggest an independent potting

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[20] E. N. Chernykh, *Ancient metallurgy in the USSR: The early metal age*, trans., Sarah Wright (Cambridge: Cambridge University Press, 1992).

[21] GSWKY et al, "Gansu Zhangye Shi Xichengyi yizhi," 3–17.

[22] Zhang Xuelian, Zhang Liangren, Wang Hui, Lu Xuefeng, Chen Guoke, and Wang Peng, "Zhangye Shi Xichengyi yizhi de tanshisi cenian ji chubu fenxi 张掖市西城驿遗址的碳十四测年及初步分析 [Radiocarbon 14 Dating of the Xichengyi Site in Zhangye City and Preliminary Analysis]," *Huaxia Kaogu* 华夏考古 [*Huaxia Archaeology*] 4 (2015a): 38–45.

[23] Song Yanbo, Chen Guoke, Wang Hui, Fan Xianjun, and Jin Guiyun, "Zhangye Xichengyi yizhi 2014 nian chutu dongwu yicun fenxi 张掖西城驿遗址 2014 年出土动物遗存分析 [Analysis of Faunal Remains Unearthed from the 2014 Excavation at the Xichengyi Site, Zhangye]," *Dongfang Kaogu* 东方考古 [*Oriental Archaeology*] 13 (2016): 233–42.

[24] Jiang Yuchao, Chen Guoke, and Li Shuicheng, "Gansu Zhangye Xichengyi yizhi 2010 nian fuxuan jieguo fenxi 甘肃张掖西城驿遗址 2010 年浮选结果分析 [Analysis of Flotation Results of 2010 Excavation at the Xichengyi Site in Zhangye, Gansu]," *Huaxia Kaogu* 华夏考古 [*Huaxia Archaeology*] 1 (2017): 62–68.

[25] Zhang Xuelian, Zhang Jun, Li Zhipeng, Zhang Liangren, Chen Guoke, Wang Peng, and Wang Hui, "Gansu Zhangye Shi Xichengyi yizhi xianmin shiwu zhuangkuang de chubu fenxi 甘肃张掖市西城驿遗址先民食物状况的初步分析 [Preliminary Analysis of the Ancient Population's Dietary Status at the Xichengyi Site in Zhangye City, Gansu]," *Kaogu* 考古 [*Archaeology*] 7 (2015b): 110–120.

[26] Zhao Chunyan, "Gansu Zhangye Heishuiguo yizhi chutu renlei yihai de Si tongweisu bizhi fenxi 甘肃张掖黑水国遗址出土人类遗骸的锶同位素比値分析 [Analysis of the Strontium Ratio of the Human Skeletons Unearthed at the Heishuiguo Site in Zhangye, Gansu]," in *Di Shisanjie Zhongguo Gujizhui Dongwuxue Xueshu Nianhui Lunwenji* 第十三届中国古脊椎动物学学会年会论文集 [*Proceedings of the 13th Annual Conference of the Chinese Society of Vertebrate Paleontology*], ed., Dong Wei (Beijing: Haiyang Chubanshe, 2012), 267–72.

Figure 3. *Metallurgical remains from the Xichengyi site, Zhangye.*[27]
1. Ores; 2. Furnace/crucible fragments; 3. Slag; 4. Bellow nozzle; 5. Stone mold of mace head.

tradition from the co-occurring Machang-Xichengyi counterparts, which could also point to the interaction of population with different technological traditions during the late Machang and Xichengyi periods.[28] While the appearance of West Asia-originated crops (e.g., wheat and barley) and imported valued objects (e.g., mace heads, cowrie shells, and pearls) at Xichengyi reveal the cultural connections to the Eurasian neighbors through long-distance trading networks.

Scientific analysis of unearthed copper ores, slag, and finished objects all suggest the existence of a quite developed metallurgy at the Xichengyi site.[29] Copper is mainly and directly retrieved from pure oxidized copper ores, besides a small portion of polymetallic ores bearing common alloy elements such as arsenic (As), lead (Pb), tin (Sn), and antimony (Sb). Among 32 analyzed slag samples, 27 are the by-products of smelting for pure copper. While only five slag samples, dating to the middle Xichengyi period, bear the signals of alloyed copper smelting. It is clear that pure copper, rather than copper-based alloys (bronze), is the major product at Xichengyi in the early stage of metallurgy. This is also corroborated by the analysis of 42 copper-based artifacts from archaeological

[27] After GSWKY, "Gansu Zhangye Shi Xichengyi yizhi", 10, 11, 16; BKDYCY, and GSWKY, "Zhangye Xichengyi yejin yizhi diaocha baogao," 34.

[28] Yu Yongbin, Wu Xiaohong, Cui Jianfeng, Chen Guoke, and Wang Hui, "Gansu Zhangye Shi Xichengyi yizhi taoqi de keji fenxi yu yanjiu 甘肃张掖市西城驿遗址陶器的科技分析与研究 [Scientific Analysis and Study of the Pottery from the Xichengyi Site in Zhangye City, Gansu]," *Kaogu* 考古 [*Archaeology*] 7 (2017): 108–120.

[29] Li Yanxiang, Chen Guoke, Qian Wei, and Wang Hui, "Zhangye Xichengyi yizhi yezhu yiwu yanjiu 张掖西城驿遗址冶铸遗物研究 [Study of Metallurgical Remains at the Xichengyi Site in Zhangye]," *Kaogu yu Wenwu* 考古与文物 [*Archaeology and Cultural Relics*] 2 (2015): 119–128.

contexts.[30] Amongst them, 25 objects (59.5%) are made of pure copper, 10 are arsenic copper, two tin copper, one antimony copper and one arsenic-antinomy copper. 13 out of 32 are formed by casting, one piece is cold forged after casting, eight are hot forged, and ten are cold forged after hot forging. The repertoire of copper objects is dominated by mundane tools or ornaments, including knives, awls, rings, buttons, tubes, bars, mirror-shaped plaques (only in the form of casting mold), besides a few ceremonial objects such as mace head (also in the form of casting mold). It is interesting to point out that all copper-based objects found heretofore among Qijia period sites have never exceed the abovementioned technological scope defined by the Xichengyi metallurgical remains. Moreover, source tracing research based on lead isotope analysis of copper ores from five archaeological site bearing metallurgical remains in the Hexi corridor including Xichengyi, demonstrates that the Baishantang copper deposit (Fig. 1: 6) in the Beishan Mountain (the northern boundary of the Hexi corridor) is likely a major source of copper ores.[31]

Mazongshan and Hanxia: Jade Mines at the Western End of the Hexi Corridor

Prospecting for copper ores in mountainous regions, to some degree, encourages the jade mining activities. The time-honored tradition of jade working and using in the lowland China is almost absent in the northwestern highlands before the Longshan era (2300–1800 BCE).[32] The Qijia communities, who inherit the lowland Longshan jade-using legacy, and then disperse to the upper Yellow River with jade-working knowledge, and probably, the ritual knowledge associated with jade objects, likely stimulate the emergence of local lapidary industry working with local jade ores.

According to the review of jade sources in China,[33] multiple sources of serpentine-nephrite, dolomite-nephrite, and actinolite-tremolite have been reported along the line of Eastern Kunlun (Mang'ai)-Mazongshan-Qilianshan-Maxianshan-Wushan (Yuanyang) mountain range. So far, only the jade source at Mazongshan has been archaeologically explored and confirmed (Fig. 1: 5). Since 2008 two locations, Jingbaoer Meadow[34] and Hanyaozi Mead-

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[30] Chen Guoke, Li Yanxiang, Qian Wei, and Wang Hui, "Zhangye Xichengyi yizhi chutu tongqi de chubu yanjiu 张掖西城驿遗址出土铜器的初步研究 [Preliminary Study of Unearthed Copper-based Artifacts from the Xichengyi Site in Zhangye]," *Kaogu yu Wenwu* 考古与文物 [*Archaeology and Cultural Relics*] 2 (2015): 105–118.

[31] Chen G., Cui Y., Liu R., Wang H., Yang Y., A. M. Pollard, and Li Y., "Lead isotopic analyses of copper ores in the Early Bronze Age central Hexi Corridor, north-west China," *Archaeometry* 62.5 (2020): 952–964.

[32] Li Min, *Social Memory and State Formation in Early China* (Cambridge: Cambridge University Press, 2018), 111.

[33] G. L. Barnes, "Understanding Chinese jade in a world context," *Journal of the British Academy* 6 (2018): 1–63.

[34] Gansu Sheng Wenwu Kaogu Yanjiusuo (GSWKY), Beijing Daxue Kaogu Wenbo Xueyuan (BDKWX), and Beijing Keji Daxue (BKD), "Gansu Subei Mazongshan guyukuang yizhi diaocha jianbao 甘肃肃北马鬃山古玉矿遗址调查简报 [Brief Report on the Survey of the Ancient Jade Mine Site at Mazongshan in Subei, Gansu]," *Wenwu* 文物 [*Cultural Relics*] 10 (2010): 27–33; Gansu Sheng Wenwu Kaogu Yanjiusuo (GSWKY), "Gansu Subei Mazongshan yukuang yizhi 2011 nian fajue jianbao 甘肃肃北马鬃山玉矿遗址 2011 年发掘简报 [Brief Report on the 2011 Excavation of the Jade Mine Site at Mazongshan in Subei, Gansu]," *Wenwu* 文物 [*Cultural Relics*] 8 (2012): 38–44; Gansu Sheng Wenwu Kaogu Yanjiusuo (GSWKY), "Gansu Subei Xian Mazongshan yukuang yizhi 2012 nian fajue jianbao 甘肃肃北县马鬃山玉矿遗址 2012 年发掘简报

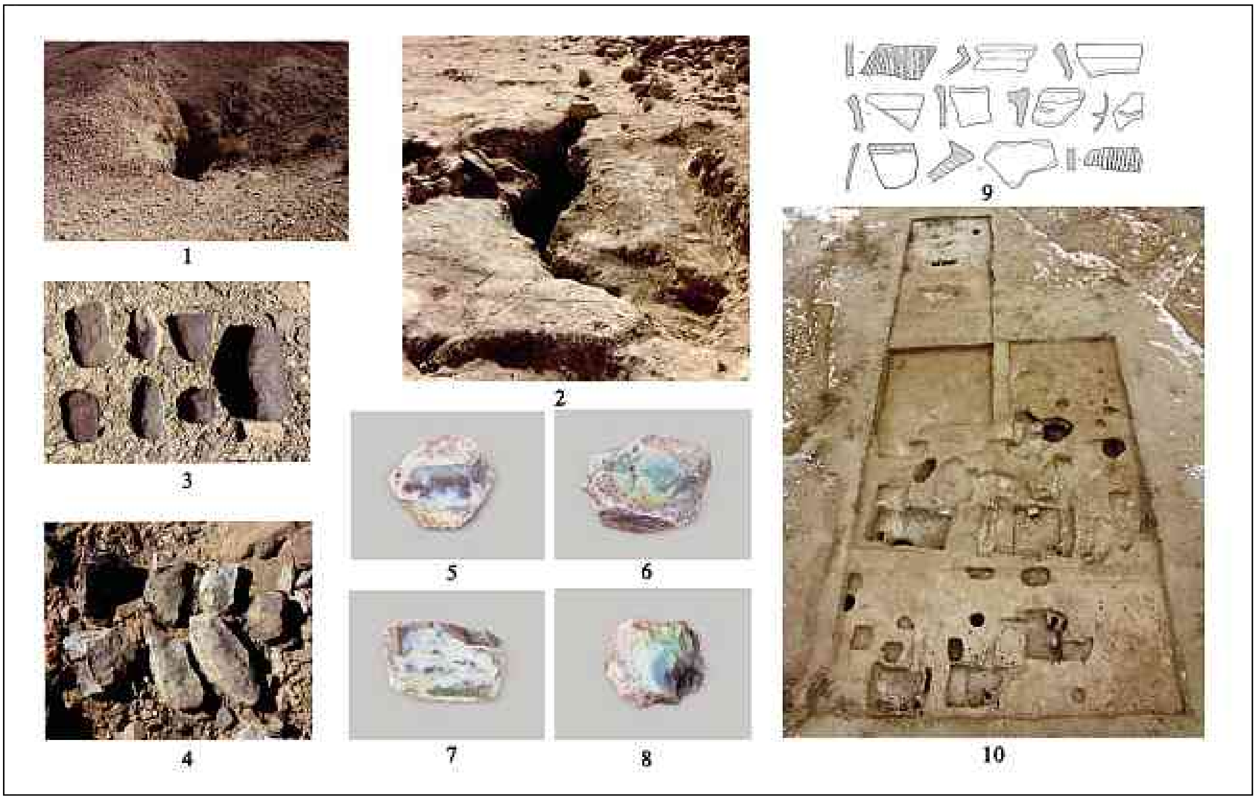

Figure 4. *Jade mining remains at Mazongshan, Subei.*[35] *1. Mining pit at Hanyaozi; 2. Mining gallery at Jingbaoer; 3. Stone hammers collected at Hanyaozi; 4. Abandoned jade ores at Hanyaozi; 5–8. Jade ores from Jingbaoer; 9, 10. Dwellings and associated pottery sherds at Jingbaoer.*

ow,[36] have been uncovered with abundant jade mining remains and features, including dry-stone subterranean houses, mining pits, ditches and galleries, defensive watch towers, along with mining and jade-working remains including raw jade ores, stone hammers, and whetstones (Fig. 4). The coexistence of two different types of pottery sherds, one in typical Central Plains style dating to the Warring States through Han Dynasty (475 BCE–AD 220), the other in autochthonous Shanma style, suggests a rather late date of these jade mining locations. This is also corroborated by seven radiocarbon dating samples which give a date range from 390–60 BCE (calibrated, 2 Sigma).[37] However, a small number of painted potteries with typical Siba-style decorations shows these jade mines had probably been exploited in a much earlier period no later than the first quarter of the second millennium BCE. None finished jade objects have been reported from these two locations, indicating

[Brief Report on the 2012 Excavation of the Jade Mine Site at Mazongshan in Subei County, Gansu]," *Kaogu* 考古 [*Archaeology*] 1 (2016): 40–53; Gansu Sheng Wenwu Kaogu Yanjiusuo (GSWKY), "Gansu Subei Mazongshan Jingbaoer caochang yukuang yizhi 2016 nian fajue jianbao 甘肃肃北马鬃山径保尔草场玉矿遗址 2016 年发掘简报 [Brief Report on the 2016 Excavation of the Jade Mine Site at Mazongshan Jingbaoer Meadow in Subei, Gansu]," *Wenwu* 文物 [*Cultural Relics*] 4 (2020): 31–45.

35 After GSWKY, "Gansu Subei Xian Mazongshan yukuang yizhi 2012 nian fajue jianbao," 42, 48, 50; GSWKY, "Gansu Subei Xian Mazongshan yukuang yizhi," 4–6.

36 GSWKY, "Gansu Subei Xian Mazongshan yukuang yizhi," 3–14.

37 GSWKY, "Gansu Subei Mazongshan Jingbaoer caochang yukuang yizhi 2016 nian fajue jianbao," 31–45.

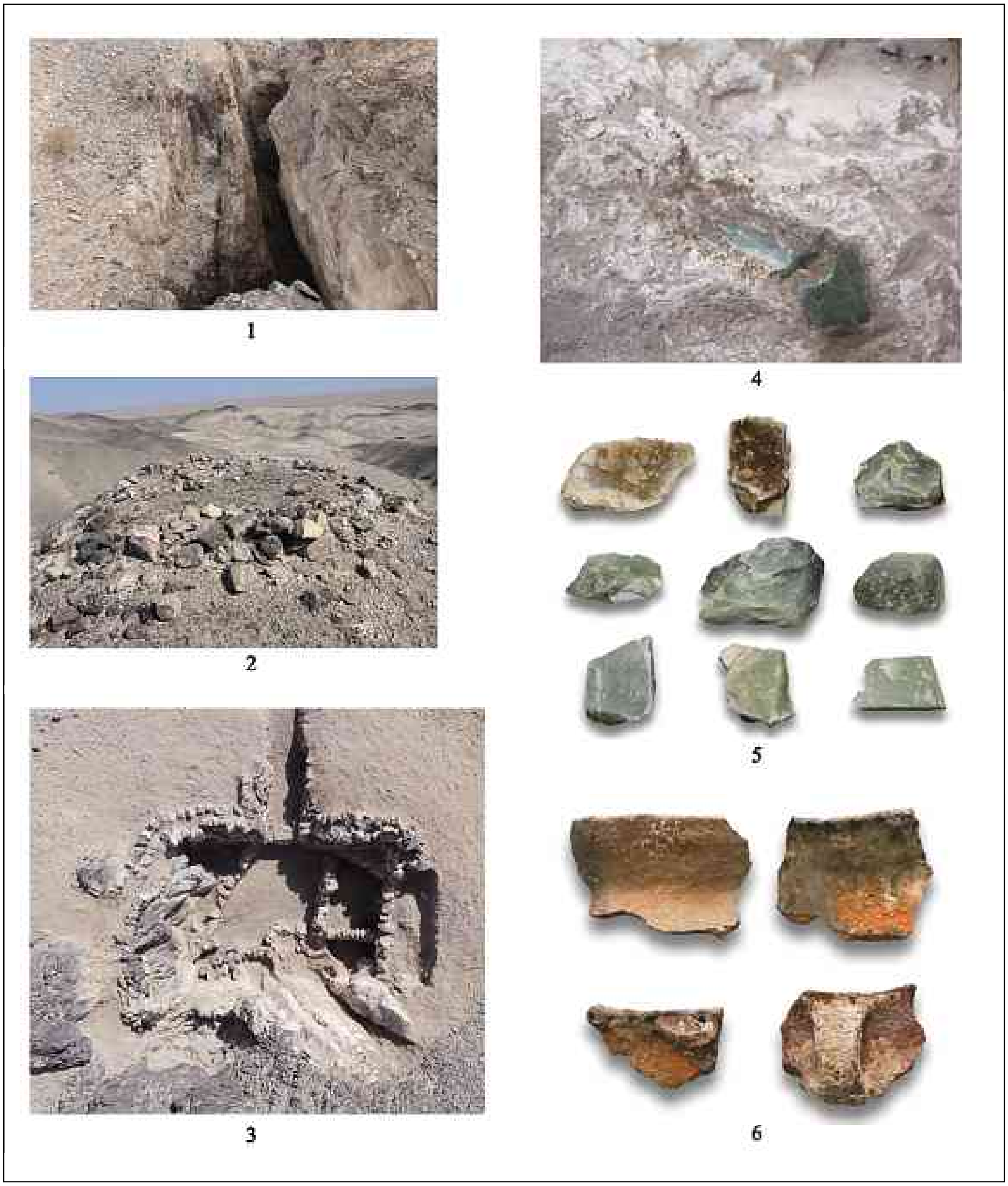

Figure 5. *Jade mining remains at Hanxia, Dunhuang.*[38]
1. Mining gallery; 2. Watch tower;
3. Subterranean dwelling;
4. Jade ore vein in situ;
5. Unearthed jade ores;
6. Unearthed Xichengyi-style pottery sherds.

[38] After GSWKY, and ZDDKGX, "Gansu Dunhuang Hanxia yukuang yizhi kaogu diaocha baogao," 13, 15; Yang, and Chen, "Hanxia yukuang yizhi," 189, 190.

that raw jade ores are mainly transported to oasis settlements after initial selections on site. A series of chemical analyses on jade ore samples prove that they are predominately tremolite-nephrite in mineral composition.

Hanxia jade mine is located at the foothill of the Eastern Kunlun Mountain, about 200 km to the southwest of the Mazongshan jade mines (Fig. 5). A preliminary survey in 2015 discovered 145 mining features, including 114 mining pits, eight mining galleries, 12 watch towers, eight houses, and three ore-selecting areas, as well as three ore veins parallel to the directionality of mountain range.[39] All mining features are identical to those at Mazongshan. Pottery sherds collected on ground surface can be attributed to two periods: the Shanma culture period (800–200 BCE), slightly earlier than Mazongshan mines, and the Xichengyi-Qijia period (2000–1700 BCE), as indicated by the occurrence of painted pottery sherds along with fine buff pottery with typical Qijia-style basket impressions.[40] Traces of thick soot on the wall of one mining pit (K3) indicate the vein rock is cracked by fire-setting.[41] Scientific analyses of jade ore samples from Hanxia yield the same result with the ones from Mazongshan: they are all tremolite-nephrite.[42]

So far, no conclusive connection has been made between abovementioned sources of jade ores and unearthed Qijia jade artifacts, due to the notorious difficulty in pinpointing the source of nephrite artifacts.[43] Nevertheless, high visual similarities in color and texture, along with the large-scale mining activities at Hanxia and Mazongshan lasting for millennium, support the hypothesis that they are likely primary sources of the archaeologically uncovered jade artifacts during the Qijia period, for example, the ones from the Huangniangniangtai and Haizangsi sites in the eastern Hexi corridor.

Huangniangniangtai: A Qijia Gateway Community

The concept of gateway community is first proposed to define the settlements characterized by a complex level of sociopolitical integration and a strong commitment to interregional commerce.[44] Gateway communities are "generally located along natural corridors of communication and at the critical passages between areas of high mineral, agricultural, or

[39] Gansusheng Wenwu Kaogu Yanjiusuo (GSWKY), and Zhongshan Daxue Diqiu Kexue yu Gongcheng Xueyuan (ZDDKGX), "Gansu Dunhuang Hanxia yukuang yizhi kaogu diaocha baogao 甘肃敦煌旱峡玉矿遗址考古调查报告 [Report on the Survey of the Jade Mine Site at Hanxia in Dunhuang, Gansu]," *Kaogu yu Wenwu* 考古与文物 [*Archaeology and Cultural Relics*] 4 (2019): 12–22.

[40] Yang Yishi, and Chen Guoke, "Hanxia Yukuang Yizhi 旱峡玉矿遗址 [Hanxia Jade Mine Site]," in *Gansu Zhongyao Kaogu Faxian (2000–2019)* 甘肃重要考古发现（2000–2019) [*Major Archaeological Discoveries in Gansu from 2000–2019*], ed., GSWKY (Beijing: Wenwu Chubanshe, 2020c), 186–191.

[41] G. Weisgerber, and L. Willies, "The use of fire in prehistoric and ancient mining: firesetting," *Paléorient* 26.2 (2000): 131–149.

[42] Qiu Zhili, Zhang Yuefeng, Yang Jiong, Wang Hui, Chen Guoke, Li Deyin, Zong Shizhen, Guo Zhiyong, Yang Yishi, Gu Xianzi, and Ye Xu, "Subei Dunhuang Hanxia xinfaxian de guyukuang: Yige zaoqi gudai yuqi cailiao qianzai de zhongyao yuantou 敦煌肃北旱峡新发现的古玉矿：一个早期古代玉器材料潜在的重要源头 [Newly Discovered Ancient Jade Mine at Hanxia in Dunhuang-Subei: A Potential Source of Early Jade Materials]," *Journal of Gems & Gemology* 22.5 (2020): 1–12.

[43] C. G. Tremain, "Pre-Columbian 'Jade': Towards an Improved Identification of Green-Colored Stone in Mesoamerica," *Lithic Technology* 39.3 (2014): 137–150.

[44] K. G. Hirth, "Interregional trade and the formation of prehistoric gateway communities," 44.

craft productivity".[45] Their locations are so strategic that they can usually control over the flow of prestige goods and rare resources into and out of highly productive regions. With a strong external economic orientation, gateway communities would always develop specialized craft production inside the community, as indicated by trade-related warehouse facilities and workshops. Due to the control over interregional exchange, economic prosperity and social differentiation based on wealth should also be expected inside gateway communities. In light of these criteria, the Huangniangniangtai site is therefore defined as a gateway community flourishing during the first quarter of the second millennium BCE in the eastern end of the Hexi corridor.

The Huangniangniangtai site was first discovered in a surface survey in 1957 and underwent four excavations in 1957, 1959 and 1975.[46] The data published for the first three excavations are quite brief, and thus a lot of details are not retrievable based on the published report (even the plan of excavation area is absent). Most of the data analyzed in this section come from the report of the fourth excavation published in 1978. Based on all available data, the site at Huangniangniangtai is a multi-cultural strata site covering a time period from the end of the 3rd millennium to the beginning of the 2nd millennium BCE. The first three excavations yielded 26 tombs, 42 ash pits and 5 dwellings with plastered living floors and large amounts of artifacts made of pottery, stone, bone, and copper. Among the painted pottery vessels are some with unique painted motifs for which one cannot find exact parallels in either the typical Qijia or the Majiayao culture (Machang Phase), for example, the painted pottery with rhomboid motifs filled with net-patterned painting that was first proposed as the "Transitional Type" and assumed as the remains of the transitional period from late Machang to early Siba period.[47] Recently it has been officially named as the Xichengyi culture after the site of Xichengyi in Zhangye.[48] The coexistence of the Xichengyi style painted pottery with the typical Qijia amphora in archaeological context clearly indicates their contemporariness. That means the Qijia culture, for a quite long time period, overlapped with the late phase of the Machang culture and the Xichengyi culture. The combination of the typical Xichengyi motifs with the double-loop handled amphora, the insignia of the Qijia cultural pottery assemblage, to some degree, suggests cultural emulation in potting practices. Considering the extremely scarce painted pottery found among Qijia cultural sites, it might be the case that the Qijia community at Huangniangniangtai selectively adopted painting technique from the local Machang-Xichengyi

[45] K. G. Hirth, "Interregional trade and the formation of prehistoric gateway communities," 37.

[46] Gansu Sheng Bowuguan (GSB), "Gansu Wuwei Huangniangniangtai yizhi fajue baogao 甘肃武威皇娘娘台遗址发掘报告 [Report on the Excavation of the Huangniangniangtai Site in Wuwei, Gansu]," *Kaogu Xuebao* 考古学报 [*Acta Archaeologica Sinica*] 2 (1960): 53–71; Gansu Sheng Bowuguan (GSB), "Wuwei Huangniangniangtai yizhi disici fajue 武威皇娘娘台遗址第四次发掘 [Report on the Fourth Excavation of the Huangniangniangtai Site in Wuwei]," *Kaogu Xuebao* 考古学报 [*Acta Archaeologica Sinica*] 4 (1978): 421–48.

[47] Li Shuicheng, "Siba wenhua yanjiu 四坝文化研究 [Study of the Siba Culture]," in *Kaoguxue Wenhua Lunji III*考古学文化论集 [*Anthology on Archaeological Culture vol. 3*], ed., Su Bingqi (Beijing: Wenwu Chubanshe, 1993), 80–121.

[48] GSWKY et al., "Gansu Zhangye Shi Xichengyi yizhi," 3–17; Li Shuicheng, "Cong 'guodu leixing' yicun dao Xichengyi wenhua 从 "过渡类型" 遗存到西城驿文化 [From the Transitional Type Remains to the Xichengyi Culture]," in *Zaoqi Sichou Zhilu ji Zaoqi Qinwenhua Guoji Xueshu Yantaohui Lunwenji* 早期丝绸之路及早期秦文化国际学术研讨会论文集 [*The Proceeding of the International Conference on Prehistoric Silk Roads and Predynastic Qin Culture*], ed., GSWKY et al. (Beijing: Wenwu Chubanshe, 2014), 9–21.

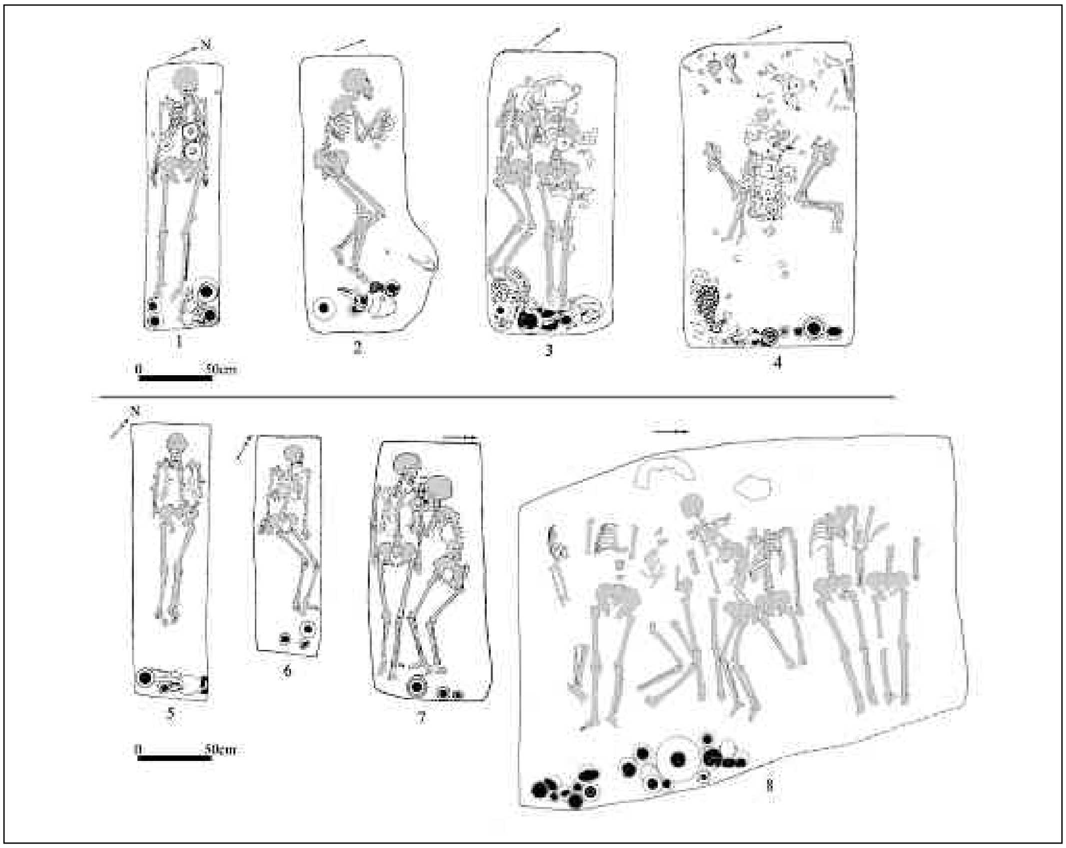

Figure 6. *The comparisons of burial cases between the gateway community (upper row) and the hinterland communities in the Tao-Daxia River valley (lower row).*
1–4. Huangniangniangtai cemetery: M83, M59, M52, M48.[49]
5–7. Qinweijia cemetery: M89, M56, M105.[50]
8. Qijiaping cemetery: M110.[51]

potting communities when they moved into the Hexi corridor. It is noteworthy that this kind of painted Qijia amphora has never been found so far in the Tao-Daxia River valley and southeast Gansu. However, identical burial practices represented by body position and arrangement, assemblage of grave goods suggest close cultural connections between the Qijia communities in the eastern Hexi corridor and the Tao-Daxia River valley (Fig. 6).

In addition to the pottery remains, there were also found about 30 copper objects. Most of them were tools and ornaments such as awls, knives, scrapers and rings (Fig. 7). None of them was unknown in the Xichengyi metallurgical repertoire. It is quite bizarre that no evidence of metallurgical production (e.g., copper ores, smelting furnace, slag, and molds) except finished objects has been reported either from the Huangniangniangtai

[49] After GSB, "Wuwei Huangniangniangtai yizhi disici fajue," 426, 428, 429, 431.
[50] After Zhongguo Kexueyuan Kaogu Yanjiusuo Gansu Gongzuodui (ZKKYGG), "Gansu Yongjing Qinweijia Qijia Wenhua Mudi 甘肃永靖秦魏家齐家文化墓地 [Qijia Cultural Cemetery at Qinweijia in Yongjing, Gansu]," *Kaogu Xuebao* 考古学报 [*Acta Archaeologica Sinica*] 2 (1975): 64, 65.
[51] Chen Pin, "Qijia Wenhua de Fenqi yu Yuanliu," 35.

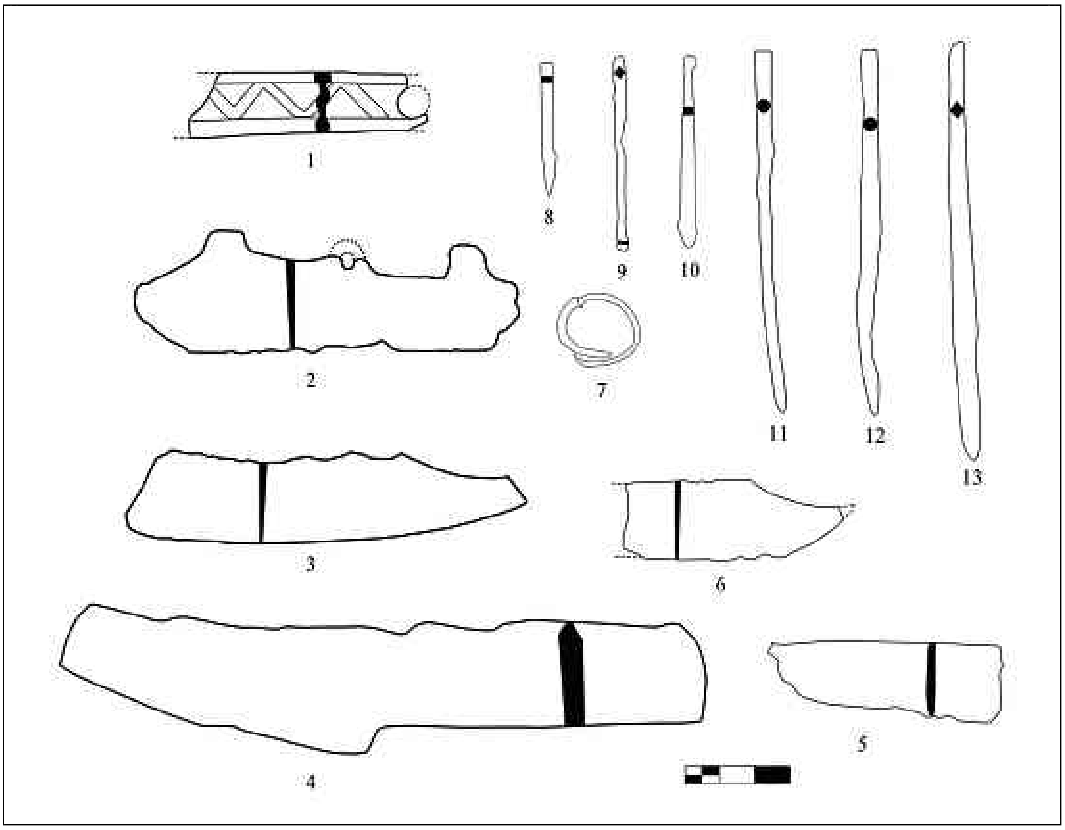

Figure 7. *The copper assemblage unearthed from the Huangniangniangtai cemetery. 1. Knife hilt; 2. Knife with top-mounted handle; 3–6. Knife; 7. Finger ring; 8–13. Awl.*[52]

site or from any other type sites in the Tao-Daxia River valley. The chemical analysis on metal component shows that all of them were made of pure copper with trace impurities, which well agrees with the technological characteristics of the metal objects found in the metallurgical center at Xichengyi.[53] The absence of local metallurgical production and the high uniformity in shape and chemical components indicate that the metal objects found at Huangniangniangtai were likely not locally produced but imported from its western neighbors—the metallurgical community represented by the Xichengyi-Siba culture. A quantitative statistic on published unearthed copper objects displays a spatial pattern of fall-off abundance with distance from the Hexi corridor to its neighboring areas (Fig. 8), which probably indicates the trading of metal objects.

Besides participating in copper trading, the Qijia community at Huangniangniangtai probably also engaged in the specialized lapidary production, as evidenced by a relative complete technological process (*chaine operatoire*) in mortuary contexts. Among the twenty-six tombs recovered in the first three excavations stone disks are commonly buried with the deceased. Most of them are made of green-colored nephrite, sharing great visual similarities with the unearthed jade ores at Hanxia and Mazongshan. In some cases, stone slabs

[52] After GSB, "Wuwei Huangniangniangtai yizhi disici fajue jianbao," 437; GSB, "Gansu Wuwei Huangniangniangtai yizhi fajue baogao," 60.

[53] Chen Guoke et al., "Zhangye Xichengyi yizhi chutu tongqi de chubu yanjiu," 105–118.

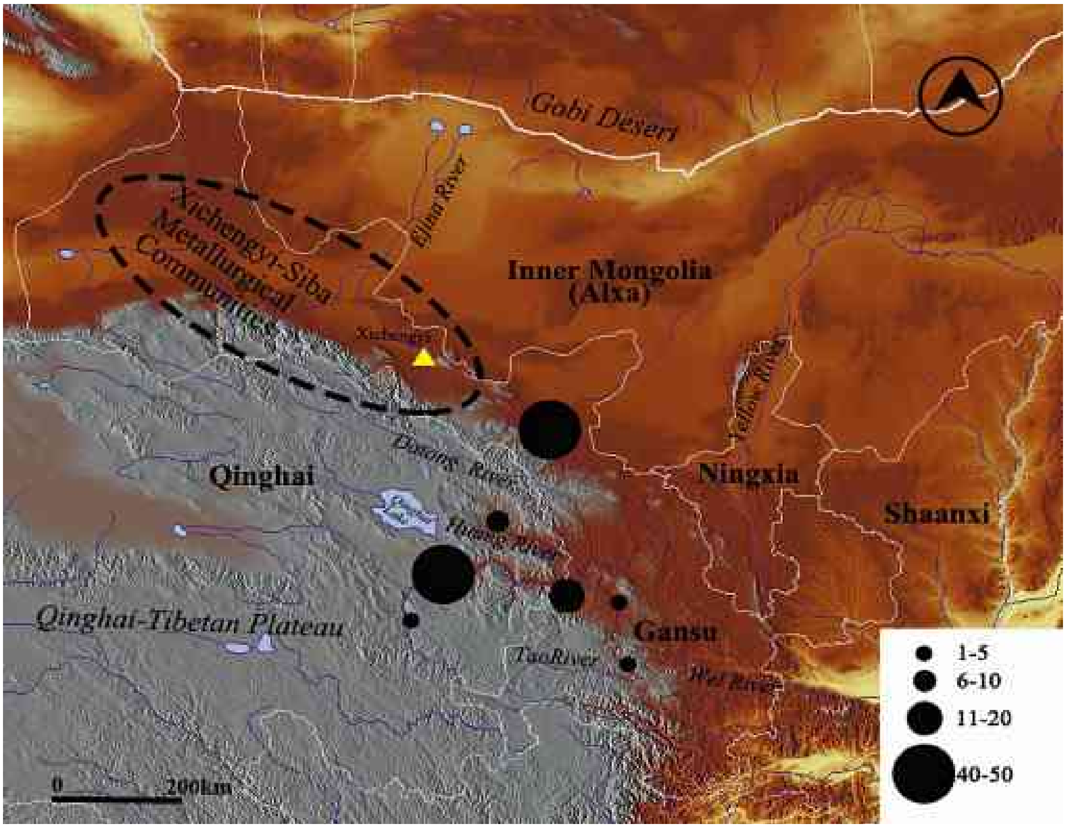

Figure 8. *The spatial distribution of copper-based objects during the Qijia period.*[54]
The location of the metallurgical focus at Xichengyi is highlighted by a yellow triangle.

of white or green color are laid beneath the extremities of the deceased.[55] Even though more details on those stone slabs are not given in the brief report, the same remains encountered in later excavations indicate those stone slabs are actually the raw materials, or blanks, for the lapidary production due to clear scoring-snapping traces on the section.[56] In tomb No. 40 uncovered in 1975 three pieces of raw stone slabs were placed on both hands and hip besides a stone disk on the chest of the deceased. The same case can also be found in tomb 32, 52 and 76.[57] In tomb No. 83 one stone core, the by-product of core drilling for perforation on the stone disk, is found around the left shoulder of the deceased together with other 6 stone disks.[58] It is reported that further 14 stone cores have been found in burials or midden pits. The raw stone/jade slabs, cores and finished stone disks all together suggest that a complete reduction sequence of nephrite disks existed at Huangniangniangtai.

[54] After Liu Xuetang, and Li Wenying, "Zhongguo zaoqi qingtong wenhua de qiyuan jiqi xiangguan wenti xintan 中国早期青铜文化的起源及其相关问题新探 [New Exploration into the Origin of Early Bronze Cultures in China and Related Problems]," *Zangxue Xuekan* 藏学学刊 [*Journal of Tibetology*] 3 (2007): 13–15, Table 3.

[55] GSB, "Gansu Wuwei Huangniangniangtai yizhi fajue baogao," 56.

[56] GSB, "Wuwei Huangniangniangtai yizhi disici fajue," 431.

[57] GSB, "Wuwei Huangniangniangtai yizhi disici fajue," 425.

[58] GSB, "Wuwei Huangniangniangtai yizhi disici fajue," 426.

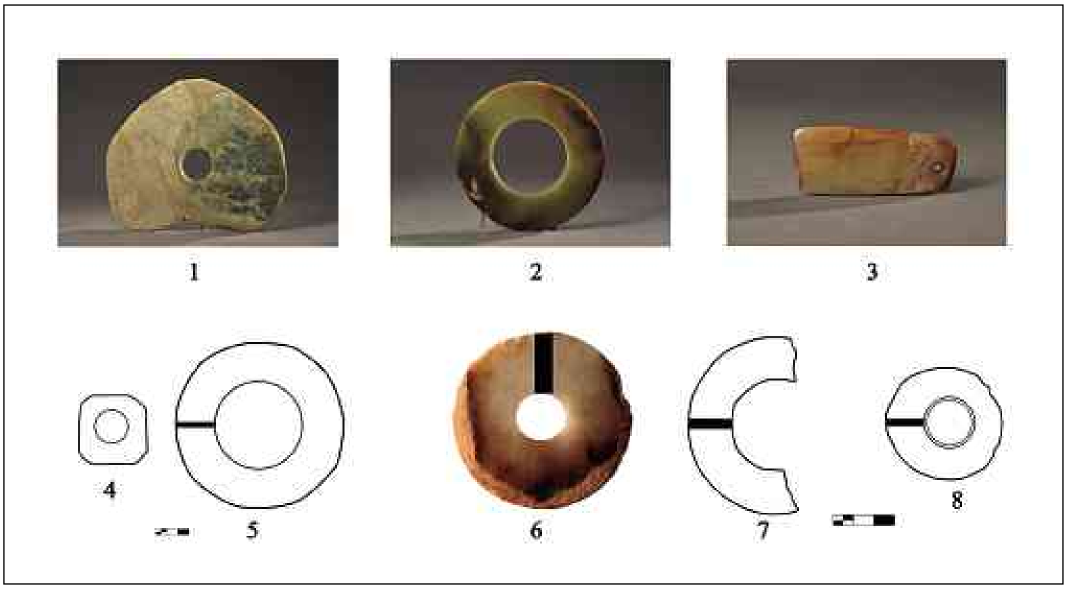

Figure 9. *Jade objects unearthed from Qijia gateway community.*[59]
1, 2, 4–8. Jade disk; 3. Jade ceremonial axe; 1–3, 6–8: Huangniangniangtai; 4, 5: Haizangsi.

As for the direct archaeological evidence of lapidary workshops, it is still unknown for the moment due to limited excavation area at Huangniangniangtai. Nevertheless, it is noteworthy to mention the site of Haizangsi, about 2 km northeast of Huangniangniangtai. It was discovered by chance during the construction of an artificial lake near the Haizang River in 1983–1985 (Fig. 9). The unearthed assemblage of artifacts shows great similarity with that at Huangniangniangtai and thus is cross-dated to the Qijia period. A complete assemblage including pottery, stone, copper, jade and bone objects suggests that they are originally deposited in a mortuary context, rather than a lapidary workshop alleged by the authors.[60] This is corroborated by a salvage excavation at Haizangsi in 2020, which uncovered a few Qijia burials with identical grave goods assemblage including jade disks and copper knives.[61] More interestingly, the retrieved jade objects at Haizangsi, accounting for the largest percentage among all objects, also cover a complete operational sequence of lapidary: raw nephrite, blanks, half-finished products, debitage and finished products including disks, bracelet, adzes, axes and knives etc. Although it is still unclear what the scale, density and intensity of the lapidary production in the local community, the re-occurrence of archaeological evidence of a whole jade reduction sequence predicts a specialized lapidary craft somewhere in the vicinity of Huangniangniangtai or Haizangsi. The raw

[59] After Chen Xiaofeng, "*Wuwei Wenwu Jingpin Tuji* 武威文物精品图集 [*Catalogue of Selected Cultural Relics Unearthed in Wuwei*]" (Lanzhou: Duzhe Chubanshe, 2019), 25; Gansu Sheng Bowuguan (GSB). "*Gansu Sheng Bowuguan Wenwu Jingpin Tuji* 甘肃省博物馆文物精品图集 [*Catalogue of Selected Cultural Relics from the Gansu Provincial Museum*]" (Xi'an: Sanqin Chubanshe, 2006), 63; Liang Xiaoying, and Liu Maode, "Wuwei xinshiqi shidai wanqi yushiqi zuofang yizhi," 3.

[60] Liang Xiaoying, and Liu Maode, "Wuwei Xinshiqi Shidai Wanqi Yushiqi Zuofang Yizhi 武威新石器时代晚期玉石器作坊遗址 [Late Neolithic Jade Workshop site in Wuwei]," *Zhongguo Wenwubao* 中国文物报 [*Chinese Cultural Relics Gazette*] May 30th (1993), 3.

[61] Yang Yishi, personal communication, September 18, 2020.

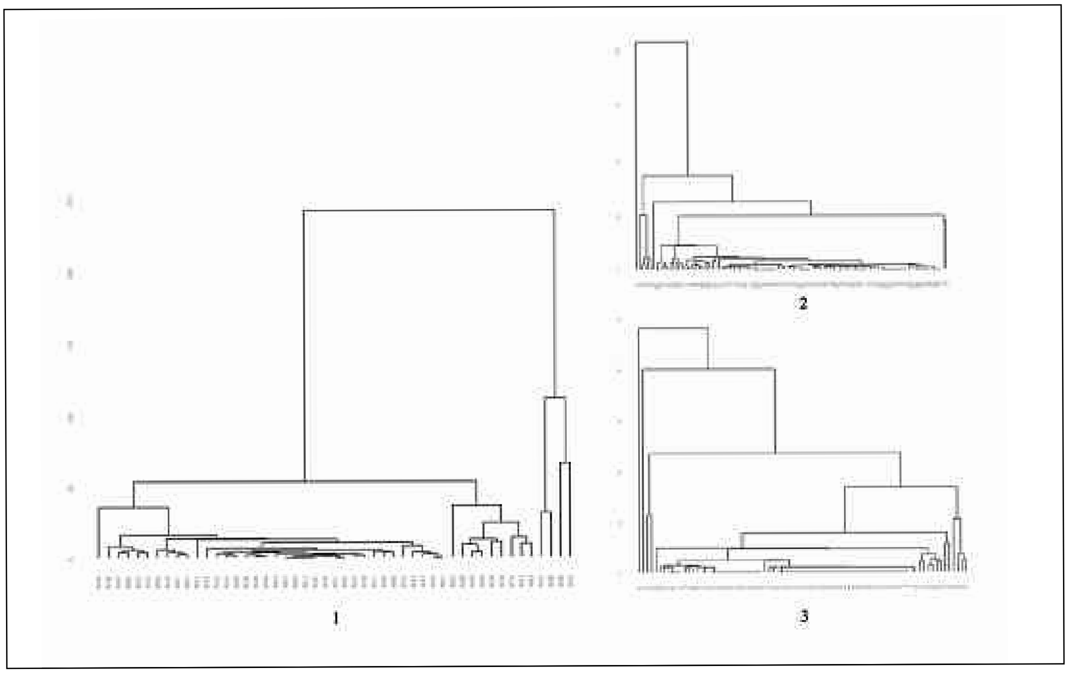

Figure 10. *Cluster analysis of burials according to the quantity of grave goods at Huangniangniangtai (1), Qinweijia (2), and Dahezhuang (3).*[62]

nephrite could be mined from Hanxia or Mazongshan in the western Hexi corridor. But the processing of raw nephrite must be locally conducted. Considering the high labor and time investment in jade reduction, the finished products are probably exchanged and circulated as valued objects in the interregional trading network.

Benefiting from the interregional trade and the control over the flow of metal and jade objects, economic prosperity along with social differentiation based on wealth emerge in the gateway community at Huangniangniangtai. Through comparing with the Qijia hinterland communities at Qinweijia, Dahezhuang, and Qijiaping, the burials at Huangniangniangtai stand out in the quality and quantity of valuable grave goods, including jade disks, and precious stone tokens, and pig mandibles (Fig. 6). Burial No. 48, for instance, containing two female adults and one male adult in typical Qijia-style burial position, yields the largest number of valuable stone objects (83 jade disks and 304 precious stone tokens) in the whole cemetery (Fig. 6:4). By contrast, 11 out of 43 single tombs include no grave goods at all. The statistics on grave goods suggest clear pattern of differentiation among Huangniangniangtai burials versus homogeneity at Dahezhuang and Qinweijia (Fig. 10). Moreover, valuable objects commonly found at Huangniangniangtai are very rare in the hinterland: only 2 jade disks are found among 138 burials at Qinweijia, while none is found at Dahezhuang cemetery. If those valuable objects were fungible goods, it is straightforward that the Qijia gateway community has more access to social wealth than their hinterland counterparts.

[62] Zhongguo Kexueyuan Kaogu Yanjiusuo Gansu Gongzuodui (ZKKYGG), "Gansu Yongjing Dahezhuang yizhi fajue baogao 甘肃永靖大何庄遗址发掘报告 [Report on the Excavation of the Dahezhuang Site in Yongjing, Gansu]," *Kaogu Xuebao* 考古学报 [*Acta Archaeologica Sinica*] 2 (1974): 29–62.

Conclusion

Archaeological analysis of material cultures at the site of Huangniangniangtai support the thesis that it is a gateway community established during the Qijia period in a strategically important location – the eastern terminal of the Hexi corridor. The identification of the gateway community at Huangniangniangtai sheds new light on the understanding of the economic dynamics of the interregional network in the early Bronze Age Northwest China. The emergence of the Huangniangniangtai gateway community is the consequence of endogenous economic expansion coinciding with the culmination of trans-Eurasia cultural exchange around 2000 BCE. Bordering on the high mineral and craft productivity region, represented by the innovative metallurgical focus and systematical tapping of mineral resources in the mid-western Hexi corridor, the gateway community probably actively engaged in the interregional exchange of copper objects and other exotic goods. The dynamic economic commitment brought about the accumulation of wealth and finally resulted in the emergence of social differentiation at both the intra- and the inter-community scale. Meanwhile, a complete technological sequence reflected by the jade-working remains indicates the existence of a specialized lapidary production inside the community, the products of which could have been circulated and exchanged for the imported goods. The appearance of large-scale jade mining activities at the western end of the Hexi corridor, geographically overlapping with the copper deposit, should not be a coincidence but a natural development of intense prospecting for copper ores for the emerging metallurgy in the Hei River valley, which has been stimulated by the technological expansion of the Eurasian Metallurgical Province at the end of the third millennium BCE.

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New Archaeological Discoveries at the Majiayao site in Lintao County, Gansu Province

by

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Abstract

The type site for the Majiayao culture was discovered in 1924 but subsequent field research has broadened our understanding of the cultural sequences at the site. The results from the survey undertaken in 1957 demonstrated that the cultural deposits of the site include three periods: Miaodigou Culture, Majiayao Culture and Qijia Culture. Subsequent surveying and coring in 2012–13 provided an overall spatial understanding of the site and excavations during the field seasons 2014–17 have provided us with relatively abundant material belonging to the Majiayao and Qijia Cultures. In this article a selection of finds and constructional features are briefly presented as an underhand report of research questions that are presently being addressed.

Introduction to the Majiayao Site and Brief Research History

The Majiayao site is located on a terrace on the west side of Majiayao village in Lintao County, Dingxi City, Gansu Province. It is about 1 km from Tao River in the east and Bamayugou in the south (Fig. 1) and 10 km from the county town to the northeast. The site was first discovered, and test excavated in 1924 during fieldwork led by Johan Gunnar Andersson, a scholar from Sweden.[1] Andersson conducted a series of archaeological work in Northwest China in order to test the hypothesis of "the Yangshao culture originated from the West." In 1945, Xia Nai investigated the Majiayao site during the scientific expedition in Northwest China, however, he did not carry out excavations.[2] In 1947, when Pei Wenzhong conducted a field survey in Gansu, he investigated the Majiayao site and carried out a trial excavation. He confirmed that Wajiaping, on the top of the terrace, was

[1] Johan Gunnar Andersson, "The Ma Chia Yao site," *The Bulletin of the Museum of Far Eastern Antiquities* 15 (1943): 88–98, plates 44–57. Andersson mentions that the site was discovered and excavated by the field-team member Chin and that he himself visited the site only once, ibid., 89.

[2] Xia Nai 夏鼐, *Xia Nai Riji* 夏鼐日记 [*Xia Nai's Diary*] (Shanghai: East China Normal University Press, 2011).

Figure 1. *Bamayugou (literately meaning "the gully at Bamayu", photoed from east to west by Guo Zhiwei).*

also within the distributional area of the site.[3] In 1949, these archaeological remains were named the Majiayao Culture by Xia Nai.[4] After this it became accepted widely by the academic world. In 1957, the Gansu Provincial Committee of Cultural Relics Management conducted a detailed investigation at Majiayao and found the stratigraphic sequence: the Qijia cultural deposit was above the Majiayao cultural deposit, and the latter was above the Miaodigou cultural deposit (Yangshao period).[5] In 1988, the Majiayao site was designated an Important Protected Unit by the State Council.[6]

3 Pei Wenzhong 裴文中, "Gansu shiqian kaogu baogao 甘肃史前考古报告 [Report on Gansu prehistoric archaeology]," in *Pei Wenzhong shiqian kaoguxue lunwenji* 裴文中前考古学论文集 [*Collected papers on prehistoric archaeology by Pei Wenzhong*] (Beijing: Wenwu Chubanshe, 1987), 238–243.

4 Xia Nai 夏鼐, "Lintao Siwashan fajue ji 臨洮寺窪山發掘記 [Note from the excavation at Siwashan in Lintao]," *Acta Archaeologica Sinica* 4 (1949), 71–137.

5 Gansu Sheng Wenwu Guanli Weiyuanhui 甘肃省文物管理委员会 [Gansu Provincial Committee of Cultural Relics Management], "Gansu Lintao, Linxia liangxian kaogu diaocha jianbao 甘肃临洮、临夏两县考古調查簡報 [Brief report on the archaeological survey in Lintao and Linxia counties]," *Kaogu Tongxun* 考古通訊 [*Archaeological communications*] 9 (1958): 36–49.

6 Zhonghua Renmin Gongheguo Guowuyuan 中华人民共和国国务院 [State Council of the People's Republic of China], *Guowuyuan guanyu gongbu disanpi quanguo zhongdian wenwu baohu danwei de tongzhi* 国务院关于公布第三批全国重点文物保护单位的通知 [*Notice on the 3rd batch of major historical and cultural sites protected at the national level released by the state council*], 1988.

Figure 2. *Map of excavated loci at the Majiayao site. Locus 7 is situated behind the photographer. (photoed from west to east by Guo Zhiwei).*

Recent Archaeological Discoveries

Between 2012 and 2013, under the cooperation of local archaeological institutes, the Institute of Archaeology, Chinese Academy of Social Sciences, together with the Gansu Provincial Institute of Culture Relics and Archaeology, conducted a systematic survey and coring at the Majiayao site. The results demonstrate that the site covers an area of approximately 400,000 square meters and the distribution of archaeological remains is concentrated on the southern part of the terrace. Between 2014 and 2017, the joint archaeological team conducted four seasons of excavations at Majiayao. The seven designated loci (Fig. 2) where excavations took place include the four terraces facing Bamayugou in the southern part of the site, the southern part of Wajiaping and the two higher terraces on the west side. Those excavations uncovered a total of approximately 2,000 square meters and revealed a lot of remains dated to different periods. A large number of samples for scientific analysis were collected as well.

Majiayao Culture Remains

The remains of the Majiayao Culture are mainly distributed on several low terraces in the southern part of the site facing Bamayugou. They are also distributed in the southern part of Wajiaping. The archaeological remains mainly include cultural layers, houses, pits, pottery kilns, and ditches.

Figure 3.
House 2017GLMT215-120F4 (photoed by Guo Zhiwei).

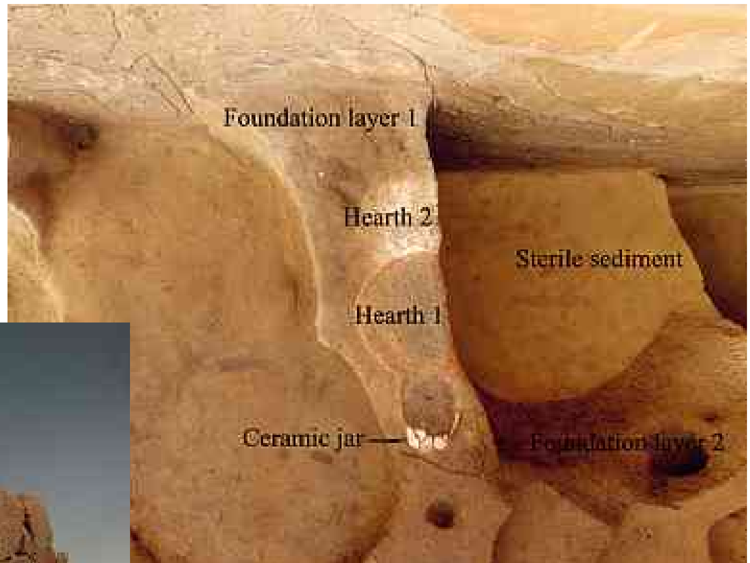

Figure 4.
Pottery jar 2017GLMT215-120F4:1 (photoed by Guo Zhiwei).

Houses

The structure 2017GLMT215–120F4 (Fig. 3) is situated at locus 3, in the northwestern part of the grid T215–120. It was found 3.5 m below the surface. The structure was identified as a house belonging to the Majiayao Culture. In stratigraphic terms, it intruded upon the sterile sediment and was intruded upon by other features. The northern part of the house extended outside the grid, and it was not fully exposed. We reconstructed the structure as a round house with a diameter of more than 2.2 m. The house was severely destroyed, only two hearths and the foundation were preserved. Two sub-layers can be distinguished in the foundation: the upper layer is some 10 cm thick, it has a strong brown color and contains pulverized charcoal, burnt earth and some calcium carbonate nodules. The lower layer is 0–20 cm thick, it is brown in color and compact in texture.

Located more or less at the center of the living floor, there are two round areas of severely burnt earth and white chalky materials, and we identified them as the two hearths of the house. The larger hearth with a diameter of 0.72 m disturbs the smaller one with a diameter of 0.62 m. In stratigraphic terms they start more or less at the living floor level, continue with an exceptional dense concentration of burnt earth, and break through the foundation. Both hearths are 2–10 cm thick. A pottery jar (Fig. 4) was found associated with the larger hearth. We assume that it was used to collect and save embers.

Figure 5.
Pit 2017GLMT210-120H14 (photoed by Guo Zhiwei).

Figure 6.
Pottery from pit 2017GLMT210-120H14 (photoed by Guo Zhiwei).

The jar 2017GLMT215–120F4:1 (Fig. 4) is not complete. The belly diameter is 31.2 cm, and the base diameter is 16.2 cm. Its remaining height is 41.8 cm, and the wall is 0.6–1.2 cm thick. The jar is tempered with sand and mica. The mouth and neck are not decorated but are covered with marks of horizontal trimming. The interior wall of the vessel is rough. The color of the interior wall is red, and there are traces of soot.

Pits

The pit 2017GLMT210–120H14 (Fig. 5) is situated in the middle of the grid T210–120 at locus 3. It was found 3.1 meters below the surface and excavated in 2017. It intrudes upon other features and the sterile sediment. The shape of the pit is nearly circular, with a diameter of about 1.75 meters at the top. The interior wall of the pit is relatively regular and most of the pit is slightly bag-shaped in cross-section. The bottom of the pit is relatively flat, with a diameter of about 1.85 meters. The depth of the pit is about 0.35 meters. The fill of the pit can be divided into two layers: the upper layer, which is about 0–35 cm thick, is distributed in the southwestern part of the pit. It is compact and yellow in color, contains pulverized charcoal, burnt earth and calcium carbonate nodules. The second layer, which is about 0–35 cm thick, is distributed in the northeastern part of the pit. It is black-brown in color, relatively loose, and contains pulverized charcoal, grains of

Figure 7.
Bone awl 2017GLMT210–120H14①:1 (photoed by Guo Zhiwei).

Figure 8. *Stone sphere 2017GLMT210–120H14②:2 (photoed by Guo Zhiwei).*

Figure 9.
Pottery jar 2017GLMT210–120H14②:3 (photoed by Guo Zhiwei).
◀

Figure 10.
Pottery flask 2017GLMT210–120H14②:7 (photoed by Guo Zhiwei).

loess and calcium carbonate nodules. Many artifacts have been unearthed from the pit, including a bone awl (2017GLMT210–120H14①:1, Fig. 7), a spherical stone (2017GLMT210–120H14②:2, Fig. 8) and ceramic vessels (Fig. 6).[7] These vessels can be divided into two groups: vessels tempered with sand (e.g., Fig. 9) and vessels made from fine clay (e.g., Fig. 10). In the following section, two vessels will be described.

The jar 2017GLMT210–120H14②:3 (Fig. 9) is roughly complete. The rim diameter is 27.3 cm, the belly diameter is 30.7 cm, and the base diameter is 16.8 cm. It is 38.1 cm high, and the wall is 0.6–0.9 cm thick. The jar is tempered with sand and mica. There are traces of soot on the lower body. The interior wall of the jar is reddish-brown in color and relatively smooth. Traces of mending can be seen in different parts of the jar.

[7] The specific layer from which each artifact is unearthed is indicated by its category number, as the circled number (①, ② etc.) suggests, according to Chinese archaeological coding convention.

Figure 11. *Ditch 2017GLMG1 (photoed by Guo Zhiwei).*

Figure 12. *Ditch 2017GLMG1 (photoed by Guo Zhiwei).*

Figure 13. *Ditch 2017GLMG1 (photoed by Guo Zhiwei).*

The flask 2017GLMT210–120H14②:7 (Fig. 10) is made from fine clay. The rim diameter is 7.5 cm, the belly diameter is 20.5 cm, and the base diameter is 10.5 cm. It is 20.7 cm high, and the wall is 0.6–0.9 cm thick. The rim, neck, and shoulder are polished and covered with scraping marks. The lower belly is fully decorated with vertical thin cord patterns. Near the base, a belt, 2.5–3 cm wide, was scraped and partially polished. The junction of upper and lower body features a ring of appliqué. It is decorated with 47 sets of diagonal stamping patterns. The interior wall of the flask is also grey in color.

Ditch

The ditch 2017GLMG1 (Fig. 11–13) is situated at locus 5. In general, it stretches from east to west, starting from the cliff in the east and gradually becoming shallower to the west, until it disappears near the hillside. The known length is about 130 meters. In 2016

Figure 14.
Stone spindle 2017GLMG1⑥:1 (photoed by Guo Zhiwei).

Figure 15.
Stone axe 2017GLMG1⑥:2 (photoed by Guo Zhiwei).

Figure 16.
Pottery jar 2017GLMG1⑥:3 (photoed by Guo Zhiwei).

and 2017, the archaeological team selected two locations for excavation and exposed the western end clarifying the overall direction and extent of the ditch. The 2016 excavation results show that the ditch is 8–8.5 meters wide on the surface, the two sides are oblique and become narrow near the flat bottom, which is 3.5–4.5 meters wide. The depth from the surface to the bottom is about 3.5–4 meters. The results of the 2017 excavation are similar to that of the 2016 excavation showing a depth of about 2.5–3 meters from the surface to the bottom. In stratigraphic terms the ditch can be divided into 6 large layers and 7 small layers. Based on various information obtained from coring and excavation, it can be inferred that this ditch was a large-scale facility constructed and used by Majiayao inhabitants. There are many artifacts unearthed from the ditch, including stone spindles (Fig. 14), stone axes (Fig. 15), and ceramic vessels tempered with sand (Fig. 16) or made from fine clay (Figs. 17–21). In the following section, some of them will be described.

The stone spindle 2017GLMG1⑥:1 (Fig.14) is complete. The diameter is about 6 cm, and its thickness is about 0.5–0.6 cm. The middle part is thick, and the edges are thin. Both sides are polished. The hole is drilled in the center, and the hole wall is relatively straight, with a diameter of about 0.8–0.9 cm. A shallow circular drill mark with a diameter of about 1.2 cm was seen on the outside of the hole. The edges of the spindle are polished and smooth.

The stone axe 2017GLMG1⑥:2 (Fig. 15) is complete. The overall length is about 13.9 cm, the top width is about 3.5 cm, the width of the blade is about 5.1 cm, and the middle thickness is about 3.4 cm. The top is irregular and pitted. The upper half of the body is covered with pecking marks. On one side the part near the blade was polished, and oblique

Figure 17.
Pottery flask 2017GLMG1⑥:7 (photoed by Guo Zhiwei).

Figure 18. ▲
Pottery flask 2017GLMG1⑥:7 (photoed by Guo Zhiwei).

Figure 19.
Pottery flask 2017GLMG1⑥:7 (photoed by Guo Zhiwei).

wear marks can be seen. The blade is convex and double-sided. The cutting edge is located in its center and the junction between blade and body is clear to see. The blade is partially damaged, and there are scars.

The jar 2017GLMG1⑥:3 (Fig. 16) is tempered with sand. The rim diameter is 24 cm, the belly diameter is 26.5 cm, and the base diameter is 12.4 cm. The jar is 33.6 cm high, and its wall is 0.5–0.9 cm thick. The whole body is decorated with interlaced cord patterns. The lower belly is decorated with appliqué. The appliqué is also diagonally decorated with cord patterns, which are partly connected with the cord patterns on the shoulder. The base is plain and flat, and traces of scratching can be observed on the edges. The interior wall of the jar is also grey in color. Traces of repairing in different directions, mainly vertical and diagonal, can be observed.

The flask 2017GLMG1⑥:7 (Figs. 17–19) is made from fine clay and painted. The rim

Figure 20. *Pottery bowl 2017GLMG1④:4 (photoed by Guo Zhiwei).*

Figure 21. *Pottery bowl 2017GLMG1④:4 (photoed by Guo Zhiwei).*

diameter is 14 cm, and the belly diameter is 30.4 cm. The flask is more than 46.8 cm high, and its wall is 0.4–0.6 cm thick. There are traces of trimming on the surface of the rim. The neck and body below the neck are polished smoothly. Marks of scraping can be seen on the neck, shoulder and belly. Two handles are attached to the middle of the belly. The handles are about 5.5 cm long, 2.2 cm wide, and 0.7 cm thick. The handles are decorated with a vertical strip of appliqué in the center. The joints between the two handles and the body were repaired with clay and traces of repairing in different directions can be observed on the body under the handles. The neck, shoulder and belly are decorated with painted black designs on one side. The back side is decorated with a cross. The interior wall of the vessel is rather uneven and there are traces of trimming and scraping in different directions.

The bowl 2017GLMG1④: 4 (Fig. 20–21) is made from fine clay and painted. The rim diameter is 12 cm, the belly diameter is 12.4 cm, and the base diameter is 5.1 cm. The bowl is 4.6 cm high, and the wall is 0.3–0.5 cm thick. The bowl is red in color, and horizontal or diagonal repairing marks can be seen. Black designs are painted onto the interior and external surfaces. There are two holes in the lower belly of the vessel, which are drilled from both sides (inside and outside), with an outer diameter of 0.7 cm and an inner diameter of 0.4 cm. From the damaged sections of the vessel, it is apparent that the wall cross-section is red in color.

Qijia Culture Remains

The Qijia Culture remains are distributed across a wide area. They are largely concentrated at Wajiaping and the higher slope on its western side. The archaeological remains mainly consist of cultural layers, houses, pits, and burials. They are represented by the following examples.

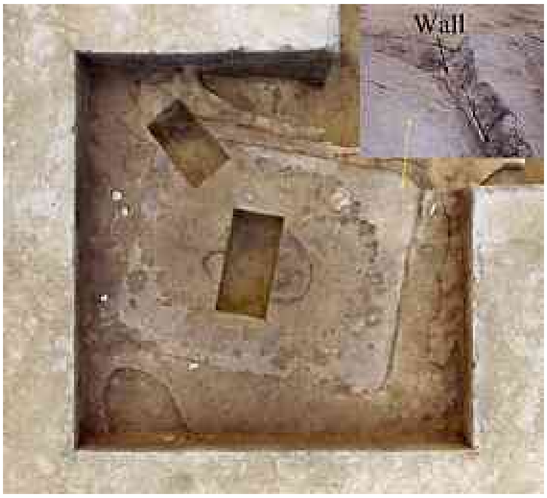

Figure 22. *House 2017GLMT210–280F1 (photoed by Guo Zhiwei).*

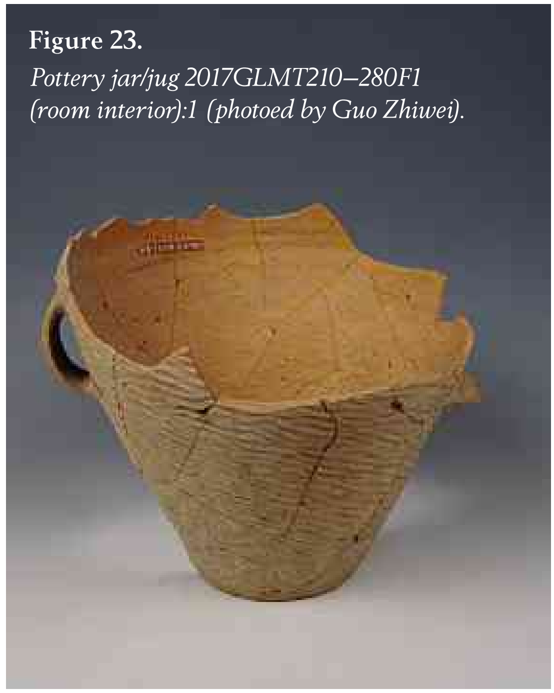

Figure 23.
Pottery jar/jug 2017GLMT210–280F1 (room interior):1 (photoed by Guo Zhiwei).

Houses

2017GLMT210–280F1 (Fig. 22): House F1 is situated at locus 5, in the southeastern area of excavation trenches T210–280 and their extension. It was excavated in 2017. F1 is a building with lime plastered floor. While its upper half has been lost, the preserved features include the floor, parts of the walls, hearths, and the foundation. The outline of the house is rectangular in shape with rounded corners. It is 3.15 m long from north to south and 2.6 m wide from east to west. The lime plastered floor is mostly preserved around the edges of the room, next to the walls. Its cross-section indicates that the floor consisted of only one layer, about 0.5 cm in thickness. The walls are not well preserved. The walls are curving inward very slightly and are also covered with a 0.5 cm thick layer of lime plaster on their interior surface. There are two hearths that overlap each other in the center of the room. Three layers can be distinguished: layer 1, the upper layer, is about 10 cm thick and consists of mixed gray earth, containing large amounts of pulverized charcoal as well as many lumps of burnt earth and calcium carbonate nodules. Layer 2 is about 3–5 cm thick and consists of gray-brown earth, containing a lot of pulverized charcoal and lumps of burnt earth as well as several calcium carbonate nodules. Layer 3 is about 10–15 cm thick and consists of yellow-brown earth, containing a few charcoal grains and calcium carbonate nodules as well as several lumps of burnt earth. Any traces of a doorway or any other feature above floor level have been lost. Based on its construction, its stratigraphic location, and finds material, F1 has been interpreted as a Qijia Culture house.

Sample Artifact from F1:

2017GLMT210–280F1(room interior):1 (Fig. 23): A fine-textured double-handled jar/jug. The vessel surface is red, and it appears to have sported a thin white slip. The vessel pro-

Figure 24. *Stone axe 2015GLMT225,230–235H6②:1 (photoed by Guo Zhiwei).*

Figure 25. *Stone knife 2015GLMT225,230–235H6②:5 (photoed by Guo Zhiwei).*

file features a bend in the middle of the belly. Above the bend, the surface is smooth and undecorated. Below the bend, the body is covered in horizontal and diagonal basket impressions. Towards the base of the vessel, there are patches of scraping marks along its circumference. The handles are attached below the bend on opposing sides of the vessel. The base is indented in some areas. The interior wall of the vessel is red and pitted to a large extent, while smooth otherwise. The vessel wall cross-section has the same red color as the surface of the interior wall. The texture of the pottery is on the coarser side of fine, levigated clay.

Pits

2015GLMT225,230–235H6: Pit H6 is situated at locus 5 at the intersection of excavation trenches T225–235 and T230–235. It was discovered 2.32 m below the surface, cutting into the sterile sediment and the layer above the sterile sediment. The opening of the pit is almost circular with a diameter of about 1.57 m. The pit walls are regular, giving the pit a bag shape in profile that widens towards the bottom. The pit bottom is flat with a diameter of 1.73 m. Altogether the pit is about 0.67 m deep. The upper part of the southern side of the pit exhibits some slight collapse. Neither the pit walls nor the bottom retain any marks of tool use. The pit fill can be divided into two layers: Layer 1, the upper layer, is 0.37–0.54 m thick. It extends throughout the length and width of the pit and was deposited quite evenly. The earth is loose and gray and contains very small grains of yellow earth as well as sporadic remains of burnt earth and pulverized charcoal. Layer 2 is 0.25–0.32 m thick. It evenly covers the extent of the pit as well, although there are undulations in its surface in

Figure 26. *Pottery jar 2015GLMT225,230–235H6②:2 (photoed by Guo Zhiwei).*

places. The earth is loose and gray-black with a rather large grain size. It contains a large amount of pieces of burnt earth and pulverized charcoal as well as sporadic calcium carbonate nodules. Based on its stratigraphic position as well as the artifacts found in the fill, this pit is tentatively dated to the Qijia Culture Period.

Sample Artifacts from H6:

2015GLMT225,230–235H6②:1 (Fig. 24): A stone axe. The preserved length is 13.3 cm. The width at the butt is 3.7 cm and the width at the blade is 5.1 cm. It is 3.2 cm thick at its mid-section. The butt has a quite regular rounded shape, although it is flat in a few places. The axe body is covered in grinding marks. It is slightly damaged, so the boundary between the edge and the body of the ax is not completely clear. The cutting edge of the blade was in the middle of the axe, when viewed in cross-section, but it is not preserved.

2015GLMT225,230–235H6②:5 (Fig. 25): A stone knife. Its overall length is 8.9 cm and its width 4.3 cm. The back of the knife is almost straight with only a slight curve in the middle. It is 0.4 cm thick and has been polished smooth. One of the short sides of the knife is flat, while the other is curved. Both sides have been polished. The edge of the knife is in the middle when viewed in cross-section. It is sharp but slightly damaged. The flat sides retain the original surface of the stone. In the middle, close to the edge, the knife features a hole with a diameter of 0.3–0.4 cm. It appears to have been drilled from both sides.

2015GLMT225,230–235H6②:2 (Fig. 26): A coarse-textured jar with a single handle. The base is somewhat damaged. The mouth diameter is 9.5 cm, and the base diameter is

Figure 27. *Pottery cup 2015GLMT225,230–235H6②:4 (photoed by Guo Zhiwei).*

7.7 cm. The vessel is 12.3 cm tall. The wall thickness is 0.2–0.4 cm. The rim and base as well as parts of the body show soot stains, which are most pronounced on the belly of the vessel. The neck is burnished and there is a horizontal groove where it joins the body. Close to the base some patches of scraping marks can be seen. A single handle is attached at the neck. It is 3.5 cm wide in the middle. Its upper end sports three poked impressions, while faint horizontal cord marks can be seen across the middle of the handle. The handle has been stuck to the vessel through the additional application of clay. The interior surface of the vessel has largely the same color as the exterior. The surface is quite smooth but has sporadic traces of working in different directions. The wall cross-section is red-brown in color. The ceramic paste has been tempered with coarse sand and a few pieces of mica.

2015GLMT225,230–235H6②:4 (Fig. 27): A fine-textured cup with large double handles. One of the two handles is missing. The mouth diameter is 8 cm, and the base diameter is 4 cm. The cup is about 9.8 cm tall. The wall thickness is about 0.2–0.4 cm. The whole surface of the vessel is red and mostly smooth, although a few parts are rough. At the part where the neck meets the body, a horizontal groove that is rather irregular appears to have been pressed into the vessel. Two broad handles were attached on opposing sides of the neck. The preserved handle is 2.5 cm wide. Its surface shows vertical scraping marks. The handle has been attached by applying additional clay. The vessel surface under the handle is rough and has not been polished. The interior wall of the cup has largely the same color as the exterior. It has been smoothed but not burnished and traces of working in different

Figure 28. *Burials 2016GLMT230–270M2 and M9 (photoed by Guo Zhiwei).*

Figure 29. *Burial-2016GLMT230–270M2 (photoed by Guo Zhiwei).* ▲

directions are visible in some parts. The wall cross-section has the same red color as the interior and exterior surfaces. The ceramic paste is finely levigated.

Burials

2016GLMT230–270M2, M9 (Fig. 28–29): Burials M2 and M9 are situated at locus 5 in the southeast area of excavations trenches T230–270 and their expansion. They were excavated in 2016. Both burials consist of rectangular pit graves with straight vertical shafts. The opening of grave M2 is about 2.2 m long and about 0.6 m wide. The pit walls are rather straight with a few slight undulations. The bottom of the grave pit is even, and the overall depth is about 0.4–0.5 m. There are no traces of any kind of body container. There is one grave occupant placed in supine position with stretched limbs in the middle of the grave. It is a primary burial. Apart from the chest area, the skeleton is rather well preserved. The head is pointing northwest with the face looking up but slightly turned south. The buried individual is a male and was about 40 years old when he died. The grave contains two pieces of jade at the right shoulder of the body. The opening of grave M9 is about 1.9 m long and about 0.6 m wide. The pit walls are quite straight with slight undulations. The bottom of the pit is even, and the overall depth is about 0.80–0.86 m. There is one grave occupant placed in supine position with stretched limbs in the middle of the grave. This is also a primary burial. The skeleton is quite well preserved. The head is pointing in west-north-western direction, while the face is looking up but slightly turned north. The buried

Figure 30. *Jade piece 2017GLM T230–270M2:1 (photoed by Guo Zhiwei).*

individual is a female and was about 40 years old when she died. There are no traces of body containers or burial goods. Based on their stratigraphic position and archaeological find material, these two burials are tentatively dated to the Qijia Culture Period.

Sample Find from M2:

2017GLMT230–270M2:1 (Fig. 30): A piece of jade. The piece is 5.6 cm long with a diameter of 2.2–3.3 cm. Most of its surface has been polished smooth and it shows very fine traces of grinding. Only a few spots that are uneven have not been ground. Both ends of the piece have been cut in a slanted direction and are very smooth. At the thicker end, the cut surface makes up about two thirds of the entire section. The rest appears to have broken off, creating a rough section. The thinner end resembles the thicker end in this regard, except that the broken section appears to have undergone some grinding in the opposite direction. However, it is still not as smooth as the cut section.

New Archeological Insights into the Majiayao Site

Majiayao Culture Remains

According to recent excavations, the Majiayao Culture remains are mainly distributed on the southern margin of the site, on several low terraces facing Bamayugou, including the newly excavated loci 1–4. The first and second loci, and the third and fourth loci are all adjacent terraces. There is a big gully between the first and the second, and the third and the fourth loci, respectively. From a topographical point of view, the first and third loci and the second and fourth loci, respectively, may have belonged to the same terrace, later cut by the big gully. The Majiayao Culture remains were also found on the higher terraces such as Wajiaping, where the fifth excavated area was located, however, the abundance of remains is far less than that of the above-mentioned low terraces.

At the excavated loci 1–4, archaeological remains including cultural strata, houses, storage pits, other settlement pits, and pottery kilns were revealed. Among them, the houses were mainly found at the bottom layer of each excavated grid, close to the sterile sediment. As of now, six houses have been found, one is from the 3rd locus and the rest are from the 1st locus. These houses are round or square in shape. All of these houses were destroyed, the features above the living floor were not found. We can only observe the living floor, the foundation, and associated features including hearths and post holes. The hearths and post holes often occur in multiple overlapping phases, which suggests that during the use of these houses they were renewed at times. The structures of door, wall and ceiling are not clear. The distribution of these houses was restricted by topography. At locus 1, the five houses were arranged in rows, however, it is not clear whether they were contemporaneous and how they evolved. The remains of storage pits and other pits are the most abundant. They were also found at the bottom layer of each grid, distributed around the houses. The inner walls of some bag-shaped pits were smeared with yellow mud, which suggests that they were used as storage facilities. The number of pottery kilns is small; only one was found at the 3rd locus, where the kiln was located in the open space between houses and pits. At loci 1–4, in cultural strata above the above-mentioned houses, pits and kilns were also revealed. In some grids, such as at the 2nd and 4th loci, only cultural strata and no other features were revealed. These strata were several meters thick. They contained several sub-layers in various shapes and with various properties. Abundant artifacts were found in these strata, but associated features were rare, which is in contrast to the bottom layers of these excavated loci. Thus, what was the nature of these strata and how were they formed? Were they formed because these terraces were viewed as places for garbage dumping by inhabitants living on higher terraces after they were abandoned by earlier inhabitants at Majiayao? Were they the secondary deposits? These issues are worth continuing to explore.

On the higher terraces of the site, Majiayao Culture remains were also found, however, they are not so abundant. At locus 5 at Wajiaping for example, only a big ditch was discovered, other features such as houses, pits, and kilns were not found. This may be related to the limited area and depth of the excavations. However, compared to the findings from loci 1–4, it is more likely that inhabitants of the Majiayao Culture lived on lower terraces rather than on higher terraces. This is only a temporary conclusion based on current archaeological discoveries, other possibilities cannot be precluded. For example, is it possible that the inhabitants of the Qijia Culture completely destroyed the remains of the Majiayao Culture? The answers require future excavations and studies.

According to the style of artifacts uncovered at Majiayao, they are mostly ascribed to the Majiayao Type. A small number of artifacts belong to the Miaodigou phase, while typical Shilingxia remains are absent. No artifacts belonging to the later Banshan Phase were found. In general, these artifacts belonging to the earlier phase of the Majiayao Culture gives us the potential to divide it into finer stages or phases. In addition, abundant animal and plant remains were found at Majiayao and a large number of samples for environmental analysis were collected. The sorting and analysis of these materials are proceeding in an orderly manner and will be published by the Cultural Relics (Wenwu) Publishing House around 2024. The above-mentioned work will help the academic world understand Majiayao society better.

Qijia Culture Remains

Although the Majiayao site is the eponymous type site for the Majiayao Culture, rich remains of the Qijia Culture have been discovered here as well. Archaeological surveys actually show the Qijia Culture remains at the Majiayao site to outmatch the Majiayao Culture remains by far in terms of the extent of their distribution. All seven of the recently investigated loci feature Qijia Culture remains, but the Qijia Culture deposits is unevenly distributed across the loci. Among them, the richest Qijia Culture deposits are located at Wajiaping and the high ground at its western side.

During the excavation of loci 5–7 at Wajiaping and the high ground to the west of it, a large amount of Qijia Culture artifacts was unearthed along with an abundance of Qijia Culture features such as cultural layers, houses, pits, and burials. The houses are mainly ground surface structures with lime plaster floors, but they appear in a variety of sizes. The largest exceeds 60 m^2, while the smallest only measures 3–4 m^2. Their outlines are mostly square or circular in shape. The preserved parts of the houses mostly consist of the lime plaster floors, hearths, and foundations. A few of the houses also retain walls, posts, and doorways. At locus 7 on the high ground, suspected cave dwellings (dated to the Qijia Culture based on the finds) have been discovered as well. Outside of the cave room, they featured an annex building and a courtyard. In terms of their layout, the Qijia Culture houses are mostly constructed on high ground and thereby subject to the spatial restrictions created by the natural plateaus. The houses that share the same plateau are arranged horizontally, while depending on the terrain, ground surface dwellings or cave dwellings would be constructed. The vertical plane shows a diverse layout as well, since houses are frequently built on plateaus of different height, frequently giving adjacent houses a different elevation. The storage pits or other settlement pits of the Qijia Culture occur in large numbers. They are usually located in the vicinity of the houses or concentrated within a small area. Some of the bag-shaped pits show traces of tool use on their walls. They possibly functioned as storage pits. Qijia Culture burials were mostly discovered at locus 5 on the Wajiaping plateau. In this constricted area, we excavated eight Qijia Culture burials. They were interspersed among the houses and pits. No dedicated cemetery has been discovered so far. These Qijia Culture burials all consist of grave pits with straight vertical shafts. They are grouped in twos, one of which is deep, the other is shallow. Each grave contains one occupant buried in supine position with stretched limbs. As far as could be determined, among the two graves in a group, the deceased man was buried in the shallower pit with the woman in the adjoining grave to his left (and thus the deceased woman in the deeper pit with the man in the adjoining grave to her right). The graves contain almost no burial goods. Since the scale of excavation is quite limited, not a lot more can be said about the burials at this point. A considerable number of Qijia Culture ditches have been found. They are all situated at loci 5 and 6. They differ in size, but all of them show traces of tool use. They must have been dug by the people of the Qijia Culture for a certain purpose. Because of the limitations of the excavation, the entire extent of these ditches is not yet clear. But it is without a doubt that the ditches of different sizes must have played an important role in the lives of the people at the time.

Compared to the Majiayao Culture Remains, the Qijia Culture Remains Stand out in the Following Aspects

1. The Qijia Culture remains were mosly discovered on plateaus rising above the surrounding landscape. Groups of people during the Qijia Culture Period must have sought out elevated positions to settle.
2. The limitations of this kind of terrain mean that horizontal living space is limited. Hence, the Qijia Culture remains are frequently located on plateaus with different elevations with neighboring features on different heights. This creates a distinct vertical pattern of distribution.
3. Because of the spatial limitations, the Qijia Culture remains are usually small in scale and distributed in patches. In many places, these patches link up to form larger settlements.
4. People of the Qijia Culture grasped more techniques of opening up and using spaces for settlement. They were able to plan according to the terrain and construct buildings of suitable sizes and shapes, as can be seen in the ground surface dwellings and cave houses of varied sizes that have been unearthed.
5. The Qijia Culture deposits are rather shallow and thin, while thick cultural layers are rare. This could indicate a high level of mobility of the Qijia Culture groups who probably did not settle at a certain spot for a long period of time. The factors listed above taken together should be understood as the result of the natural environment, the level of technology, the styles of living, and the choices of the social groups acting in conjunction during the Qijia Culture Period.

Summary

The Majiayao site is the type-site for the Majiayao Culture and is an important prehistoric site in Northwest China. Over the past years, archaeologists have been working at the site, broadening our understanding of which cultural sequences that are represented. In previous research, the Majiayao Culture was recognized, together with the preceding Miaodigou Culture and the later Qijia Culture. Based on this work the archaeological sequences of Northwest China could be elaborated. In recent years, the work of survey and coring has delineated the scope of the site and discerned the locations where archaeological remains ascribed to different periods were distributed. Excavations in key areas have enabled us to better understand the human societies at the site by periods. In addition, the results of scientific analysis will provide us with new insights pertaining to environmental changes, the utilization of animal and plant resources, modes of production and the dissemination of technology during this period. In summary, the archaeological work at the Majiayao site has promoted preservation and utilization of the cultural heritage, as well as addressed some significant cultural historic issues.

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Investigating Prehistoric Pottery from the Gansu-Qinghai Region (Northwest China): from Andersson's first Excavations to Contemporary Research

by

Anke HEIN, Andrew WOMACK, Ole STILBORG, Evgenia DAMMER

Abstract: Over the past 100 years since J.G. Andersson first brought the prehistoric pottery of Gansu and Qinghai Provinces, China, to the world stage, significant advances have been made in our understanding of Neolithic and Bronze age pottery from that region. From the first typologies produced by Andersson and colleagues to the refinement of chronologies in the 1940s–1990s to the application of modern analytical techniques in the last 20 years, our understanding of both the pottery itself and the people who produced it has been radically transformed. However, up to this point, the history of this research has been scattered across dozens of publications in multiple languages. Here, for the first time, we present a concise history of this work, paired with recent findings from research on newly excavated materials as well as older collections from the Museum of Far Eastern Antiquities (MFEA) and various institutions in China. We hope that this will allow scholars to better understand the trajectory of ceramic research in this field, while also illuminating areas of interest for future research projects

Keywords: Pottery; Ceramics; China; Neolithic; Bronze Age; History of Research; Technology; Majiayao; Qijia; Xindian; Siwa; Kayue; Shajing

1. Introduction

It has been nearly 100 years since Johan Gunnar Andersson first visited Gansu Province with Ding Wenjiang and his colleagues from the Geological Survey of China.[1] There, he investigated not only the local geology, but also prehistoric material remains. In his 1925 publication, "Preliminary Report on Archaeological Research in Kansu," Andersson presented the results of this research, introducing the Western world to the Neolithic and early Bronze Age material culture of northwestern China. He also provided the first descriptions of remains belonging to what he categorizes as Yangshao, Ch'i Chia (Qijia),[2]

[1] Magnus G. Fiskesjö, "Science across borders: Johan Gunnar Andersson and Ding Wenjiang," in *Explorers and Scientists in China's Borderlands, 1880–1950*, ed., Denise Marie Glover, Steven Harrell, Charles F. McKhann, and Margaret Byrne Swain (Seattle: University of Washington Press, 2011), 240–266.

[2] The early English-language publications in the field use Wade-Giles transcription, while now Pinyin is the

Hsin Tien (Xindian), Sha Ching (Shajing), Ma Chang (later reorganized and reclassified as a Majiayao subphase), and Ssu Wa Shan (Siwa); names that are largely still in use today.[3] Over the next 70 years, a variety of studies on Neolithic and early Bronze Age pottery of Gansu focused on questions of classification, chronology, and cultural interaction. These typological studies helped refine our understanding of the wide geographic and chronological variation in pottery; however, an unfortunate side effect of this reliance on pottery typology is that absolute dating was rarely undertaken, while other aspects of pottery production and use were seldom addressed beyond initial assessments. Thus, many aspects of craft production, social organization, and interaction that have been addressed in other areas using ceramic studies largely remained unrefined since the 1940s.

In the past two decades, however, a host of new research on both older collections and newly excavated materials has been helping to shed light on many aspects of ceramic production, classification, and the lives of the people who produced, used, and were buried with these items. These new insights are causing some scholars to reconsider long-held views such as the distinctive differences between "cultural" periods or the firm boundedness of archaeological cultures defined largely based on ceramic typology.[4] In some cases, however, recent work is reaffirming the usefulness of typological analysis for understanding circulation of goods and interactions between people in the past[5] or reconfirming observations first made nearly 90 years ago.[6]

The present paper provides an overview of the major trends in archaeological research on ceramics from northwestern China and brief introductions to many of the individual scholars who undertook it. We commence with the work done by Andersson and others in the early to mid-20th century, then discuss the typochronological research conducted mostly by Chinese scholars since the mid-20th century, finally turning to recent approaches using various analytical techniques from archaeological sciences as well as new theoretical and methodological frameworks. The latter includes both research on the Andersson collections held in the Museum of Far Eastern Antiquities (MFEA) in Stockholm and other collections across the world, and materials obtained during recent fieldwork. The aim is to provide a broad overview of the insights gained and the material published in a number of different languages in a wide range of disparate publication venues over the last 100 years.

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commonly used transcription system for Chinese used in the Mainland Chinese context. Throughout the paper, we will be referring to culture and site names using the transcription system that the publication we are summarizing is using, but if this is not Pinyin, we are also providing the current Pinyin transcription for easy reference.

3 Johan Gunnar Andersson, "Preliminary report on archaeological research in Kansu," *Memoirs of the Geological Survey of China* (Series A) 5 (1925):1–51; Johan Gunnar Andersson, "The Origin and aims of the Museum of Far Eastern Antiquities," *Bulletin of the Museum of Far Eastern Antiquities* 1 (1929): 11–28.

4 e.g. Anke Hein, "The Problem of Typology in Chinese Archaeology," *Early China* 39 (2016): 21–52; Anke Hein, "Keramik = Kultur? – Das Problem der Kulturdefinition in der euroamerikanischen und der chinesischen Archäologie," in *Vom Wesen der Dinge – Realitäten und Konzeptionen des Materiellen in der chinesischen Kultur*, ed., Grete Schönbeck, and Phillip Grimberg (Wiesbaden: Harassowitz, 2019), 33–56.

5 e.g. Hung Ling-yu, "Pottery Production, Mortuary Practice, and Social Complexity in the Majiayao Culture, NW China (ca. 5300-4000 BP)" (Ph.D. diss., Archaeology, Washington University in St. Louis, 2011).

6 Andrew Womack, and Hui Wang, "Formation and Function of Majiayao and Qijia Pottery: Analysis of Manufacturing Marks and Use-alteration on Vessels from the Tao River Valley," *Asian Perspectives* 59.1 (2020): 2–32.

In conclusion, this paper highlights advances made and points out open questions, suggesting various avenues for future research.

2. Early Research on Pottery of Northwestern China (1920s–40s)

2.1 Fieldwork and Research of Johan Gunnar Andersson

Born in rural Sweden, Johan Gunnar Andersson (1874–1960) attended Uppsala University where he studied geology and paleontology, receiving his PhD in 1901. In 1906, Andersson took up the position of director of the Swedish Geological Survey; then from 1914–1925 he worked in China as a mining adviser to the National Geological Survey. His interest in archaeology led him to devote much of 1920–25 to identifying and excavating sites dating to the Neolithic period.[7] While most local archaeologists were focusing on excavations of early historical sites such as Anyang, Andersson became a leading scholar of prehistoric materials, with many of the identified Neolithic and Bronze Age cultures of northern China still retaining the names he gave them. Thus, Andersson has become perhaps the most well-known, and in some ways infamous, foreign archaeologist to have worked in China.[8] His research at the time was encouraged by his Chinese colleagues, especially by the "father" of Chinese archaeology, Ding Wenjiang, who worked closely with him.[9] However, his focus on potential Western origins of Chinese pottery and culture, as well his removal of significant archaeological materials from the country, albeit with permission from the Chinese government, made him an easy figure to vilify as a foreign imperialist during the 60s-80s. In more recent times his status has been largely rehabilitated, although flaws in his research methods and findings are rightly noted.[10]

Andersson's initial archaeological research focused heavily on questions of pre-dynastic societies of north central and northwestern China.[11] While Andersson's research first centered on Henan, where he identified the type-site of Yangshao in 1921, in search for the origins of painted pottery, he moved on to focus on a variety of locations in Qinghai and Gansu Provinces in 1923–24.[12] In northwestern China Andersson and his Chinese colleagues concentrated their archaeological research on the area around Lanzhou, the Tao River Valley, Qinghai lake, and Minqin County in northern central Gansu. Based on excavations, collections, and purchases in these areas, Andersson was able to distinguish several cultural stages, as he termed them. These designations take into account multiple artifact types; however, since Andersson found most bone and stone tools to be generally

[7] Magnus G. Fiskesjö, "Johan Gunnar Andersson," in *The Encyclopedia of Archaeology*, ed., Charles Smith. New York: Springer, 2014. Accessed 26th of August 2020.https://doi.org/10.1007/978-1-4419-0465-2_2448.

[8] Perry Johansson, "Saluting the yellow emperor: a case of Swedish sonography," *Sinica leidensia*, 0169-9563; v. 104. (Leiden: Brill, 2012).

[9] Magnus G. Fiskesjö, "Science across borders: Johan Gunnar Andersson and Ding Wenjiang."

[10] e.g. Li Shuicheng, "Ancient interactions in Eurasia and Northwest China: Revisiting J. G. Andersson's legacy," *Bulletin of the Museum of Far Eastern Antiquities* 75 (2003): 9–13.

[11] Magnus G. Fiskesjö, "Chinese Autochthony and the Eurasian Context: Archaeology, Mythmaking and Johan Gunnar Andersson's 'Western Origins'," in *Fitful Histories and Unruly Publics: Rethinking Temporality and Community in Eurasian Archaeology*, ed., Kathryn O. Weber, Emma Hite, Lori Khatchadourian, and Adam T. Smith (Leiden: Brill, 2016), 303–320.

[12] Johan Gunnar Andersson, "An early Chinese culture," *Bulletin of the Geological Survey of China* 1 (1923): 1–68; Johan Gunnar Andersson, "Preliminary report on archaeological research in Kansu."

similar between the stages, he primarily used pottery, as well as the presence or absence of metal objects, to distinguish between time periods.[13]

Given the lack of absolute dating methods available at the time, he instead relied on stylistic comparison between pottery from the Northwest and similar pottery known from other parts of China and across Eurasia, in order to produce a rough relative chronology of cultural stages. In this process, he also took into account the presence of metal in association with pottery, although he did not find any metal at the Qijia sites he investigated. This led him to the tentative, but mistaken conclusion, that Qijia was older than Yangshao as the Qijia ceramics are largely unpainted, smaller, and to him seemed technologically less sophisticated. However, despite this error, Andersson was accurate in his general chronology of later stages, and indeed, his chronology has largely survived through later typochronological work. Absolute dates, however, have shifted over time. For example, Andersson provides a somewhat later start date for Yangshao (Majiayao) at 3000BC and only suggests a 300-year span for each of his six periods;[14] nevertheless, his overall estimate of 3000–1700BC is not too far off from the 3300BC start currently generally cited for Majiayao to the 1000BC end date currently proposed for Xindian.[15] Andersson also considered the possibility that some of these stages could be illustrating concurrent but geographically distinct traditions. He concluded that it was unlikely that any of the stages were contemporaneous, but this is an issue that keeps being discussed until the present.[16]

All in all, Andersson and his colleagues' initial work in Gansu and Qinghai set the stage for research into the prehistoric communities who lived in this region and for typological research into pottery with the goal of distinguishing chronological stages and archaeological cultures. While the initial aim of investigating a possible link between pottery styles in western China and eastern Europe soon came to be derided as a search for Western origins of Chinese civilizations, it should be noted that Andersson never endorsed this conclusion, but on the contrary argued that these cultural developments were largely local.[17] Interestingly, in recent decades both Chinese and foreign scholars have once again begun hypothesizing connections between the Majiayao, Qijia, and contemporary groups in Central Asia regarding transfers of crops, animals, and technologies between regions.[18] Thus, while contemporary scholars are no longer searching for cultural "origins" in the west, they are still probing questions first proposed in the 1920s such as technology transfers between northwestern China and Central Asia.

[13] Johan Gunnar Andersson, "Preliminary report on archaeological research in Kansu."

[14] Johan Gunnar Andersson, "Researches into the prehistory of the Chinese," *Bulletin of the Museum of Far Eastern Antiquities* 15 (1943): 1–340.

[15] Hung Ling-yu, "Pottery Production, Mortuary Practice, and Social Complexity in the Majiayao Culture, NW China (ca. 5300–4000 BP)"; Jaffe et al. forthcoming.

[16] Johan Gunnar Andersson, "Researches into the prehistory of the Chinese."

[17] Johan Gunnar Andersson, "Preliminary report on archaeological research in Kansu"; Magnus G. Fiskesjö, "Chinese Autochthony and the Eurasian Context: Archaeology, Mythmaking and Johan Gunnar Andersson's 'Western Origins'."

[18] Louisa G. Fitzgerald-Huber, "Qijia and Erlitou: the Question of Contacts with Distant Cultures," *Early China* 20 (1995): 17–67; Li Jaang, "The Landscape of Chinas Participation in the Bronze Age Eurasian Network," *Journal of World Prehistory* 28.3 (2015): 179–213; Li Shuicheng, "Ancient interactions in Eurasia and Northwest China: Revisiting J. G. Andersson's legacy," 9–13.

While Andersson's departure from Gansu in 1924 marked the end of foreign archaeological excavations on the ground in Gansu and Qinghai for 85 years,[19] it did not mark the end of research on ceramics from this region. Back in Sweden, the collections that Andersson brought to Stockholm under an agreement with the Chinese government formed the core of the Museum of Far Eastern Antiquities (MFEA),[20]with the publication of the Bulletin of the Museum of Far Eastern Antiquities (BMFEA) becoming a main venue for ongoing research into Andersson's collections. Half of Andersson's materials were returned to China in seven shipments between 1927 and 1936, where they subsequently disappeared in the upheavals of the Second Sino-Japanese War, but half remained in Stockholm, where subsequent research in the 1930's and 40's built on his initial research.[21]

2.2 Early Research at the Museum of Far Eastern Antiquities, Stockholm

Following the transfer of a portion of Andersson's materials to Stockholm to form the core of the MFEA, several scholars undertook pioneering work on portions of the collections from northwestern China. The first of these was **Nils Palmgren** (1890–1955), the curator of the Crown Prince of Sweden's Chinese Art Collection from 1931, who also worked at Stockholm University where he earned his DPhil in 1934.[22] Palmgren was appointed as an assistant to Andersson upon his return to Stockholm from China. While initially focused on cleaning materials, he soon shifted to research on pottery from the Banshan and Machang localities, which culminated in his thesis on these materials.[23]

Palmgren's research combines aspects of classic typological studies with information on forming processes based on his analysis of manufacturing marks. This includes many observations that are still commonly made today, such as that painted Banshan urns were produced using the coiling method and constructed in multiple stages. Other hypotheses

[19] It did not mark the end of foreign exploits in Northwest China, as for instance the Sino-Swedish Expedition continued its work under explorers such as Sven Hedin (1927–35) and Sir Aurel Stein (various expeditions in the 1920s and 1930s). Systematic excavations of settlement sites and burials using principles of stratigraphy as done by Andersson were not conducted.

[20] Johan Gunnar Andersson, "The Origin and aims of the museum of far Eastern antiquities," *Bulletin of the Museum of Far Eastern Antiquities* 1 (1929): 11–28.

[21] In 2002, in connections with renovations at the Geological Museum of China (successor to the museum of the Geological Survey in which Andersson had worked), three crates of ceramic vessels and fragments from Andersson's excavations were found. They have been part of a 2006 exhibition of the Geological Museum about its founders, and a documentary has been made about the re-discovery, but so far no research has been conducted on these objects. See Magnus G. Fiskesjö, "Science across borders: Johan Gunnar Andersson and Ding Wenjiang"; Magnus G. Fiskesjö, "The Reappearance of Yangshao? Reflections on unmourned artifacts," *China Heritage Quarterly* 23: September 2010. Accessed 26th of August 2020. http://www.chinaheritagequarterly.org/scholarship.php?searchterm=023_yangshao.inc&issue=023;
For information on the recent re-discovery of some of Andersson's materials in China, see the film Chuanyue lishe de milu: Yangshao wenwu xianshen ji (yi) 穿越歷史的迷霧：仰韶文物現身記全 (Through the fog of history: the appearance of Yangshao cultural relics) at http://www.cctv.com/program/tsfx/topic/geography/C18835/20070705/106013.shtml and https://www.bilibili.com/video/av21319812/ .

[22] National Museums of World Culture, "Palmgren, Nils (1890-1950)," *KulturNav*. 2020. Accessed 18th of December 2020. https://kulturnav.org/125800e7-51d7-47d3-bf1e-8ead2642f827.

[23] Nils Palmgren, "Kansu mortuary urns of the Pan Shan and Ma Chang groups, China. Geological survey," *Palaeontologia sinica*, ser. d. vol. III. fasc. I. (Peiping [Peking]: Geological survey of China, 1934).

have been forgotten over the years, such as that a mold was used for producing the neck. Palmgren also does not neglect unpainted vessels, which have rarely been discussed in more recent literature. The production of these items is covered in great detail, although a formal typology is not provided. He also presents the most complete discussions of firing to date, citing "branding" marks as evidence that many painted pots were fired together in a kiln.[24] Indeed, Palmgren's work is almost certainly the most detailed study of the production techniques of Majiayao-period vessels, and, based on recent research on these vessels, is highly accurate.[25]

Alongside his discussion of construction, Palmgren also offers a detailed typology of 40 vessel types distinguishing plates, bowls, vases with and without necks, vases with necks with and without handles, and so on. Palmgren decided to address painted decoration entirely separately from vessel form, devoting a separate chapter to classification of what he refers to as "décor families" in both the Banshan and Machang portions of his book. This approach was later taken up by Li Shuicheng in his seminal work on Banshan and Machang[26] (discussed below). Palmgren discusses connections in form and decoration flowing from Banshan to Machang and potentially onward to later periods including Xindian. Interestingly, Palmgren suggests that unpainted Banshan pottery is more "primitive" than Qijia pottery. However, he states "I regard this primitiveness in the unpainted Pan Shan as degeneracy, as compared with the Ch'i Chia pottery.".[27] Despite this chronological error, Palmgren's initial work set the stage for later typological studies of Majiayao pottery, while also providing a technical discussion of pottery production that remains unrivaled to the present.

In the same year as Palmgren's publication, **Margit Bylin-Althin** (1906–1988) presented her own thesis based on her analysis of Qijia pottery, arguing correctly that Qijia occurs after Banshan and Machang.[28] However, the publication including this argument took another decade due to the outbreak of World War II (1946), coinciding with additional confirmation via fieldwork by Xia Nai[29] (discussed below). Bylin-Althin's research focused on Andersson's materials from Ch'i Chia P'ing (Qijiaping), Lo Han T'ang (Luohantang), and Hsin Tien (Xindian), which were comprised mostly of sherds, as well as whole vessels of unknown provenance purchased by Andersson in Lanzhou. By comparing shape and decoration, as well as the nature of the paste and quality of manufacture, Bylin-Althin was able to divide Qijia pottery into three qualitative classes with several subdivisions.

[24] Ibid.

[25] Andrew Womack, and Hui Wang, "Formation and Function of Majiayao and Qijia Pottery: Analysis of Manufacturing Marks and Use-alteration on Vessels from the Tao River Valley."

[26] Li Shuicheng 李水城, *Banshan yu Machang caitao yanjiu* 半山與馬廠彩陶研究 [*Research on Banshan and Machang painted pottery*] (Beijing: Beijing Daxue Chubanshe 北京大學出版社, 1998).

[27] Nils Palmgren, "Kansu mortuary urns of the Pan Shan and Ma Chang groups, China. Geological survey," 165.

[28] Margit Bylin-Althin, "The Sites of Ch'i Chia P'ing and Lo Han T'ang in Kansu," *Bulletin of the Museum of Far Eastern Antiquities* 18 (1946): 383–554; Later Margit Althin, who, following her archaeological research at the MFEA in the 1930s, became a well know lawyer, pioneering women's entry into the field of law in Sweden and chairing a number of significant legal and cultural organizations in Sweden throughout her lifetime. See Elsa Trolle Önnerfors, "Margit Christina Althin," *Svenskt kvinnobiografiskt lexikon.* Accessed 17th of June 2020. https://www.skbl.se/sv/artikel/MargitAlthin.

[29] Xia Nai (Shiah Nae), "New Discovery of a Ch'i Chia Culture Cemetery," *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 76.2 (1946): 169–175.

Microscopic studies of thin sections of a subset of samples were also carried out by the geologist Gunnar Beskow, with the results supporting the initial subdivisions.[30] To our knowledge, this is the first instance of petrography being used on material from China and also the first time petrographic analysis was conducted on pottery in Sweden, during a time when this technique was not commonly used in ceramic analysis anywhere in the world.

Bylin-Althin also explored the technical details of manufacture and decoration, discussing various forming techniques, including pinching, coiling, and molding, tools used, and firing methods, which have been supported by recent analyses.[31] Her suggestion that the presence of basket marks on vessels is the result of mold forming using baskets explains where the Chinese terminology of basket marks (*lanwen* 篮纹) comes from, although recent research suggests a different method was used for creation of these unusual markings.[32] Despite the detailed nature of the study, Bylin-Althin was not able to create a chronology for the material recovered from Qijiaping since there was no stratigraphic information.[33] In terms of culture contact, Bylin-Althin argued that Qijiaping pottery has no relation to "Russo-Baltic" material, an opinion that in the long run has proven correct, but at the time was opposed by contemporary European scholars.

Despite the relative obscurity of the field of Chinese archaeology at the time, other scholars took note of Bylin-Althin's research, including Sidney M. Kaplan of Harvard University, who used it to argue for connections between Qijia pottery and later Bronze Age black-ware vases found in stone cist burials in Sichuan. In his assessment, Kaplan considered not only form and decoration, but also similarities in paste preparation and firing techniques.[34] It was also used by Tolstoy, along with work by Andersson and others, to argue for diffusion of pottery across Asia and even into the Americas.[35] Bylin-Althin's works furthermore had an impact on the work of Xia Nai, who would be the first scholar to return to Gansu, where he began fieldwork in the mid-1940s.

Bo Sommarström (1923–2008), born in Hubei, China to Swedish missionary parents, spent the first 12 years of his life there before moving back to Sweden where he went on to study ethnography, archaeology, and sinology at the University of Stockholm. When working as the librarian and archivist at the MFEA from 1953–57 he undertook extensive research and published a major volume on sites in the Edsen-gol region of Mongolia, while also publishing work based on Andersson's excavations at the site of Majiayao. He later worked as curator of the Ethnographic museum from 1967–88.[36]

30 Margit Bylin-Althin, "The Sites of Ch'i Chia P'ing and Lo Han T'ang in Kansu," 388–414.

31 Margit Bylin-Althin, "The Sites of Ch'i Chia P'ing and Lo Han T'ang in Kansu"; Andrew Womack, and Hui Wang, "Formation and Function of Majiayao and Qijia Pottery: Analysis of Manufacturing Marks and Use-alteration on Vessels from the Tao River Valley."

32 Ibid.

33 Margit Bylin-Althin, "The Sites of Ch'i Chia P'ing and Lo Han T'ang in Kansu."

34 Sidney M. Kaplan, "Some Observations on Ch'i-Chia and Li-Fan Pottery," Harvard Journal of Asiatic Studies 11.1/2 (1948): 187–196.

35 Paul Tolstoy, "Some Amerasian Pottery Traits in North Asian Prehistory," *American Antiquity* 19 (1) (1953): 25–39.

36 SMVK Ethnographic Museum, "Object 1058624," *Carlotta Database.* Accessed 22nd of June, 2020. http://collections.smvk.se/carlotta-em/web/object/1058624.

In his work on Majiayao, Sommarström undertakes an extensive description of each artifact category from the site, including pottery. The pottery vessel groups he breaks down based primarily on surface treatment and surface color, while also providing highly detailed descriptions of vessel shapes and appendages, and technological details such as paste composition. Like Palmgren and Bylin-Althin, he discusses painted decoration separately, however, Sommarström does not explain how the classifications were made, or what these might indicate such as vessel function or change in forms over time.[37] This work largely marks the end of direct research on Andersson's MFEA collection. For the next 50 years virtually all studies of pottery from northwestern China took place in China itself, with research on external collections only beginning again in the last decade.

Following work by Sommarström, research on a small number of Yangshao (Majiayao) sherds was undertaken by geologist **Nils Sundius** in the early 1960s.[38] This research included thin-section petrography, chemical analysis, and refiring experiments. Although the results are limited due to the small number of sherds sampled, the petrographic findings do generally match more recent studies,[39] while the refiring experiments point to temperatures around 800–950°C being achieved in Majiayao kilns. Sundius' research largely marked the end of work on Andersson's collections in Sweden in the 20th century.

2.3 Early Chinese Research

As research on Andersson's collections was winding down in Sweden, research in northwestern China was picking back up under the authority of China's leading archaeologists. **Xia Nai** (1910–1985) pioneered research in northwestern China following his groundbreaking work with Li Chi (Li Ji) at Anyang in 1935 and his PhD research in Great Britain and Egypt from 1935–1943.[40] While perhaps most famous for his later role as Director of the Institute of Archaeology from 1962–82, it is his fieldwork and publications on the archaeology of northwestern China in the late 1940s that took the important step of clarifying cultural chronologies in this region.

Following the end of World War II, Academia Sinica and the National Central Museum of China organized the North-western Scientific Expedition from 1944–45, during which Xia Nai and his colleagues visited a number of sites first identified by Andersson while also identifying and excavating several previously unknown sites.[41] Foremost among the sites they investigated are Wa Kuan Tsui (Waguanzui), near the site of Banshan in the northern Tao River Valley, as well as Siwashan around 40km south. Xia and his colleagues excavated two Qijia graves near the site of Banshan, with several complete pots matching the categories developed by Bylin-Althin, and, more importantly, several Majiayao-style painted sherds at the lowest levels of the grave pits.[42] These finds conclusively showed that

[37] Bo Sommarström, "The Site of Ma-Kia-Yao," *Bulletin of the Museum of Far Eastern Antiquities* 28 (1956): 55–138.

[38] Nils Sundius, *Some aspects of the technical development in the manufacture of the Chinese pottery wares of pre-Ming age* (Stockholm: Museum of Far Eastern Antiquities, 1961).

[39] Andrew Womack, Hui Wang, Jing Zhou, and Rowan Flad, "A petrographic analysis of clay recipes in Late Neolithic north-western China: continuity and change," *Antiquity* 93.371 (2019): 1161–1177.

[40] Kwang-chih Chang, "Xia Nai (1910–1985)," *American Anthropologist* 88.2 (1986): 442–444.

[41] Ibid.

[42] Xia Nai (Shiah Nae), "New Discovery of a Ch'i Chia Culture Cemetery."

Qijia was not a predecessor to Majiayao but post-dated it. Based on work by other scholars, such as Bylin-Althin and Andersson, as well as his own research, Xia also suggested that "we could not push back the date of the Ch'i Chia culture to a period much earlier than 2000 B.C," an impressively accurate date given the lack of C14 dating at this time.

Xia also traveled to Siwashan, a site first excavated by Andersson's team in 1924, where he identified habitation remains from the Yangshao (Majiayao) period as well as burials from a later period, which he termed Ssu Wa (Siwa).[43] Since Andersson's team only spent a few days at the site, Xia was determined to return to carry out further investigations to understand the stratigraphic relationship between Majiayao[44] and Siwa, as well as to uncover additional Siwa material. He and his team were successful in both endeavors, conclusively demonstrating that Majiayao is earlier than Siwa, due to the discovery of Majiayao potsherds in Siwa grave fill, as well as what he thought were ground Majiayao sherds used as grog in Siwa pottery. Xia's team also excavated six Siwa tombs, significantly expanding the amount of Siwa material available for study, including remains of a cremation burial, which were virtually unknown from this period at that time.[45]

Xia's publications discuss in detail site locations, excavation areas, and artifact types.[46] While this research does not go into detail on manufacturing techniques and function, it set the standard for future pottery research in this area, and many later typologies were built on those established by Xia and his colleagues. Xia cited the work by Andersson, Palmgren, and Bylin-Althin, addressing arguments, particularly by Andersson, relating to chronology. While Xia would continue his interest in the archaeology of northwestern China throughout his career, further field efforts in this area would soon shift primarily to rescue excavations, which over the next 40 years provided a plethora of new ceramic data.[47]

Pei Wenzhong (1904–1986) also discussed early painted pottery of northwestern China in his 1946 article, utilizing the early fieldwork of Andersson and others to argue for the existence of a broad Painted Pottery Culture spanning much of Eurasia, with each region having its own localized variations. For example, he argued that the "Yangshao Culture" encompassed only part of the Chinese Painted Pottery Culture and should not be used to cover all early painted pottery in China.[48] He largely accepted and built on Andersson's typochronology, adding information from other parts of China where painted pottery had been found.[49] On the whole, he distinguished between the Painted Pottery Culture(s)

[43] Xia Nai 夏鼐, "Lintao Siwashan fajueji 臨洮寺窪山發覺記 [Excavation report on the site of Siwashan, Lintao]," *Zhongguo kaogu xuebao* 中國考古學報 [*Chinese archaeological journal*] 4 (1949): 71–187.

[44] Xia Nai adopted the term Majiayao for the specific painted pottery of Gansu and the archaeological culture defined by it. This term has come to replace the term Yangshao used by Andersson. The use of Yangshao in Gansu now typically denotes a stage preceding Majiayao and closely related to Yangshao material from Shaanxi.

[45] Xia Nai 夏鼐, "Lintao Siwashan fajueji 臨洮寺窪山發覺記 [Excavation report on the site of Siwashan, Lintao],"

[46] Xia Nai 夏鼐, and Wu Liangcai 吴良才, "Lanzhou fujin de shiqian yicun 蘭州附近的事前遺存 [Prehistoric remains near Lanzhou]," *Kaogu xuebao* 考古學報 *Acta Archaeologica Sinica* 1 (1951): 63–100.

[47] Kwang-chih Chang, "Xia Nai (1910–1985)."

[48] Pei Wenzhong 裴文中, "Zhongguo zhi caitao wenhua 中國之彩陶文化 [China's painted pottery culture]," *Lishi yu kaogu* 歷史與考古 [*History and archaeology*] 1 (1946): 2–10.

[49] Pei Wenzhong 裴文中, Mi Taiheng 米泰恆, *Gansu shiqian kaogu baogao chugao* 甘肅事前考古報告初稿 [*An initial report on Gansu prehistoric archaeology*] (Jingjibu Zhongyang Dizhi Diaochasuo Beijing Fensuo

of the Yellow River Valley (splitting it into the Central Plain and the upper Yellow River Valley, including parts of Gansu and Qinghai) and the border regions ("mixed cultures" around the Great Wall, and the painted pottery culture(s) of the Southwest, Northwest, and Northeast). The relative and absolute dates for all of these phenomena were still unclear at the time and he argued that further data was needed before deciding where in China the painted pottery tradition had originated. He was, however, fairly certain that it could not have come from the West as the painted pottery in Xinjiang was late, but he was not sure if the origin lay in Gansu, as Andersson thought, or rather in northern China as Li Ji and Liang Siyong argued.

Alongside field research, collections research was also taking place in China, with **Wu Jinding** (1901– 1948, published in English under Chin-ting Wu) considering not only vessel shapes and decoration but also ceramic technology in his discussion of all prehistoric pottery from China. Relying on a combination of material held at Academia Sinica as well as material from Henan and Gansu collected by Andersson, Wu distinguished between six classes of prehistoric pottery, describing their distribution, and making suggestions for relative and absolute dates.[50] In particular, he focused on differences in color, wall thickness, evidence for hand-modelling vs wheel-throwing, burnishing/ polishing as well as painting of the surface. Much like Bylin-Althin, Wu considered these technological factors alongside form and decoration in forming his chronology, a methodology that would not be replicated for nearly 60 years after his seminal publication.

3. Culture-historical Research on Northwestern Pottery: Typology, Chronology, and Culture Contact

Building on new excavations in China by Xia and the North-western Scientific Expedition, and in subsequent years by many others, as well as initial typological work done in Sweden by Andersson and his associates, Chinese scholars in the 1950s to early 2000s used pottery typologies to explore a variety of subjects. They mostly focused on the large body of newly excavated pottery, alongside stratigraphic excavation data and some C14 dates, to further refine initial chronologies and suggest subphases for most of Andersson's "cultures." As chronologies were being established, other scholars took up work investigating interactions, including potential exchange networks and migrations, by mapping similar pottery forms and decoration across northern China. While questions of production and use were largely overlooked, the cultural-historical focus of this research provided a wealth of information on pottery types that form the foundation of much recent research.

3.1 General Typochronological Research

Some of the first papers discussing pottery typology building on post-1950 research in northwestern China come from renowned archaeologist **An Zhimin** (1924–2005), who alongside Xia Nai was involved in re-excavating some sites first explored by Andersson. An wrote several papers on the chronology of prehistoric sites in northern China, including on

經濟部中英地址調查所北京分所 [The Economics Ministry Central Geographic Survey Institute Beijing Branch], 1948).

50 Chin-ting Wu, *Prehistoric pottery in China* (London: Pub. on behalf of the Courtauld Institute of Art, University of London, by K. Paul, Trench, Trubner & Co., ltd, 1938).

Yangshao and Longshan in 1960 and on early cultures in Gansu in 1956.[51] While both papers focus on the use of pottery for distinguishing between cultures, they are brief and do not provide the detail of later works. More influential is his later English-language publication on the Bronze Age in Eastern Central Asia which describes the main cultural characteristics of Qijia, Siba, Xindian and Tangwang, Siwa, Kayue, Shajing, and cultural remains in Xinjiang.[52] Although the description of each culture is brief, it remains widely cited by researchers not fluent in Chinese since for many years it was the only English-language summary publication on that area, only recently being supplanted by Li Shuicheng's English-language publications.

Some contributions have also been made by European scholars, though reception of their work has been hindered by language barriers. Nevertheless, **Corinne Debaine-Francfort**'s work on Qijia burial customs and ceramic typology is widely cited, especially her insights into contact across northwestern China and beyond.[53] Sadly, only rarely consulted is **Mayke Wagner**'s PhD dissertation on style in Neolithic painted pottery exploring avenues similar to those developed by Li Shuicheng, or her highly useful discussion on Kayue, the probably least well-understood of the Bronze Age archaeological cultures of northwestern China.[54]

Other key overviews of ceramics from the Northwest include **Xie Duanju**'s (*1932) volume on Prehistoric Archaeology of the Gansu-Qinghai Region, which is widely read by undergraduate students in Chinese Archaeology.[55] While providing an introduction to the cultures and ceramics of the Northwest, the book is much less detailed in regard to ceramics than some other recent works. More detail can be found in the Neolithic and Xia-Shang volumes of the Chinese Archaeology series prepared by the Chinese Academy of Social Sciences.[56] These volumes are organized by sub-periods, regions, and archaeological cultures, the latter defined based on ceramic types. In the Neolithic volume, the authors distinguish between Yangshao (with the sub-groups of Banpo, Miaodigou, Xiwangcun,

[51] Reprinted in An Zhimin 安志敏, *Zhongguo xinshiqi shidai lunji* 中國新石器時代論集 [*Collected essays on the Neolithic of China*] (Beijing: Wenwu Chubanshe 文物出版社, 1982).

[52] An Zhimin, "The Bronze Age in Eastern Parts of Central Asia," in *History of Civilizations of Central Asia*," ed., A. H. Dani, and V. M. Masson (Delhi: Motilal Banarsidass Publishers, 1999), 319–336.

[53] Corinne Debaine-Francfort, *Du Néolithique à l'Age du Bronze en Chine du Nord-Ouest: la culture de Qijia et ses connexions* (Paris: Editions Recherche sur les civilisations, 1995).

[54] Mayke Wagner, "Die Motive der bemalten neolithischen Keramik Chinas – Ein auf stilkritischen Analysen beruhender und in Typologien geordneter Bildatlas zur Sino – Archäologie" (Ph.D. diss., University of Leipzig, 1993); Mayke Wagner, "Kayue – ein Fundkomplex des 2. Jahrtausends v. Chr. am Nordwestrand des chinesischen Zentralreiches," in *Migration und Kulturtransfer. Der Wandel vorder- und zentralasiatischer Kulturen im Umbruch vom 2. zum 1. vorchristlichen Jahrtausend. Akten des Internationalen Kolloquiums Berlin, 23. bis 26. November 1999. Kolloquien zur Vor- und Frühgeschichte Vol. 6*, ed., Ricardo Eichmann, and Hermann Parzinger (1999), 37–56.

[55] Xie Duanju 謝端琚, *Ganqing diqu shiqian kaogu* 甘肅地區史前考古 [*Prehistoric archaeology of Gansu*] (Beijing: Wenwu Chubanshe 文物出版社, 2002).

[56] Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所, *Zhongguo kaoguxue – Xia Shang juan* 中國考古學——夏商卷 [*Chinese Archaeology: Xia, Shang volume*] (Beijing: Zhongguo Shehui Kexueyuan Chubanshe 中國社會科學院出版社, 2003); Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所, *Zhongguo Kaoguxue: Xinshiqi shidai juan* 中國考古學——新石器時代卷 [*Chinese Archaeology: Neolithic volume*] (Beijing: Zhongguo Shehui Kexue Chubanshe 中國社会科学出版社, 2010).

Hougang Period I, Dasikong, Dahecun, and Xiawanggang culture), early and middle Majiayao (distinguishing between Shilingxia and Majiayao-style painted pottery, comparing it with the painted pottery from Zongri), and late Majiayao (distinguishing between Banshan and Machang types, highlighting especially the decoration patterns and differences between sub-regions).[57] The Bronze Age volume is considerably less detailed, though that may be due to the earlier publication date, and has little to say on the Gansu-Qinghai region or indeed any place outside the Central Plains.[58] Xinjiang finds no mention at all. Qijia is discussed in some detail, distinguishing between an eastern, a central, and a western variety, and providing typologies of the main vessel types and a comparison with the Machang pottery types from which they are deemed to have developed. Siba and Kayue are mentioned only briefly, and Siwa and Xindian go completely unmentioned, again reflecting the lack of research on material assigned to these archaeological cultures. This has improved only in recent years with work by Ren Ruibo and research conducted in context with the Tao River Archaeological Project (TRAP), an international collaboration between Harvard University, Peking University, and the Gansu Provincial Institute of Archaeology.[59] A short, though by now somewhat outdated, summary on Qijia, Yangshao, Machang, Xindian, and Siwa cultural developments focusing mostly on ceramic types has been provided by Wang Hui;[60] however, new volumes are now needed to incorporate the large amount of new data that has been published on Northwestern pottery in recent years.

3.2 Typochronologies and Cultural Contact 1970s–2000s

A more in-depth typological study of the origins, characteristics, and development of Gansu painted pottery comes from **Yan Wenming** (*1932), who discussed Banpo, Miaodigou, Majiayao, and Machang period remains, as well as Siba and Laoguantai finds.[61] Combining stylistic analysis of motifs and to a lesser extend vessel forms with 11 radiocarbon dates from eight sites he suggested that Gansu painted pottery originated in the Guanzhong area of Shaanxi, reaching Gansu during the Banpo phase in the mid-5th millennium BC, extending to the eastern part of the Hexi Corridor during the Majiayao phase (mid-4th millennium BC), developing locally into the subsequent Xiaopingzi period, Machang period, and Siba- period, and eventually extending all the way to the western end of the Hexi Corridor.

Yan argued that the Guanzhong region was particularly suitable for the development of dryland agriculture, with the development of large-scale pottery use due to farmers needing pottery more than herders of the Northwest. He reasoned that in the Laoguantai-

[57] Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所, *Zhongguo Kaoguxue: Xinshiqi shidai juan* 中國考古學——新石器時代卷 [*Chinese Archaeology: Neolithic volume*].

[58] Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中國社會科學院考古研究所, *Zhongguo kaoguxue – Xia Shang juan* 中國考古學——夏商卷 [*Chinese Archaeology: Xia, Shang volume*].

[59] see below; e.g. Yitzchak Y. Jaffe, and Anke Hein, "Considering change with archaeological data: Reevaluating local variation in the role of the ˜4.2k BP event in Northwest China," *The Holocene*. Accessed 26th of August 2020. https://doi.org/10.1177/0959683620970254 ; Jaffe et al. forthcoming.

[60] Wang Hui 王輝, "Gansu diqu xinshiqi-qingtongqi shidai kaoguxue wenhua de puxi yu geju 甘肃地区新石甘肅地區新石器-青銅時代考古學文化的譜系與格局 [Genealogy and patterns of Neolithic and Bronze Age cultures in Gansu]," *Kaoguxue yanjiu* 考古學研究 [*Archaeological research*] 9 (2012): 210–243.

[61] Yan Wenming 嚴文明, "Gansu caitao de yuanliu" 甘肅彩陶的源流 [The origin of the painted pottery of Gansu], *Wenwu* 文物 [*Cultural relics*] 10 (1978): 62–76.

period pottery was too uneven in color to be painted. Only the advent of kiln firing allowed for producing evenly colored pottery which then formed the basis for the development of Yangshao painted pottery. Yangshao farmers eventually developed the means to also work less ideal farmland, allowing them to move into eastern Gansu and eventually further west. Once the Yangshao people moved into Gansu, contact with their homeland became more sporadic and they intermingled with local populations, leading to a new, Yangshao-derived pottery style with its own local characteristics. As was customary at the time, and to some extent persists today, Yan connected the prehistoric remains in Gansu with ethnic groups mentioned in later-period historical texts from the Central Plains, in this case the Book of Han (*Hanshu* 汉书). Based on this work as well as questionable evidence from cranial morphometrics, he suggested that they were Rong or Qiang, though mostly Qiang.[62] Subsequent excavation reports often relied on Yan's work for integrating their finds into the overall picture of ceramic development in prehistoric northwestern China.

Typological analysis of pottery from the Northwest continued with the work of **Li Shuicheng** (*1953), whose monograph in Chinese on the painted pottery of Banshan and Machang set the standard for modern typological studies.[63] Subsequent publications in Chinese and English focus on culture contact in Bronze Age northwestern China and beyond.[64] With a preface by Yan Wenming and a detailed account of research on Banshan and Machang up to the late 1990s, Li's work clearly builds on earlier typologies, before developing a detailed typology of the major Banshan and Machang vessels and their decoration. His work considers placement of decoration, combination of designs, and co-occurrence of object types to suggest typochronologies for both Banshan and Machang separately before placing them into an overall chronological and spatial framework. Li thus took an approach similar to Palmgren's early work, albeit with much more material at hand and in a more sophisticated manner. Details of ceramic technology also receive some – albeit relatively short – treatment, summarizing work done on clay material, refinement, shaping techniques, selection of pigments, paint application techniques, and firing temperatures.

In this and more recent works, Li argues that changes in vessel forms were caused partially by technological changes and partially by the local environment both due to local subsistence practices influencing food production, preparation, and consumption patterns, and raw material choices for ceramic production.[65] In his eyes, ceramic forms

[62] Ibid.

[63] Li Shuicheng 李水城, *Banshan yu Machang caitao yanjiu* 半山與馬廠彩陶研究 [*Research on Banshan and Machang painted pottery*].

[64] Li Shuicheng, "A discussion of Sino-Western cultural contact and exchange in the second millennium BC based on recent archaeological discoveries," *Sino-Platonic Papers* 97 (1999): 1–30; Li Shuicheng, "Ancient interactions in Eurasia and Northwest China: Revisiting J. G. Andersson's legacy"; Li Shuicheng 李水城, "Xibei yu Zhongyuan zaoqi zhitongye de quyu tezheng ji jiaohu zuoyong 西北與中原早期治銅業的區域特徵及交互作用 [Regional characteristics and interaction in early copper smelting between northwest China and the Central Plains]," *Kaogu xuebao* 考古學報 *Acta Archaeologica Sinica* 3 (2005): 239–278; Li Shuicheng, "The Regional Characteristics and Interactions Between the Early Bronze Metallurgies of the Northwest and Central Plains," *Chinese Archaeology* 6.1 (2006): 132–139.

[65] Li Shuicheng 李水城, *Banshan yu Machang caitao yanjiu* 半山與馬廠彩陶研究 [*Research on Banshan and Machang painted pottery*]; Li Shuicheng 李水城, "Huangtu de kuizeng: Zhongguo xibei de shiqian taoqi ji xiangguan wenti 黃土的饋贈：中國西北的史前陶器及相關研究 [The gift of loess: research on prehistoric

are mostly canvases for designs which he sees as directly connected with social values and beliefs, signaling specific messages. In the case of the painted pottery of Banshan and Machang, he argues that forms changed faster and independently while designs changed more slowly. Li distinguishes two different design systems (one more concrete, the other more abstract) which both varied over time, developing through different coloring schemes. Overall, Li distinguishes 5 phases in the development of form and 8 for decoration in the case of Banshan and 3 and 5 respectively for Machang. He furthermore distinguishes between an eastern and a western Machang subtype, the latter developing into Siba during the Bronze Age. Over time, he sees a westward spread of the painted ceramic tradition, while the eastern areas are taken over by Qijia.[66] This westward expansion, so he argues, was caused by cultural as well as environmental factors, with painted pottery being related to dryland farming, suggesting a causal link between pottery technology and prosperity.[67] He also argues that there was exchange in ceramics with specialization of production in some areas and organized trade of high-quality painted pottery into what he calls more remote and "backward" areas that produced their own everyday ware. Finally, Li suggests that wheel-throwing technology brought an end to painted pottery.[68]

Li has also explored Bronze Age cultural developments using pottery and other materials as both indicators for culture contact and markers of chronology.[69] While in his 1999 publication he sharply criticized Andersson and other foreign scholars for hypothesizing that painted pottery of the Yellow River Valley originated in Central Asia, he later noted that Andersson had corrected his viewpoint and emphasized that "'China' – whether defined in terms of ethnicity or material culture, had developed continuously from the Yangshao through the Shang period, and to the present day".[70] Li also addresses the question of the development of Chinese civilization and the role of external contacts using data including ceramic forms and decorative motifs, as well as metal objects, mace heads, and bioarchaeological and palaeobotanical research (esp. the spread of wheat and barley). He argues that the Yangshao culture spread west into Gansu from 5,000 BC, reaching Qinghai around 3,500 BC and into the Dadu River Valley of southern Sichuan. From 3,000 BC, the Majiayao culture expanded further west with painted pottery appearing in Hami, Xinjiang, around 2,000 BC. Based on the presence of two different painted pottery types

pottery of Northwest China]," in *Dahe shangxia: Huanghe liuyu shiqian taoqizhan* 大和上下——黄河流域史前陶器展 [*Up and down the large river: exhibition of prehistoric pottery from the Yellow River Valley*], ed., Shandong Bowuguan 山東博物館 (Beijing: Wenwu Chubanshe 文物出版社, 2015), 3–29.

66 Li Shuicheng 李水城, *Banshan yu Machang caitao yanjiu* 半山與馬廠彩陶研究 [*Research on Banshan and Machang painted pottery*].

67 Ibid. and Li Shuicheng 李水城, "Huangtu de kuizeng: Zhongguo xibei de shiqian taoqi ji xiangguan wenti 黃土的饋贈：中國西北的史前陶器及相關研究 [The gift of loess: research on prehistoric pottery of Northwest China]."

68 Li Shuicheng 李水城, *Banshan yu Machang caitao yanjiu* 半山與馬廠彩陶研究 [*Research on Banshan and Machang painted pottery*].

69 e.g., Li Shuicheng, "A discussion of Sino-Western cultural contact and exchange in the second millennium BC based on recent archaeological discoveries"; Li Shuicheng, "Ancient interactions in Eurasia and Northwest China: Revisiting J. G. Andersson's legacy"; Li Shuicheng 李水城, "Huangtu de kuizeng: Zhongguo xibei de shiqian taoqi ji xiangguan wenti 黃土的饋贈：中國西北的史前陶器及相關研究 [The gift of loess: research on prehistoric pottery of Northwest China]."

70 Li Shuicheng, "Ancient interactions in Eurasia and Northwest China: Revisiting J. G. Andersson's legacy," 9.

at the site of Tianshan Beilu in Xinjiang, Li suggests that two different ethnic groups lived here, one of Siba origin from Gansu, the other Central Asian. Overall, he argues that first contact between East and West took place in the late Neolithic (c. 3,000 BC), increasing after 2,000 BC, with the Yellow River cultures spreading increasingly further westwards with elements from West and Central Asia reaching Xinjiang. Overall, Li's work has not only contributed to our understanding of specific ceramic typologies but has pushed the use of typologies alongside other aspects of material culture to explore questions not just of chronology, but of technology, contact, and exchange.

Shui Tao (*1960) is also highly influential in terms of typological work, and in particular his 2001 essay collection on Bronze Age cultures in Northwest China is much cited. Nearly all the essays rely heavily on typochronological work including the extensive "Study of Cultural Structure and Economic Form in the Bronze Age of Gansu and Qinghai," which largely consisted of ceramic typologies for Qijia, Xindian, Siwa, Kayue, Siba, Shajing, Nuomuhong, and pre-dynastic and Western Zhou, with a special treatment of tripodal vessel shapes. Much like the work of Li Shuicheng, Shui uses pottery to track human movement, culture contact, and human-environment interaction, with culture definitions and identification of instances of inter-group interaction being based nearly entirely on ceramic forms and decorations. Ceramic crafts and other technologies, such as metal production, receive no consideration. However, Shui does take into account environmental and spatial correlates, focusing on everyday life and especially subsistence practices rather than on social differentiation as reflected in burial practices. Nevertheless, ceramics are still seen mostly as a means of establishing a chronological framework, rather than the result of complex technological, social, and cultural processes intertwined with particularities of locally available natural resources.[71] This is surprising, given that the same book also contains a glowing review of Li Shuicheng's book, calling it a revolutionary multi-dimensional approach to ceramics research providing new explanations for reasons for change in ceramic style and how they can be researched and assessed. Yet Shui still relies on tropes of environmental degradation and subsequent changes in subsistence practices to explain social changes, a view that remains prevalent in research on Bronze Age northwestern China.[72]

3.3 Typochronologies and Culture Contact, 2010s–Present

Recently several PhD students at Jilin University have conducted typological analysis on ceramics from western China. **Ren Ruibo**'s 2016 dissertation focuses on the "Painted Pottery Culture of Northwest China," discussing painted pottery by period (Yangshao, Majiayao, Xia, and Shang to Han). Here and in an article summarizing his findings, Ren discusses 19 painted-pottery cultures and 6 non-painted pottery cultures based on typological comparison and the spatial and temporal spread of the different ceramic types and sub-types.[73]

[71] Shui Tao 水濤, *Zhongguo xibei diqu qingtong shidai kaogu lunji* 中國西北地區青銅時代考古論集 [*Papers on the Bronze Age Archaeology of Northwest China*] (Beijing: Kexue Chubanshe 科學出版社, 2001).

[72] For a critical discussion of this approach and the underlying assumptions, see Yitzchak Y. Jaffe, and Anke Hein, "Considering change with archaeological data: Reevaluating local variation in the role of the ~4.2k BP event in Northwest China."

[73] Ren Ruibo 任瑞波, "Xibei diqu caitao wenhua yanjiu 西北地區彩陶文化研究. [Study on the Painted-Pottery Culture of Northwest Culture]" (Ph.D. diss., Archaeology, Jilin University, Changchun, 2016); Ren Ruibo 任瑞波, "Xibei diqu caitao wenhua de yanjiu huigyu yu zhanwang 西北地區彩陶文化的研究

Ren groups the material into three traditions: eastern, western, and Xinjiang based on painstaking typochronological work, comparing in detail individual sites, grouping them together in regions and traditions, and connecting them with absolute dates, some based on C14 dating, others on comparison with reliably dated material from other regions. However, this assessment is nearly exclusively based on ceramic forms and decorations, which is surprising given the strides made by Li Shuicheng and others who have also incorporated placement of decoration and ceramic technology in their analyses. In follow-up publications, Ren discussed the chronology of Xindian, again conducting typological work on ceramics from a considerable number of sites and drawing them into one typochronological scheme of six phases and four stages of development while arguing that more radiocarbon dates are needed to suggest a clear absolute time frame.[74]

Chen Wei's work encompasses the whole eastern rim of the Tibetan Plateau, focusing on long-distance culture contact and chronology.[75] The dissertation and resultant book provide an overview of the ceramic types used to define prehistoric archaeological cultures in the region[76] and then relies on similarities in ceramic and metal objects to suggest inter-regional culture contact. Much like earlier work there is a strong focus on environmental factors in prompting social change that is then reflected in pottery. Unfortunately, despite an emphasis on pottery from graves, the function of pottery in burial contexts or the sociocultural implications of grave assemblages is not discussed. Typically, the role of pottery in burials is addressed in studies of individual cemeteries[77] or broader studies on burial customs,[78] while ideally it should also be addressed in general studies of pottery from mortuary contexts.

Chen Xiaosan's work deals with the early Bronze Age cultures of the Hexi corridor, mostly Qijia and Siba, while also discussing cultural phenomena preceding them.[79] Like

回顧與 展望 [Retrospect and Prospect Research on the Painted Pottery Culture of northwestern China]," *Xibu kaogu* 西部考古 [*Archaeology of the western regions*] 3 (2017): 31–37.

[74] Ren Ruibo 任瑞波, "Lun Xindian wenhua de fenqi yu niandai 論辛店文化的分期與年代 [Discussion on the chronology and date of the Xindian culture]," *Kaogu xuebao* 考古學報 *Acta Archaeologica Sinica* 4 (2019): 439–460.

[75] Chen Wei 陳葦, "Ganqing diqu yu Xinan shandi Xianqin shiqi kaoguxue wenhua ji hudong guanxi 甘青地區與西南山地先秦時期考古學文化及互動關係 [The Archaeological Culture and Interactive Relationship between Gansu & Qinghai and Southwest Mountain Regions in the Pre-Qin Period]" (PhD dissertation, Department of Archaeology and Museology, Jilin University, Changchun, 2009); Chen Wei 陳葦, *Xianqin shiqi de Qingzang gaoyuan donglu* 先秦時期的青藏高原東麓 [*The eastern rim of the Tibetan Plateau during the pre-Qin period*] (Beijing: Kexue Chubanshe 科学出版社, 2012).

[76] For Northwest China, these include Miaodigou, Banpo, Majiayao, Dali Jiaping, Changshan Xiaceng, Zongri, Banshan, Keshengzhuang, Qijia, Siwa, Xindian, and Kayue cultures as well as Tangwang type remains. Other regions discussed are the upper Minjiang River, the Qingyi River, the Dadu River (separated into upper and middle), the Yalongjiang (lower, middle, and upper), Jinshajiang (middle and upper), and Lancangjiang (upper and middle).

[77] e.g., Zhou Jing 周靜, "Mogou Qijia wenhua mudi fenqi fenqu ji xiangguan wenti yanjiu 磨溝齊家文化分期分區及相關問題研究 [Chronology and spatial distribution of the Mogou Qijia culture cemetery and rela-ted research]" (Master's thesis, Department of Archaeology and Museum Studies, Northwestern University 西北大學, Xi'an, 2010).

[78] e.g., Francis Allard, "Mortuary Ceramics and Social Organization in the Dawenkou and Majiayao Cultures," *Journal of East Asian Archaeology* 3 (3/4) (2001): 1–22.

[79] Chen Xiaosan 陳小三, "Hexi zoulang jiqi lingjin diqu zaoqi qingtong shidai yicun yanjiu 河西走廊及其鄰

Chen Wei, Chen Xiaosan focuses on typochronological work, based mostly on ceramics and to a lesser extent metal objects. She discusses patterns of interaction with neighboring regions based on ceramic and bronze objects, first establishing the connections between Qijia and Siba and then the interaction between both and groups and other regions including Xinjiang, Inner Mongolia, eastern Gansu, and the Guanzhong region, but going as far as the Central Plains. In conclusion, she emphasizes the influence of Qijia and Siba on cultures across northern China.

There are numerous other studies that discuss contacts between the Central Plains and northwestern China during the Bronze Age, especially in connection with the emergence of metallurgy and the advent of western domesticates.[80] Of particular relevance for the issue of ceramic research is the suggestion made by Han Jianye and others that there was a "painted pottery road" preceding the Silk Road, enabling the transmission of painted pottery and other items from west to east (and to a lesser extend in the opposite direction) during the Neolithic period, paving the way for later long-distance exchange shaping cultural developments in the Central Plains.[81] While these studies are based on ceramic typologies, mostly of painted pottery, new research is now incorporating archaeometric approaches in order to answer not only questions of cultural chronology, contact, and exchange, but also why such changes and interactions were taking place.

4. Recent Trends and New Methods in Pottery Research in Northwestern China

While analysis of chronologies, contact, and cultural change based on ceramic typology has been the dominant trend from the beginnings of the field through the 2000s, typology is not the only ceramics-focused method that has been used to explore these issues. In recent decades, a host of archaeometric methods have been used to explore various aspects of ceramic technology from raw materials sourcing to production methods and evidence for potential patterns of ceramic exchange, often connecting these with questions of social organization. In turn, a wave of new data is now available that complements, and in some cases contradicts, earlier typology-focused studies.

4.1 Research on Raw Materials and Production Methods

Systematic analysis of Chinese ceramics using archaeometric methods commenced in the 1960s, starting with **Zhou Ren** (1892–1973; materials engineer and metallurgist) and colleagues from the Shanghai Institute of Ceramics of the Academy of Sciences, who combined macroscopic and microscopic observation, chemical analysis, spectrography, ethnographic observation in Yunnan, and experimental work to learn about raw material choice for both clay and paints/glazes, clay processing, forming, surface treatment, and firing

進地區洵氣青銅時代遺存研究 [Research on the Early Bronze Age remains in the Hexi Corridor and surrounding areas]" (Ph.D. diss., Department of Archaeology, Jilin University, Changchun, 2012).

[80] see e.g., Li Jaang, "The Landscape of Chinas Participation in the Bronze Age Eurasian Network."

[81] Han Jianye 韓建業. "'Caitao zhilu' yu zaiqi Zhong xi wenhua jiaoliu "彩陶之路" 與早期中西文化交流 [The 'painted pottery road' and early sino-western cultural contact]," *Kaogu yu wenwu* 考考古與文物 [*Archaeology and cultural relics*] 1 (2013): 28–37.

temperature and atmosphere.[82] They worked with 69 sherds from 20 different sites across northern and eastern China dating from the Neolithic to the Bronze Age, including one Qijia-period sherd from Qijiaping and two Majiayao-period sherds from Xindian alongside geological samples. They inferred that, in spite of common assumptions, loess was not used in ceramic production but rather a range of natural clays. They suggested that most vessels were coil-built, refined on a turntable, and fired around 950–1050°C. Zhou himself later focused mostly on metallurgical research, while many other scholars continued scientific research on ceramics. A small number of scientific studies using chemical analysis, microscopic and macroscopic observations, have been conducted on earthenwares,[83] including some first studies using thin-section analyses in China.[84] However, very little material from northwestern China has been considered in these studies prior to the last 20 years.

In the US, **Pamela Vandiver** was the first scholar to apply X-ray radiography in combination with macroscopic analysis to study forming techniques of five Banshan-type vessels of different shapes from the Peabody Museum, Harvard University.[85] Additionally, she conducted a chemical analysis of the clay paste in samples from three vessels using scanning electron microscopy with energy dispersive X-ray spectroscopy (SEM-EDX). On the radiographs, she was able to distinguish between the rings of coils and traces of secondary forming techniques, which are often not recognizable through visual examination alone. Her study confirmed Palmgren's observation of the coiling method being used for making Banshan and Machang pottery. She also agreed with Wu in disputing Palmgren's claim that the necks of the vessels were made using a mould.[86] Instead, the necks were likely shaped on a turntable. Vandiver concluded, based on the traces observed in the radiograph, that high pressure was applied to clay bodies through use of the beating technique. This observation confirmed Wu's initial suggestion that the vessels were further shaped by a secondary technique which involved percussion.

Significant research on changes in ceramic technology and raw-material choice as indicators for interaction in northwestern China has been conducted by a number of scholars in recent years, including **Ma Qinglin** (*1965).[87] His first forays into cultural heritage

[82] Zhou Ren 周仁, Zhang Fukang 張福康, and Zheng Yongpu 鄭永圃, "Woguo Huanghe liuyu xin shiqi shidai he Yin Zhou shidai zhitao gongyi de kexue zongjie 我國黃河流域新石器時代和殷商時代製陶工藝的科學總結 [Scientific summary of ceramic technology in the Neolithic and Yin-Zhou periods in the Yellow River Basin of China]," *Kaogu xuebao* 考古學報 *Acta Archaeologica Sinica* 1 (1964):1–27.

[83] e.g., Li Jiazhi 李家治, Chen Xianqiu 陳顯求, Zhang Fukang 張福康, Guo Yanyi 郭演儀, and Chen Shiping 陳士泙, eds., *Zhongguo gudai taoci kexue jishu chengjiu* 中國古代陶瓷科學技術成就 [*Scientific and technical achievements in ancient Chinese pottery and porcelain*] (Shanghai: Shanghai Kexue Jishu Chubanshe 上海科學技術出版社, 1985).

[84] Li Jiazhi 李家治, Chen Xianqiu 陳顯求, Deng Zequn 鄧澤群, and Gu Zujun 谷祖俊, "Hemudu yizhi taoqi de yanjiu 河姆渡遺址陶器的研究 [Research on the ceramics of Hemudu site]," *Guisuanyan xuebao* 硅酸鹽學報 [*Journal of the Chinese Ceramic Society*] 7.2 (1979): 105–112.

[85] Pamela Vandiver, "The implications of variation in ceramic technology: the forming of Neolithic storage vessels in China and the Near East," *Archeomaterials* 2 (1988): 139–174.

[86] Nils Palmgren, "Kansu mortuary urns of the Pan Shan and Ma Chang groups, China. Geological survey"; Chin-ting Wu, *Prehistoric pottery in China*.

[87] Graduate of Lanzhou University with an undergraduate degree in organic chemistry (1986), followed by a master's (1997) and PhD (2000) in analytical chemistry and postdoctoral work at the School of Archaeology and Museology of Peking University (2000–2001) and at the Getty Conservation Institute in Los Angeles

research were under the guidance of **Li Xian** at the Science Department at the Gansu Provincial Museum.[88] A joint article by Ma and Li reconstructs the development of pottery technology in northwestern China based on analysis of 25 samples from Neolithic and Bronze Age sites in Gansu typologically dated to early Yangshao, Banpo, Miaodigou, Shilingxia, Majiayao, Banshan, Machang, Qijia, Huoshaogou, Xindian, Siwa, and Shajing.[89] They assessed physical properties of the samples including hardness, porosity, and water absorption as well as firing temperature using a high-temperature dilatometer. X-ray fluorescence (XRF) analysis was conducted on all samples and paint layers where possible, and a small number of samples including Malan loess underwent SEM analysis. Unlike Vandiver, Ma and colleagues conclude that Malan loess was not used for prehistoric pottery in Gansu, but probably a different aeolian deposit, and on occasion kaolin clay.

To reconstruct the overall chaîne opératoire[90] the authors consulted information on excavated kilns and visited modern kilns in Qin'an, Gangu, and Lanzhou, observing the entire pottery production process from clay preparation to post-firing application of paint. Based on macroscopic observations, the authors suggest that levigation started appearing in later periods (probably Banshan and Machang), as did polishing and slip-coating. They also suggest that sand temper is common, and that grog could be observed, rarely in Yangshao Miaodigou material and commonly in Xindian-style ceramics. For Yangshao, Majiayao, and Qijia, they suggest that both hand-building and wheel-throwing techniques had been used, while for Siwa and Shajing hand-building was dominant and finally that overall pottery technology declined due to the emergence of bronze production. Given the small number of samples compared to the large area and time covered, the authors point out the preliminary nature of their findings. Nevertheless, the multi-disciplinary, multi-source approach provided a new benchmark for scientific studies of pottery from the Northwest.

Ma continued his research in his unpublished PhD thesis on "Research on the Classification of Pottery Pigments and Pottery Composition in the Neolithic and Bronze Age of Gansu", combining thin-section analysis, low-level microscopy and SEM with thermo-

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with Dr. David A. Scott (2001), as well as at the University of Zurich (2003). He has held professorial positions at various universities, since 2008 until present at Shandong University, not in Chemistry but in the School of History and Culture which is explained by his previous work history and research focus. After his undergraduate work, in 1986 he had been assigned to work at the Science Department at the Gansu Provincial Museum, working his way up to Director level and conducting several scientific projects that bridged cultural heritage work and chemistry. Ma Qinglin 馬清林, "Ma Qinglin 馬清林 [Personal profile]," Website of the School of History and Culture, Shandong University 山東大學歷史文化學院 Last updated 29th March 2019. Accessed 14th of July 2020.https://www.history.sdu.edu.cn/info/1359/12812.htm; Wang Lili 王莉莉, "Ma Qinglin: baohu chenfeng de jiyi zhanshi wenming de meili 馬清林：保護塵封的記憶展示文明的美麗 [Ma Qinglin: Protecting memories and showing the enchantment of early civilizations]," *Shanda xiandian* 山大现點. Published on 8th of April 2019. Accessed 14th of July 2020. https://www.view.sdu.edu.cn/info/1207/116267.htm.

88 Wang Lili 王莉莉, "Ma Qinglin: baohu chenfeng de jiyi zhanshi wenming de meili 馬清林：保護塵封的記憶展示文明的美麗 [Ma Qinglin: Protecting memories and showing the enchantment of early civilizations]".

89 Ma Qinglin 馬清林, and Li Xian 李现, "Gansu gudai ge wenhua shiqi zhitao gongyi yanjiu 甘肅古代格文化時期製陶工藝研究 [Research on the ceramic technology of the various prehistoric periods of Gansu]," *Kaogu* 考古 [*Archaeology*] 3 (1991): 263–272.

90 The term denotes a systemic analytical view on the craft process from raw material extraction to finished object.

luminescence dating.[91] Ma published six papers from his dissertation research, the first one emphasizing the importance of scientific ceramics research in gaining insights into past social structures, exchange pattens, and production methods.[92] The other five papers report specific results of the work Ma and his colleagues conducted in connection with his dissertation and largely focus on analysis of pigment.[93] For instance, XRF analyses of the paints of Majiayao vessels from various sites in Gansu showed that the white pigment consisted of gypsum and calcite, rather than kaolin as previously assumed.[94] They identified black pigment as franklinite, magnetite, and black manganese. A similar study using XRF and X-ray diffraction (XRD) to analyze the paint of two Banshan and five Machang-period vessels from the sites of Dibaping and Jiangjiaping showed that red pigment was made from hematite, while black pigment consisted of franklinite, magnetite, and hausmannite.[95] The

[91] Ma Qinglin 馬清林, "Gansu xinshiqi shidai yu qingtong shidai zhitao gongyi taoqi yanliao ji taoqi chengfen fenlei yanjiu 甘肅新時期時代與青銅時代制陶工藝陶器顏料及陶器成分分類研究 [Research on the classification of pottery pigments and pottery compositions in the Neolithic and Bronze age of Gansu]" (Ph.D. diss., Department of Chemistry, Lanzhou University, Lanzhou, 2000).

[92] Ma Qinglin 馬清林, Kang Mingda 康明大, and Lu Yanling 盧燕玲, "Gansu xinshiqi shidai yu qingtong shidai taoqi yanjiu de neirong he kexue yiyi 甘肅新石器時代與青銅時代陶器研究和科學意義 [Content and scientific meaning of research on ceramics of the Neolithic and Bronze Age ceramics from Gansu]," *Wenwu baohu yu kaogu kexue* 文物保護與考古科學 [*Conservation of cultural relics and archaeological sciences*] 14.2 (2002): 44–51.

[93] Chen Xiaofeng 陳曉峰, Ma Qinglin 馬清林, Song Dakang 宋大康, "Majiayao leixing caitao heibai yanliao de X- shexian yanshe fenxi 馬家窯類型彩陶黑、白顏料的X-射綫衍射分析 [X-ray diffraction analysis of black and white pigments in Majiayao- type painted pottery]," *Lanzhou Daxue xuebao* 蘭州大學學報 [*Lanzhou University Journal*] 2 (2000): 54–59; Chen Xiaofeng 陳曉峰, Ma Qinglin 馬清林, Zhao Guangtian 趙廣田, "Banshan, Machang qi hei, hong fuhe yanliao yanjiu 半山、馬廠期黑、紅複合顏料研究 [Research on the composite pigments of black and red multi-colored pottery of the Banshan and Machang period]," *Lanzhou Daxue xuebao* 蘭州大學學報 [*Lanzhou University Journal*] 5 (2000): 71–76; Ma Qinglin 馬清林, Hu Zhide 胡之德, Li Zuixiong 李最雄, and Liang Baoliu 梁寶鎏, "Gansu Qin'an Dadiwan yizhi chutu caitao (caihuitao) yanliao yiji kuaizhuang yanliao fenxi yanjiu 甘肅秦安大地灣遺址出土彩陶（彩繪陶）顏料以及快裝顏料分析研究 [Analysis of paints of painted pottery and pigment blocks unearthed from the Dadiwan Site, Qin'an, Gansu]," *Wenwu* 文物 [*Cultural relics*] 8 (2001): 84–92; Ma Qinglin 馬清林, Hu Zhide 胡之德, and Li Zuixiong 李最雄, "Gansu gudai caitao de kexue fenxi yu jianbie 甘肅古代彩陶的科學分析與鑒別 [Scientific analysis and identification of prehistoric painted pottery in Gansu]," *Gugong wenwu yuekan* 故宮文物月刊 [*Monthly journal on the cultural relics of the Forbidden City*] 222 (2001): 76–83; Ma Qinglin 馬清林, Liang Baoliu 梁寶鎏, Yan Aixia 閻愛俠, and Hu Zhide 胡之德, "Nengliang sesan X-yingguang guangpu he rengong shenjing wangluo zai Gansu xinshiqi shidai taopian fenlei yanjiu zhong de yingyong 能量色散X-熒光光譜和人工神經網絡在甘肅新石器時代陶片分類研究中的應用 [Application of EDXRF and artificial neural networks to provenance studies of the archaeological pottery sherds during Neolithic Age in Gansu Province, China]," *Lanzhou Daxue xuebao (ziran kexue ban)* 蘭州大學學報（自然科學版） [*Scientific journal of Lanzhou University* (natural sciences series)] 39.1 (2003): 47–53; Ma Qinglin 马清林, Su Baimin 蘇伯民, Hu Zhide 胡之德, and Li Zuixiong 李最雄, "Gansu Qin'an Dadiwan yizhi chutu taoqi chengfen fenxi 甘肅秦安大地灣遺址出土陶器成分分析 [Composition analysis of pottery sherds unearthed from the Dadiwan Site, Qin'an County, Gansu]," *Kaogu* 考古 [*Archaeology*] 8 (2004): 86–93.

[94] Chen Xiaofeng 陳曉峰, Ma Qinglin 馬清林, Song Dakang 宋大康, "Majiayao leixing caitao heibai yanliao de X- shexian yanshe fenxi 馬家窯類型彩陶黑、白顏料的X-射綫衍射分析 [X-ray diffraction analysis of black and white pigments in Majiayao-type painted pottery]," 54–59.

[95] Chen Xiaofeng 陳曉峰, Ma Qinglin 馬清林, Zhao Guangtian 趙廣田, "Banshan, Machang qi hei, hong fuhe yanliao yanjiu 半山、馬廠期黑、紅複合顏料研究 [Research on the composite pigments of black and red multi-colored pottery of the Banshan and Machang period]," 71–76.

authors also conducted experimental research and were able to show that several different minerals were mixed at times to obtain specific colors.[96]

Another study covers research on 44 sherds from the five phases of Dadiwan, again using XRF and XRD, and considering macroscopic observations on ware composition, color, and forming technique.[97] According to Ma et al.'s assessment, Banpo and Miaodigou-type ceramics at Dadiwan and other sites in the Qin'an region are mostly made of levigated clay which helped reduce the CaO contents to prevent lime spalling and vessel failure, but also to improve the color, vessel strength and evenness of the surface, and durability of the paint. In a separate study, Ma et al. used P-ED-XRF equipment to analyze 70 sherds from Phases 1, 2, 4, and 5 of Dadiwan, the Yangshao-period site of Pingliang, and the Majiayao-period site of Yongdeng.[98] The results suggest that two samples of Dadiwan Phase 5 pottery had come from Pingliang and three from Yongdeng, exemplifying what the authors refer to as short-distance (150 km) and long-distance (500 km) exchange of ceramics between sites, which agrees with their observations on vessel style, decoration, and manufacturing techniques. Additional work by **Ma Hongjiao**, **Anke Hein**, **Julian Henderson**, and Ma Qinglin at Dadiwan has addressed geological differences (or lack thereof) between different parts of the Loess plateau.[99] They found that raw materials available in the eastern and western part of the Loess Plateau are different, and Miocene red clay was the most commonly used by Dadiwan potters. Only Yangshao wares in early layers at Dadiwan were made from different material, suggesting that they were imports from the Yangshao heartland. This paper shows the substantial potential of consulting existing geological research together with local geological survey and multi-method analysis of ceramic and geological samples.

Vandiver as well as Zhou and Ma Qinglin and their colleagues have clearly demonstrated the usefulness of archaeometric research for exploring ceramic production methods in early China. While Ma has been able to draw initial conclusions on ceramic exchange from his research, in recent years increasing numbers of archaeologists have focused on this topic, perhaps due to the growing focus in the archaeology of northwestern China on the role of exchange in introducing new domesticates and technologies to the region during

[96] Further detailed research on paint pigments from various sites in northwestern China and beyond have furnished similar results. For a summary of this work, consult Rong Bo 容波, Chen Hong 陳洪, Wu Lina 武麗娜, Li Bin 李斌, Ma Yu 馬宇, Nie Li 聶莉, and Cui Dalong 崔大龍, "Ganqing diqu chutu zaoqi caitao kexue yanjiu shuping 甘青地區出土早期彩陶科學研究述評 [A review of scientific research on early colored pottery unearthed in Gansu and Qinghai]," *Qin Shi Huangdi Ling Bowuyuan* 秦始皇帝陵博物院 [*Museum of the mausoleum of the Qin Emperor*] 8 (2018): 191–206.

[97] Ma Qinglin 馬清林, Su Baimin 蘇伯民, Hu Zhide 胡之德, and Li Zuixiong 李最雄, "Gansu Qin'an Dadiwan yizhi chutu taoqi chengfen fenxi 甘肅秦安大地灣遺址出土淘氣成分分析 [Composition analysis of pottery sherds unearthed from the Dadiwan Site, Qin'an County, Gansu]".

[98] Ma Qinglin 馬清林, Liang Baoliu 梁寶鎏, Yan Aixia 閻愛俠, and Hu Zhide 胡之德, "Nengliang sesan X-yingguang guangpu he rengong shenjing wangluo zai Gansu xinshiqi shidai taopian fenlei yanjiu zhong de yingyong 能量色散X-熒光光譜和人工神經網絡在甘肅新石器時代陶片分類研究中的應用 [Application of EDXRF and artificial neural networks to provenance studies of the archaeological pottery sherds during Neolithic Age in Gansu Province, China]".

[99] Ma Hongjiao, Anke Hein, Julian Henderson, and Ma Qinglin, "The geology of Tianshui-Qin'an area of western Loess Plateau and the chemical characteristics of its Neolithic pottery," *Geoarchaeology* 35 (2020): 611–624.

the late Neolithic period. The resulting studies have not only brought new technologies to the study of ceramics in northwestern China but have also provided new insights into both short and long-distance interactions.

4.2 Archaeometric Approaches to Ceramic Exchange

In recent years, work by Hung Ling-yu (Hong Lingyu) and other members of the TRAP, as well as by **Cui Jianfeng**, and Chen Honghai, as well as Wang Hui and Chen Jian[100] sparked a lively discussion about ceramic exchange in northwestern China. Research by **Hung Ling-yu** included typological studies of Yangshao painted pottery and studies of firing technology using ethnoarchaeology.[101] In her PhD dissertation, Hung focused on Majiayao ceramic production and its relation to craft specialization, mortuary practices, and culture contact.[102] Based on laser ablation inductively coupled plasma atomic emission spectrometry (LA-ICP-AES) analyses on a large number of samples from Gansu, Qinghai, and Sichuan, Hung and her colleagues suggested that painted wares produced in the Tao River Valley in Gansu were exported as far as northern Sichuan; however, due to homogenous geology in the region, they were not able to pinpoint a precise origin for any of the vessels analyzed.[103] Ren et al. re-analyzed their data confirming their results but suggested that chemical analysis alone is not sufficient, and needs be combined with information on painting and vessel

[100] Hung Ling-yu (1975–2017) (referred to as Hong Lingyu in Chinese publications due to differences in Romanization (Pinyin vs Wade-Giles); dissertation work at Washington University in St. Louis; later at Indiana University); Cui Jianfeng (2006 PhD from Peking University, material sciences and archaeology, Peking University); Chen Honghai (*1964, Northwestern University, archaeologist); Wang Hui (2006 PhD from Kobe University; Gansu Provincial Institute of Archaeology, Fudan University); Chen Jian (*1971, Chengdu City Institute of Archaeology).

[101] Hung Ling-yu (Hong Lingyu) 洪玲玉, "Zhongguo xinshiqi shidai de zaowenhua yanjiu: yige minzu kaoguxue de guandian 中國新石 器時代的灶文化研究：一個民族考古學的觀點 [Study on hearths of the Chinese Neolithic period: An ethnoarchaeological perspective]," *Qingnian kaogu xuejia* 青年考古學家 [*Young archaeologists*] 10 (1998): 60–67; Hung Ling-yu (Hong Lingyu) 洪玲玉, "Weihe liuyu yangshao wenhua caitao huawen yanjiu 渭河流域仰韶文化彩陶花紋研究 [Study on ceramic decoration designs of the Yangshao culture in the Weihe River Valley]" (Master's Thesis, Department of Archaeology, Peking University, Beijing, 2000).

[102] Hung Ling-yu, "Pottery Production, Mortuary Practice, and Social Complexity in the Majiayao Culture, NW China (ca. 5300–4000 BP)".

[103] Hung Ling-yu (Hong Lingyu) 洪玲玉, Cui Jianfeng 崔劍鋒, Wang Hui 王煇, and Chen Jian 陳劍, "Chuanxi Majiayao leixing caitao chanyuan fenxi yu tantao 川西馬係窯文化類型彩陶產源分析與探討 [Analysis and discussion on the origin of the painted pottery of the Majiayao culture in western Sichuan]," *Nanfang minzu kaogu* 南方民族考古 [*Southern Ethnology and Archaeology*] 7 (2011): 1–58; Hung Ling-yu (Hong Lingyu) 洪玲玉, Cui Jianfeng 崔劍鋒, and Chen Honghai 陳洪海, "Yimin, maoyi, fangzhi yu chuangxin: Zongri yizhi xin shiqi shidai wanqi taoqi fenxi 移民、貿易、仿製創新：総日遺址新時期時代晚期陶器分析 [Migration, trade, imitation, and innovation: Analysis of pottery at the Zongri site in the late era in the new era]," *Kaoguxue yanjiu – qingzhu Yan Wenming xiansheng bashi shouchen lunwenji* 考古學研究——慶祝嚴文明先生八十壽辰論文集 [*Collection of essays on archaeological research in celebration of the 80th Birthday of Mr. Yan Wenming*] 8 (2012): 242–262; Hung Ling-yu, Cui Jianfeng, and Chen Honghai, "Emergence of Neolithic Communities on the Northeastern Tibetan Plateau: Evidence from the Zongri Cultural Sites," in *The Crescent-Shaped Cultural-Communication Belt: Tong Enzheng's Model in Retrospect: An Examination of Methodological, Theoretical and Material Concerns of Long-Distance Interactions in East Asia*, ed., Anke Hein (Oxford: British Archaeological Reports, 2014), 66–78.

styles.[104] They also question Hung et al.'s assumption that the high calcium contents in painted pottery samples are due to the high calcium contents of clays from northwestern China. As Huan (this volume) discusses in detail, high calcium loess and red clay are also available in northwestern Sichuan, and calcium may have entered the ceramics during raw material processing or after deposition.[105] He also points out that using but six elements in statistical analysis (out of only 12 tested for by Hung et al.) can only point to large geological regions but not to specific sources. Instead, he suggests, future studies should take into account trace elements for source fingerprinting and raw material processing.

In spite of all these issues, similar techniques have been adopted by other studies. For instance, **Cui Yifu** et al. conducted XRF analysis on 118 potsherds from Yangshao, Majiayao, and Qijia-period sites, inferring that during the late Yangshao and Majiayao periods most wares were made locally while the Qijia period saw inter-regional exchange between groups in Gansu and Qinghai.[106] In another study, **Hou Guangliang** et al. reach the conclusion that major and minor elements alone are not enough to reach firm conclusions on the source material of specific pots.[107] Nevertheless, they say so only in a side remark while their article on the whole concludes that Majiayao type pottery found at Zongri was imported from Gansu. Yet another study by **Xiang Jihui** collates the results of chemical analyzes on painted pottery sherds from two Majiayao sites in Gansu (Dalijiaping and Linjia), Qinghai (Zongri), and Sichuan (Haxiu, Boxi, Yingpanshan) conducted by other scholars using various methods (in and of itself a problematic proposal), to address the issue of contact between Gansu, Qinghai, and Sichuan, arriving at the conclusion that the early painted pottery in Sichuan at sites such as Haxiu may have been imported from further north while later painted pottery from Yingpanshan may be local products.[108] These inferences are problematic for the same reasons as those pointed out by Huan (this volume) in reference to the work by Hung et al. This does not mean, however, that there was no contact. Indeed, other kinds of evidence cited by Hung et al. such as similarities in ceramic shapes and/or decoration do point to some form of contact between the regions.[109] However, the

[104] Ren Ruibo 任瑞波, Chen Wei 陳葦, and Ren Yunjian 任贇娟. "Chuanxi caitao chandi laiyuan xinshuo jiantan 川西彩陶產地來源新說檢討 [A renewed discussion on the origin of the raw materials of the painted pottery of western Sichuan]," *Sichuan wenwu* 四川文物 [*Sichuan cultural relics*] 2 (2013): 40–45.

[105] Huan Limin, "Rethinking Provenance Studies of Painted Neolithic Pottery from Western China," *Bulletin of the Museum of Far Eastern Antiquities*, this volume.

[106] Cui Yifu, Guanghui Dong, Haiming Li, Ting An, Xinyi Liu, Jian Wang, Hui Wang, Xiaoyan Ren, Xiaobin Li, and Fahu Chen, "Early ceramic trade in Gansu and Qinghai regions, northwest China: A comparative elemental analysis on sherds of Majiayao culture, Yangshao culture and Qijia culture," *Journal of Archaeological Science*: Reports 3 (2015): 65–72.

[107] Hou Guangliang 侯光良, E Chongyi 鄂崇毅, Yang Yang 楊陽, and Wang Qingbo 王青波, "Gongcun yu jiaoliu: Qingzang gaoyuan dongbeibu shiqian taoqi yuandi fenxi 共存與交流——青藏高原東北部史前陶器來源地分析 [Codependent and exchange: the source analysis of prehistoric pottery in the Northeast Tibetan Plateau]," *Diqu huanjing xuebao* 地球環境學報 [*Journal of earth environment*] 7.6 (2016): 556–569.

[108] Xiang Jinhui 向金辉, "Chuanxi Majiayao wenhua caitao laiyuan zai jianshi: yi taoqi huaxue chengfen wei zhongxin 川西馬家窯文化彩陶來源再檢視——以陶器化學成分分析爲中心 [Re-examination of the source of Majiayao culture painted pottery from western Sichuan — focusing on the analysis of the chemical composition of the pottery]," *Sichuan wenwu* 四川文物 [*Sichuan cultural relics*] 4 (2018): 81–90.

[109] Hung Ling-yu, Cui Jianfeng, and Chen Honghai, "Emergence of Neolithic Communities on the Northeastern Tibetan Plateau: Evidence from the Zongri Cultural Sites."

connections need to be investigated not solely based on comparative chemical analysis of ceramics, especially if these analyses take into account only a few major and minor elements or rely on a very small number of samples per site.

Additional research on ceramic exchange has occurred as part of the TRAP, a project which has been investigating the intersection of technological, social, and environmental change in early Bronze Age northwest China since 2012. In that context, many of the sites originally discovered by Andersson (Majiayao, Qijiaping, Huizuiwa, Siwa, Xindian), but also more recent discoveries such as Dibaping and Dayatou have been surveyed and, in some cases, re-excavated.[110] The ceramic material recovered during this fieldwork has been the basis of ceramics research by a number of scholars including Hung Ling-yu, Andrew Womack, Yitzchak Jaffe, and Anke Hein.

Womack has focused on raw-material procurement and processing using petrographic analysis of several hundred sherds from three Majiayao-period contexts at Dibaping, Dayatou, and Siwashan, as well as two Qijia-period contexts at Qijiaping and Majiayao, alongside geological samples from throughout the region.[111] Taking a communities of practice approach, this research focused on identifying production groups using potentially unique paste recipes to produce various types of vessels. Womack found that for the Majiayao period in the northern Tao River Valley exchange of cord-marked vessels found in habitation contexts took place with multiple other groups, likely on a local basis, while finewares from mortuary contexts had more diverse paste recipes than those from habitation contexts. For the Qijia period, both finewares and cord-marked vessels appear to have been exchanged regularly, seemingly with the same exchange partners as during the Majiayao period, pointing to long-term continuity in both production practices and exchange relationships, despite significant changes in vessel forms. In addition to petrographic analysis, Womack and Jaffe have also undertaken use-wear research, which fits in with a wider trend in experimental archaeology that has been underway in northwestern China since the 1980s.

4.3 Experimental Research in Gansu and Abroad

With the support of museums in Gansu and Qinghai, **Li Husheng** conducted experimental work trying to recreate Majiayao-style vessels.[112] Based on this work, he argued that

[110] Hung Ling-yu (Hong Lingyu) 洪玲玉, Wu Haosen 吴浩森, Ha Ke 哈克, Zhou Jing 周靜, Wang Hui 王輝, Chen Bozhen 陳伯楨, Li Shuicheng 李水城, Fu Luowen 傅罗文, "Qijiaping: Qijia wenhua dianxing yizhi yanjiu de xin jinzhan 齊家坪：齊家文化典型遺址研究的新發展 [Qijiaping: Recent developments in the investigation of the type site of the Qijia culture]," *Kaogu yu wenwu* 考古與文物 [*Archaeology and cultural relics*] 3 (2019): 63–74; Andrew Womack, "Crafting community, exploring identity and interaction through ceramics in late Neolithic and early Bronze Age Northwest China" (Ph.D. diss., Department of Anthropology, Yale University, 2017); Andrew Womack, Hui Wang, Jing Zhou, and Rowan Flad, "A petrographic analysis of clay recipes in Late Neolithic north-western China: continuity and change;" Andrew Womack, Timothy Horsley, Hui Wang, Jing Zhou, and Rowan Flad, "Assessing site organization and development using geophysical prospection at Dayatou, Gansu, China," *Journal of Archaeological Science*: Reports 27 (2019): 101964.

[111] Andrew Womack, "Crafting community, exploring identity and interaction through ceramics in late Neolithic and early Bronze Age Northwest China"; Andrew Womack, Hui Wang, Jing Zhou, and Rowan Flad, "A petrographic analysis of clay recipes in Late Neolithic north-western China: continuity and change".

[112] Li Husheng 李湘生, "Shixi Yangshao wenhua caitao de niliao, zhitao gongyi, lunhui jishu he yishu 試析仰韶文化彩陶的泥料、製陶工藝、輪回技術和藝術 [Preliminary research on clay, production process,

Majiayao potters used what he calls yellow and red clay (*huang nietu* 黄粘土 and *hongtu* 紅土) from the Yellow River basin that was naturally levigated, a suggestion that was supported by earlier chemical analysis.[113] In terms of production methods, he suggests two main categories, hand making and wheel-shaping, with five different methods of hand-shaping. For instance, he suggests that Machang and Banshan-period painted pottery jars were made with external molds as Palmgren had suggested. In fact, Li seems to have consulted Palmgren's work and conducted experiments accordingly. He also discusses painting methods, suggesting the use of a turntable in some cases, noting changes over time in both arrangement of patterns over vessel surfaces and their effects on how the person applying these motifs would have had to sit and move their hand and body. This attention to action, movement and how the body of the individual craftsperson would have been intertwined with the range of products they made and the raw materials they use is an unusual approach for the time, one that has unfortunately not been taken up by other scholars in China but has only recently come to be applied to ceramics research conducted by scholars in movement sciences such as Enora Gandon – notably without knowledge of Li's work.[114]

Further experimental analysis was conducted by a team from the **Gansu Provincial Museum** in the 1980s, in part based on experiments conducted by **Li Wenjie** (*1935), however a summary of the findings was not published until 2005.[115] The main aim of the project was to reconstruct the development and improvement of ceramic technology from Dadiwan to the early historical period using a combination of experimental research and ethnographic observation. For their research they examined clay selection, preparation techniques, painting, and firing, observing that pottery likely used quaternary red soil that was usually dried and smashed to remove coarse particles, then ground and levigated to remove further impurities.[116] Mortar and pestles were likely used for paint preparation, and fine or coarse-haired brushes, some made of wolf or deer hair, as Li Husheng suggests, were likely used for painting.[117] After the paint had been applied and was completely dry,

painting technique, and art of Yangshao culture painted pottery]," *Zhongyuan wenwu* 中原文物 [*Cultural relics of the Central Plain*] 1 (1984): 53–59.

113 Zhou Ren 周仁, Zhang Fukang 張福康, and Zheng Yongpu 鄭永圃, "Woguo Huanghe liuyu xin shiqi shidai he Yin Zhou shidai zhitao gongyi de kexue zongjie 我國黃河流域新石器時代和殷周時代製陶工藝的科學總結 [Scientific summary of ceramic technology in the Neolithic and Yin-Zhou periods in the Yellow River Basin of China 9," 1–27.

114 e.g., Enora Gandon, and Valentine Roux, "Cost of motor skill adaptation to new craft traits: Experiments with expert potters facing unfamiliar vessel shapes and wheels," *Journal of Anthropological Archaeology* 53 (2019): 229–239.

115 Li Wenjie 李文傑, *Zhongguo gudai zhitao gongyi* 中國古代志濤工藝 [*Pottery making technology in ancient China*] (Beijing: Kexue Chubanshe 科學出版社, 1996); Li Wenjie 李文傑, "Zhongguo gudai zhitao gongyi de fenqi yu leixing 中國古代製陶工藝的分期和類型 [Types and development of pottery making in ancient China]," *Ziran kexueshi yanjiu* 自然科學史研究 [*Research on the history of natural history*] 15.1 (1996): 80–91.

116 Li Wenjie 李文傑, *Zhongguo gudai zhitao gongcheng jishu shi* 中國古代志濤工藝技術史 [*The history of early pottery production in China*] (Taiyuan: Shanxi Jiaoyu Chubanshe 陝西教育出版社, 2017); Li Wenjie 李文傑, Lang Shude 郎樹德, and Zhao Jianlong 趙建龍, "Gansu Qin'an Dadiwan yiqi taogongyi yanjiu 甘肅秦安大地灣一期製陶工藝研究 [Research on the ceramic technology of Dadiwan period I, Gansu]," *Kaogu yu wenwu* 考古與文物 [*Archaeology and cultural relics*] 2 (1996): 22–34.

117 Li Husheng 李湘生, "Shixi Yangshao wenhua caitao de niliao, zhitao gongyi, lunhui jishu he yishu 試析仰韶文化彩陶的泥料、製作工藝、輪繪技術和藝術 [Preliminary research on clay, production process,

the vessels were polished with smooth stones, bone, or wood, thus giving the vessel a shine, and embedding the paint more firmly into the clay. Based on the mottled color and the lack of discernible kilns at the site, Li suggests that early Dadiwan pottery was pit-fired at low temperatures of around 750°C. The Yangshao-period kilns at Dadiwan (35) and Tianshui Zhaocun (6) were mostly horizontal kilns, in the later periods with several fire channels, or even updraft kilns for firing at 900–1000°C with a well-controlled firing atmosphere allowing for the production of increasingly grey pottery (reduced firing).

Additional research on forming methods and use-wear have been undertaken in Gansu as part of TRAP by **Jaffe**, **Womack and Wang**, and **Dammer.**[118] Jaffe's work included a comparative analysis of Zhou-period pottery and the Zhou expansion by examining Siwa *li* vessels from Gansu as well as Zhou-period pottery from Shandong. By mapping use patterns including carbonization and sooting on *li* from the Tianma-Qucun cemetery and comparing the result to works on use-wear from other parts of the world, Jaffe was able to determine that multiple modes of food preparation were taking place using the same types of vessels. Womack and Wang focused on both manufacturing marks and use-alteration on vessels from the Banshan cemetery of Dibaping and cemetery portion of the Qijia type-site. Results revealed that vessels from Dibaping appear to have highly variable manufacturing marks, likely indicating diverse origins. Use-alteration was also variable, with virtually all vessels being used extensively before being placed in graves, but in different ways, despite similarities in vessel forms. Qijia vessels also all appear to have been used before being placed in graves, calling into question whether any vessels in either period were made exclusively for placement in burials.

In 2019–2020 Evgenia Dammer conducted firing experiments and petrographic analysis of geological samples collected around the Majiayao type-site as a part of a collaborative PhD project between the Oxford University and the British Museum.[119] More than three dozen samples of clay, sand, and stone were collected. After purifying the sampled clay by suspension, four briquettes were made from each sample – three for firing and one for reference and comparison. The briquettes were fired at 700°, 900° and 1050°C. All samples, except one, stayed intact immediately after firing. After several hours of cooling at room temperature half of the samples were damaged by lime building. Dammer's results demonstrated that seemingly homogeneous sediments around the Majiayao site have different elemental and clay mineral composition that would likely have been noticed by prehistoric

painting technique, and art of Yangshao culture painted pottery]," *Zhongyuan wenwu* 中原文物 [*Cultural relics of the Central Plain*] 1 (1984): 53–59.

[118] Karine Taché, Yitzchak Jaffe, Oliver E. Craig, Alexandre Lucquin, Jing Zhou, Hui Wang, Shengpeng Jiang, Edward Standall, and Rowan K. Flad. "What do "barbarians" eat? Integrating ceramic use-wear and residue analysis in the study of food and society at the margins of Bronze Age China." Plos one 16, no. 4 (2021): e0250819. Yitzchak Jaffe, "The Continued Creation of Communities of Practice – Finding Variation in the Western Zhou Expansion (1046–771 BCE)" (PhD Dissertation: Harvard University, 2016); Andrew Womack, and Hui Wang, "Formation and Function of Majiayao and Qijia Pottery: Analysis of Manufacturing Marks and Use-alteration on Vessels from the Tao River Valley;" Evgenia Dammer, "Technological transfer in Majiayao-style pottery production between Neolithic communities in northwest China" (DPhil thesis, School of Archaeology, University of Oxford, Oxford, forthcoming).

[119] Evgenia Dammer, forthcoming, "Technological transfer in Majiayao-style pottery production between Neolithic communities in northwest China."

potters. Comparison with Majiayao pottery on the mineralogical or elemental level should help clarify how Majiayao potters chose between available options.

Petrographic study of the experimentally fired briquettes revealed that the mineral composition of the natural clay largely matches the composition of fine prehistoric pottery fabrics. There were no coarse fabrics among the fired briquettes which leads to the conclusion that the coarse mineral inclusions in the prehistoric pottery were added by potters. The mineral composition of rock samples collected in the study area corresponds to the types of coarse mineral inclusions found in Majiayao pottery fabrics. The preferred rock temper in the pottery fabrics appears to be granite or granodiorite which is not easily found in the immediate vicinity of the Majiayao site. A future study addressing these questions is planned to address how prehistoric potters engaged with their environment.

Additional insight into forming technology comes from **Elizabeth La Duc** and **Angela Chang** using visual examination, X-ray radiography, and replication studies focusing on Qijia ceramics held at the Harvard Art Museum in connection with the exhibition "Prehistoric Pottery from Northwest China".[120] They focused on the use of a turntable vs a potter's wheel and other forming methods, as well as the application of surface decorations. They refute Bylin-Althin's theory that Qijia pottery was made with basket molds but rather suggested that they were coil-built, beaten, and finished on a turntable. As to decorations, the authors see the term cord-marked as problematic and suggest based on experimental research that combs and carved paddles may have been used rather than cords. Additionally, they discovered traces of cinnabar on several vessels that were thought to be undecorated; however, follow-up research by Womack on several excavated samples from Gansu did not reveal presence of cinnabar.[121] Cinnabar has been noted in other Qijia burials,[122] and the traces observed by La Duc and Chang may be left by the use of cinnabar in burial ritual or by actual decoration.

As each of these studies has demonstrated, careful scientific analysis combined with ethnographic observation and experimental studies may provide significant insights into how ancient pottery was produced and used. In combination with provenance studies, we are now able to better understand the entire chain of pottery production for some groups in northwestern China, from clay selection to forming and decoration to firing, use, and deposition. It is also apparent, however, that there are a number of controversies on raw material sources and firing in particular that need more research to be resolved. At the same time, an increasing number of studies are focusing not just on ancient technology, but on what production, exchange, and use can tell us about larger questions of social organization and interaction that have implications of our understanding of Neolithic and

[120] Elizabeth La Duc, and Angela Chang, "Analysis and Replication Studies of Prehistoric Chinese Ceramics from the Qijia Culture," *Materials Issues in Art and Archaeology* XI 2 (35–36) (2017): 1849–1867; Hung Ling-yu, and Rowan Flad, "Prehistoric Pottery from Northwest China," Website accompanying the installation Prehistoric Pottery from Northwest China on display May 21–August 14 in the Harvard Art Museums' University Study Gallery, Harvard Art Museum (2016). Accessed 5th of August 2020. https://www.harvardartmuseums.org/tour/prehistoric-pottery-from-northwest-china.

[121] Andrew Womack, and Hui Wang, "Formation and Function of Majiayao and Qijia Pottery: Analysis of Manufacturing Marks and Use-alteration on Vessels from the Tao River Valley."

[122] Honghai Chen, "The Qijia Culture of the Upper Yellow River Valley," in *A Companion to Chinese Archaeology*, ed., Anne P. Underhill (West Sussex, UK: Wiley-Blackwell, 2013), 105–124.

Bronze Age societies throughout the region. However, it is not only data from recent survey and excavation that is contributing to our understanding of these topics, but also new investigations of older collections presently being undertaken, particularly with Andersson's original materials at the MFEA.

4.4 Revisiting the Andersson Collections

While analytical work on old museum collections can be challenging due to risks of contamination and issues arising from a lack of information from the original excavations or surveys, on the upside it is often relatively easy to access these untapped data resources. Additionally, most issues can be overcome by carefully constructed research questions aided by a multi-stage approach encompassing pilot studies on selected materials in order to calibrate sampling and analytical methods. One such study is a pilot conducted as part of the long-term Andersson Prehistoric Pottery Analysis (APPA) project commenced by **Anke Hein** and **Ole Stilborg** in 2017 as a collaboration between the MFEA, University of Oxford, and Stockholm University with the aim of throwing new light on the ceramics held in the Andersson collections. The pilot study combined petrographic thin-section analysis of 11 samples from Majiayao, Qijia, and Xindian-period sites in northwestern China with handheld XRF (P-ED-XRF) analysis of 52 sherds, mostly Majiayao painted fine wares from Majiayao, Siwashan, and Xindian. The authors focus on behavioral patterns of raw material preparation to distinguish different ware and fabric groups and relate them to different craft traditions.

Results of the thin-section study on Majiayao and Qijia-period samples generally match those of previous TRAP studies, with the addition of the identification of crushed rock (different types of granite/granodiorite) appearing as temper in some coarse wares.[123] The 2019 study, furthermore, rediscovered Majiayao-style two-ware vessels already identified by Bylin-Althin and Sommarström in the first studies of the collection but not discussed since.[124] The two-ware vessels, combining a fine ware upper part with a coarse ware lower part, not only represents a remarkable craft feat but also form an important key to understanding the relationship between ware groups including the fabric solutions.[125] Analysis of Xindian-period pottery identified significant use of grog temper, including secondary grog (grog in grog), indicating an established tradition that is now the subject of a new study within the APPA project conducted by Stilborg and Hein.

Results of chemical analyses using the P-ED-XRF method suggest that Majiayao fine wares from different sites are virtually indistinguishable in composition (at the level of accuracy of this method), however, wares from the Majiayao type-site have considerably more variation. The results could not answer the question of central or dispersed production. The next step in the APPA project is currently underway and consists of thin-section

[123] Anke, Hein and Ole Stilborg, "Ceramic production in prehistoric northwest China: preliminary findings of new analyses of old material from the Museum of Far Eastern Antiquities, Stockholm," *Journal of Archaeological Science*: Reports 23 (2019): 104–115.

[124] Bo Sommarström, "The Site of Ma-Kia-Yao"; Margit Bylin-Althin, "The Sites of Ch'i Chia P'ing and Lo Han T'ang in Kansu."

[125] Ole Stilborg, and Anke Hein, "A Tale of Two Wares: An Unusual Type of Late Neolithic Vessels from Gansu Province, China," *Bulletin of the Museum of Far Eastern Antiquities*. This volume.

analyses of a larger sample of different vessel types from a broader range of sites, which it is hoped, will complement the increasing number of chemical and petrographic studies of ceramics from northwestern China.

As part of new research on the Andersson collections, Dammer has also conducted a petrographic study of 187 samples of Majiayao-style pottery from Majiayao, Waguanzui, Zhujiazhai and Luohantang, as well as macroscopic analysis on 47 complete vessels from the collection and three from the British Museum. The large distances between sites and the presence of pottery of the same style allowed for an investigation of possible pottery technology transfer between these sites. The results of this study are forthcoming.[126]

5. Discussion & Conclusion – How can New Approaches Inform Past Results?

When reflecting on 100 years of research on the pottery of northwestern China there are several clear currents that have ebbed and flowed over the decades. The strongest of these trends is undoubtedly typological research, which has been present in one form or another running from Andersson's initial classifications in the 1920s up through recent dissertations and publications in the 2010s. Over time, however, the ways in which typologies are formed, and the questions they have been used to answer, have become increasingly more sophisticated. Andersson, and those who immediately followed him, both in Sweden and China, were largely concerned with establishing and refining typochronologies. While Andersson's initial chronology lacked anchoring scientific dates and placed Qijia before Majiayao, it otherwise has been largely unchanged after those issues were corrected by Xia and later researchers who had access to additional data, including increasing numbers of C14 dates.[127] Scholars in the intervening years have further refined our understanding of typological and decorative change over time, for example breaking Majiayao into three subphases based on pottery forms and decorative motifs, and, less successfully, attempting to do the same for Qijia.

Other researchers have expanded their use of typological analysis for addressing other matters including questions of exchange, migration, subsistence practices, and cultural change over time. The earliest studies, as well as more recent approaches, have attempted to address issues of exchange and migration by simply comparing pottery forms and decoration between regions.[128] While these studies are helpful in considering general similarities and differences in form and decoration, they generally lack the ability to explain how and why pottery styles were potentially transferred between groups. This leaves one wondering if groups that share similar pottery styles actually had close relations, or simply

[126] Evgenia Dammer, "Technological transfer in Majiayao-style pottery production between Neolithic communities in northwest China."

[127] Xia Nai (Shiah Nae), "New Discovery of a Ch'i Chia Culture Cemetery.

[128] Chen Xiaosan 陳小三, "Hexi zoulang jiqi lingjin diqu zaoqi qingtong shidai yicun yanjiu 河西走廊及其領進地區早期青銅時代遺存研究;" Ren Ruibo 任瑞波, "Xibei diqu caitao wenhua yanjiu 西北地區彩陶文化研究 [Study on the Painted-Pottery Culture of Northwest Culture];" Ren Ruibo 任瑞波, "Xibei diqu caitao wenhua de yanjiu huigyu yu zhanwang 西北地區彩陶文化的研究回顧與展望;" Shui Tao 水濤, Zhongguo xibei diqu qingtong shidai kaogu lunji 中國西北地區青銅時代考古論集 [Papers on the Bronze Age Archaeology of Northwest China]; Yan Wenming 嚴文明, "Gansu caitao de yuanliu" 甘肅彩陶的源流 [The origin of the painted pottery of Gansu]," 62–76.

found a particular style aesthetically pleasing and thus copied it without engaging in closer ties. Luckily, other typological studies, pioneered by Li Shuicheng and soon taken up by others, have addressed this issue by supplementing their ceramic data with information on other aspects of material culture while also considering similarities and differences in ceramic production technologies.[129] These multifaceted approaches not only are more convincing by correlating multiple sources of data, but also are able to answer a wider range of questions regarding interaction and exchange or sharing of technologies and other cultural features. It is hoped that such multifaceted studies will point the way for future typological research, be it on questions of chronology, interaction, or cultural change.

A second major trend, that was present in some of the earliest research on pottery from the Northwest, but waned until recent decades, is archaeometric research on ceramic production, use, exchange, and relations to broader topics such as social organization. While it has been largely forgotten today, such studies were pioneered in the first half of the 20th century both in Sweden by Palmgren, Bylin-Althin, Sundius and others as well as in China by Wu Jinding.[130] This early work was largely descriptive in nature, however it utilized many techniques that are still common today, including manufacturing mark analysis, experimentation, and thin-section petrography. While many of these studies were cited by early researchers in China, including Xia and Pei, they were largely left out of later research trends, in part due to difficulty of locating these publications.[131] Experimental, ethnographic, and archaeometric studies took place sporadically in China and abroad[132] until they gained traction in the 2000s with work by Chen and Ma.[133] Now experimental and

[129] Li Shuicheng 李水城, *Banshan yu Machang caitao yanjiu* 半山與馬廠彩陶研究 [*Research on Banshan and Machang painted pottery*] (Beijing: Beijing Daxue Chubanshe 北京大学出版社, 1998); Chen Xiaosan 陳小三, "Hexi zoulang jiqi lingjin diqu zaoqi qingtong shidai yicun yanjiu 河西走廊及其領進地區早期青銅時代遺存研究. ."

[130] Nils Palmgren, "Kansu mortuary urns of the Pan Shan and Ma Chang groups, China. Geological survey;" Margit Bylin-Althin, "The Sites of Ch'i Chia P'ing and Lo Han T'ang in Kansu;" Nils Sundius, *Some aspects of the technical development in the manufacture of the Chinese pottery wares of pre-Ming age* (Stockholm: Museum of Far Eastern Antiquities, 1961); Chin-ting Wu (Wu Jinding), *Prehistoric pottery in China.*

[131] Xia Nai 夏鼐, "Lintao Siwashan fajueji 臨洮寺窪山發覺記 [Excavation report on the site of Siwashan, Lintao]," 71–187.

[132] Zhou Ren 周仁, Zhang Fukang 张福康, and Zheng Yongpu 鄭永圃, "Woguo Huanghe liuyu xin shiqi shidai he Yin Zhou shidai zhitao gongyi de kexue zongjie 我國黃河流域新石器時代和殷商時代製陶工藝的科學總結 [Scientific summary of ceramic technology in the Neolithic and Yin-Zhou periods in the Yellow River Basin of China]"; Pamela Vandiver, "The implications of variation in ceramic technology: the forming of Neolithic storage vessels in China and the Near East."

[133] Chen Xiaofeng 陳曉峰, Ma Qinglin 馬清林, Song Dakang 宋大康, "Majiayao leixing caitao heibai yanliao de X- shexian yanshe fenxi 馬家窯類型彩陶黑、白顏料的X-射線衍射分析" [X-ray diffraction analysis of black and white pigments in Majiayao- type painted pottery]"; Chen Xiaofeng 陳曉峰, Ma Qinglin 馬清林, Zhao Guangtian 赵广田, "Banshan, Machang qi hei, hong fuhe yanliao yanjiu 半山、馬廠期黑、紅复彩陶器複合顏料研究 [Research on the composite pigments of black and red multi-colored pottery of the Banshan and Machang period]"; Ma Qinglin 馬清林, Hu Zhide 胡之德, Li Zuixiong 李最雄, and Liang Baoliu 梁寶鎏, "Gansu Qin'an Dadiwan yizhi chutu caitao (caihuitao) yanliao yiji kuaizhuang yanliao fenxi yanjiu 甘肅秦安大地灣遺址出土彩陶（彩繪陶）顏料以及塊 [Analysis of paints of painted pottery and pigment blocks unearthed from the Dadiwan Site, Qin'an, Gansu]," 84–92; Ma Qinglin 馬清林, Liang Baoliu 梁寶鎏, Yan Aixia 閻愛俠, and Hu Zhide 胡之德, "Nengliang sesan X-yingguang guangpu he rengong shenjing wangluo zai Gansu xinshiqi shidai taopian fenlei yanjiu zhong de yingyong 能量色散 X熒光光譜和人工神經網絡在甘肅新石器時代陶片分類研究中的應用 [Application of EDX-

scientific studies in China and abroad appear to be the dominant trend, largely outpacing production of exclusively typological research.

Addressing both trends, typology and archaeometry should not be viewed as serving different, let alone opposing purposes, but to the contrary, they ideally should be used in a complementary fashion, each considering results of the other in order to improve our overall understanding of past societies of northwestern China. Indeed, we suggest that the many new archaeometric studies can help inform and improve on past results. For instance, questions of interaction and exchange, still at the forefront of research in the region,[134] can now be considered from multiple angles. As an example, chemical and petrographic analysis of reasonable sample sizes of sherds from specific sites and pottery types, when paired with geological sampling, can allow researchers to pinpoint potential sources of pottery with specific paste recipes.[135] However, such studies are highly time consuming and moderately destructive, meaning only relatively small numbers of sites can be investigated each year. While efforts such as the China Ceramic Petrography Database are helpful in bringing together samples from multiple sites, the overall results of such studies are still limited geographically and chronologically.[136] However, when pottery types and decorations are also taken into account and matched with samples studied petrographically and/ or chemically, then larger patterns of interaction may be examined. While such studies are rare in China, approaches in other parts of the world combining chemical and typological data with network analysis have shown promising results in tracking large-scale exchange as well as long term trends in interaction and migration over time.[137]

The same synergies can be found in studies looking at other aspects of early societies in the Northwest including mortuary practices, subsistence, and social organization. For example, studies of Majiayao pottery from mortuary contexts have often treated painted pottery as something that was created specifically for placement in graves;[138] however, use-wear analysis has revealed that most painted pottery placed in graves, at least at the Banshan subphase cemetery of Dibaping, was heavily used before interment, calling into ques-

RF and artificial neural networks to provenance studies of the archaeological pottery sherds during Neolithic Age in Gansu Province, China]," 47–53; Ma Qinglin 馬清林, Su Baimin 蘇伯民, Hu Zhide 胡之德, and Li Zuixiong 李最雄, "Gansu Qin'an Dadiwan yizhi chutu taoqi chengfen fenxi 甘肅秦安大地灣遺址出土陶器成分分析 [Composition analysis of pottery sherds unearthed from the Dadiwan Site, Qin'an County, Gansu]".

134 Li Jaang, "The Landscape of Chinas Participation in the Bronze Age Eurasian Network"; Yitzchak Jaffe, and Rowan Flad, "Prehistoric Globalizing Processes in the Tao River Valley, Gansu, China?" in *Globalization and the People without History*, ed., Nicole Boivin, and Michael Frachetti (Cambridge: Cambridge University Press, 2018), 131–161.

135 Andrew Womack, Hui Wang, Jing Zhou, and Rowan Flad, "A petrographic analysis of clay recipes in Late Neolithic north-western China: continuity and change".

136 Andrew Womack, and Anke Hein, "China Ceramic Petrography Database." Open Context, [cited 2018-08-18 2018]. http://opencontext.org/projects/2c5addea-41d5-4941-b2bd-672bc1e60448.

137 Carl Knappett, *Network analysis in archaeology: New approaches to regional interaction* (Oxford University Press, 2013); Barbara J. Mills, Matthew A. Peeples, Jr W. Randall Haas, Lewis Borck, Jeffery J. Clark, and Jr John M. Roberts, "Multiscalar Perspectives on Social Networks in the Late Prehispanic Southwest," *American Antiquity* 80.1 (2015): 3–24.

138 Francis Allard, "Mortuary Ceramics and Social Organization in the Dawenkou and Majiayao Cultures".

tion the very existence of "mortuary" pottery.[139] As has been demonstrated in many parts of the world, including other regions of China, examination of manufacturing processes and production organization can provide significant information on social organization.[140] We hope this topic will be further explored in this region given the comparatively large number of studies that have now taken place on the production of Majiayao pottery. Aside from work on Majiayao pottery, we also hope that such studies will eventually be applied to pottery from other regions and time periods in the Northwest. Overall, we suggest that research combining these dominant trends of typology and archaeometry should be seen as complementary, and together can provide a better understanding of the ebb and flow of pottery production and use, as well as wider questions of interaction and social organization, throughout the Neolithic and Bronze Age in northwestern China.

139 Andrew Womack, and Hui Wang, "Formation and Function of Majiayao and Qijia Pottery: Analysis of Manufacturing Marks and Use-alteration on Vessels from the Tao River Valley".

140 Wesley Bernardini, "Kiln Firing Groups: Inter-Household Economic Collaboration and Social Organization in the Northern American Southwest," *American Antiquity* 65.2 (2000): 365–377; Cathy L. Costin, "Formal and technological variability and the social relations of production: Crisoles from San José de Moro, Peru," in *Material meanings: Critical approaches to the interpretation of material culture*, ed., Elizabeth S. Chilton (Salt Lake City: The University of Utah Press, 1999), 85–102; Rowan K. Flad, *Specialized salt production and changing social structure at the prehistoric site of Zhongba in the Eastern Sichuan Basin, China* (University of California, Los Angeles, 2004); Anne P. Underhill, *Craft production and social change in northern China* (London: Springer, 2002).

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A Tale of Two Wares: An Unusual Type of Late Neolithic Vessels from Gansu Province, China

by

Ole STILBORG and Anke HEIN

Abstract

A group of pots found at Majiayao-period Neolithic sites in Gansu and Qinghai Provinces is very special. As they are made of two parts – one coarse ware with a rusticated surface and one fine ware with a burnished, painted surface – we named the phenomenon Double-Wares. This group was acknowledged by Bylin-Ahltin and Sommarström in their analysis of ceramics from the Andersson collections but not studied further. Double-Wares defy a central rule in pottery making, to strive for a homogenous paste to avoid diverse rates of shrinkage leading to cracks during drying and firing. In this study, sherds from 15 different vessels of this type have been analysed by thin-section analysis. The results show different combinations of clays and tempers as well as different ways of uniting the two wares devised to reduce the risk of cracks along the joint. It suggests that different potters made both fine and coarse ware as well as Double-Wares. All known examples of Double-Wares are settlement finds and most are fragments of large vessels from spouted basins to two-handled shouldered jars. More pots of this type have been found in recent excavations at Majiayao and may have come out at other sites as well, though they were not recognized as a special phenomenon by the excavators. Double-Wares demonstrate a close connection between fabric and design and that the joining of fine and coarse ware despite the practical problems must have been meaningful. Future research should aim at exploring the meaning behind this unusual phenomenon.

Keywords:

Ceramic technology; Northwest China; Neolithic; painted pottery; Double-Ware; fine ware; coarse ware; thin-section analysis; temper; levigation; Majiayao; Luohantang

Introduction

In a way, ceramic material is a paradox: it is a heterogeneous material consisting of plastic material (the clay fraction) and non-plastic material (the silt/sand fraction and possible added temper) one of which (the clay) will shrink when dried and fired while the other (the non-plastics) will not. Therefore, the aim of the potter is to make the ceramic body as homogenous as possible to stay whole throughout the production process, meaning that a naturally heterogeneous material has to be made homogenous. Through the ages and around the world, potters have developed various solutions to the problem of uneven shrinkage, and it is rare to come across pottery craft challenging this basic goal of creating a homogenous ceramic body. This paper focuses on one rare exception, vessels made of two different wares, with and without temper, which we refer to as Double-Ware pots or Double-Wares.[1]

In connection with the Andersson Prehistoric Pottery Analysis project (APP-project), which focuses on the collections of ceramics from Northwest China assembled by Johan Gunnar Andersson in the 1920s and housed in the Museum of Far Eastern Antiquities (MFEA) in Stockholm, we encountered a sherd from a large pot with painted ornamentation on its smooth upper part (the *fine ware* part, hereafter FW) and a rusticated surface on its lower part (the *coarse ware* part, hereafter CW).[2] It was apparent macroscopically and later confirmed by microscopic thin-section analysis that the latter consisted of a fine clay tempered with coarsely crushed rock while the former was made from the same fine clay without added temper. This seemed a strange combination given what we know of the behavior of ceramic material. The more non-plastics (silt/sand/temper) a clay contains, the less the ceramics will shrink, while un-tempered material shrinks more significantly.[3] An un-tempered fabric and a tempered fabric thus react differently and when joined this difference in behavior will create tension resulting in cracks and potential vessel failure. We therefore decided to devote a special study to this type of ware to investigate if they were but a "one-off" experiment or a broader tradition. A survey of the collections at the MFEA brought to light a number of examples whose technological particularities as well as chronological and geographic spread and underlying motivations of production are discussed in this paper.

Background

Prehistoric Northwest China and the Andersson Collection

Among the various archaeological phenomena first identified in Northwest China by Andersson and his colleagues in the 1920s, the Majiayao-style painted fine wares are probably the most well-known and most intensively researched. Andersson saw Majiayao (c. 3,300–2,000 BCE) as part of the Yangshao cultural phenomenon (c. 5,000–3,000 BCE) which he had first identified in Henan and seen as remarkable for its high-quality painted

1 Two central concepts in the discussion to follow are "ware" and "fabric". We use these concepts with the following distinction: "Ware" is the broad concept - used for example in stoneware, earthenware, coarse ware, fine ware, kitchen ware. "Fabric" is a specific term for the composition of the fired ceramics as revealed by macroscopic or microscopic analysis.

2 Anke Hein, and Ole Stilborg, "Ceramic production in prehistoric northwest China: preliminary findings of new analyses of old material from the Museum of Far Eastern Antiquities, Stockholm," *Journal of Archaeological Science: Reports* 23 (2019): 104–115.

3 See e.g., Frank Hamer, and Janet Hamer, *The potter's dictionary of materials and techniques.* 5th ed (London, New York: Pitman Pub.; Watson-Guptill Publications, 2003).

pottery.[4] It had been in search for the origins of this painted pottery tradition that Andersson ventured into Northwest China, trying to establish if the painted pottery tradition of Neolithic northern China had come from western Asia or if it was a local development.[5] By now, it is clear that the painted pottery found in China is a phenomenon that first emerged in the middle Yellow River Valley, spreading from there into the region of modern-day Gansu Province, among other places, where it became the basis for the Majiayao painted pottery tradition.[6]

The MFEA holds about half of the items that Andersson retrieved during his survey and excavation work in various parts of China, among them materials from at least 12 sites with Majiayao-style ceramics, including the eponymous site of Majiayao. The ceramics from this collection have been the subject of some initial, mostly typological research by Andersson.[7] In the 1940s and 1950s, more detailed technological analyses – mostly macroscopic but also including a small number of thin sections – were undertaken on material from Majiayao,[8] Luohantang West, and Qijiaping.[9] Since then, most research on painted pottery in China has focused on questions of chronology, typology, and culture contact,[10] all of it based on newly excavated materials while the Andersson collections have until recently lain largely dormant.[11] Nevertheless, some progress has been made in understanding ceramic technology in prehistoric northwest China based on research conducted on newly excavated finds, focusing partially on raw-material sourcing, partially on ceramic technology.

Majiayao Pottery-making Technology

As was common among many pottery-making communities in the world and through the ages, Majiayao pottery production can also basically be divided into fine ware and coarse ware. The vessels were all coil-built or molded and sometimes further refined on a slow

4 Johan Gunnar Andersson, "Preliminary report on archaeological research in Kansu," *Memoirs of the Geological Survey of China* (Series A) 5 (1925): 1–51; Johan Gunnar Andersson, "Researches into the prehistory of the Chinese," *Bulletin of the Museum of Far Eastern Antiquities* 15 (1943): 1–198.

5 Magnus Fiskesjö, and Chen Xingcan, *China before China: Johan Gunnar Andersson, Ding Wenjiang, and the discovery of China's prehistory* (Stockholm: Museum of Far Eastern Antiquities, 2004); Magnus Fiskesjö, "Science across borders: Johan Gunnar Andersson and Ding Wenjiang," in *Explorers and Scientists in China's Borderlands, 1880–1950*," ed., Denise M. Glover, Steven Harrell, Charles F. McKhann, and Margaret Byrne Swain (Seattle: University of Washington Press 2011), 240–266.

6z Wang Hui 王煇, "Ganqing diqu xinshiqi qingtong shidai kaoguxue wenhua de puxi yu geju 甘青地區新石器--青銅時代考古學文化的譜系與格局 [Variants and patterns in the Neolithic and Bronze Age cultures of the Gansu-Qinghai region]," *Kaoguxue yanjiu* 考古學研究 9 (2012): 210–243.

7 Johan Gunnar Andersson, "Preliminary report on archaeological research in Kansu,"; Johan Gunnar Andersson, "Researches into the prehistory of the Chinese,"; Johan Gunnar Andersson, "The Site of Chu Chia Chai," *Bulletin of the Museum of Far Eastern Antiquities* 17 (1945): 1–64.

8 Bo Sommarström, "The Site of Ma-Kia-Yao," *Bulletin of the Museum of Far Eastern Antiquities* 28 (1956): 55–138.

9 Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," *Bulletin of the Museum of Far Eastern Antiquities* 18 (1946): 383–554.

10 Anke Hein, Andrew Womack, Evgenia Dammer, and Ole Stilborg, "Investigating prehistoric pottery from northwest China: from Andersson's first excavations to contemporary research," *Bulletin of the Museum of Far Eastern Antiquities* (this volume).

11 Anke Hein, and Ole Stilborg, "Ceramic production in prehistoric northwest China: preliminary findings of new analyses of old material from the Museum of Far Eastern Antiquities, Stockholm," 104.

wheel with paddle and anvil.[12] Fine-ware vessels underwent further surface compaction and burnishing and were sometimes slipped. Grey (reduced-fired) fine wares are either plain or comb-marked and sometimes carry appliqué bands while the yellow-reddish (oxidized) fine wares are often brush-painted using black, red, and/or white pigments; coarse wares often have a rusticated surface achieved by cord or mat impressions.[13] Vessel forms include basins, open and closed bowls, pointed-bottom vases, and jars of various sizes.[14] The painted fine wares – most of them bowls, basins, and pointed-bottom jars – are decorated with geometric motifs that are shared throughout Gansu and Qinghai but vary somewhat chronologically between the three Majiayao sub-phases, Majiayao, Banshan, and Machang.[15]

For the painted fine wares, it has been suggested that the firing temperature was around 1000°C[16] and based on that relatively high temperature and the uniform yellow-orange surface color it has been inferred that at least some of the painted fine wares were fired in kilns.[17] The coarse wares were likely fired at lower temperatures, though, and might have been produced in open firing. Thin-section studies have also shown that even the fine wares often contain mica that is still anisotropic and optically active, showing that the firing temperature cannot have exceeded 700°C for a long period, so these could have been produced in open firings or a kiln.[18]

The kilns found so far at Majiayao sites are horizontal or vertical updraft kilns as seen at Baidaoguoping, Linjia, and Xipogu, the latter of which have diameters of 0.4 to 1.3 m.[19]

[12] Andrew Womack, "Crafting community, exploring identity and interaction through ceramics in late Neolithic and early Bronze Age Northwest China" (PhD diss., Department of Anthropology, Yale University, 2017).

[13] Ibid., 36

[14] Xie Duanju 謝端琚 *Ganqing diqu shiqian kaogu* 甘青地區史前考古 [*Prehistoric archaeology of the Gansu-Qinghai region*] (Beijing: Wenwu Chubanshe 文物出版社, 2002).

[15] Li Shuicheng 李水城, *Banshan yu Machang caitao* yanjiu 半山與馬場彩陶研究 [*Research on Banshan and Machang painted pottery*] (Beijing: Beijing Daxue Chubanshe 北京大學出版社, 1998); Hung Ling-yu, "Pottery Production, Mortuary Practice, and Social Complexity in the Majiayao Culture, NW China (ca. 5300-4000 BP)" (Ph.D. diss. Archaeology, Washington University, St. Louis, 2011).

[16] Ma Qinglin 馬清林, "Gansu sinshiqi shidai yu qingtong shidai zhitao gongyi taoqi yanliao ji taoqi chengfen fenlei yanjiu 甘肅新時期時代與青銅時代制陶工藝陶器顔料及陶器成分分類研究 [The Manufacturing – techniques, Pigments and Chemical Compositions Classification Methods of the Pottery during the Neolithic and Bronze Ages in Gansu Province, China]" (PhD diss., Department of Chemistry, Lanzhou University, Lanzhou, 2000), 21.

[17] Hung Ling-yu, "Pottery Production, Mortuary Practice, and Social Complexity in the Majiayao Culture, NW China (ca. 5300-4000 BP)," 52.

[18] See samples analyzed in the present study and Hein and Stilborg 2019 and Womack 2017. Anke Hein, and Ole Stilborg, "Ceramic production in prehistoric northwest China: preliminary findings of new analyses of old material from the Museum of Far Eastern Antiquities, Stockholm"; Andrew Womack, "Crafting community, exploring identity and interaction through ceramics in late Neolithic and early Bronze Age Northwest China".

[19] Gansusheng Wenwu Gongzuodui 甘肅省文物工作隊, Linxia Huizu Zizhizhou Wenhuaju 臨夏回族自治州文化局, and Dongxiangzu Zizhixian Wenhuaguan 東鄉族自治縣文化館. "Gansu Dongxiang Linjia yizhi fajue baogao 甘肅東鄉林家遺址發掘報告 [Excavation report of Linjia site, Dongxiang, Gansu]." *Kaoguxue jikan* 考古學集刊 4 (1984): 111–161.; Gansusheng Bowuguan 甘肅省博物館, "Lanzhou xinshiqi shidai de wenhua yicun 蘭州新石器時代的文化遺存 [Neolithic remains at Lanzhou]," *Kaogu xuebao* 考古學報 1 (1957): 1–8; Gansusheng Bowuguan 甘肅省博物館, "Gansu Lanzhou Xipogua yizhi fajue jianbao 甘 蘭州西坡坬遺址發掘簡報 [Preliminary report on the excavation at Xipogua in Lanzhou, Gansu]," *Kaogu* 考古 9 (1960): 1–4.

Considering that Majiayao-style vessels tend to be rather large with vessel diameters of mostly over 20 cm, many even 30–60 cm, these kilns seem very small. As some Majiayao graves furthermore contain large numbers of vessels and the settlements tend to have considerable amounts of ceramic remains, it seems reasonable to assume that most wares were fired in open fires rather than these small kilns. Baidaogouping has a group of 12 kilns and a considerable number of stone and ceramic tools likely used in pottery production such as paddles, knives, and other shaping and decoration tools, suggesting a more professionalized production using kiln firing.[20] At all other sites, there were only few kilns located in between houses, and from several Majiayao settlement sites no kilns have been reported, suggesting that in many cases smaller scale production for the household may have been practiced.

As for object usage, traditionally, coarse ware vessels are thought to encompass large storage containers and cooking pots while the fine ware group comprise serving vessels, storage jars, and possibly purpose-made grave goods. In the case of the Majiayao-style pottery, however, painted fine wares have been found in both graves and settlement contexts, and large vessels suitable for storage were made in both coarse and fine ware of grey or reddish color. Lipid and use-wear analyses of wares from graves suggest that some of the coarse cord-marked vessels may have been used for fermentation but most probably stored dry food stuffs or liquids.[21] Some of the coarse wares show soot marks outside indicating a use in food preparation.

A New Avenue of Research: Raw Material Choice and Preparation

In recent years, there has been a renewed interest in the ceramic technology of prehistoric Northwest China with a particular focus on the Majiayao-style painted pottery. Experimental re-creation of Majiayao-style pottery has provided some insights into general production techniques and several studies have discussed the question of raw material choice.[22] Based on LA-ICP-AES analysis (laser ablation inductively coupled plasma atomic emission spectroscopy), Hung and her colleagues have suggested that painted wares produced in the Tao River Valley, Gansu Province, may have been exported to northern Sichuan, but given the relative homogeneity of the local clay deposits they have not been able to pinpoint precise production locations.[23] For a criticism of their approach see Ren et

[20] Gansusheng Bowuguan 甘肅省博物館, "Lanzhou xinshiqi shidai de wenhua yicun 蘭州新石器時代的文化遺存 [Neolithic remains at Lanzhou]".

[21] Andrew Womack, "Crafting community, exploring identity and interaction through ceramics in late Neolithic and early Bronze Age Northwest China"; Andrew Womack, and Hui Wang, "Formation and Function of Majiayao and Qijia Pottery: Analysis of Manufacturing Marks and Use-alteration on Vessels from the Tao River Valley," *Asian Perspectives* 59.1 (2020): 2–32; Womack, Andrew, Hui Wang, Jing Zhou, and Rowan Flad. "A petrographic analysis of clay recipes in Late Neolithic north-western China: continuity and change." *Antiquity* 93.371 (2019): 1161–1177.

[22] Li Xinyan 李新燕, "Gansu caitao zhizuo gongyi shiyan yu tansuo 甘肅彩陶工藝實驗與探索 [Gansu painted pottery manufacturing experiments and research]," *Kaogu yu wenwu* 考古与文物 6 (2005): 85–89.

[23] Hung Ling-yu, "Pottery Production, Mortuary Practice, and Social Complexity in the Majiayao Culture, NW China (ca. 5300-4000 BP)"; Hong Lingyu 洪玲玉, Cui Jianfeng 崔劍鋒, Wang Hui 王煇, and Chen Jian 陳劍, "Chuanxi Majiayao leixing caitao chanyuan fenxi yu tantao 川西馬傢窯文化類型彩陶產源分析與探討 [Analysis and discussion of Majiayao type painted pottery from western Sichuan]," *Nanfang Minzu Kaogu* 南方民族考古 [*Southern Ethnology and Archaeology*] 7 (2011): 1–58.

al.[24] XRF analyses of samples from prehistoric sites in Northwest China conducted by Cui et al. suffer similar issues and their suggestion of a lack of inter-regional exchange during the Yangshao and Majiayao periods thus bears re-examining.[25]

Womack has thus taken a communities-of-practice approach, focusing on choices made in raw-material procurement and processing studied through thin-section microscopy.[26] Based on material from three Majiayao-period sites, Dibaping, Dayatou, and Siwashan, he distinguishes between seven different fabric groups the most dominant one being a fine fabric followed by the Feldspar-Quartz group.[27] Within these groups, there is considerable variation in the levels of silt, sand and other inclusions, which Womack interprets as differences in clay sources or refining process (i.e., levigation), and/or added temper.[28] When plotting point counting results (matrix, silt, sand/temper) against fabric groups it becomes clear that the painted fine wares form a fairly homogenous group. The coarse wares range widely in silt and sand levels as well as types of inclusions, suggesting differences in clay sources and/or added temper.

Interestingly, one sample from Dayatou that – based on the presence of slip and paint – had previously been classified as fine ware was shown to have 26% of feldspar-quartz inclusions, leading Womack to suggest that this may actually be a coarse ware sherd.[29] This raises the question if this may actually be a Double-Ware sherd.

Overall, Womack suggests that the Majiayao-period potters used natural local clay when producing fine wares, with differences of +/- 6% in silt levels and 3–4% in sand levels in the final composition being due either to natural variation or to processing techniques.[30] For coarse wares, he suggests, likewise local, low-silt and low-sand clay was chosen and varying amounts of feldspar and quartz-rich sand from the Tao River added. The dominant fabric groups persist from the Majiayao into the Qijia period.

Recent preliminary analysis of Majiayao and Qijia period samples from the Andersson collection largely confirm these results.[31] The authors have taken a somewhat different approach, trying to identify and study raw material preparation (esp. tempering) and using these behaviors to distinguish between different fabric groups. They agree with Womack

[24] Ren Ruibo 任瑞波, Chen Wei 陳葦, and Ren Yunjian 任贇娟, "Chuanxi caitao chandi laiyuan xinshuo jiantan 川西彩陶產地來源新說檢討 [Review of recent insights into the origins of the painted pottery of western Sichuan]," *Sichuan wenwu* 四川文物 2 (2013): 40–45.

[25] Cui Yifu, Guanghui Dong, Haiming Li, Ting An, Xinyi Liu, Jian Wang, Hui Wang, *et al.* "Early Ceramic Trade in Gansu and Qinghai Regions, Northwest China: A Comparative Elemental Analysis on Sherds of Majiayao Culture, Yangshao Culture and Qijia Culture," *Journal of Archaeological Science: Reports* 3 (2015): 65–72.

[26] Andrew Womack, "Crafting community, exploring identity and interaction through ceramics in late Neolithic and early Bronze Age Northwest China".

[27] These are Fine Paste (N=61), Clay Pellet (N=24), Feldspar-Quartz (N = 11), Feldspar-Pellet (N=7), Feldspar-Quartz-Biotite (N=4), Feldspar-Quartz-Amphibole-Biotite (N=3), Carbonate-Feldspar-Quartz (N=2), with considerable variation in the numbers as well as in the relative abundance of silt and sand/temper (summarized in ibid.:141–146).

[28] Ibid.: 143.

[29] Ibid.: 144.

[30] Andrew Womack, and Hui Wang, "Formation and Function of Majiayao and Qijia Pottery: Analysis of Manufacturing Marks and Use-alteration on Vessels from the Tao River Valley".

[31] Anke Hein, and Ole Stilborg, "Ceramic production in prehistoric northwest China: preliminary findings of new analyses of old material from the Museum of Far Eastern Antiquities, Stockholm".

that the Majiayao fine wares were made from fine and on occasion possibly levigated silty to silt-rich, often calciferous clays without added temper. The coarse wares were made from fine to medium coarse sand rich, calciferous clays tempered with crushed rock (different types of granite/granodiorite) or with coarse sand.

Based on a combination of handheld XRF analysis on 52 sherds and thin-section petrographic analysis on 11 samples from Majiayao, Qijia, and Xindian period sites in Northwest China held at the MFEA, Hein and Stilborg have furthermore shown that the Majiayao fine wares from different sites are very similar to each other in composition, so much so that distinguishing wares from different sites chemically seems problematic if not impossible.[32] Production technologies for Majiayao fine wares are largely identical between sites throughout the Tao River Valley, though, suggesting a shared craft tradition. It is unclear so far if this applies to coarse wares as well. The study has also shown that there is continuity in tempering traditions between Majiayao and Qijia in spite of the changes in vessel shapes and decoration patterns while there are significant technological differences between Qijia and Xindian. Majiayao and Qijia are mostly characterized by fine wares vs sand- or crushed-rock tempered coarse wares, while the Xindian material sees a considerable number of grog-tempered wares. This study also pointed out a Majiayao-style half-tempered/half-un-tempered vessel that was recommended for further study. The present study attempts to answer this question and make progress toward understanding this unusual tradition.

Previous Studies of the Double-Wares in the Andersson Collection

We are not the first to notice the Double-Wares. Margit Bylin-Althin, writing a detailed account of the finds from Qijiaping and Luohantang West, mentions eight pieces from the latter site that "*are from the technical point of view quite unique....the upper part... is made of fine, purified clay, whereas the lower part is constructed of coarse clay mixed with quartz*"[33] (Fig. 1). Seven pieces belong to four different vessels; a piece from a fifth vessel has the same design but, according to Bylin-Althin, is made entirely from the same tempered ware.[34] She suggests that the coarse-tempered lower half in the four big vessels is a technical solution to ensure that the lower half could carry the weight of the upper part.

In an article from 1956 presenting the pottery from Andersson's excavation at Majiayao, Bo Sommarström records 17 fragments of what he names "painted fine-and-coarse ware".[35] He describes the paste as follows: "*The upper parts of the vessels consist of fine, homogenous paste; the lower parts have likewise been made of fine clay, but are moderately tempered with coarse or fine grains of different materials ...resulting in a coarse, porous texture*". The upper parts are burnished and painted, often with horizontal black lines while the lower parts are covered with cord-impressions or fine crisscross impressions sometimes with applied wavy/cord-marked bands. As to shape, he finds only few rim sherds that may reveal the vessel type. He recognizes one Double-Ware find as a fragment of a vase, while

[32] Ibid.

[33] Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," 443 and pl. 43:4–5, pl. 44:1–2; depicted in Fig. 1 in this paper.

[34] Ibid., pl. 43:3; 443.

[35] Bo Sommarström, "The Site of Ma-Kia-Yao," 87f, 131, pl 48:3–6.

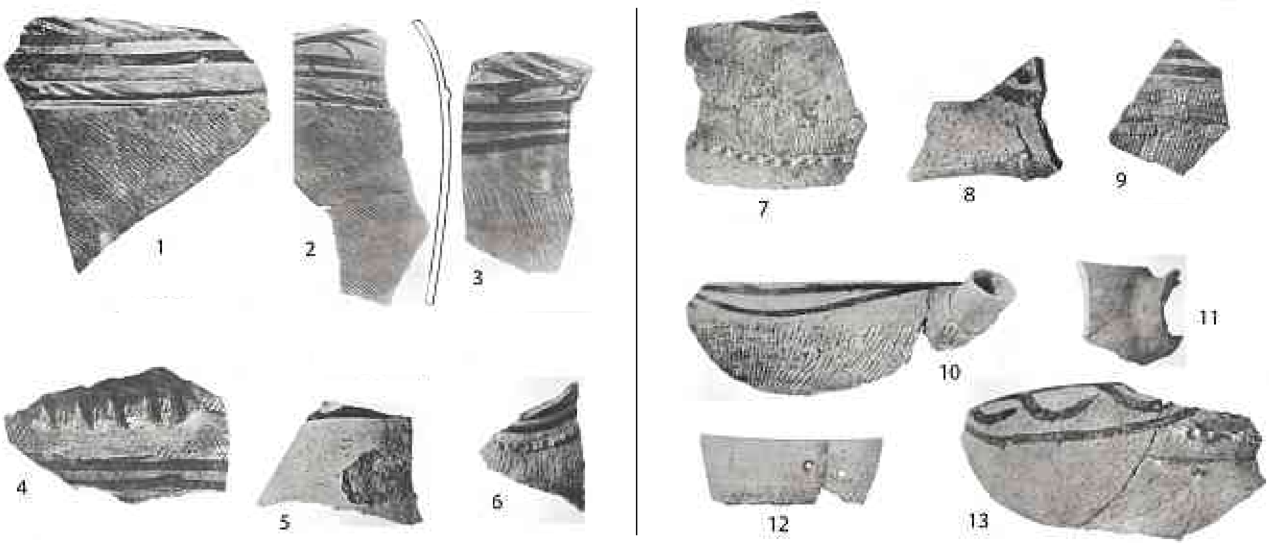


Figure 1. *Double-Wares identified by Bylin-Althin and Sommarström:*[36] *1. K12003:894 (BA44.1); 2. K12003:895; 3. K12003:405 (BA43.4-5); 4. K12003:896 (BA43.3); 5. K12003:897 (BA44.2); 6. K11998:486 (S48.3); 7. K11998:19 (S48.5); 8. K11998:130 (S49.2); 9. K11998:28 (S48.4); 10. K11998:116 (S49.1); 11. K11998:28 (S48.6a); 12. K11998:123 (S48.6b); 13. K11998:117 (S49.3).*

the shape of some of the sherds covering the fine-ware/coarse-ware-transition remind him of painted fine-ware vessels.[37] He also includes two sherds (one of them a rim) from a large basin with inward-curving rim with a burnished fine-ware rim-part above a rusticated coarse-ware body and with a spout near the rim.[38] Sommarström places this vessel in a separate group named "plain fine-and-coarse ware" because of the lack of painting. Finally, Sommarström observed parallels to the painted group in the materials from Luohantang published by Bylin-Althin and Xindian B without giving further details.[39] The group is not discussed further in the article and – as far as we know – no further research has been conducted on the group since.

An immediate conclusion to draw from the mere existence of Double-Wares is that the same potters seem to have made both fine ware and coarse ware vessels. That has been a discussion concerning many other contexts, e.g., the Scandinavian Iron Age, where there are large differences between the fine wares and the coarse wares.[40] Together with a ten-

[36] Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," pl. 43 and 44 (hereafter BA43 and BA44); Bo Sommarström, "The Site of Ma-Kia-Yao," pl. 48 and 49 (hereafter S48 and S49).

[37] Ibid., pl. 48:3.

[38] Ibid., pl. 48:2 and 6a.

[39] Luohantang published by Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu".

[40] Ole Stilborg, "Uppbyggnadsteknik," in *Keramik i Sydsverige – en handbok för arkeologer*, Monographs on Ceramics no.1, Report Series no. 81 och RAÄ UV Syd Rapport 2002:6, ed., Anders Lindahl, Debbie Olausson, and Anne Carlie (Lund, 2002), 21–24; Ole Stilborg, Siv Olsson, and Hannelore Håkansson, *Shards of Iron Age communications: a ceramological study of internal structure and external contacts in the Gudme-Lundeborg area, Funen during the late Roman Iron Age* (Lund: Monographs on ceramics, Keramiska forskningslaboratoriet, Lunds Universitet, 1997).

dency for modern eyes to see smooth, decorated surfaces as belonging to higher quality products than rough, plain surfaces, that has led to the assumption that specialists were needed to make the fine wares. For the material from Scandinavia, petrographic analyses pointing out the similarities in the raw materials suggest that the same potters probably made both types of pottery, working at the household level, but in most cases, it has not been possible to definitely prove this hypothesis.[41]

Temper and Clay – Basics of the Pottery Craft

Some material behaviors are fundamental to the ceramic craft. One of them is that clay shrinks as it dries and when it is fired.[42] Shrinking is caused successively by the loss of pore water and crystal water, transformations of the clay crystals, and sintering and finally vitrification which occur successively with rising temperatures. How large the shrinkage is at any stage largely depends on the types of clay minerals and the amount and distribution of non-plastics naturally occurring in the clay. The shrinkage from moist clay object to fired functional ceramic may be up to 30 % but is most often considerably less. Nonetheless, fast, or uneven shrinkage may cause a pot to crack.[43] This means that the conditions of both drying and firing are important factors that affect the degree to which shrinkage is a problem. The more the potter is able to control the rate of drying (e.g., by using a drying shed) and the temperature curve in firing (e.g., in a modern pottery kiln), the smaller the risk of vessel failure at any stage. A basic way to control shrinkage is to add non-plastic material – temper – which in effect supplements the natural non-plastic content (silt and sand) of the clay. Temper also has other functions such as altering the workability of the clay and supporting the functionality of the ceramics, but shrinkage control is a central reason for tempering. This is especially true for the production of pottery using open bonfire firing during which the temperatures may rise rapidly and fluctuate significantly.

For temper to work well as a shrinkage control mechanism, an even distribution is essential. This can be achieved by kneading the tempered clay body thoroughly. If the temper amount is sparse (i.e., below 10 % volume) and the temper fragments are far apart from each other, control of the shrinkage will be poor. If the temper is unevenly distributed, the temper may even increase the risk of damage through the uneven shrinkage between un-tempered and tempered parts of a pot. The portions without temper will shrink as determined by the clay minerals and natural temper, while the tempered portions will have reduced shrinkage because of the added material. Therefore, increasing the amount of unevenly distributed temper increases the difference in shrinkage and in turn the risk of cracks forming between the two parts will increase. There are cases, though, where different temper amounts will increase shrinkage control. If a vessel has a thick base and considerably thinner walls, extra temper in the base will even out the difference in the rate of shrinkage between the base and walls.[44]

[41] Ole Stilborg, Siv Olsson, and Hannelore Håkansson, *Shards of Iron Age communications: a ceramological study of internal structure and external contacts in the Gudme-Lundeborg area, Funen during the late Roman Iron Age*, 238.

[42] William Worrall, *Clays and ceramic raw materials*, 2nd ed. (London, New York: Elsevier, 1986), 170–172; Owen S Rye, *Pottery technology: principles and reconstruction*, (Washington, D.C.: Taraxacum, 1981), 21–22.

[43] Owen S Rye, *Pottery technology: principles and reconstruction.*

[44] Pers. obs. Ole Stilborg.

It thus follows that having areas without temper next to areas with a fair amount of temper in the same pot will increase the risk of cracking during drying and firing. By using clay with a naturally low shrinkage rate while at the same time securing slow and steady drying and firing, the potter may reduce the problem but cannot remove it entirely. From a purely technological viewpoint, which seems to have been shared by potters around the globe through millennia of pottery making, having distinctly different temper amounts throughout a vessel is an unnecessary and easily avoidable risk.[45] To introduce the risk deliberately is so contrary to good pottery craft, that there must have been a specific reason for doing so. Indeed, modern Japanese potters were horrified by the Double-Ware idea when introduced to the notion.[46]

While the present research has not attempted a global search for cases where potters have taken the risk of combining tempered and un-tempered fabrics in the same pot, it is not something that the authors have encountered in their work with pottery from three continents. In a rare ethnographic case from Mali that has come to our attention, the potters used a clay without added temper to form the neck of a pot on top of a body made of grog-tempered clay.[47] Another example is a special type of chapatti cooking vessel made in the Thar desert (Sindh province of Pakistan) with a grog tempered bottom and a sand tempered rim.[48] However, none of these examples are true parallels to the Double-Ware phenomenon as they represent the joining of two different fabrics but not two established ware types.

Ware Analysis Using a Petrographic Study of Thin Sections

Thin sections are 0.03 mm thick slices of geological samples or ceramic materials mounted on glass slides which can be studied under a petrographic microscope at different magnifications. In the present study, we have used magnifications between X20 and X600. This method enables an estimation of the coarseness of the clay (i.e., content of non-plastics), the content of calcium, mica, and iron oxide and the determination of accessory minerals like ore and various dark minerals. Fossils may also be located and identified.

Based on the knowledge of the composition of the raw clay, added temper may be discerned either as a material foreign to the raw clay or as a deviant grain size fraction. A clear break in the grain size distribution will, in most cases, signal an added temper. A crushed stone temper will be characterized by a limited range of minerals and often also structural similarities in the composition of the rock fragments. A sand temper should be characterized by a fairly homogenous grain size i.e., be well-sorted. Sorted sands are mostly dominated by quartz, but quartzite and sandstone are also common. The less sorted the sand (i.e., with a larger variation in grain sizes), the more difficult it is to tell an added

[45] Owen S. Rye, *Pottery technology: principles and reconstruction*, 39–40.

[46] Pers. comment Robin Wilson, Oxford University, 26 February 2021: "their reaction to being asked about composite wares was general shock and horror at the ungodly nature of the whole enterprise. Do you know what motivated the original potters to perpetrate such a crime against good taste?"

[47] Pers. comment Alexandre Livingstone-Smith.

[48] Michela Spataro, "Pottery production in the Thar dessert (Sindh, Pakistan): Three case studies (Hindwari, Pir Chebo, and Hingorja)," *Rivista di Archeologia anno* XXVIII (*2004*): 171–184 (172–173).

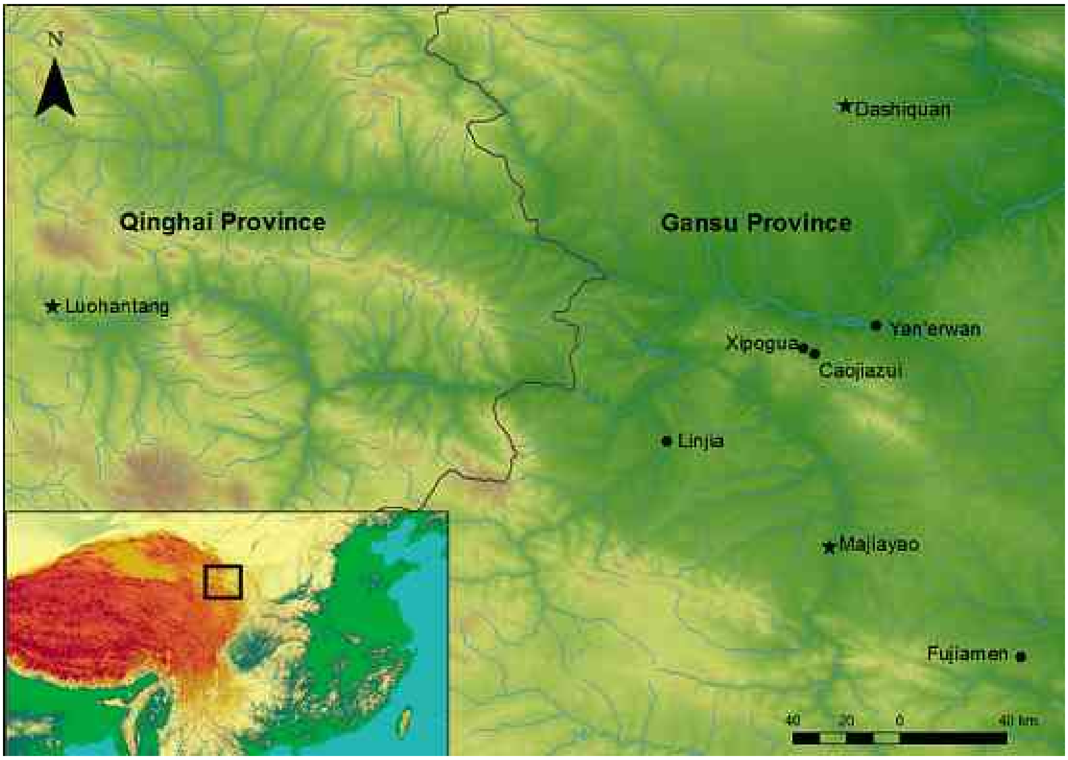


Figure 2. *Map showing sites where actual and/or potential Double-Wares have been identified. Sampled sites are marked with a star.*

temper from the sand content of a naturally coarse sandy clay, but comparisons with locally available raw clays may solve that problem.

Having identified added temper, the quality – i.e., the amount and maximum grain size – can be estimated and the homogeneity described. For a temper to function properly, it needs to be evenly distributed throughout the clay body. Structures in the ware may reveal vessel building techniques, while the homogenization of the clay and the temper in the clay are good parameters for assessing the quality of the craft (in practical terms the amount of time and effort invested).

The Double-Ware Samples and what Fabric Analyses Tell us

The present sample of Double-Wares from the Andersson collection at the MFEA consists of 19 Majiayao-period pots from two sites in Gansu (Majiayao and Dashiquan) and one site in Qinghai (Luohantang) (Fig. 2). A limited pilot study conducted by Hein and Stilborg in 2017 happened to include one of the Double-Ware vessels recorded in the study made by Sommarström.[49] On the basis of the results of the fabric analysis of this Majiayao site pot (K19998:19), we decided to expand the sample with the sherds mentioned in the publications by Sommarström and Bylin-Althin and other examples that might appear during

[49] Bo Sommarström, "The Site of Ma-Kia-Yao," 88.

a new search in the collection. This search aimed for sherds including the transition from rusticated coarse ware to painted fine ware. Since we did not succeed in locating all examples discussed by Bylin-Althin and Sommarström but were able to add a few new ones from the Majiayao as well as the Luohantang site, it is clear that there are more Double-Ware samples to be found in the collection. Nevertheless, the number is relatively low. Evgenia Dammer working within the same project on a PhD focusing on Majiayao ceramics from Luohantang, Majiayao, Waguanzui, and Zhujiazhai held in the collections of the MFEA, identified only a small number of Double-Ware sherds among her samples, which we included in this study. We also included a pot from the group named "plain fine-and-coarse ware" by Sommarström and a similar one from the site of Luohantang. Additionally, we were able to add a Double-Ware sherd retrieved during renewed excavations at Majiayao in 2017. The new sample group of 19 pots, while still limited, significantly expands the possibility to study the phenomenon. Though Sommarström suggested there were further examples to be found at the site of Xindian B, so far, we have not been able to find any among the Xindian collections held at the MFEA.

Of the 19 identified Double-Ware samples, we have chosen to perform thin-section analysis on 14 (Ts 1–13 and Ts 15) which have sufficient material left of both FW and CW to facilitate reliable data. The results of the earlier pilot petrographic analysis of one Majiayao pot are included. Three of the 15 samples come from the site of Luohantang and 12 from the site of Majiayao. A thin section was also made from a fourth Luohantang pot. Two independent macroscopic recordings place it in the Double-Ware group, but the thin section sample does not include a clear transition to FW as too little of the vessel was preserved.[50] Nevertheless, the CW part in the sample has been analysed and the data added to the temper analysis in the present study (Ts 14).

The results of the thin section analyses are summarized according to parameters essential to the craft decisions made by the potters (or potentially potter) creating the Double-Ware pots (Tab. 1) following the chaîne opératoire. Specific data for each analysis are given in datasheets in the Appendix.

The Choice of Clay

The choice of clay for each of the wares in the Double-Wares (the FW and the CW) varies between using the same clay for both (A), using two different fine clays (B) and using a coarser clay for the CW (C). Data on the tempering is included in this grouping but discussed further below.

Using the Same Clay for Both Wares

In seven of the pots (two from Luohantang, five from Majiayao) the same type of clay had been used for both FW and CW (K19998:019; 116; 132 and 486; 2014GLMH1.4:4; K12003:278 and 894). In six pots, the clay chosen is fine and varies from the very fine clay with a small amount of silt in Luohantang K12000:894 to medium silty clays with a little fine sand in the other samples. For K19998:486, a medium-coarse, silt-rich, fine sandy clay was used. The clays are calciferous to calcium rich. In all seven cases, the CW part has

[50] Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," 443 and pl. 44:2; Evgenia Dammer pers. comment.

Sherd no	**Site**	**Ceram. Culture**	**FW clay**	**FW max G mm**	**FW Temper**	**Temper max gr MM**	**Temper amount %**	***CW clay***	***CW Temper***	***Temper max gr MM***	***Temper amount %***	***Clay choice***	***Joining***	***Ts no***
K11998:19	Majiayao	Majiayao	Fs	0.3				Same as FW	Gr	4.3	10	A	| | III	11 pilot
K11998:28 (cnp 16)	Majiayao	Majiayao	Fs	0.1				MCs	Gr	2	15	B	| | III	1
K11998:116	Majiayao	Majiayao	Fs		Gr	1.1	19	Same as FW	Gr	2.3	28	A	/ I	2
K11998:132 (cnp 36)	Majiayao	Majiayao	Fs	0.2				Same as FW	Sa	3.1	19	A	/ I	3
K11998:391	Majiayao	Majiayao	Fs	0.45				MCs	Gr	2.6	14	C	/ I	4
K11998:486	Majiayao	Majiayao	MCs		Sa	0.95	<10	Same as FW	Sa	2.6	16	A	/ I	5
K11199:70	Majiayao	Majiayao	Fs	0.25				Fs	Gr	2.6	16	B	< II	6
K11199:75	Majiayao	Majiayao	Fs	0.2				MCs	Gr	2.3	10	C	< II	7
K11199:79	Majiayao	Majiayao	Fs	0.25				Fs	Gr	2.7	13	B	/ I	8
K11999:98	Majiayao	Majiayao	Fs	0.25				Fs	Gr	3.9	17	B	< II	9
K11199:470-471	Majiayao	Majiayao	Fs	0.2				Same as FW	Sa	2.75	29	A	/ I	10
K12003:278 (cnp 145)	Luohantang	Majiayao	Fs	0.2				Same as FW	Gr	2.6	6	A	| | III	11
K12003:894-895 (cnp 187)	Luohantang	Majiayao	Fs	0.2				Same as FW	Sa	2.1	11	A	(IV	12
K16000:051 (cnp 181)	Luohantang	Majiayao	Fs		Plant?	1.7	<10	Fs	Gr	2.5	8	B	ʃ IV	13
K12003:897 (cnp 156;CW only)	Luohantang	Majiayao	N/A	N/A	N/A	N/A	N/A	Fs	Sa	1.8	8	?	?	14
2014GLMH1.4:04	Majiayao	Majiayao	Fs	0.1				Same as FW	Gr	2.5	27	A	/ I	15

Table 1. Results of the petrographic analysis of Double-Ware samples from Majiayao and Luohantang: FW = fineware, CW = coarseware; T = temper, max. G = maximum grainsize; Joining: | |= gradual reduction of temper, /= diagonal overlap, < = wedge overlap; (= curved joining without overlap; ʃ s-shaped joining without overlap. Clay: Fs= fine, sorted; MCs = medium coarse, sorted; Temper: Gr = granite, Sa = sand; clay choice: A = same clay for both; B = using two different fine clays, C = using a coarser clay for CW.

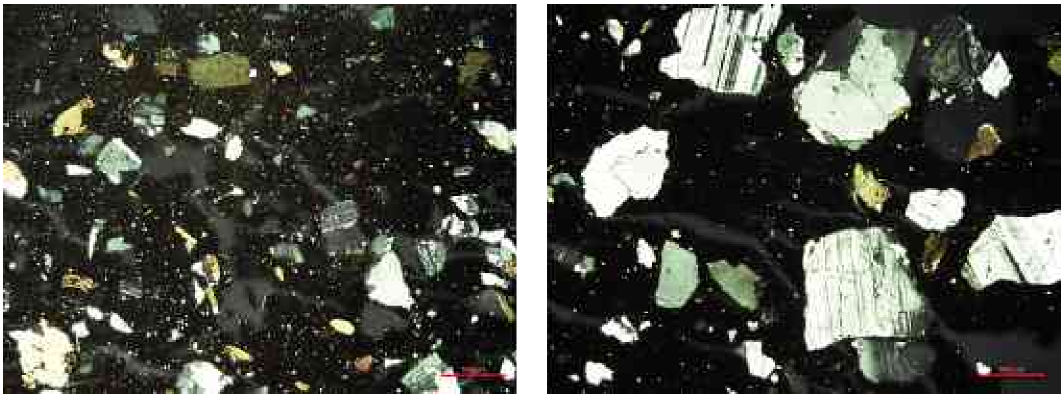


Figure 3. *Microscope photos of the coarse tempered CW (right) and the finer tempered FW (left) of the Double-Ware sample K11998:116. Crossed polars.*

been tempered with either crushed granite (Fig. 3) or a poorly sorted sand. In two cases (K19998:116 and 486), the FW part has been tempered with the same temper as the CW but finer crushed in one case (Fig. 3, left) and using a finer fraction and smaller amount of sand in the other.

Using Different Fine Clays for the Fine and Coarse Ware Respectively

In five of the pots (one from Luohantang, four from Majiayao), the FW and CW parts are made from different fine clays (K19998:028; K11999:070; 79 and 98; K16000:051). The fine clays for the CW can be characterized as silty with little sand. The clays used for the FW parts are all a little finer or of another sorting and have somewhat different mineralogical compositions of the non-plastics. In K11998:028, there is a ca 1 cm wide zone in

Figure 4. *Photo of the Ts-sample K11998:028 showing the mixture of some CW-ware with the fine clay of the FW in a part of the latter (at white line).*

Figure 5. *Microscope photo of the FW part of Luohantang sample K16000:051 showing the oblong cavities (grey) left by burnt out organic material. Crossed polars.*

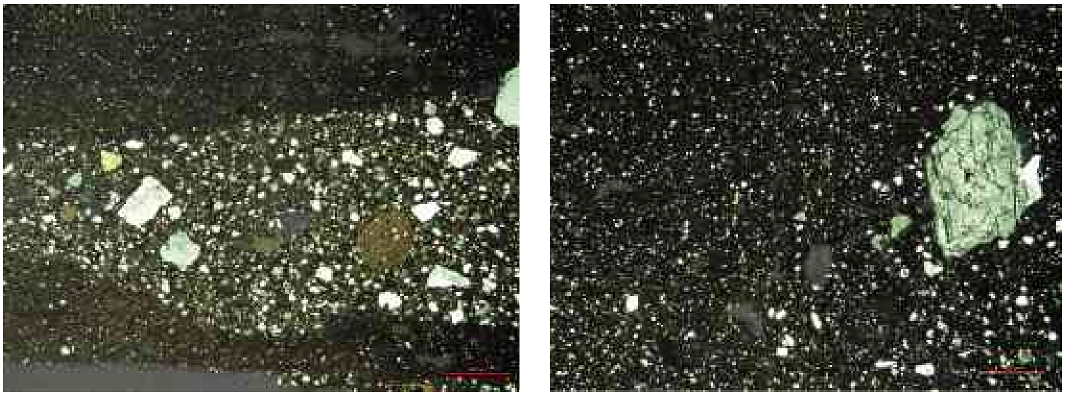


Figure 6. *Microscope photos of the medium coarse clays in the CW and the fine clays in FW parts of the samples K11999:075 (right) and K11998:391 (left). The coarser (rock tempered) CW wares in the middle and lower right corner respectively. Crossed polars.*

between the Double-Wares where the different fine clays seem to have been mixed (Fig. 4). The clays are calciferous to calcium rich. In all cases the CW part has been tempered with granite (Fig. 3). In one case (K16000:051), burnt out organic material has left voids in the fine ware part which may represent added temper but could even be naturally occurring organics in the clay (Fig. 5). The potential organic temper in the fine ware part of K16000:051 has no match in other Majiayao wares from Luohantang which means that the organics most likely are a natural occurring content of the raw clay.[51]

Using a Coarser Clay for the Coarse Ware

For three pots from Majiayao (K19998:028, K19998:391; K11999:075), medium coarse clays were chosen for the CW part and fine clays for the FW part (Fig. 6). The four different clays vary in coarseness from silt rich and fine sandy to rich in both silt and fine sand. They also vary from calciferous to calcium rich. The CW parts in all three pots are tempered with crushed granite.

Joining the Double-Wares

The next choice of major importance that a potter had to make when producing the Double-Wares concerns the way the FW and CW parts were joined. As discussed in the beginning of this article, the join between the two will be a weak spot prone to cracking during drying and firing, but it will be sensitive even when the finished vessel is used. The different ways coils may be joined in coil-building is a good starting point for understanding how the makers of the Double-Ware pots have chosen to solve the problem.[52] The principles of both the U-technique (implying that material from the last coil is smeared down on both sides of the preceding) and the N-technique (implying that material from the last coil is smeared down on one side of the preceding coil while material from the latter is smeared

[51] Pers. comment Evgenia Dammer.

[52] Birgitta Hulthén, *On ceramic technology during the Scanian Neolithic and Bronze Age* (Stockholm: Theses and Papers in North-European Archaeology 6. Akademilitteratur, 1977), 35; Ole Stilborg, “Uppbyggnadsteknik,” 21–22.

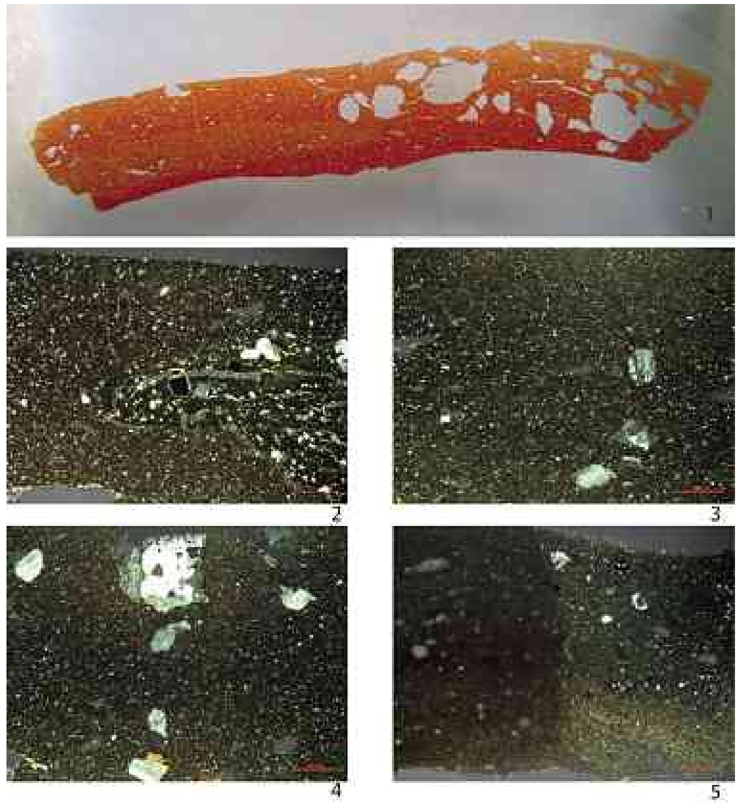


Figure 7. *The four identified types of joining the FW part with the CW part. 1. I: Slanting overlap (photo of Ts sample of K11999:471). 2. II: wedge overlap (micro-scope photo of K 11999:070). 3.-4. III: Gradual transtion (microscope photo of K12003: 278). 5. IV: Straight coil contact (microscope photo of K16000:051). Crossed polars.*

upward on the other side) are represented in the joining of the FW and CW. There are, however, other variants of joining which have made it necessary to make an expanded list of joining types:

Type I. Slanting long overlap (i.e., long N-technique[53]): A slanting overlap of the FW and CW parts (Fig. 6; Fig.7.1) is the most common technical solution being used in 7 of the 14 samples (K11998:166; 132; 391 and 486; K11999:079 and 471; 2014GLMH1.4:04).

Type II. Wedging (i.e., extreme U-technique[54]): In three pots (K11999:070; 75 and 98) the top of the CW vessel wall was pressed into a thin wedge and the FW was smeared down on both sides (Fig. 7.2).

Type III. Gradual temper reduction In another three pots (K11998:019 and 28; K12003: 278, Luohantang), the potter chose to make a gradual transition by placing coils with a smaller amount of the same temper as in the CW part on top of the CW part before continuing with new coils of the FW ware (Fig. 7.3). In one instance (K11998:028), the use of different fine clays for the FW and CW respectively allows for more details to be observed.

[53] Ole Stilborg, and Ingrid Bergenstråhle, "Traditions in transition: a comparative study of the patterns of Ertebølle lithic and pottery changes in the late Mesolithic ceramic phase at Skateholm I, III and Soldattorpet in Scania, Sweden," *Lund archaeological review* (2001.6): 31.

[54] Birgitta Hulthén, *On ceramic technology during the Scanian Neolithic and Bronze Age*, 35.

A ca. 1 cm wide, slightly slanting (N-technique) zone represents a coil made from a mixture of the two fine clays and a few grains of the temper used for the CW part (Fig. 4).

Type IV. Simple contact For two of the pots analysed from Luohantang (K12003:894 and K16000:051) the FW and the CW parts meet in a straight or slightly U-formed coil contact (Fig. 7.5).

While solutions I-III to the problem of joining Double-Wares with different plasticity and likely different drying- and firing behavior all seem very sensible, solution IV appears at first sight to be less ideal. However, it may also be the result of an amassed experience that with the low amounts of temper added to the CW (up to 11 %) in these two pots, the risk of cracking was minimal and no special joining necessary.

Temper Quality

While petrographic determinations have been performed of the sand and granite stones used as temper, the overall variation was not of particular interest for the understanding of the Double-Ware craft at the present stage of research. The tempering quality (max. grain size and amount) of the CW part, however, is an interesting indicator for the technical variation in the Double-Ware group (Fig. 8). In the plot we see a fairly wide spread of tempering qualities regardless of whether sand or crushed rock was used, but we also see a clear

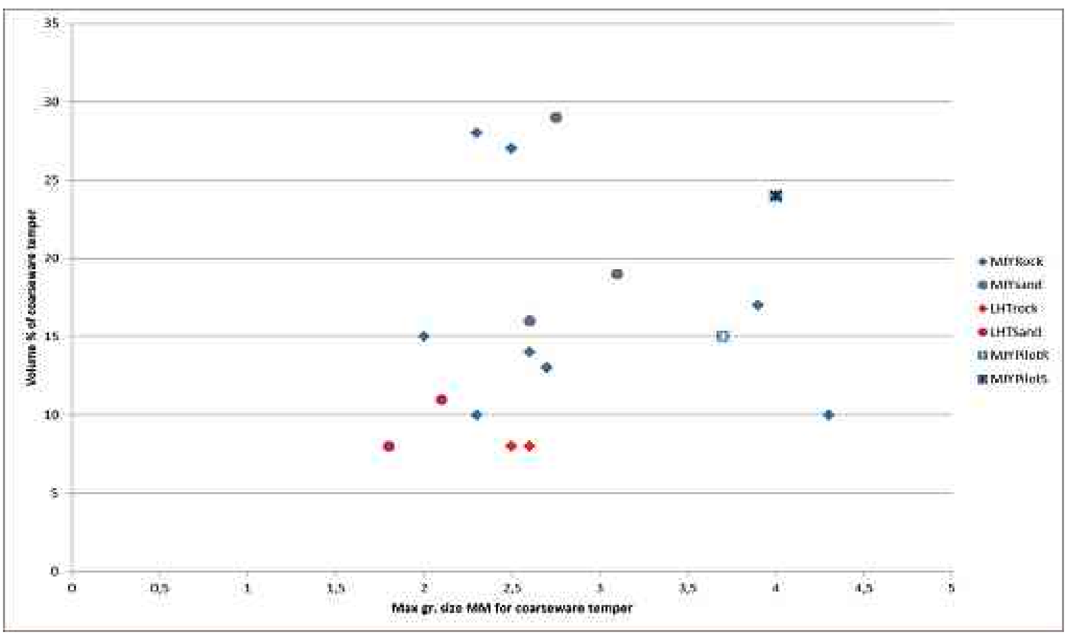


Figure 8. *Diagram showing the relation between temper volume (%) and temper maximum grain size in the CW parts of the analyzed Double-Ware samples from Majiayao (blue) and Luohantang (red). The latter sample includes the CW of K12003:897. Also separately plotted were the Majiayao samples from the pilot study.*[55]

[55] See Anke Hein and Ole Stilborg, "Ceramic production in prehistoric northwest China: preliminary findings of new analyses of old material from the Museum of Far Eastern Antiquities, Stockholm," 107–110.

Figure 9. *Sherds sampled for this study: 1. K12003:894 (LHT; BA44.1); 2. K12003:895 (LHT; BA43.4); 3. K11999:98 (MJY); 4. K11199:70 (MJY); 5. K11198:116 (MJY; S49.1); 6. K11998:28 (MJY; S48.4); 7. K11199:79 (MJY); 8. K11998:019 (MJY; Pilot TS11; S48.5); 9. K11199:75 (MJY); 10. K11998:391 (MJY); 11. K12003:897 (LHT; BA44.2); 12. K11998:486 (MJY; S48.3); 13. K11999:17 (MJY); 14. K16000:051 (LHT; l ooks like BA43.5 but different number); 15. 2014GLMH1.4:04 (MJY); 16. K11998:132 (MJY); 17. K11999:471 (MJY; looks like S48.6b but different number); 18. K12003:278 (LHT).*

difference between the low-tempered and homogenous group of samples from Luohantang and the much wider spread of mostly heavier-tempered Majiayao samples.

Types and Sizes of the Double-Ware Sherds Analyzed

The sherds sampled in this study are all fragments of large vessels, the upper part of which is made of fine purified clay, whereas the lower part is constructed of coarse tempered clay (Fig. 9). All of the fragments have painted decor on the smooth upper part, while the bottom portion shows cord, cross-cord, or comb marks. The sherd reproduced in Figure 9.4 differs from the other fragments in that it is made entirely of tempered clay, albeit of two different temper qualities. There is black painting below the relief ridge, whereas we should expect to find the painting above the ridge-shaped handle. As far as we can judge from the direction of the furrows on the ridge, the painting must have been applied to the lower part of the vessel, but we interpret this as an exception, suggesting that the unknown upper part was made of fine clay and painted. The painting below the ridge might thus have belonged to the decorative system of the upper part.

All Double-Wares identified so far are only preserved as sherds – the majority relatively small – with no complete vessels having been noted in any publication. While typochronologies for Majiayao pottery are rather refined, distinguishing between three main phases (Majiayao, Banshan, Machang) and several sub-phases each, these differentiations are based largely on complete painted fine-ware vessels with intricate decor covering usually at least half of the vessel.[56] Coarse ware has received relatively little attention and has not played a significant role in establishing chronological frameworks, partially because the coarse wares seem to undergo relatively little change over time, making them less suitable for typochronological purposes. As much research has gone into the painted décor of Majiayao wares and the changes over time, these are important indicators for chronological purposes.

Unfortunately, from the Double-Ware sherds identified so far in the Andersson collection, relatively little can be gleaned regarding the painted décor. It consists mostly of one or several horizontal or sometimes curving black bands, occasionally with additional hooks placed at regular intervals, or with slated lines wedged in between horizontal bands (Figs 1 and 9). This type of simple decoration is quite common on Majiayao phase bowls, basins, and to a lesser extend jars and vases, especially during the earlier sub-phases dated within the span of 3,300–3,000 BCE.[57] Only one sample had a combination of red and

[56] e.g., Chen Wei 陳葦, *Xianqin shiqi de Qingzang gaoyuan donglu* 先秦時期的青藏高原東麓 [*The eastern road on the* Qinghai-*Tibet Plateau during the pre-*Qin *period*] (Beijing: Kexue Chubanshe 科学出版社, 2012); Hung Ling-yu, “Pottery Production, Mortuary Practice, and Social Complexity in the Majiayao Culture, NW China (ca. 5300–4000 BP)”; Ren Ruibo 任瑞波, Chen Wei 陳葦, and Ren Yunjian 任赟娟, “Chuanxi caitao chandi laiyuan xinshuo jiantan 川西彩陶产地来源新说检讨 [Review of recent insights into the origins of the painted pottery of western Sichuan]”; see also Womack et al. this volume.

[57] We see these especially in Majiayao Culture Phase II and to a lesser extend Phase IV according to Chen *Xianqin shiqi de Qingzang gaoyuan donglu*, fig. 2.3; Majiayao Period II according to Hung “Pottery Production, Mortuary Practice, and Social Complexity in the Majiayao Culture, NW China (ca. 5300–4000 BP),” fig. 2.6–2.8; Majiayao Phases II-III according to Ren Ruibo,“Xibei diqu caitao wenhua yanjiu 西北地區彩陶文化研究 [Study on the Painted-Pottery Culture of Northwest Culture]”(PhD diss., Archaeology, Jilin University, Changchun, 2016); Chen Wei 陳葦, *Xianqin shiqi de Qingzang gaoyuan donglu*; Hung Ling-yu,

black paint (Fig. 9.18), something that is more commonly observed with Banshan phase material. Coarse ware with cord impressions and appliqué bands as seen on some of the Double-Wares is common throughout the entire Majiayao phase and beyond, to a certain extend continuing into Qijia,[58] however, based on typological traits, the Double-Wares themselves seem to be much rarer and appear in a narrower time window.

Most of the sherds are too small to be certain about the overall vessel shapes, but most of them seem to be bowls or basins with inward-curving rims – some of them with tubular funnels attached at an angle a little bit below the rim at the transition from coarse to fine ware – or closed jars/urns/vases (Figs 9 and 10). The former usually have a few painted black lines on the upper part combined with a rusticated lower part; the latter have a combination of rusticated surface and appliqué bands with or without tool or fingertip impressions below and several parallel horizontal lines in black paint further up on the vessel, potentially connecting to a short narrow neck. Only the black-and-red painted sample has a handle, suggesting that it belonged to a double-handled high-shouldered jar with painted shoulders and with or without a constricted neck, both of them forms that are common throughout all Majiayao phases.

Besides the samples analyzed here and those mentioned by Bylin-Althin and Sommarström, some further examples are known from various sites, though they have not been discussed much. A few Double-Ware sherds have been found during recent excavations at the Majiayao 馬家窯 type-site in Lintao County 臨洮縣, Gansu, all of which come from early Majiayao phase layers.[59] However, the project has finished only recently, and the results are still awaiting publication, so it is unclear what vessel types they are or what decoration they bear, if any. The Majiayao phase Linjia 林家 site in Dongxiang 東鄉, Gansu Province, has furnished a couple of examples of complete or near-complete vessels whose drawings suggest a rusticated – and thus possibly coarse ware – lower body and a painted – and thus likely fine ware – upper body.[60] Among them are spouted basins (3 examples from Layer 5;[61] Fig. 11.1) very similar to some of the examples discussed by Sommarström,[62] spouted vessels without paint[63] (Fig. 11.4 and 11.5), vessels with a combination of paint, rustication, and appliqué[64] (Fig. 11.11 and 11.8), and two high-shouldered double-handled vases[65] (Fig. 11.12 and 11.13). They appear throughout all phases of the site, though the

"Pottery Production, Mortuary Practice, and Social Complexity in the Majiayao Culture, NW China (ca. 5300–4000 BP)"; Ren Ruibo 任瑞波, "Xibei diqu caitao wenhua yanjiu 西北地區彩陶文化研究 Study on the Painted-Pottery Culture of Northwest Culture". The latter include material from early and middle period Linjia settlement: Ren Ruibo, "Xibei diqu caitao," fig. 3.1.3-1, 3.1.3-2, 3.1.3-3; from early and late Xipogua and Yan'erwan settlement sites (Ibid. fig. 3.1.3-5), Caojiazui settlement (Ibid. fig. 3.1.3-7 and 3.1.3-10), and Linjia cemetery (Ibid. fig. 3.1.4-1).

58 Andrew Womack, "Crafting community, exploring identity and interaction through ceramics in late Neolithic and early Bronze Age Northwest China," 251.

59 Personal communication Guo Zhiwei.

60 Gansusheng et al., "Gansu Dongxiang," 111–161.

61 Ibid, e.g., F19:2.

62 Bo Sommarström, "The Site of Ma-Kia-Yao," Fig. 1.10, 1.11, and 1.13.

63 Gansusheng Wenwu Gongzuodui 甘肃省文物工作队, et al, "Gansu Dongxiang Linjia yizhi fajue baogao 甘肃东乡林家遗址发掘报告 [Excavation report of Linjia site, Dongxiang, Gansu]," F21.6 and T52.3.

64 Ibid., T15.4 and H59.31.

65 Ibid., H9:1 and H9:2.

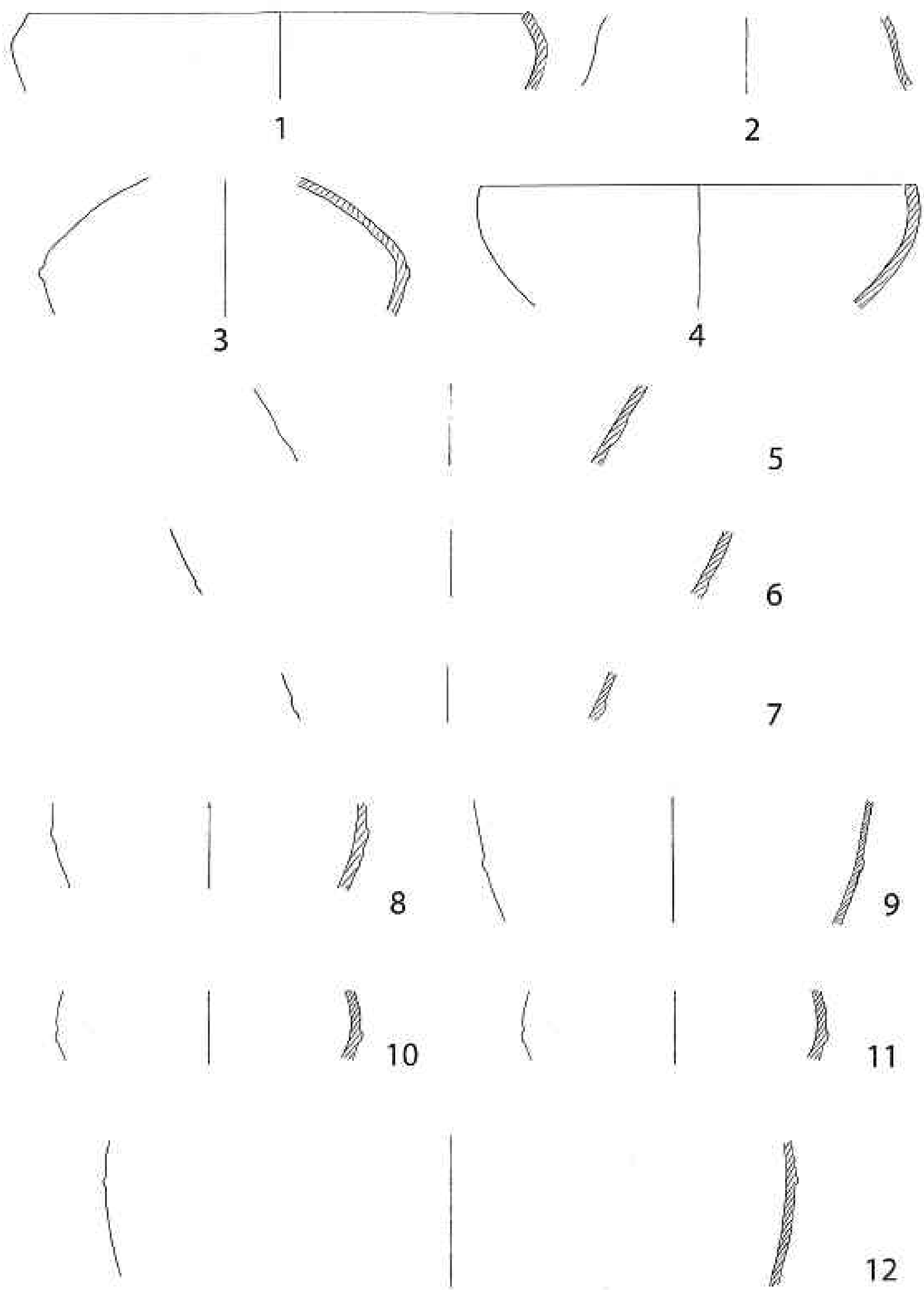


Figure 10. *Profiles of sherds discussed in the text: 1. K3248:002 (Dashiquan; not sampled, non-Double Ware); 2. K3941:035 (Dashiquan, not sampled); 3. K11998:019 (MJY); 4. K11998:116 (MJY); 5. K11998:391 (MJY); 6. K11999:017 (MJY, not sampled); 7. K11999:071 (MJY, not sampled); 8. K11999:079 (MJY); 9. K11999:098 (MJY); 10. K11999:470 (MJY); 11. K12003:278 (LHT); 12. K12003:894 (LHT).*

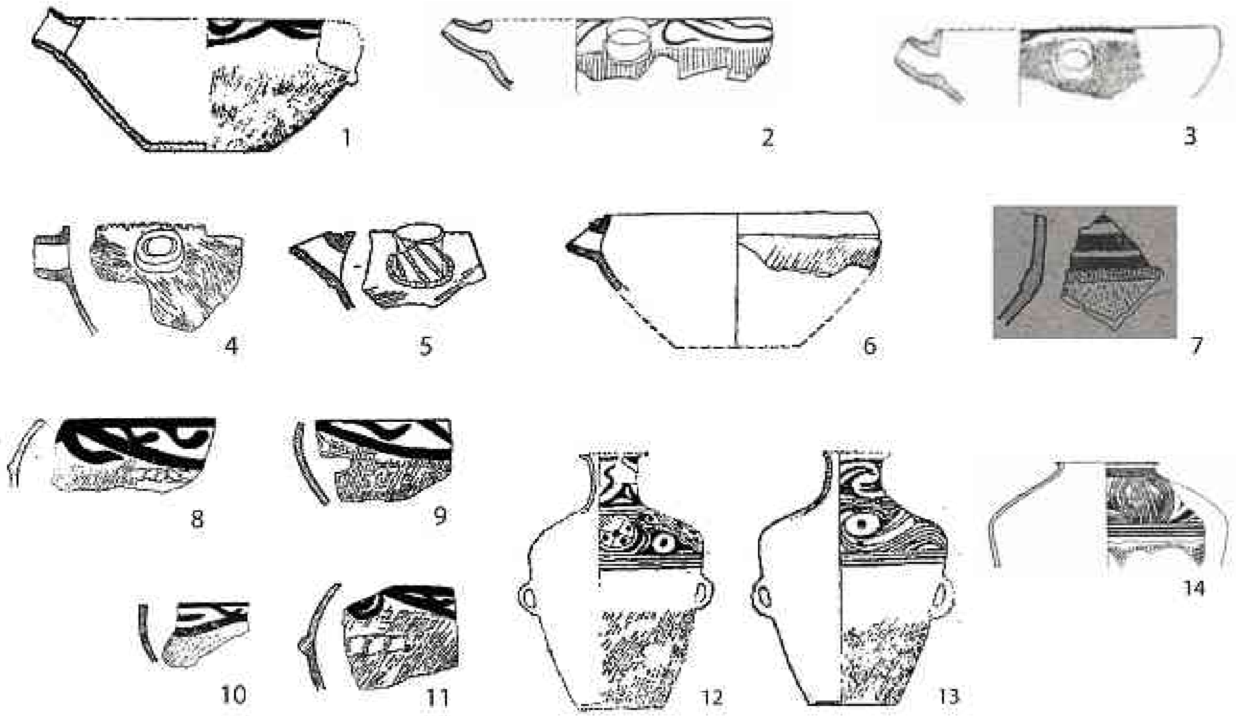


Figure 11. *Potential Double-Wares from other sites: 1. Linjia F19:26;*[66] *2. Yan'erwan H1:103;*[67] *3. Xipogua T13:23;*[68] *4. Linjia F21:6;*[69] *5. Linjia T52:3;*[70] *6. Fujiamen T2.3:76;*[71] *7. Xipogua T13.2;*[72] *8. Linjia H59:31;*[73] *9. Linjia H59:31;*[74] *10. Caojiazui;*[75] *11. Linjia T15:4; 12. Linjia H9:1;*[76] *13. Linjia H9:2;*[77] *14. Xipogua H10:5.*[78]

66 Ren Ruibo 任瑞波, "Xibei diqu caitao wenhua yanjiu 西北地區彩陶文化研究 [Study on the Painted-Pottery Culture of Northwest Culture]," fig. 3.1.3-10.8

67 Ibid, fig. 3.1.3-7.7

68 Ibid, fig. 3.1.3-5.8

69 Gansusheng Wenwu Gongzuodui 甘肅省文物工作隊, et al, "Gansu Dongxiang Linjia yizhi fajue baogao 甘肅東鄉林家遺址發掘報告 [Excavation report of Linjia site, Dongxiang, Gansu]," fig. 24.13.

70 Ibid, fig. 24.12.

71 Zhongguo Shehui Kexuezuan Kaogu Yanjiusuo Ganqing Gongzuodui 中國社會科學院考古研究所甘青工作隊, "Wushan Fujiamen yizhi de fajue yu yanjiu 武山傅家門遺址的發掘與研究 [Excavation and research at Fujiamen site, Wushan]," fig. 9.8.

72 Gansusheng Bowuguan 甘肅省博物館, "Gansu Lanzhou Xipogua yizhi fajue jianbao 甘 蘭州西坡坬遺址發掘簡報 (Preliminary report on the excavation at Xipogua in Lanzhou, Gansu)," fig. 4.2.

73 Gansusheng Wenwu Gongzuodui 甘肅省文物工作隊, et al, "Gansu Dongxiang Linjia yizhi fajue baogao 甘肅東鄉林家遺址發掘報告 [Excavation report of Linjia site, Dongxiang, Gansu]," fig. 24.8.

74 Ibid., fig. 24.10.

75 Gansusheng Bowuguan 甘肅省博物館, "Lanzhou Caojiazui yizhi de shijue 蘭州曹家咀遺址的試掘 [Test excavations at Lanzhou Caojiazui]," fig. 1.2.

76 Ibid., fig. 26.21.

77 Ibid., fig. 28.9.

78 Ren Ruibo 任瑞波, "Xibei diqu caitao wenhua yanjiu 西北地區彩陶文化研究 [Study on the Painted-Pottery Culture of Northwest Culture]," fig. 3.1.3-6.9.

seem to be slightly more common in earlier layers (i.e., early Majiayao phase). Considering the small number of examples, it is not possible to generalize based on the available data.

Several spouted basins from Fujiamen 傅傢們 lacking paint may also be Double-Wares[79] (Fig. 11.6). There are several examples of spouted basins from other sites as well such as Xipogua 西坡瓜 (Fig. 11.3[80]), Caojiazui 曹家咀 (Fig. 10.10[81]) and Yan'erwan 雁兒灣 (Fig. 11.2[82]), all of which are located in Lanzhou, Gansu. Xipogua additionally furnished a fragment similar to Majiayao K11998:486[83] (Fig. 11.7, compare with Fig. 1.6 in the present paper). Xipogua also held a high-shouldered jar with narrow opening with black paint on the upper part and a rusticated body below[84] (Fig. 11.14). While these types of jars are rather common in pure fine ware, the spouted basins are rare and mostly appear as Double-Wares. The only exception known to us is a bowl from Dahiquan (K3048:002) of quite similar design to K11998:116 observed in our larger ongoing study.

The fact that all Double-Ware pots identified so far seem to have been large vessels is an argument in favor of the suggestion by Bylin-Althin that this construction technique was chosen as a way to ensure that a lower part can carry the upper part (during construction) of a large vessel.[85] However, the most common ways to do this is either to make the vessel wall thicker or to allow the lower part to dry to leather hardness before you continue the construction of the upper part. Also, if the coarse tempered fabric is there just as a reinforcement for an extra-large painted vessel, it leaves the rustication of the outside of the lower part unexplained.

Discussion

In order to understand what the Double-Wares may tell us about Majiayao potting, we need to follow different lines in the analytical results. We start by recognizing that the group of Double-Wares analyzed here is just as heterogeneous in raw material choices as any sample consisting of separate Majiayao FW pots and CW pots, and covers a range of different vessel shapes. This can be seen as an argument that *Double-Ware pots were made by just as many potters as the "normal" Majiayao FW and CW wares. At least the results leave no obvious indication that the Double-Wares were a specialty of one or a few potters.* Only better dating and more scientifically excavated examples will help us elucidate whether the Double-Ware potters were primarily spread in space (within each site/between sites), in time,

79 Zhongguo Shehui Kexuezuan Kaogu Yanjiusuo Ganqing Gongzuodui 中國社會科學院考古研究所甘青工作隊, "Wushan Fujiamen yizhi de fajue yu yanjiu 武山傅家门遗址的发掘与研究 [Excavation and research at Fujiamen site, Wushan]," *Kaoguxue jikan* 考古學集刊 16 (2006): T2.3:76.

80 Yan Wenming 嚴文明, and Zhang Wangao 張萬高, "Yan'erwan yu Xipogua 雁兒灣與西坡坬 [Yan´erwan and Xipogua]," *Kaoguxue wenhua lunji* 考古學文化論集 3 (1993): T13:23

81 Gansusheng Bowuguan 甘肅省博物館, "Lanzhou Caojiazui yizhi de shijue 蘭州曹家咀遺址的試掘 [Test excavations at Lanzhou Caojiazui]," *Kaogu* 考古 3 (1973).

82 Yan Wenming 嚴文明, and Zhang Wangao 張萬高, "Yan'erwan yu Xipogua 雁兒灣與西坡坬 [Yan´erwan and Xipogua]," H1:103.

83 Gansusheng Bowuguan 甘肅省博物館, "Gansu Lanzhou Xipogua yizhi fajue jianbao 甘 蘭州西坡坬遺址發掘簡報 [Preliminary report on the excavation at Xipogua in Lanzhou, Gansu]," 4.

84 Yan Wenming 嚴文明, and Zhang Wangao 張萬高, "Yan'erwan yu Xipogua 雁兒灣與西坡坬 (Yan´erwan and Xipogua)," H10:5.

85 Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," 443.

or both. What the Double-Wares unequivocally tell us is that *there were Majiayao potters that made both the painted FW pots and rusticated CW pots and it suggests that all potters could probably make both types.* In addition, the makers of the Double-Wares had the experience to master the problems posed by building a vessel of two different wares and fabrics. Skillful potters are not necessarily professionals, though. That the solutions to the problem of joining two different fabrics are almost as many as the number of vessels analyzed (10 different combinations of A-C and I–IV) seems to indicate that there was no fixed building recipe, and likely more solutions than we know of now.

One way of making a vessel combining two different surface decorations would have been to use the same ware for the whole pot and just mark the difference in the surface treatment. It would have been possible to use an un-tempered clay or one with fine sand temper which would not have posed any problems for the burnishing of the FW part. That the potters making the Double-Wares insisted on keeping the quality of fabrics traditionally associated with the groups of fine ware and coarse wares vessels despite entailing problems tells us about a very strong connection between outer appearance and inner fabrics quality in members of the two vessel categories. Alternatively, there might be other, technological reasons that we are not aware of.

Two of the vessels (K11999:070 and :098) not only share superficial appearance, but the CW parts of both have been made from the same (or very similar) fine sorted, silty clay tempered with around 15 % (volume) of the same crushed granite, while the fine clays used for the FW parts (joined in both cases by the wedge method – II) are of the same quality but deviate in a common presence of dark minerals in K11999:098 not seen in the other clay in K11999:070. In addition, the lack of optical reaction of the matrix in K11999:098 shows that the firing temperature has been higher than 700°C while K11999:070 was fired below this temperature. The use of almost identical clays tempered with pieces of the same lump of granite would be extremely unlikely with any substantial time lapse between the making of the two vessels. The collective result is that these two samples most likely represent two separate Double-Ware vessels made by the same potter or the same workshop probably shortly after each other. This pair of pots thus shows us that at least one potter/workshop had a personal recipe to follow and made more than one Double-Ware pot.

Two other vessels are interesting because of their different solution to the FW/CW-challenge. The basin K11998:116 and the short-necked vessel K11998:486 are both made with similar clays in both parts (group *A*) and with a slanting joint (Joining I) but deviate in the tempering from the rest of the Double-Ware samples. The FW part of the basin only makes up the upper couple of centimeters below the rim (Fig. 12). This ware has been tempered with 19 % of finely crushed granite (max grain 1.1 mm) while the CW part below was tempered with 28 % from a coarser crushed fraction (max grain 2.3 mm) of the same rock.[86] After the whole outer surface was striated, the upper couple of centimeters – matching the underlying fine ware part – was burnished and painted. Thus, both the inside and the outside display a less marked difference between the FW and the CW than the majority of the Double-Ware samples.

[86] Smaller crystals on average and less biotite in the granite in the fine ware part suggests that it might be from a different part of the same rock – possibly chosen because the smaller crystal size would make finer crushing easier.

Figure 12. *Photo of basin K11998:116 with indication of the sample section and microscope photo showing the transition from the lower* CW *with coarser and richer rock temper and the upper FW with a finer temper of the same rock. Crossed polars.*

While the short-necked vessel K11998:486 (Fig. 13) has the typical, marked outer difference between a burnished, painted FW upper part and a rusticated lower CW part matched by different fabrics in the vessel wall, both parts are tempered with sand although in different amounts (16 % in CW /less than 10% in FW) and with different sorting (max. grain 2,6 mm/ 1 mm). Even in this case, the potter has bypassed the essential risk of cracking by differential shrinkage (from joining tempered and un-tempered ware), but all the same kept up the difference between the two different ware types. Although it is technically easier to achieve a smooth burnished surface if the grains are small and rounded (e.g., 1 mm) there is no practical reason why the amount of temper should be lower. *This stresses that a vital goal of the Double-Ware production was to truly unite two types of vessels each with their own ware identity.* The possible rationale behind this will be discussed further below. These two vessels that, so to speak, belong to the edge of the phenomenon of Double-Wares could possibly mark a beginning and/or end of the phenomenon. A Majiayao-bowl from the site of Dashiquan (K03248:002) of quite similar design to K11998:116

Figure 13. *Photo of vessel K11998:486 with indication of the sample section and of the Ts sample showing the transition from the lower* CW *with coarser sand temper and the upper FW with a finer fraction of sand temper.*

Figure 14. *Majiayao-style Double-Ware vessel K11998:116 from Majiayao site compared to similar Majiayao-style non-Double-Ware sherd K03248:002 from Dashiquan.*

is not a Double-Ware bowl (this vessel is included in a larger ongoing ware study) (Fig. 14). The dating of this vessel in relation to the Majiayao site finds is not known, but it shows that the same type of vessel existed as "normal" coarse ware as a contrast to the typical Double-Ware vessels. The Luohantang vessel K12003:896 mentioned by Bylin-Althin as combining a rusticated and a painted part but having a uniformly quartz tempered ware may be a parallel to the two vessels from Majiayao and the vessel from Dashiquan.[87]

A further interesting pair of samples is K11998:132 and K11999:471 – both belonging to Sommarström's group named "plain fine-and-coarse ware".[88] They are made of quite similar fine clays (group A) where the CW part in each of them has been tempered with different amounts of sand (of different compositions). The joint of the FW and CW parts is slanting in both pots (joining I). Although the resemblance is not enough to argue that they were made by the same potter, it is worthwhile to look out for more, similar vessels to see if they could be part of a separate tradition or sub-tradition of Double-Wares.

A pertinent question to the Majiayao fine ware production is whether the potters used levigation to ensure a fine clay quality.[89] Normally, levigating a clay will reduce the amount of inclusions heavier than clay depending on both specific weight and size so that heavier minerals like ore will be much less frequent in the levigated clay as will sand grains of quartz and feldspar. Shape is also important, meaning that plate-shaped mica grains, although with a higher specific weight than quartz, will stay afloat in the levigated clay and may even increase in amount. When it comes to the Gansu clays, calcium is of course especially interesting. Limestone is very slightly lighter (in specific weight) than quartz and the fine-grained character of the calcite dominating these clays would help to further keep the calcium in the levigated clay rather than sinking to the bottom of the levigation tank. Thus, a reasonable result of levigating coarser Gansu clays would be a fine, silty clay without heavy material such as ore and sand grains but with the same amount or more of mica and fine-grained calcium. Turning to the Double-Wares we analyzed in this study, in most cases, *levigation as an explanation for the differences in coarseness seems unlikely as grains of ore and other heavier dark minerals are still present in the finer clay.* In the sample

[87] Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," 443 and pl 43.3.

[88] Bo Sommarström, "The Site of Ma-Kia-Yao," 87f.

[89] See Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," 433.

K11999:098, the fine clay in the FW part could be a levigated version of the slightly coarser, fine clay (more fine sand) in the CW part, but it is fair to wonder why a potter would bother with the work of levigation to achieve a just slightly finer clay. Rather, this sample shows that the potter – and presumably other Majiayao potters – had access to and distinguished between different qualities of naturally fine clay.

At another level, we may compare the Double-Ware samples from Majiayao and Luohantang bearing in mind that only three pots from the latter site have been studied (plus one CW part of a fourth). Among only three samples, we find both groups A and B and both sand temper and temper of crushed granite. At the same time, it is only at Luohantang that we see the simpler, straight coil joining of the FW and CW parts (joining IV). That may in turn be related to the other difference between the Majiayao and Luohantang Double-Ware samples, the latter having generally finer temper qualities (Fig. 8), reducing differential shrinkage rates between the two parts of the pots and thus the risk of cracks where they are joined. It should be interesting in the future to compare these temper qualities with other (normal) Majiayao period/style pottery from Luohantang to see if finer temper quality is a general difference in craft tradition between the sites or a special accommodation for the Double-Ware pots. Other data from the APP-project suggests that preferences for temper qualities may vary between sites.[90] However, further research is needed to explore to what extent the variation could be determined by chronology.

The Main Results of the Analyses

To sum up what new knowledge this limited study of Majiayao Double-Ware sherds have given us, we now have new arguments:

- *That the same Majiayao potters made both painted fine ware and rusticated coarse ware pots.*
- *That the connection between general vessel category (painted fine ware versus rusticated coarse ware) and fabric composition is so strong that the potter setting out to make a Double-Ware pot rather put his efforts at risk than chose a homogenous, intermediate ware for the whole pot (which would not have been visible on the outside).*
- *That different potters had different solutions to the problem of joining the two parts of the vessel and that the variation was larger between sites than within sites (whether because of space or time).*

These results also indicate that:

- *Majiayao potters had access to and were able to discern between different fine qualities of clay.*
- *Majiayao potters used various types of natural clay rather than using levigation to refine their clay.*
- *The choice between sand or crushed rock either marks different sub-traditions or was a personal choice with each potter.*

[90] See Hein et al. this volume.

Figure 15. *Double-Ware sherd from 2018 Majiayao excavation (2017GLMG1, layer 6).*

The Double-Ware pots show us that the Majiayao potters were skilled and both very traditional and at the same time experimenting craftspeople that managed the challenge of uniting two different traditional wares in the same pot rather than choosing an easier solution. That makes it reasonable to see them as craftspeople with highly regarded skills but most likely not as professionals making their livelihood from turning out pottery products. It is tempting to see the Double-Wares as a dare to show that you are able to do both types of vessels and unite them in one – perhaps fit for a "masterpiece" at the end of a potter's training.

The Double-Wares – a Rare Phenomenon?

An important aspect for the discussion about the reasons for making Double-Ware pots is how common the phenomenon was in Majiayao pottery making; whether it occurred all through the Majiayao period and of course whether it was limited to this style/period. At present, the pieces known at MFEA from the recording of Sommarström and Bylin-Althin and our own recording are all sherds of Majiayao period/style vessels from the sites of Majiayao, Dashiquan, and Xindian in Gansu province and Luohantang in Qinghai province. Personal communications from the head of the recent excavations at the Majiayao site confirm new finds of Double-Ware sherds but the numbers are as of yet unknown (Fig. 15). Whole pots from various sites (Fig. 11) display Double-Ware design but no analyses have been performed. Although more data is needed, it is worthwhile to discuss the frequency of Double-Wares in the Andersson collection. At face value, Double-Ware frequency is low in the large sherd material. However, it must be taken into account that the sherds need to include the transition between the fine ware and coarse ware parts in order to be recognized as Double-Ware. Furthermore, despite the efforts of the Majiayao potters, this transition is a weak spot where the sherds will easily break, making it more difficult to make a Double-Ware determination. The frequency of Double-Wares is likely higher than what we have seen so far but even though it is still an uncommon type.

Double-Wares – Rich in Information, but what Can they Tell us?

The discussion above has hopefully shown that the Double-Ware pots are rich in information as each vessel forms a perfect unit of two ware types with contingent different fabrics fixed in time and space and with numerous details. They may be seen as one vital key to understanding Majiayao pottery making. However, they also form a conundrum: *what are they and why were they made?* As we have seen, the pots range from low, medium-sized bowls over bigger bowls and basins to large bulky jars with or without neck. The painted decoration often takes the form of horizontal lines but there are also unpainted specimens. The Double-Ware phenomenon appears to have had no attachment to a specific vessel type or design. And the sherds appear among everyday settlement refuse just as any other pottery type. So far, no examples have been reported from burial sites. No lipid analyses have yet targeted Double-Ware pots, but there are no clearly visible traces of use (macro- or microscopically) on any of the recorded sherds.

Above, we suggested that the technical challenges posed by the making of Double-Ware pots could mark it as a daring testimony to the skills of a potter with a certain similarity to the master pieces of medieval crafts guilds. With the focus on the technical aspects of handling the two main types of potter's products together in one pot, it would be understandable that they are relatively rare, different types of pots and not used. The potters might have been young individuals finishing their education in household potting and making a Double-Ware pot as a centerpiece in their crockery set-up. It is quite common in present-day pottery using communities in Africa that the original set-up of pots that a woman brings into her new home is never used.[91] Or it may be the masterpiece of a semi-professional potter in the same situation using this pot as a show piece to "customers" as a proof of competence. The pair of vessels discussed above – K11998:070 and :098 –, however, speaks against the pots being a one-off feat.

Although difficult to test, we cannot avoid including the possibility of an esoteric aspect. Uniting the two most common types of household pots in one may also be to unite a duality in the setting of ordinary life (*fine* and *coarse* for lack of better words) thereby creating a "conversation piece" around which you may talk and perform actions focused on uniting all kinds of opposing elements. The Double-Ware pot would act as a very versatile open metaphor.

Acknowledgements

This study has only been possible with the support and openness of the National Museums of World Culture and the enthusiastic assistance of the MFEA staff. We are also most grateful to PhD-student Evgenia Dammer for finding additional examples of Double-Wares and allowing us to include the result of the Luohantang samples here.

[91] Pers. comment Edward Matenga.

Appendix

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11998:28	Ts 1	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 1	
Coarseware	
Coarseness	**MC**
Sorting	**S**
Silt	+
Fine sand	*
Sand	
Calcium	+
Mica	-
Iron oxide	+
Acc. minerals	**O, A/P, Z, Mu**
Plant fragm	
Diat/fossil	
Temper	
Type	**Gr**
Amount	**15 %**
Max. grain	**2 mm**
$\bar{X}$ max. grain	**1.5 mm**
Fineware	
Coarseness	**F**
Sorting	**S**
Silt	+
Fine sand	
Sand	
Calcium	*
Mica	*
Iron oxide	*
Acc. minerals	**O, A/P, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**Nat**
Amount	
Max. grain	**0.1 mm**
$\bar{X}$ max. grain	

Ware structures:
Well/very well homogenized.

Comment/Interpretation
Joining:
| |

Sample description

Photo of sample

Microscope photo of Ts 1. Crossed polars.

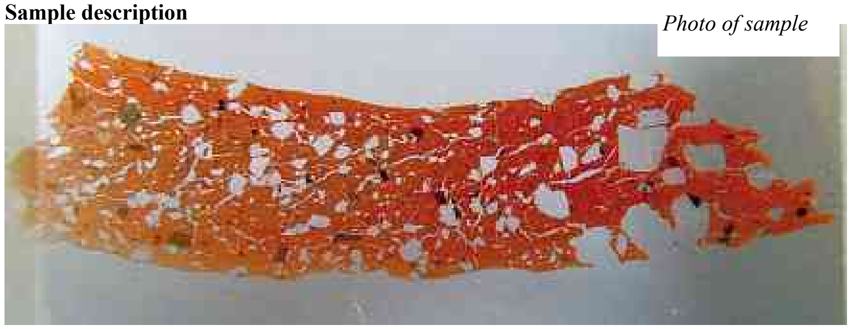
Microscope photo of Ts 1. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11998:116	Ts 2	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 2	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	--
Sand	
Calcium	-
Mica	+
Iron oxide	*
Acc. minerals	**O, A/P, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**Gr**
Amount	**28 %**
Max. grain	**2.3 mm**
$\bar{X}$ max. grain	**2 mm**
Fineware (same clay)	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	--
Sand	
Calcium	-
Mica	+
Iron oxide	*
Acc. minerals	**O, A/P, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**Gr**
Amount	**19 %**
Max. grain	**1.1 mm**
$\bar{X}$ max. grain	**1 mm**
Ware structures: Well/very well homogenized.	
Comment/Interpretation Joining: / Same base clay for CW and FW	

Sample description

Photo of sample



Microscope photo of Ts 2. Border between coarse and fine ware diagonally from mid left side to lower right corner. Crossed polars.

Legend to Double-Ware datasheets

F = fine, **MC** = medium coarse, **C** = Coarse

S = sorted, **U** = unsorted

-- = very few, - = sparse, * = common, + = rich

O = ore, **A/P** = amphibols/pyroxenes (dark minerals), **Z** = zircon, **Mu** = muscovite, **Bi** = biotite, **Iso** = isotropic mineral

S = spongia needles, **D** = diatoms, **F** = calcium fossils

Gr = granite, **Sa** = sand, **R** = rock, **GrD** = granodiorite,

Di = diorite, **G** = grog, **Nat** = naturally occurring temper/non-plastics

X = average maximum grain size based on the 5 second largest grains.

Joining: | |= gradual reduction of temper, /= diagonal overlap,

< = wedge overlap and ʃ = curved and s-shaped joining

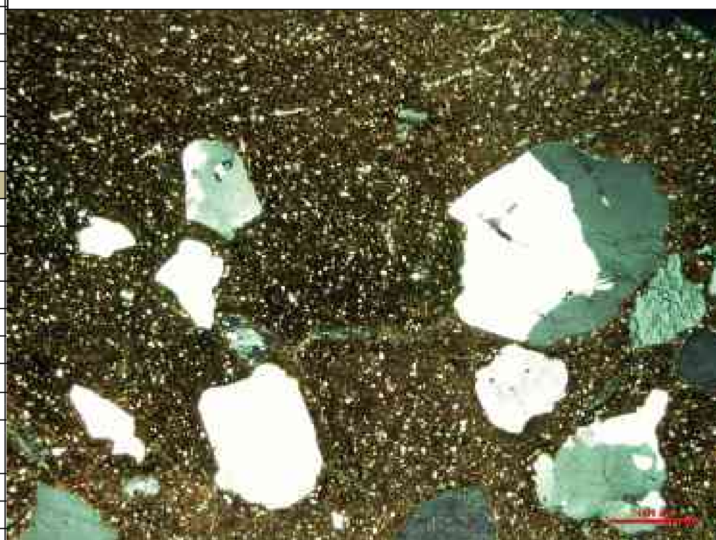
without overlap.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11998:132	Ts 3	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 3	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	+
Fine sand	--
Sand	
Calcium	*
Mica	*
Iron oxide	*
Acc. minerals	**O, A/P, Mu, Bi**
Plant fragm	
Diat/fossil	**F-**
Temper	
Type	**Sa**
Amount	**19 %**
Max. grain	**3.1 mm**
X̄ max. grain	**2.2 mm**
Fineware (same clay)	
Coarseness	**F**
Sorting	**S**
Silt	+
Fine sand	--
Sand	
Calcium	*
Mica	*
Iron oxide	*
Acc. minerals	**O, A/P, Mu, Bi**
Plant fragm	
Diat/fossil	**F-**
Temper	
Type	**Nat**
Amount	
Max. grain	**0.2 mm**
X̄ max. grain	
Ware structures: Well/very well homogenized	
Comment/Interpretation Joining: / FW and CW base clay are identical	

Sample description

Photo of sample



Microscope photo of Ts 3. Crossed polars.

Microscope photo of Ts 3. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11998:391	Ts 4	Majiayao	Vessel	Majiayao	Thin section	Petrograpic micr.

Microscopy Ts 4	
Coarseware	
Coarseness	**MC**
Sorting	**S**
Silt	+
Fine sand	*
Sand	
Calcium	-
Mica	?
Iron oxide	+
Acc. minerals	**O, A/P, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**Gr**
Amount	**14 %**
Max. grain	**2.6 mm**
$\bar{X}$ max. grain	**1.4 mm**
Fineware	
Coarseness	**F**
Sorting	**S**
Silt	+
Fine sand	--
Sand	
Calcium	*
Mica	**?**
Iron oxide	+
Acc. minerals	**O, A/P, Mu, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**Nat**
Amount	
Max. grain	**0.45 mm**
$\bar{X}$ max. grain	

Ware structures: Well homogenized clay, sufficiently hom. temper

Comment/Interpretation
Joining:
/
CW base clay coarser than that used for FW

Sample description

Photo of sample

Microscope photo of Ts 4. Crossed polars.

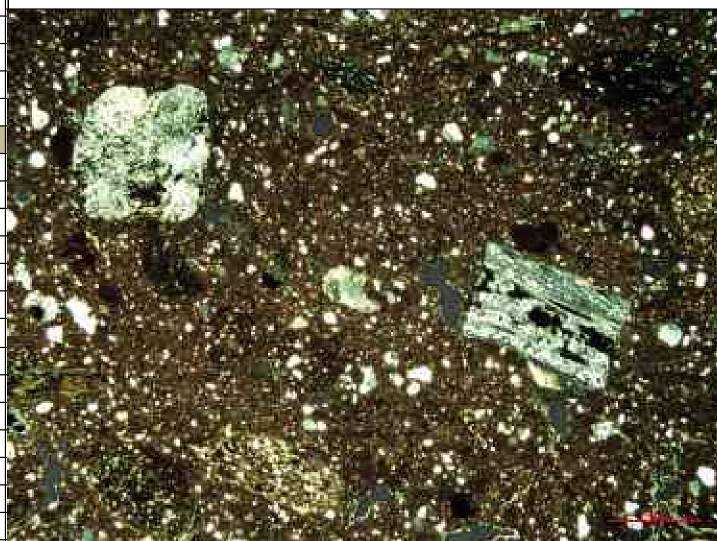
Microscope photo of Ts 4. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11998:486	Ts 5	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

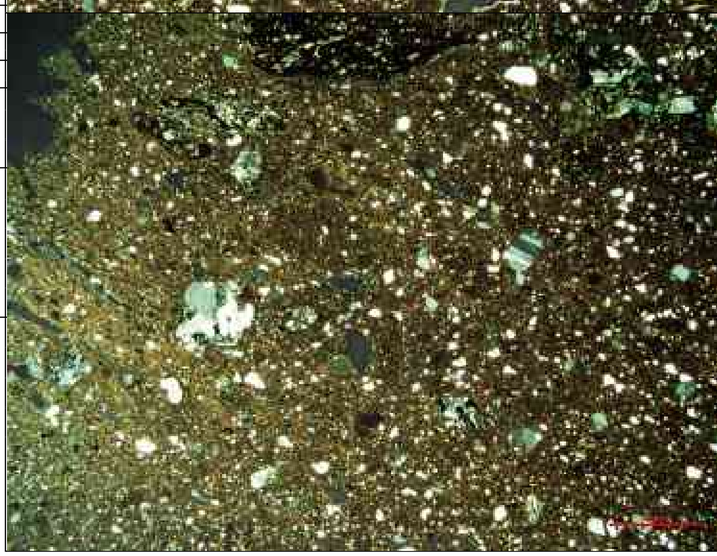
Microscopy Ts 5	
Coarseware	
Coarseness	**MC**
Sorting	**S**
Silt	+
Fine sand	*
Sand	
Calcium	++
Mica	-
Iron oxide	*
Acc. minerals	**O, A/P, Iso**
Plant fragm	
Diat/fossil	
Temper	
Type	**Sa**
Amount	**16 %**
Max. grain	**2.6 mm**
X̄ max. grain	**1.9 mm**
Fineware (same clay)	
Coarseness	**MC**
Sorting	**S**
Silt	+
Fine sand	*
Sand	
Calcium	++
Mica	-
Iron oxide	*
Acc. minerals	**O, A/P, Iso**
Plant fragm	
Diat/fossil	
Temper	
Type	**Sa**
Amount	**<10 %**
Max. grain	**0.95 mm**
X̄ max. grain	**? mm**
Ware structures: Sufficiently homogenized clay and temper	
Comment/Interpretation Joining: / Base clay for FW and CW identical	

Sample description

Photo of sample



Microscope photo of Ts 5. Crossed polars.



Microscope photo of Ts 5. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11199:70	Ts 6	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 6	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	-
Sand	
Calcium	+
Mica	-
Iron oxide	*
Acc. minerals	**O, A/P, Bi, Mu**
Plant fragm	
Diat/fossil	
Temper	
Type	**Gr**
Amount	**16 %**
Max. grain	**2.6 mm**
$\bar{X}$ max. grain	**1.7 mm**
Fineware	
Coarseness	**F**
Sorting	**S**
Silt	+
Fine sand	--
Sand	
Calcium	-
Mica	-
Iron oxide	+
Acc. minerals	**O, A/P, Bi, Mu**
Plant fragm	
Diat/fossil	**1?**
Temper	
Type	**Nat**
Amount	
Max. grain	**0.25 mm**
$\bar{X}$ max. grain	
Ware structures: Well/very well homogenized	
Comment/Interpretation Joining: < Two different fine clays for FW and CW parts	

Sample description

Photo of sample

Microscope photo of Ts 6. Crossed polars.

Microscope photo of Ts 6. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11199:075	Ts 7	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 7	
Coarseware	
Coarseness	**MC**
Sorting	**S**
Silt	+
Fine sand	+
Sand	--
Calcium	+
Mica	--
Iron oxide	+
Acc. minerals	**O, A/P, Mu**
Plant fragm	--
Diat/fossil	
Temper	
Type	**Gr**
Amount	**10 %**
Max. grain	**2.3 mm**
$\bar{X}$ max. grain	**1.5 mm**
Fineware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	--
Sand	
Calcium	-
Mica	*
Iron oxide	+
Acc. minerals	**O, A/P, Mu, Bi**
Plant fragm	-
Diat/fossil	
Temper	
Type	
Amount	
Max. grain	**0.2 mm**
$\bar{X}$ max. grain	

Ware structures: Sufficiently homogenized clay and temper

Comment/Interpretation
Joining:

<

Base clay used for CW is coarser than base clay for FW part

Sample description

Photo of sample

Microscope photo of Ts 7. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11199:079	Ts 8	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

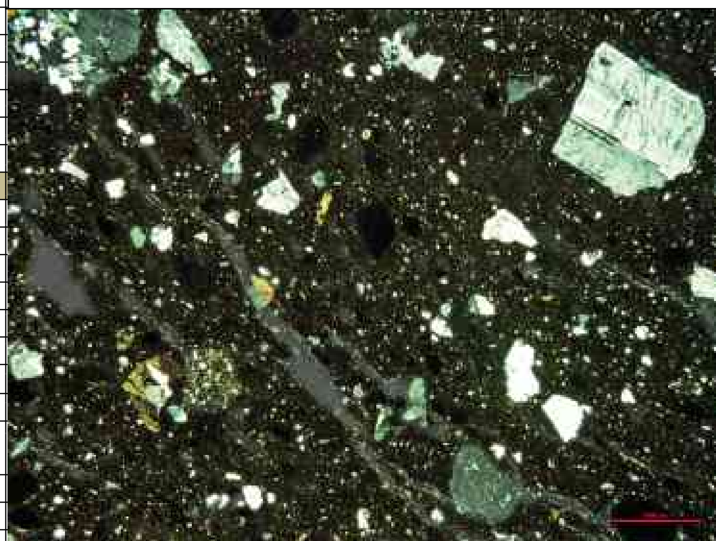
Microscopy Ts 8	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	--
Sand	
Calcium	*
Mica	-
Iron oxide	*
Acc. minerals	**O, A/P, Mu, Bi**
Plant fragm	--
Diat/fossil	
Temper	
Type	**Gr**
Amount	**13 %**
Max. grain	**2.7 mm**
$\bar{X}$ max. grain	**1.8 mm**
Fineware	
Coarseness	**F**
Sorting	**S**
Silt	+
Fine sand	--
Sand	
Calcium	-
Mica	*
Iron oxide	*
Acc. minerals	**O, A/P, Mu, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	
Amount	
Max. grain	**0.25 mm**
$\bar{X}$ max. grain	

Ware structures:
Well homogenized clay and temper

Comment/Interpretation
Joining:
/
Two different fine clays for FW and CW parts

Sample description

Photo of sample



Microscope photo of Ts 8. Crossed polars.

Microscope photo of Ts 8. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11199:098	Ts 9	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 9	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	-
Sand	
Calcium	+
Mica	?
Iron oxide	*
Acc. minerals	**O, Mu, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**Gr**
Amount	**17 %**
Max. grain	**3.9 mm**
$\bar{X}$ max. grain	**1.4 mm**
Fineware	
Coarseness	**F**
Sorting	**S**
Silt	+
Fine sand	--
Sand	
Calcium	-
Mica	**?**
Iron oxide	*
Acc. minerals	**O, Mu, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	
Amount	
Max. grain	**0.25 mm**
$\bar{X}$ max. grain	
Ware structures: Well homogenized clay and temper	
Comment/Interpretatioin Joining: < Two different fine clays for FW and CW parts	

Sample description

Photo of sample

Microscope photo of Ts 9. Crossed polars.

Microscope photo of Ts 9. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K11199:471	Ts 10	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 10	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	+
Fine sand	--
Sand	
Calcium	*
Mica	*
Iron oxide	+
Acc. minerals	**O, A/P, Mu, Bi, Iso**
Plant fragm	
Diat/fossil	**F?**
Temper	
Type	**Sa**
Amount	**29 %**
Max. grain	**2.75 mm**
$\bar{X}$ max. grain	**1.5 mm**
Fineware (same clay)	
Coarseness	**F**
Sorting	**S**
Silt	+
Fine sand	--
Sand	
Calcium	*
Mica	*
Iron oxide	+
Acc. minerals	**O, A/P, Mu, Bi, Iso**
Plant fragm	
Diat/fossil	
Temper	
Type	
Amount	
Max. grain	**0.2 mm**
$\bar{X}$ max. grain	

Ware structures: Well homogenized clay and sufficiently homogenized temper

Comment/Interpretation
Joining:
/
Same base clay for CW and FW

Sample description

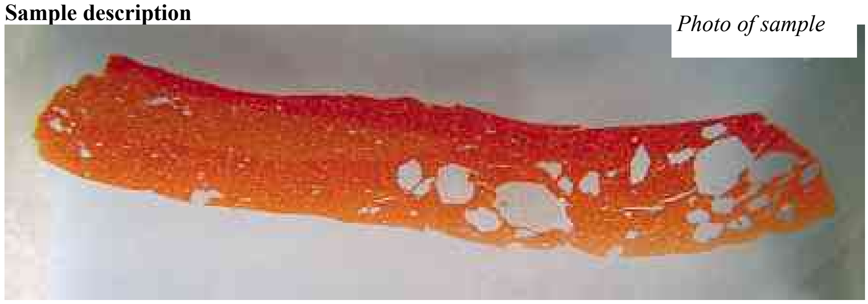
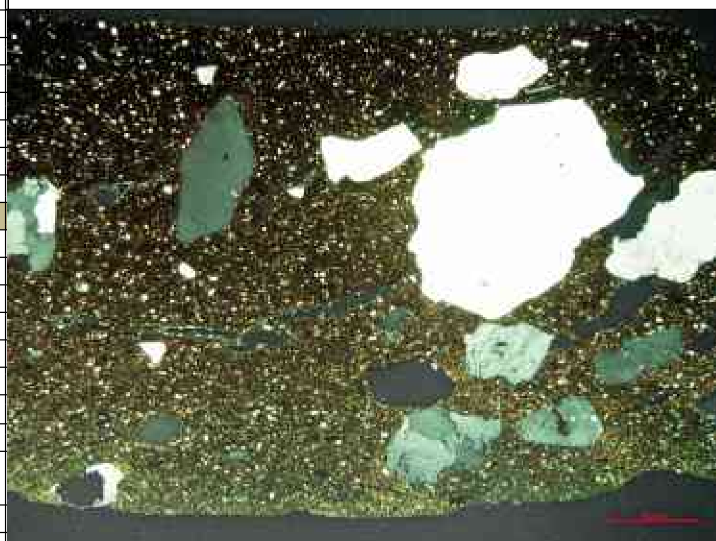


Photo of sample



Microscope photo of Ts 10. Crossed polars.

Microscope photo of Ts 10. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K12003:278	Ts 11	Luohantang	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 11	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	*****
Fine sand	**--**
Sand	
Calcium	*****
Mica	**+**
Iron oxide	*****
Acc. minerals	**O, A/P, Mu, Z**
Plant fragm	
Diat/fossil	
Temper	
Type	**Gr**
Amount	**6 %**
Max. grain	**2.6 mm**
X̅ max. grain	**1.4 mm**
Fineware (same clay)	
Coarseness	**F**
Sorting	**S**
Silt	*****
Fine sand	**--**
Sand	
Calcium	*****
Mica	**+**
Iron oxide	*****
Acc. minerals	**O, A/P, Mu, Z**
Plant fragm	
Diat/fossil	
Temper	
Type	
Amount	
Max. grain	**0.2 mm**
X̅ max. grain	

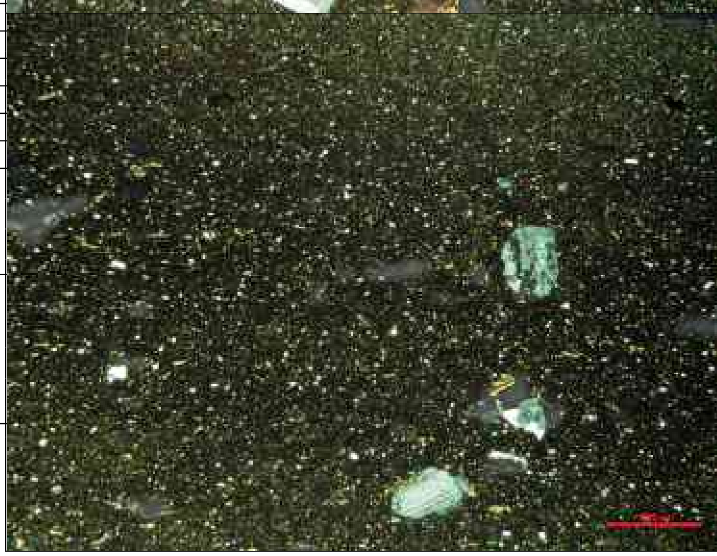
Ware structures:
Well homogenized clay and sufficiently homogenized temper.

Comment/Interpretation
Joining:
| |
Same base clay used for CW and FW

Sample description

Photo of sample

Microscope photo of Ts 11. Crossed polars.



Microscope photo of Ts 11. Crossed polars.

	Find no	Sample no	Site/period	Object	Context	Sample type	Analyses
Ceramics	K11998:19	Ts 11*(pilot)*	Majiayao	Vessel		Thin section	Petrograf. micr.

Microscopy Ts 11	
Clay	
Coarseness	**F**
Sorting	**S**
Silt	**+**
Fine sand	-
Sand	
Calcium	*
Mica	*
Iron oxide	**+**
Acc. minerals	**O, A/P, Mu, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**R**
Amount	**10 %**
Max. grain	**4,3 mm**
$\overline{X}$ max. grain	**1,4 mm**
Ware structures: Sufficiently homogenized	
Comment/Interpretat.	

Sample description

Photo of sample
b= lower cut

Microscope photo of Ts 11. Crossed polars.

Microscope photo of Ts 11. Different part of the sample Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K12003:894	Ts 12	Luohantang	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 12	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	--
Sand	
Calcium	+
Mica	*
Iron oxide	*
Acc. minerals	**O, A/P**
Plant fragm	
Diat/fossil	
Temper	
Type	**Sa**
Amount	**11 %**
Max. grain	**2.1 mm**
$\bar{X}$ max. grain	**1.7 mm**
Fineware (same clay)	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	--
Sand	
Calcium	+
Mica	*
Iron oxide	*
Acc. minerals	**O, A/P**
Plant fragm	
Diat/fossil	
Temper	
Type	
Amount	
Max. grain	**0.2 mm**
$\bar{X}$ max. grain	

Ware structures:
Well homogenized clay and sufficiently hom. temper.

Comment/Interpretation
Joining:
(
Same base clay used for CW and FW

Sample description

Photo of sample

Microscope photo of Ts 12. Crossed polars.

Microscope photo of Ts 12. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K16000:051	Ts 13	Luohantang	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 13	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	--
Sand	
Calcium	-
Mica	+
Iron oxide	*
Acc. minerals	**O, A/P, Bi**
Plant fragm	-
Diat/fossil	
Temper	
Type	**Gr**
Amount	**8 %**
Max. grain	**2.5 mm**
$\bar{X}$ max. grain	**1.5 mm**
Fineware	
Coarseness	**F**
Sorting	**S**
Silt	-
Fine sand	--
Sand	
Calcium	--
Mica	*
Iron oxide	+
Acc. minerals	**O, A/P, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	Plant?
Amount	**<10 %**
Max. grain	**1.7 mm**
$\bar{X}$ max. grain	

Ware structures:
Well homogenized clay and sufficiently hom. temper.

Comment/Interpretat.
Joining:
∫
Two different fine clays for FW and CW parts

Sample description

Photo of sample

Microscope photo of Ts 13. Crossed polars.

Microscope photo of Ts 13. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	K12003:897	Ts 14	Luohantang	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 14	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	-
Sand	
Calcium	-
Mica	+
Iron oxide	+
Acc. minerals	**O, A/P, Mu, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**Sa**
Amount	**8 %**
Max. grain	**1.8 mm**
X̄ max. grain	**1.4 mm**
Ware structures: Well homogenized clay and sufficiently hom. temper.	
Comment/Interpretation Joining: ? (Transition FW-CW not clearly included in sample).	

Sample description

Photo of sample

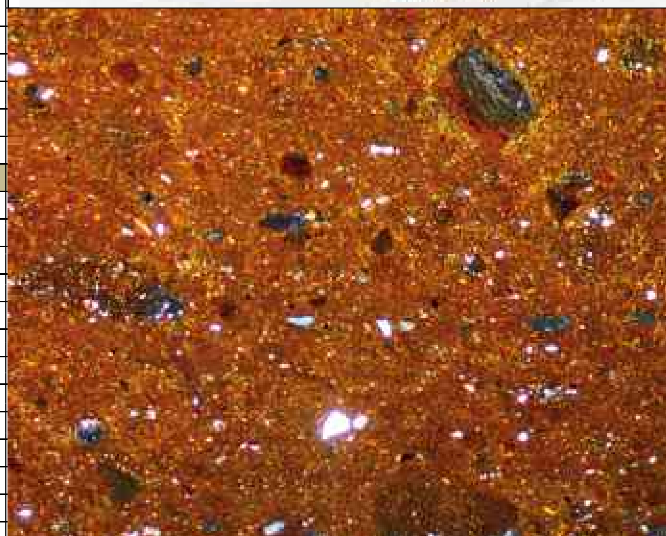
Microscope photo of Ts 14. Crossed polars.

	Find no	Sample no	Site	Object	Period	Sample type	Analyses
Ceramics	2014GLMH1.4:4	Ts 15	Majiayao	Vessel	Majiayao	Thin section	Petrographic micr.

Microscopy Ts 15	
Coarseware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	
Sand	
Calcium	-
Mica	*
Iron oxide	*
Acc. minerals	**O, A/P, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**Gr**
Amount	**27 %**
Max. grain	**2.5 mm**
X̄ max. grain	**2.1 mm**
Fineware	
Coarseness	**F**
Sorting	**S**
Silt	*
Fine sand	
Sand	
Calcium	-
Mica	*
Iron oxide	*
Acc. minerals	**O, A/P, Bi**
Plant fragm	
Diat/fossil	
Temper	
Type	**Nat**
Amount	
Max. grain	
X̄ max. grain	**0.1 mm**
Ware structures: Well/very well homogenized.	
Comment/Interpretation Joining: / Same base clay for CW and FW	

Sample description

Photo of sample



Microscope photo of Ts 15. Crossed polars.

Microscope photo of Ts 15. Crossed polars.

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Insights into Ceramic Use in Prehistoric Northwest China Obtained from Residue Analysis: A Pilot Study on the Andersson Collection at the Museum of Far Eastern Antiquities, Stockholm

by

Jennifer KEUTE, Sven ISAKSSON, Thibaut DEVIÈSE, Anke HEIN

Abstract

The Andersson Collection housed at the Museum of Far Eastern Antiquities holds finds from the earliest archaeological fieldwork ever conducted in northwest China. Recent years have seen an increased interest in the archaeology of that region, especially prehistoric subsistence practices and their environmental correlates. The Andersson Collection which has lain largely dormant since the 1940s provides a great opportunity for further research on this topic, especially on sites which are no longer accessible for a variety of reasons. As part of a larger project aimed at "re-excavating" these materials from museum storage and answer questions of identity and interaction along the old exchange corridor of the proto-Silk Road, this pilot study explores the potential of using molecular and isotopic characterization of organic residues from Neolithic and Bronze Age ceramic vessels to understand subsistence practices in northwest China.

Organic residue analysis can aid our understanding on what kinds of foodstuffs these vessels held and shed light on cooking and eating habits and how these practices change or remain consistent over time and/or space. There is some concern that long-term storage in potentially unsuitable containers, cleaning with harsh chemicals, or restoration methods deemed suitable at the time may have destroyed much of the residue. Indeed, this pilot study finds that there is a considerable amount of contaminants in all samples, however, some residue has been detected and characterised, suggesting that more advanced extraction methods combined with an investigation into museum records to find out about previous cleaning and restoration methods, may help mitigate these issues. A similar approach may also be applied to other legacy collections.

Introduction

Recent years have seen an increasing amount of research on changes in subsistence practices in prehistoric northwest China, especially in connection with climate changes such as the 4.2 ka BP climatic event.[1] So far, these discussions have largely relied on model building based on changes in site distribution patterns combined with isotope studies and a limited amount of paleobotanical and zooarchaeological work.[2] Residue analyses of the abundant ceramic material from the region can also provide insights into cooking and eating practices, however, so far this avenue of analysis remains underexplored, a lacuna that this study addresses. Rather than sampling material from recent excavations in China, which are difficult or even impossible to export, this research focuses on the large and not fully explored collections of The Museum of Far Eastern Antiquities (MFEA) in Stockholm. In particular, samples were chosen from sites that are by now destroyed or otherwise inaccessible, to complement new fieldwork being conducted in China. The current study thus aims to understand subsistence practices in northwest China through molecular and isotopic characterization of lipids extracted from ceramic vessels from the Andersson collection held at the MFEA. This unique collection holds finds from the earliest archaeological surveys and excavations ever conducted in northwest China. These finds furthermore provided the basis for the culture chronological framework developed by Andersson for the region, a framework which in large parts is used until the present day.[3] As several of the sites that Andersson excavated in the 1920's are now destroyed or severely disturbed, the material held at the MFEA allows for unique insights into the prehistory of northwest China that even very recent excavations may not be able to provide.

While collections such as this are a great source for research, there are some concerns with preservation as organic residues in ceramics have shown to degrade quicker once excavated.[4] Furthermore, given that the finds have been in storage for about a century, a period during which conservation treatments and storage regulations have changed significantly, there may have been further sources of contamination or degradation of the residues. Here, we present the results of a pilot study investigating the preservation of organic residues for the material from seven sites in northwest China dating to the Neolithic and Bronze Age which are part of the Andersson collection.

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[4] Laura Fanti, Léa Drieu, Arnaud Mazuy, Thierry Blasco, Carlo Lugliè, and Martine Regert, "The Role of Pottery in Middle Neolithic Societies of Western Mediterranean (Sardinia, Italy, 4500–4000 Cal BC) Revealed through an Integrated Morphometric, Use-Wear, Biomolecular and Isotopic Approach," *Journal of Archaeological Science* 93 (May 1, 2018): 110–28.

<table>
<tr><th>Andersson Chronology</th><th colspan="3">Current Chronology</th></tr>
<tr><td rowspan="6">Kayue
Xindian
Siwa
Majiayao
Yangshao
Qijia</td><td rowspan="2">Xindian
1600–600BC</td><td rowspan="2">Kayue
1600–700BC</td><td>Siwa
1400–700BC</td></tr>
<tr><td rowspan="3">Qijia
2300–1500BC</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td rowspan="3">Majiayao
3200–2000BC</td><td>Machang Subphase
2300–2000BC</td></tr>
<tr><td>Banshan Subphase
2650–2300BC</td><td rowspan="2">Caiyuan
2800–2200BC</td></tr>
<tr><td>Majiayao Subphase
3200–2650BC</td></tr>
</table>

Table 1. *Chronology according to Andersson and according to recent research.*

Background

Archaeology of northwest China

Having been an exchange corridor between China and Central Asia from the Neolithic onwards, northwest China has seen a significant amount of interest in recent years resulting in a number of articles discussing directions and types of long-distance interaction.[5] It was precisely his interest in potential long-distance interactions that brought Andersson to northwest China initially. Having discovered painted pottery in Henan further to the east in 1921, Andersson was told by European archaeologists that there might be a connection

[5] Guanghui Dong, Yishi Yang, Xinyi Liu, Haiming Li, Yifu Cui, Hui Wang, Guoke Chen, John Dodson, and Fahu Chen. "Prehistoric Trans-Continental Cultural Exchange in the Hexi Corridor, Northwest China." *Holocene* 28.4 (April 1, 2018): 621–28; Li Jaang, "The Landscape of China's Participation in the Bronze Age Eurasian Network," *Journal of World Prehistory* 28.3 (2015): 179–213; Yang, Y., L. Ren, G. Dong, Y. Cui, R. Liu, G. Chen, H. Wang, S. Wilkin, and F. Chen, "Economic Change in the Prehistoric Hexi Corridor (4800–2200 BP), North-West China," *Archaeometry* 61.4 (August 27, 2019): 957–76; Fu Luowen 傅羅文 [Rowan Flad], "Zaoqi sichouzhilu de jishu biange – Gansu Taohe liuyu de kaogu chengguo 早期絲綢之路上的技術變革——甘肅洮河流域的考古成果 [Technological Change on the Proto-Silk Road: Archaeological Results from the Tao River in Gansu]," in *Zhongguo keji kaogu conglun* 中國科技考古從輪 [*Discussion of the Archaeological Sciences in China*], ed., Yuan Jing 袁靖 (Shanghai: Fudan Daxue Chubanshe 復旦大學出版社, 2019).

with painted wares in Central Asia and Eastern Europe.[6] Andersson thus went West to explore the potential for such a connection, finding both painted and unpainted wares and establishing a first chronological framework.[7] Though the sequence was later corrected by Xia Nai[8] and the connections with eastern European painted pottery traditions were disproven, the culture names and part of the definitions that Andersson established are being used until the present day (Table 1).

According to the current state of research, during the Neolithic, the Northwest was first part of the Yangshao cultural horizon, soon followed by the local variety of painted pottery known as Majiayao with its sub-phases of Majiayao, Banshan, and Machang which were defined by Andersson based on ceramic styles. These ceramic types have been found in large numbers in graves but also at settlement sites associated with agricultural living.[9] The early Bronze Age Qijia cultural phenomenon is likewise defined based on ceramic types, with undecorated fine-ware double-handled vessels being seen as typical for that period. Additionally, metallurgy became more common and there is evidence for agricultural subsistence and domestication of various types of animals, especially pigs.[10] These large-scale archaeological phenomena were followed by a fragmentation into a considerable number of different ceramic traditions, most importantly Xindian, Siwa, and Kayue which are generally believed to have practiced a pastoralist form of subsistence, though this notion has recently been put into question.[11] Given that all of these archaeological cultures are defined based on ceramic types, information on what kinds of foodstuffs these vessels held would thus aid in understanding cooking and eating habits by the various communities during these different periods and thus also contribute to solving the issue of changes and/or continuities in subsistence practices.

Thus far, no such research has been conducted on the materials excavated in recent years from various prehistoric sites in northwest China, and the material held in Stockholm has lain largely dormant since the 1940s. Until the present day, parts of the Andersson collection remain unpublished. The present study is part of a larger project conducted in collaboration between the Museum of Far Eastern Antiquities Stockholm, Stockholm University, and the University of Oxford. The main goal is to "re-excavate" these materials from museum storage and answer questions of identity and interaction along this old exchange corridor, the proto-Silk Road. The project uses a combination of macroscopic, microscopic, and chemical techniques to analyse the prehistoric pottery from northwest China held at the museum to learn about relationships between sites during this period

[6] Magnus Fiskesjö, and Chen Xingcan, *China before China: Johan Gunnar Andersson, Ding Wenjiang, and the Discovery of China's Prehistory* (Stockholm: Museum of Far Eastern Antiquities, 2004).

[7] Andersson, *Researches into the Prehistory of the Chinese.*

[8] Xia Nai夏鼐, *Kaoguxue lunwenji* 考古學論文集 [*Collected Essays in Archaeology*] (Beijing: Kexue Chubanshe 科學出版社, 1961).

[9] Xie Duanju 謝端琚, *Ganqing diqu shiqian kaogu* 甘肅地區史前考古 [*Prehistoric Archaeology of Gansu and Qinghai*] (Beijing: Wenwu Chubanshe [文物出版社], 2002).

[10] Womack et al., "Mapping Qijiaping: New Work on the Type-Site of the Qijia Culture (2300–1500 B.C.) in Gansu Province, China."

[11] Jaffe, and Hein, "Considering Change with Archaeological Data: Reevaluating Local Variation in the Role of the 4.2 K BP Event in Northwest China."

of early interaction as reflected in traditions of ceramic production and usage and the transmission of these traditions over time and space. Petrographic analysis shows that production techniques stay relatively consistent from the Neolithic to the Bronze Age in terms of raw materials and tempering choices, however, tempering behaviour changes in the late Bronze Age.[12] While there may be continuity in vessel production, new vessel forms appear in the Bronze Age possibly suggesting a change in vessel function. On this issue, residue analysis can provide further insights.

Food Residue Analysis in Archaeology

Analyses of organic residues absorbed in or encrusted on ceramic vessels have been highly successful in giving insight into vessel technology (e.g. beeswax resins used to impregnate vessel surfaces,[13] agricultural and subsistence practices,[14] human movement,[15] and human-environment interaction).[16] Organic molecules, called biomarkers, can be used as indicators of specific substances (e.g. animal fat, plant oil, beeswax, milk). Much of the published literature on food residues focuses on lipids, as they tend to preserve better in archaeological contexts, and can be indicative of the products processed and stored in ceramic vessels with a varying degree of specificity.[17] Lipids are also common in most foodstuffs, making them ideal proxies for specific research regarding human diet and subsistence in the past.The study of organic residues has gained traction in recent years due to developments in analytical chemistry, namely, advancements in chromatographic coupled to mass spectrometric instrumentation – allowing for organic components in small quantities to be identified with a high degree of specificity.[18] Currently, single compound isotopic

[12] Anke Hein, and Ole Stilborg, "Ceramic Production in Prehistoric Northwest China: Preliminary Findings of New Analyses of Old Material from the Museum of Far Eastern Antiquities, Stockholm," *Journal of Archaeological Science: Reports* 23 (2019): 104–15.

[13] Mélanie Roffet-Salque, Martine Regert, Richard P. Evershed, Alan K. Outram, Lucy J. E. Cramp, Orestes Decavallas, Julie Dunne, et al., "Widespread Exploitation of the Honeybee by Early Neolithic Farmers," *Nature* 527.7577 (2015): 226–30.

[14] Julie Dunne, Richard P. Evershed, Mélanie Salque, Lucy Cramp, Silvia Bruni, Kathleen Ryan, Stefano Biagetti, and Savino di Lernia. "First Dairying in Green Saharan Africa in the Fifth Millennium BC," *Nature* 486.7403 (2012): 390–94.

[15] L. J. E. Cramp, R. P. Evershed, M. Lavento, P. Halinen, K. Mannermaa, M. Oinonen, J. Kettunen, M. Perola, P. Onkamo, and V. Heyd, "Neolithic Dairy Farming at the Extreme of Agriculture in Northern Europe," *Proceedings of the Royal Society B: Biological Sciences* 281.1791 (2014): 20140819–20140819.

[16] O. E. Craig, H. Saul, A. Lucquin, Y. Nishida, K. Taché, L. Clarke, A. Thompson, et al., "Earliest Evidence for the Use of Pottery," *Nature* 496.7445 (2013): 351–54; Alexandre Lucquin, Harry K. Robson, Yvette Eley, Shinya Shoda, Dessislava Veltcheva, and Kevin Gibbs, "The Impact of Environmental Change on the Use of Early Pottery by East Asian Hunter-Gatherers," in *Proceedings of the National Academy of Sciences of the United States of America* vol. 115.31 (2018): 7931–7936 https://doi.org/10.1073/pnas.1803782115.

[17] R. P. Evershed, "Organic Residue Analysis in Archaeology: The Archaeological Biomarker Revolution," *Archaeometry* 50.6 (2008): 895–924; Mélanie Roffet-Salque, Julie Dunne, David T. Altoft, Emmanuelle Casanova, Lucy J. E. Cramp, Jessica Smyth, Helen L. Whelton, and Richard P. Evershed, "From the inside out: Upscaling Organic Residue Analyses of Archaeological Ceramics," *Journal of Archaeological Science: Reports* 16 (2017): 627–40.

[18] Mark Pollard, Carl P. Heron, and Ruth Ann Armitage, *Archaeological Chemistry*. 3rd ed. (Cambridge: Royal Society of Chemistry, 2017); Roffet-Salque et al., "From the inside out: Upscaling Organic Residue Analyses of Archaeological Ceramics."

analyses to measure $\delta^{13}C$ values are performed on palmitic acid (C16:0) and stearic acid (C18:0) through gas-chromatography-combustion-isotope-ratio-mass-spectrometry (GC-C-IRMS) to identify a wider variety of food resources.[19] GC-C-IRMS has been successfully applied to the archaeological record in various regions to better understand human environment interactions,[20] plant cultivation,[21] and exploitation of secondary products from domestic animals such as milk and cheese.[22]

Material Investigated

The present study explores whether there is adequate lipid preservation in the ceramic collection of the MFEA for further research. To make full use of the Andersson collections and complement the field research that has been and is currently being done in northwest China, this project focuses on sites discovered by Andersson that are not being re-excavated, giving preference to those that are destroyed or otherwise inaccessible to present-day scholarship. We selected seven sites including two with remains dating to the Majiayao (Dashiquan and Siwashan), Qijia (Caojiaping and Zhujiazhai), and Xindian periods (Machangyan and Xiaxihe), and one site with Kayue period remains (Qiayao, now known as Kayue) as only one Kayue-period site has been explored by Andersson (Table 2). Fourteen samples were taken, i.e., two samples from each site, one coarse ware and one fine ware sample to account for difference in residue absorption and retention between different ceramic porosities (Table A1). This is a pilot study conducted on a small number of samples from a limited number of sites ranging in date from the Neolithic to the late Bronze Age and in location from Lanzhou in the south-eastern part of Gansu to Qinghai in the west, chosen to cover a broad chronological range, different ceramic types, and a range of different burial conditions leading to differences in preservation. In this way, the study aims to establish the feasibility and prolificacy of conducting residue analysis on this collection, testing if after nearly a hundred years of storage the sherds in this collection contain sufficient residues and are not compromised too much by the intrusion of modern elements to

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[19] Vasiliki Papakosta, Rienk H. Smittenberg, Kevin Gibbs, Peter Jordan, and Sven Isaksson, "Extraction and Derivatization of Absorbed Lipid Residues from Very Small and Very Old Samples of Ceramic Potsherds for Molecular Analysis by Gas Chromatography – Mass Spectrometry (GC – MS) and Single Compound Stable Carbon Isotope Analysis by Gas Chrom," *Microchemical Journal, Devoted to the Application of Microtechniques in All Branches of Science* 123 (2015): 196–200; Marisol Correa-Ascencio, and Richard P. Evershed, "High Throughput Screening of Organic Residues in Archaeological Potsherds Using Direct Acidified Methanol Extraction," *Analytical Methods* 6.5 (2014): 1330.

[20] Alexandre Lucquin, Kevin Gibbs, Junzo Uchiyama, Hayley Saul, Mayumi Ajimoto, Yvette Eley, Anita Radini, et al., "Ancient Lipids Document Continuity in the Use of Early Hunter–gatherer Pottery through 9,000 Years of Japanese Prehistory," *Proceedings of the National Academy of Sciences* 113.15 (2016): 3991–96.

[21] Shinya Shoda, Alexandre Lucquin, Chi Ian Sou, Yastami Nishida, Guoping Sun, Hiroshi Kitano, Joon-Ho Son, Shinichi Nakamura, and Oliver E. Craig, "Molecular and Isotopic Evidence for the Processing of Starchy Plants in Early Neolithic Pottery from China," *Scientific Reports* 8.1 (November 19, 2018): 17044.

[22] Dunne et al., "First Dairying in Green Saharan Africa in the Fifth Millennium BC"; Cramp et al., "Neolithic Dairy Farming at the Extreme of Agriculture in Northern Europe"; Jessica Hendy, Andre C. Colonese, Ingmar Franz, Ricardo Fernandes, Roman Fischer, David Orton, Alexandre Lucquin, et al., "Ancient Proteins from Ceramic Vessels at Çatalhöyük West Reveal the Hidden Cuisine of Early Farmers," *Nature Communications* 9.1 (2018): 4064.

Site name (English)	Site name (Chinese)	Period	Location
Dashiquan	大石圈	Majiayao	Gansu, Lanzhou
Siwashan	寺窪山遺址	Majiayao	Gansu, Lintao County
Caojiaping	曹家坪遺址	Qijia	Gansu, Heshui County
Zhujiazhai	朱家寨遺址	Qijia	Qinghai, Minhe County
Machangyuan	馬廠塬遺址	Xindian	Qinghai, Minhe County
Xiaxihe	下西河遺址	Xindian	Qinghai, Xining City
Kayue	卡約遺址	Kayue	Qinghai, Xining City

Table 2. *Sites involved in this study.*

infer on their original content and usage. Based on the outcomes of the study, recommendations for future research on material from these and other sites presented in the Andersson collection will be made.

Methodology

For food residue analyses, the organic substance first needs to be extracted from the ceramic matrix. We employed different extraction methods that have been developed over the last few decades.[23] A selection of these results comparing extraction methods can be viewed in table A2. A breakdown of extraction methods used on each sample can be seen in table A4. The extracts were then characterised using analytical techniques, namely gas chromatography coupled with mass spectrometry (GC-MS). Samples which contained a sufficient amount of lipid extracts were then further characterised by GC-C-IRMS (Table A4). The former allows for the identification and quantification of the lipid residues and biomarkers while the second allows for stable isotope information on these molecules to be acquired.

[23] Papakosta et al., "Extraction and Derivatization of Absorbed Lipid Residues from Very Small and Very Old Samples of Ceramic Potsherds for Molecular Analysis by Gas Chromatography – Mass Spectrometry (GC – MS) and Single Compound Stable Carbon Isotope Analysis by Gas Chrom"; Craig et al., "Earliest Evidence for the Use of Pottery"; Correa-Ascencio, and Evershed, "High Throughput Screening of Organic Residues in Archaeological Potsherds Using Direct Acidified Methanol Extraction."; Thibaut Deviese, Alicia Van Ham-Meert, Vincent John Hare, Jasmine Lundy, Peter Hommel, Vladimir Ivanovich Bazaliiskii, and Jayson Orton, "Supercritical Fluids for Higher Extraction Yields of Lipids from Archeological Ceramics," Analytical Chemistry 90.4 (2018): 2420–24.

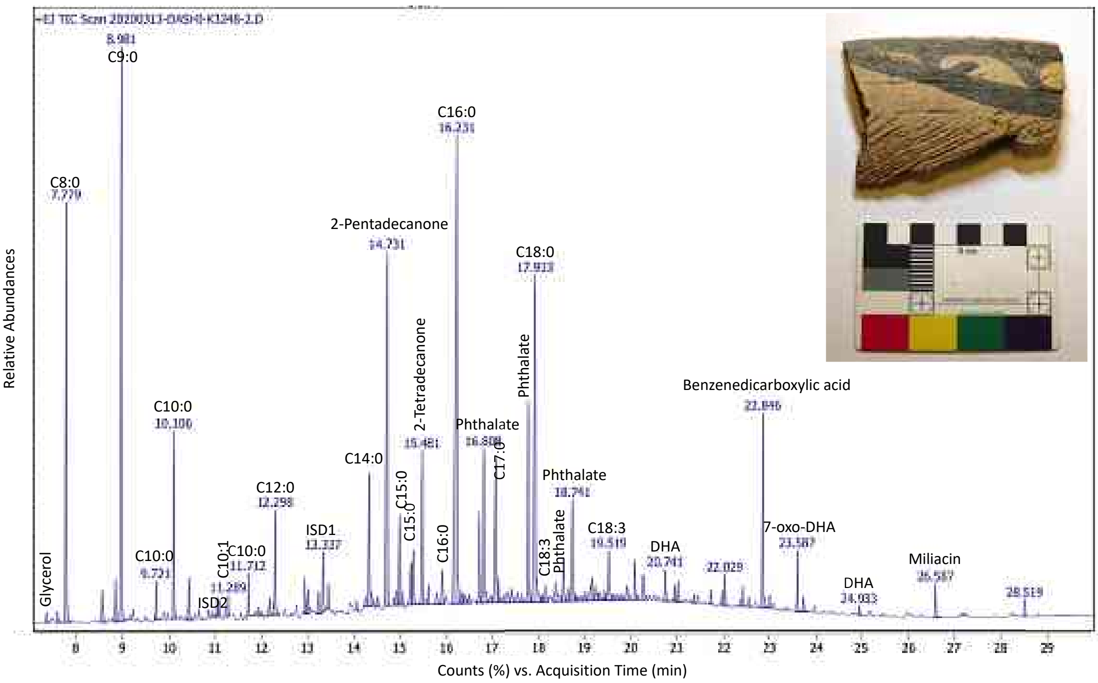

Figure 1. *Example of chromatogram obtained by gas chromatography / mass spectrometry on the sample Dashi-K3248-002 from Dashiquan.*

Results and Discussion

All samples analysed for this study yield low amounts of lipid material mainly consisting of free fatty acids and contaminates including phthalates (Table A3). A fine and coarse ware ceramic was sampled from each site in question to evaluate the effect of ceramic porosity and lipid retention. It was hypothesised that coarse wares would contain higher amounts of organic residues, as the ceramic body is more porous. While overall the course wares have higher lipid yields, this is seemingly more affected by the site location or microenvironment. Preservation overall remains consistent within sites rather than between ware types. This is highlighted by low lipid yields from both fine and coarse ware samples from Caojiaping and much higher yields from both samples from Dashiquan.

Free fatty acids make up the majority of compounds identified in the residue samples (Fig. 1). Palmitic (C16:0) and stearic acids (C18:0) are present and most abundant in the majority of samples (n=9) albeit in low quantities (<5µg/g). These compounds are the most abundant naturally occurring fatty acids, particularly in plants and animals.[24] Nine samples contain palmitic and stearic acid in abundances just at or slightly above the threshold for compound-specific isotopic analysis by GC-C-IRMS which further allows for the distinction of different food commodities and mixtures of more than one food commodities. Samples analysed showed evidence for C_4 plant processing (namely miliacin) which was not reflected in stable isotope analysis. Results mainly exhibit depleted $\delta^{13}C_{C16:0}$ and $\delta^{13}C_{C16:0}$ values (-30.4 to -27.05; Table 3) consistent with food commodities including C_3 plants, terrestrial animals (non-ruminant/wild ruminant) or freshwater fish. However, these re-

[24] Evershed, "Organic Residue Analysis in Archaeology: The Archaeological Biomarker Revolution."

Sample Number	$\delta^{13}C_{16:0}$	$\delta^{13}C_{18:0}$	$\Delta^{13}C$
MCY-K2360-143	-29.041	-30.438	-1.397
DASHI-K3248-002	-30.4325	-29.21	1.2225
XIA-K2165-5	-29.8415	-29.942	-0.1005
XIA-K2165-3	-23.7195	-27.0955	-3.376
QY-2019-001	-28.813	-29.3015	-0.4885
QY-2019-002	-27.329	-27.6845	-0.3555
MCY-2019-001	-29.291	-28.9075	0.3835
ZJZ-2019-0001	-29.3695	-27.054	2.3155
ZJZ-K2055-226	-27.928	-27.727	0.201

Table 3. *Summary of isotopic data of lipid residue analysis of ceramics from the Andersson collection*

sults cannot be further distinguished using this approach alone.[25] For the wild ruminant, non-ruminant, and freshwater species, the use of the $\Delta^{13}C$ ($\delta^{13}C_{18:0}$–$\delta^{13}C_{16:0}$) proxy, which emphasizes differences in metabolic physiologies, may provide more distinction.[26] Results cluster between -1 to 2.5‰ $\Delta^{13}C$ which falls in the range established for non-ruminant and freshwater aquatic resources (Fig. 2). This is consistent with the faunal assemblages at sites from this time period, which mainly include pig and freshwater fish remains.[27] Isoprenoid alkanoic acids and long-chain (C18-C20) ω-(o-alkylphenyl) alkanoic acids (APAAs) were not identified in lipid extracts, and these results do not satisfy the full molecular criteria for aquatic products in archaeological pottery.[28]

[25] Lucquin et al., "Ancient Lipids Document Continuity in the Use of Early Hunter–gatherer Pottery through 9,000 Years of Japanese Prehistory."

[26] Oliver E. Craig, M. Forster, S. H. Andersen, E. Koch, P. Crombé, N. J. Milner, B. Stern, G. N. Bailey, and C. P. Heron, "Molecular and Isotopic Demonstration of the Processing of Aquatic Products in Northern European Prehistoric Pottery," *Archaeometry* 49.1 (2007): 135–52; Lucquin et al., "Ancient Lipids Document Continuity in the Use of Early Hunter–gatherer Pottery through 9,000 Years of Japanese Prehistory"; Lucy Cramp, and Richard P. Evershed, "Reconstructing Aquatic Resource Exploitation in Human Prehistory Using Lipid Biomarkers and Stable Isotopes," in *Treatise on Geochemistry. Archaeology and Anthropology*, ed., H. D. Holland, and K. K. Turekian (Oxford: Elsevier, 2014), 319–339.

[27] Andrew Womack, "Crafting Community: Exploring Identity and Interaction through Ceramics in Late Neolithic and Early Bronze Age Northwestern China" (Ph.D. diss., Yale University, 2017).

[28] R. P. Evershed, M. S. Copley, L. Dickson, and F. A. Hansel, "Experimental Evidence for the Processing of Marine Animal Products and Other Commodities Containing Polyunsaturated Fatty Acids in Pottery Vessels," *Archaeometry* 501 (2008): 101–13.

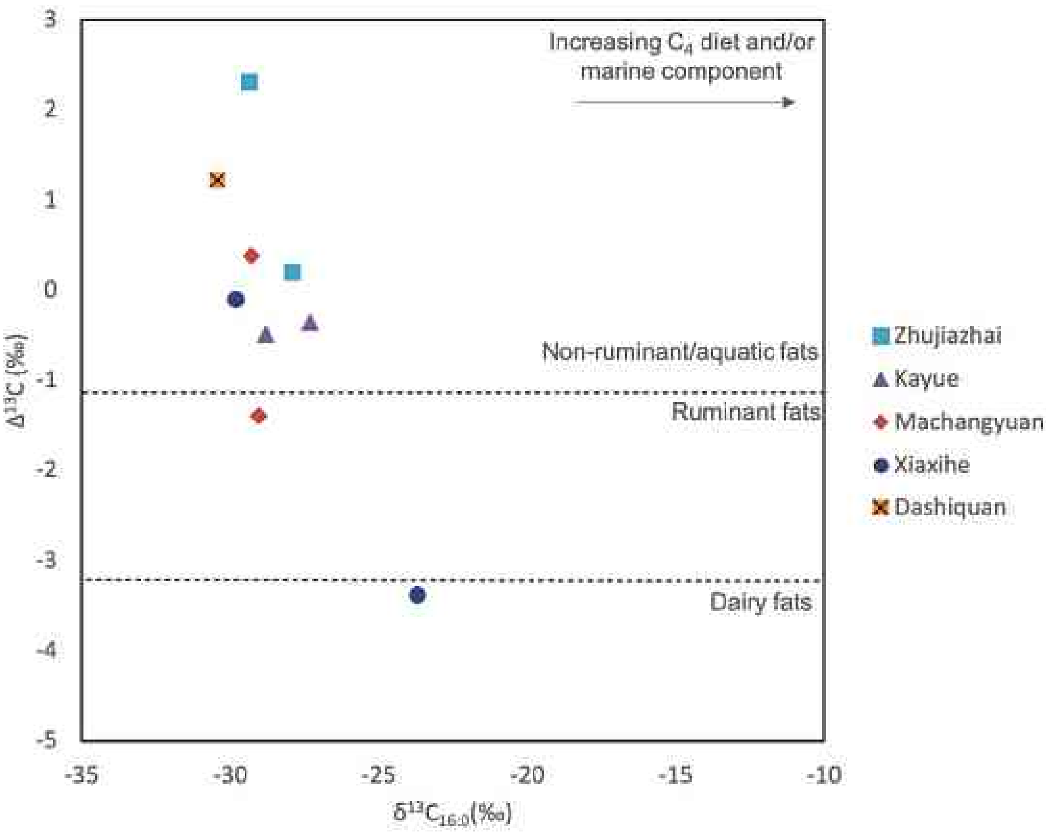

Figure 2. *Plot of* $\Delta^{13}C$ ($\delta^{13}C_{C18:0}$ - $\delta^{13}C_{C16:0}$) *values against* $\delta^{13}C_{C16:0}$ *values of Late Neolithic and Early Bronze Age pottery from northwest China from the Andersson Collection. This plot allows for the distinction of different animal fats.*[29]

The low lipid yields, the skewed ratio between palmitic and stearic acids, combined with the high amount of contaminants and lack of additional biomarkers draws scepticism about the origin of such lipid residues and they may not all derive from the use of the vessel in antiquity. Solvent extracts show high amounts of phthalates and other contaminants, and this may have been a contributing factor in inconsistent isotopic data. There is a possibility that extracted lipid material is derived from cleaning or conservation techniques which may have been routine in the past. While there are no published notes about such treatment on the sherds in question, such treatments are noted for whole vessels of the same collection.[30] In addition, as this is an exploratory pilot study, the sample size is small compared to the size of the collection; as only two samples - one coarse and one fine - were taken and they cannot be representative for the pottery of the sites as a whole. There is a possibility some

[29] Cramp and Evershed, "Reconstructing Aquatic Resource Exploitation in Human Prehistory Using Lipid Biomarkers and Stable Isotopes."

[30] Nils Palmgren, "Kansu mortuary urns of the Pan Shan and Ma Chang groups, China. Geological survey," *Palaeontologia sinica*, ser. d. vol. III. fasc. I. (Peiping [Peking]: Geological survey of China, 1934); Andersson, *Researches into the Prehistory of the Chinese.*

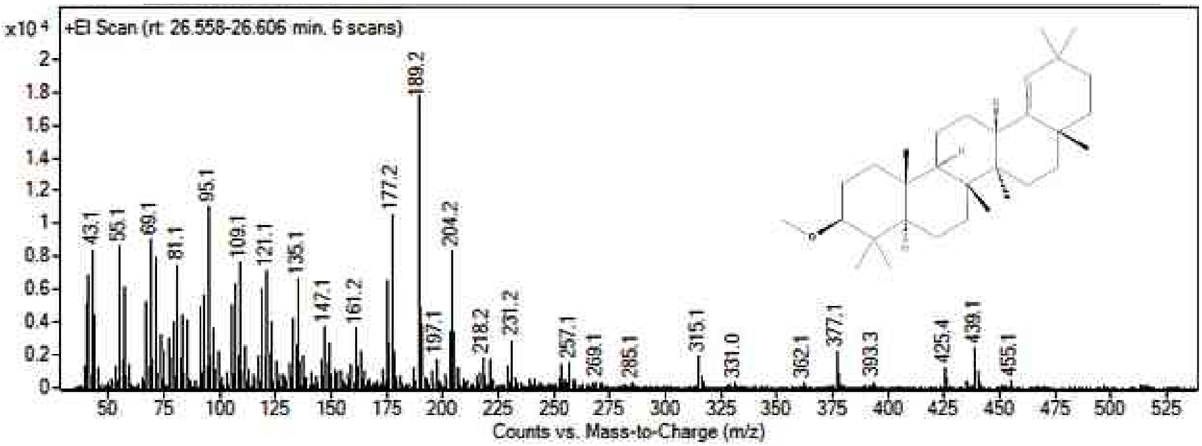

Figure 3. *Mass spectra and structure of miliacin, a biomarker for millet as identified in four samples in this study. Shown here is an example mass spectra from K2165-3 from Xiaxihe.*

ceramics from additional contexts in this collection may yield more promising results. Additional samples may also benefit from purification using $AgNO_3$-impregnated silica gel packed in pipette columns to isolate the FAMEs from contamination products for IRMS analysis.[31] Both avenues of exploration should be explored in follow-up studies.

In the analysis, a few notable biomarkers emerge. The molecule miliacin (Fig. 3) was identified in the residues of four samples: Dashi-K3248-002 and Dashi-K3241-038, from Dashiquan, K2165-3 from Xiaxihe, and CJP-2019-029 from Caojiaping (Fig. 1). This compound can be used as a biomarker for millet.[32] It has previously been identified in ceramics from South Korea dating to the Late Bronze Age (800–500 cal BC), ceramics from Poland dating from the Early to Middle Bronze Age, and samples from Early Celtic contexts in western France.[33] During the Neolithic, millet was the dominant crop produced in northwest China. By 7,000 BP, settlements with domesticated broomcorn millet emerge in the western Loess Plateau at Dadiwan.[34] Isotopic evidence from human and animal bones in this region show that millet was a dominant dietary staple until 2000 cal BC.[35]

[31] Vasiliki Papakosta, Ester Oras, and Sven Isaksson, "Early Pottery Use across the Baltic--a Comparative Lipid Residue Study on Ertebølle and Narva Ceramics from Coastal Hunter-Gatherer Sites in Southern Scandinavia, Northern Germany and Estonia," *Journal of Archaeological Science: Reports* 24 (2019): 142–51.

[32] Carl Heron, Shinya Shoda, Adrià Breu Barcons, Janusz Czebreszuk, Yvette Eley, Marise Gorton, Wiebke Kirleis, et al., "First Molecular and Isotopic Evidence of Millet Processing in Prehistoric Pottery Vessels," *Scientific Reports* 6 (June 2016): 1–9.

[33] Maxime Rageot, Angela Mötsch, Birgit Schorer, David Bardel, Alexandra Winkler, Federica Sacchetti, Bruno Chaume, et al., "New Insights into Early Celtic Consumption Practices: Organic Residue Analyses of Local and Imported Pottery from Vix-Mont Lassois," *PloS One* 14.6 (2019): 1–19.

[34] Robert L. Bettinger, Loukas Barton, Peter J. Richerson, Robert Boyd, Hui Wang, and Won Choi, "The Transition to Agriculture in Northwestern China," *Developments in Quaternary Science* 9 (2007): 83–101.

[35] Ma et al., "Stable Isotope Analysis of Human and Faunal Remains in the Western Loess Plateau, Approximately 2000 Cal BC"; Liu, Li, Lisa Kealhofer, Xingcan Chen, and Ping Ji, "A Broad-Spectrum Subsistence Economy in Neolithic Inner Mongolia, China: Evidence from Grinding Stones," *Holocene* 24.6 (2014): 726–42.

Of the samples yielding millet biomarkers, only one (Xia-K2165-3 from Xiaxihe) dates to the Xindian period of the Early Bronze Age (1600–600 BC) and exhibits enriched $\delta^{13}C_{C16:0}$ values consistent with C_4 plant processing (Table 3). This may be due to resource mixing within the vessels and millet lipids contributing a smaller portion of the total extracted residue. Interestingly, this sample also yields large $\Delta^{13}C$ differences ranging in the isotopic area established for dairy fats (> – 3.3‰; figure 2).[36] This discrepancy may be due to enriched $\delta^{13}C_{C16:0}$ values being contributed by C_4 plants or contamination from burial environment, and/or subsequent excavation and curation. False positives for dairy have been observed previously when APAA's from aquatic resources make a significant contribution to a lipid mixture with wild ruminant fats,[37] however no APAA's were identified in this study. It is uncertain if this $\Delta^{13}C$ value denotes the presence of dairy products here, however it has been suggested that people might have moved towards pastoralism in the Early Bronze age in this area, making the presence of dairy not implausible.[38] Further residue analysis combined with isotope research and zooarchaeological work is needed to resolve the question of animal use and potential dairying practices.

Dehydroabietic acid and 7-oxo-dehydroabietic acid are present in four samples (see Table A1 for full list). These compounds are indicative of resin derived from trees in the *Pinaceae* family.[39] These types of resins are common in archaeological contexts. They have been identified, for example, as waterproofing agents and glues, and in funerary practices.[40] No visible resin in the form of a surface treatment is present on the samples in question, though this does not negate the possibility of its existence.[41] Nevertheless, there could also be different reason for the presence of these residues. For instance, Reber et al.[42] showed that these compounds are present in ceramic wares when wood from trees in

[36] M. S. Copley, R. Berstan, S. N. Dudd, G. Docherty, A. J. Mukherjee, V. Straker, S. Payne, and R. P. Evershed, "Direct Chemical Evidence for Widespread Dairying in Prehistoric Britain," *Proceedings of the National Academy of Sciences of the United States of America* 100.4 (February 18, 2003): 1524–29.

[37] Evershed et al., "Experimental Evidence for the Processing of Marine Animal Products and Other Commodities Containing Polyunsaturated Fatty Acids in Pottery Vessels."

[38] Jaffe and Hein, "Considering Change with Archaeological Data: Reevaluating Local Variation in the Role of the 4.2 K BP Event in Northwest China."

[39] Erika Ribechini, Francesca Modugno, Maria Perla Colombini, and Richard P. Evershed, "Gas Chromatographic and Mass Spectrometric Investigations of Organic Residues from Roman Glass Unguentaria," *Journal of Chromatography. A* 1183.1–2 (2008): 158–69.

[40] Ilaria Bonaduce, and Maria Perla Colombini, "Characterisation of Beeswax in Works of Art by Gas Chromatography-Mass Spectrometry and Pyrolysis-Gas Chromatography-Mass Spectrometry Procedures," *Journal of Chromatography. A* 1028.2 (2004): 297–306; M. P Colombini, G. Giachi, F. Modugno, P. Pallecchi, and E. Ribechini, "The Characterization of Paints and Waterproofing Materials from the Shipwrecks Found at the Archaeological Site of the Etruscan and Roman Harbour of Pisa (Italy)," *Archaeometry* 45.4 (2003): 659–74; Thibaut Devièse, Camille Vanhove, Rémy Chapoulie, Philippe Blanchard, Maria Perla Colombini, Martine Regert, and Dominique Castex, "Détermination et Fonction Des Substances Organiques et Des Matières Minérales Exploitées Dans Les Rites Funéraires de La Catacombe Des Saints Pierre-et-Marcellin à Rome (Ier-IIIe Siècle)," *De Corps En Corps: Traitement et Devenir Du Cadaver*, 2010. https://www.academia.edu/download/31537691/MSHA_2010.pdf.

[41] Jelmer Eerkens, "The Preservation and Identification of Piñon Resins by GC-MS in Pottery from the Western Great Basin," *Archaeometry* 44.1 (2002): 95–105.

[42] E. A. Reber, M. T. Kerr, H. L. Whelton, and R. P. Evershed, "Lipid Residues from Low-Fired Pottery," *Archaeometry* 61.1 (2018): 131–144.

the *Pinaceae* family is used as fuel for pottery firing and cooking. These compounds can derive from the thermal dehydrogenation of abietic acid naturally present in the wood, and when this occurs in an oxygenated environment, produces 7-oxo-dehydroabietic acid.[43] In the present case, it is therefore most likely these compounds derive from the production process, which likely involved wood from the *Pinaceae* family.

Conclusions

This pilot study revealed that the preservation of organic residue was very low (less than 5 µg/g) in the 14 sherds analysed. However, given that this is a pilot study the sample size examined here is limited, and future examinations with larger sample sizes, a selection of samples from different contexts, and/or different methods may yield different results. In spite of these limitations, the study has also yielded a few interesting results. For instances, it has been shown that the lipid yields are determined more by the burial environment than by sherd composition (i.e., coarse vs fine wares). Finds from other sites held in the Andersson collection may thus have higher lipid yields that provide more robust insights into food preparation and subsistence practices. The lipids extracted in this study show that the vessels in question were used to process non-ruminant and freshwater aquatic resources which is consistent with faunal assemblages at these sites that include pig and freshwater fish remains. Millet may also have been included in the meals prepared and/or served in these vessels which is consistent with both palaeobotanical and isotope data from the region. There is even an indicator for the potential presence of dairy, though this will have to be tested with larger-scale research on ceramic residues combined with isotope and faunal data. The study has furthermore provided some insights into the nature of the fuel used in pottery production and/or cooking which seems to have involved wood from the *Pinaceae* family.

Future work on this collection would benefit from employing more advanced extraction methods such as supercritical fluid extraction, as this method yielded the higher lipid quantities in this study and presents the advantage of being non-destructive.[44] Additional purification using $AgNO_3$-impregnated silica gel packed in Pasteur pipette columns for FAME isolation would be beneficial to mitigate contamination hereafter.[45] Future work may also benefit from examining ceramics from other sites which may have a better lipid preservation. In particular, it might be worth-while to investigate complete ceramic vessels retrieved from graves as some of them show evidence for having contained food. The issue remains, of course, that at least part of the collection – and especially the complete vessels shown in the museum display - underwent cleaning with harsh chemicals that likely destroyed much of the remaining residue. Future work thus has to be preceded by an investigation into museum records to learn about previous cleaning and restoration methods that may prevent successful residue analysis. This study has thus shown the potential and

[43] Maria Perla Colombini, and Francesca Modugno, *Organic Mass Spectrometry in Art and Archaeology* (Chichester: John Wiley & Sons, 2009).

[44] Deviese et al., "Supercritical Fluids for Higher Extraction Yields of Lipids from Archeological Ceramics."

[45] Papakosta, Oras, and Isaksson, "Early Pottery Use across the Baltic--a Comparative Lipid Residue Study on Ertebølle and Narva Ceramics from Coastal Hunter-Gatherer Sites in Southern Scandinavia, Northern Germany and Estonia."

challenges for the study of such a unique collection and suggested avenues for research on this collection in particular as well as legacy collections at large.

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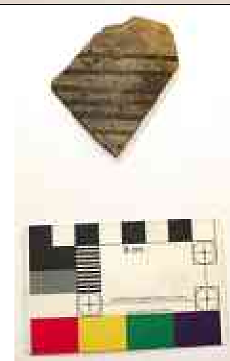
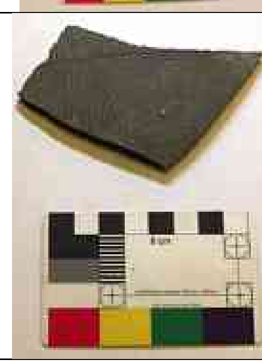
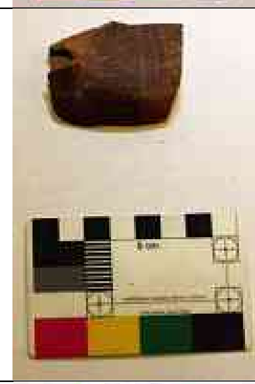
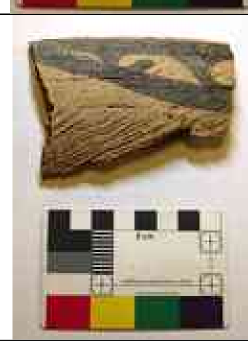
Appendix: Sample Overview

Table A1. *Ceramic samples analysed in this study*

Sherd number	Box no./label	Site	Period	Photo
K2165:3	8-28B	Xiaxihe	Xindian	
K2165:5	8-28B	Xiaxihe	Xindian	
CJP_2019_0029	Caojiaping (T.C.P) GANSU sherds	Caojiaping	Qijia	

→

CJP_2019_0039	17-88/16-83	Caojiaping	Qijia	
TEMP-2698	16-79	Siwashan	Majiayao	
TEMP-2715	16-79	Siwashan	Majiayao	
ZJZ_2019_0001	8-24	Zhujiazhai	Qijia	

ZJZ-K2055:226	8-20	Zhujiazhai	Qijia	
QY_2019_0001	8-13	Qiayao	Kayue	
QY_2019_0002	8-12	Qiayao	Kayue	
K3248:2	9-21A	Dashiquan	Majiayao	

K3241:38	9-21A	Dashiquan	Majiayao	
MCY_2019_0001	10-25A	Machangyan	Xindian	
K-2360:143	10-23	Machangyan	Xindian	

	Glycerol	Caproic acid	Enanthic acid	Caprylic acid	Pelargonic acid	Capric acid	Undecylic acid	Lauric acid	Myristic acid	Pentadecanoic acid	Palmitic acid	Margaric acid	Stearic acid	Oleic acid	α-Linolenic acid	Phthalates	Benzoic Acid	Dehydroabietic acid (DHA)	7-oxo-DHA	Cholesterol	Abietic Acid	Monostearin
DASHI-K3248-02 (SFE-GCMS)	x			x	x	x	x	x	x	x	x	x	x		x	x	x	x	x			
SIWA-2715 (SFE-GCMS)	x			x	x	x		x	x	x	x	x				x	x	x	x	x		
XIAXIHE-K2165-3 (SFE-GCMS)	x			x	x	x	x	x	x	x	x	x	x	x	x	x	x				x	x
DASHI-K3248-02 (CH3-GCMS)																x						
SIWA-2715 (CH3-GCMS)		x	x	x	x						x					x						
XIAXIHE-K2165-3 (CH3-GCMS)		x	x	x	x	x			x		x		x			x						
DASHI-K3248-02 (H2SO4-MeOH)											x	x	x	x		x						
SIWA-2715 (H2SO4-MeOH)											x		x			x						
XIAXIHE-K2165-3 (H2SO4-MeOH)										x	x	x	x	x								

Table A2. *Molecules identified in 3 selected samples in this study using three different residue extraction methods.*

	Lipid extract summary
XIA-K2165-3	High concentrations of palmitic and stearic acids for IRMS, abietic acids, miliacin, saturated and unsaturated free fatty acids, monostearin
XIA-K2165-5	High concentrations of palmitic and stearic acids for IRMS, saturated and unsaturated free fatty acids
CJP-2019-0029	Phthalates, saturated free fatty acids, concentrations not high enough for IRMS, Miliacin
CJP-2019-0039	Phthalates, saturated free fatty acids, concentrations not high enough for IRMS
SIWA-TEMP-2698	Phthalates, saturated free fatty acids, concentrations not high enough for IRMS, Squalene
SIWA-TEMP-2715	Phthalates, saturated free fatty acids, concentrations not high enough for IRMS, cholesterol, DHA
ZJZ-2019-0001	High concentrations of palmitic and stearic acids for IRMS, saturated free fatty acids, phthalates
ZJZ-K2055-226	High concentrations of palmitic and stearic acids for IRMS, saturated and unsaturated free fatty acids, phthalates
QY-2019-0001	High concentrations of palmitic and stearic acids for IRMS, saturatedfree fatty acids, phthalates
QY-2019-0002	High concentrations of palmitic and stearic acids for IRMS, saturatedfree fatty acids, phthalates
DASHI-K3248:2	High concentrations of palmitic and stearic acids for IRMS, Abietic acids, miliacin, saturated and unsaturated free fatty acids
DASHI-K3241:38	Phthalates, unsaturated and saturated free fatty acids concentrations not high enough for IRMS, DHA
MCY-K2360-143	High concentrations of palmitic and stearic acids for IRMS, saturated free fatty acids, phthalates and contaminants
MCY-2019-001	High concentrations of palmitic and stearic acids for IRMS, saturated and unsaturated free fatty acids, phthalataes and contaminants

Table A3. *Summary of lipid extracts from each sample in this study*

	Chlorform & Methanol Extraction	Acidified Methanol Extraction	Supercritical Fluid Extraction	GC-MS	GC-C-IRMS
XIA-K2165-3	X	X	X	X	X
XIA-K2165-5	X	X	X	X	X
CJP-2019-0029	X		X	X	
CJP-2019-0039	X		X	X	
SIWA-TEMP-2698	X		X	X	
SIWA-TEMP-2715	X		X	X	
ZJZ-2019-0001	X	X	X	X	X
ZJZ-K2055-226	X	X	X	X	X
QY-2019-0001	X	X	X	X	X
QY-2019-0002	X	X	X	X	X
DASHI-K3248:2	X	X	X	X	X
DASHI-K3241:38	X		X	X	
MCY-K2360-143	X	X	X	X	X
MCY-2019-001	X	X	X	X	X

Table A4. *Reference of extraction and characterisation procedures samples have been subjected to in this study.*

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Rethinking Provenance Studies of Painted Neolithic Pottery from Western China

by

Limin HUAN

Abstract

Provenance studies are important for understanding ancient artefacts and technologies. For ceramics, the information on production locales is indicated by the structure, inclusions, as well as the chemical compositions of the clays. This paper focuses on the provenance of one type of ceramics in Neolithic China: painted pottery. Painted ceramic vessels dating to the Majiayao culture period (c. 3300–2500 BC) are found in large quantities in North China, especially on the western Loess Plateau. Similar painted vessels also appeared at a few sites in Northwest Sichuan Province. In a previous study by Hung and colleagues, the authors analyse the chemical compositions of potsherd samples from both Sichuan and Gansu (western Loess Plateau) sites. Based on the results, the authors suggest that painted vessels in Sichuan may have been produced on the Loess Plateau and were transported to this area. By reviewing the geographic and archaeological background of the artefacts and the chemical data presented by Hung et al., I argue that the current evidence cannot confirm the Loess Plateau provenance of the Sichuan painted vessels. I also suggest that other methods, especially thin section petrography, should be conducted in future provenance studies.

Key words:

provenance studies, painted pottery, Sichuan, Gansu, Majiayao, Yingpanshan, chemical compositional analysis, thin-section petrography

Introduction

Pottery painting refers to applying colourant onto ceramic-based objects. This practice has a long history and was common among prehistoric societies all over the world; however, the motifs and painting techniques used in each community had their own characteristics. Based on similarities and differences, painted pottery is often considered a useful proxy for archaeologists to demonstrate cross-community exchange.

In North China, Neolithic painted vessels were first discovered by J. G. Andersson during his surveys in the 1920s. The resemblance between the Chinese painted pots and those unearthed in Southeast Europe and Central Asia immediately prompted a heated debate about the origin of the East Asian painted pottery culture.[1] By now, most scholars believe that the North China painted pottery culture has an indigenous origin in the Wei River Valley (present-day Shaanxi and Gansu Provinces), which is part of the Loess Plateau, around the sixth millennium BC. From the fourth to the second millennia BC, painted pottery was gradually adopted by communities west to the Wei River Valley.[2] Some scholars suggest that the routes through which painted pottery moved westward—dubbed the "Painted Pottery Road"—corresponds to the later Silk Road, both of them being prehistoric trade routes connecting the East and the West.[3]

To trace the distribution of painted pottery outside the Loess Plateau also leads researchers to Northwest Sichuan, as a small number of painted potsherds and very few painted pots have been found here. From a typological perspective, the style of these sherds and vessels is somewhat similar to, but cruder in execution than the Majiayao culture ceramics in the Wei River Valley (Figure 1). The Majiayao culture is defined based nearly exclusively on a style of painted pottery first discovered at Majiayao, Gansu Province. This type of ceramics emerged around 3300/3200 BC and developed into Banshan and Machang

1 Johan Gunnar Andersson, "Researches into the prehistory of the Chinese," *Bulletin of the Museum of Far Eastern Antiquities* 15 (1943): 7–304; Pei Wenzhong 裴文中, "Zhongguo zhi caitao wenhua 中國之彩陶文化 [The painted pottery culture in China]," *Lishi yu kaogu* 歷史與考古 [*History and archaeology*] 1 (1946): 2–10; Su Bingqi 苏秉琦, "Guanyu Yangshao wenhua de ruogan wenti 关于仰韶文化的若干問題 [Some problems concerning the Yangshao culture]," *Kaogu xuebao* 考古学报 [*Acta archaeologica Sinica*] 1 (1965): 51–82; Yan Wenming 严文明, "Gansu caitao de yuanliu 甘肃彩陶的源流 [On the origin and the development of Gansu painted pottery]," *Wenwu* 文物 [*Cultural relics*] 10 (1978): 62–76. See also Li Shuicheng, "Ancient interactions in Eurasia and Northwest China: revisiting Johan Gunnar Andersson's legacy," *Bulletin of the Museum of Far Eastern Antiquities* 75 (2003): 9–30.

2 Han Jianye 韩建业, "'Caitao zhilu' yu zaoqi Zhongxi wenhua jiaoliu '彩陶之路' 与早期中西文化交流 [The Painted Pottery Roads and early Sino-Western cultural communications]," *Kaogu yu wenwu* 考古与文物 [*Archaeology and cultural relics*] 1 (2013): 28–37; Han Jianye 韩建业, "Zailun Sichou Zhilu qian de caitao zhilu 再论丝绸之路前的彩陶之路 [Further discussion about the Painted Pottery Road before the Silk Road]," *Wenbo xuekan* 文博学刊 [*Journal of archaeology and museology*] 1 (2018): 20–32; Li Shuicheng, *A discussion of Sino-Western cultural contact and exchange in the second millennium BC based on recent archeological discoveries* (Philadelphia, PA: Dept. of Asian and Middle Eastern Studies, University of Pennsylvania, 1999); Li Shuicheng, "The interaction between Northwest China and Central Asia during the second millennium BC: an archaeological perspective," in *Ancient interactions: east and west in Eurasia*, ed., Katherine V. Boyle, Colin Renfrew, and Marsha Ann Levine (Cambridge: McDonald Institute for Archaeological Research, 2002), 171–82; Li Xinwei 李新伟, "Kukuteni-Teliboli wenhua caitao yu Zhongguo shiqian caitao de xiangsixing 库库特尼—特里波利文化彩陶与中国史前彩陶的相似性 [On the similarities of painted pottery between the Cucuteni-Tripoli culture and prehistoric China]," *Zhongyuan wenwu* 中原文物 [*Cultural relics of central China*] 5 (2019); Li Xinwei 李新伟, "'Huashan meigui Yanshan long' yu 'Liangzhu congbi Haidai cheng': Su Bingqi quxi leixing lilun de xinsikao '华山玫瑰燕山龙' 与 '良渚琮璧海岱城' ——苏秉琦区系类型理论的新思考 ['Rose of the Huan Mountains and dragon of the Yan Mountains' and 'Cong tube and Bi disk of the Liang zhu and walled sites in the Haidai area': the rethinking of Su Bingqi's 'regional systems and local cultural series' model]," *Nanfang wenwu* 南方文物 [*Cultural relics in southern China*] 1 (2020): 1–8; Wang Renxiang 王仁湘, "Zhongguo caitao wenhua qiyuan xinlun 中国彩陶文化起源新论 [On the origin of Chinese painted pottery culture]," *Sichuan wenwu* 四川文物 [*Sichuan cultural relics*] 3 (2017): 28–34.

3 Han Jianye, "'The painted pottery road' and early Sino-western cultural exchanges," *Anabasis: studia classica et orientalia* 3 (2012): 25–42.

Figure 1. *Comparison of Majiayao and Northwest Sichuan painted pottery. Left: painted pots, Yingpanshan, Chengdu Museum; right: pointed pots from Majiayao culture sites, Gansu Museum. Photos taken by the author.*

style wares around 2500 BC. This chronology is confirmed by a dozen radiocarbon dates.[4] This matches the radiocarbon dates from Sichuan painted pottery sites, which are located about four hundred kilometres south of Majiayao. Based on ceramic chronology and typology, many scholars argue that painted pottery dispersed from its core area into Northwest Sichuan as a result of cultural exchange.[5]

Traditionally, the provenance and dispersal of a type of objects can only be identified by typological studies. In recent decades, however, thanks to the development of new archaeometric methods, researchers can now unveil more exact information on provenience from objects themselves. Two major archaeometric methods for ceramic provenance studies are petrography and chemical analysis. Both methods have been introduced to study early Chinese ceramics. In 2011, an important paper using the latter method was published by Hung Ling-yu and colleagues.[6] By comparing the chemical compositions of ceramic samples from sites in both Gansu and Sichuan, the authors suggest that the Sichuan painted vessels were not produced locally, but that they were manufactured on the Loess Plateau and then exported to Sichuan. This paper has since been widely discussed. Its conclusion, if true, would lead to a major reassessment of the cultural exchange between Northwest and Southwest China. Meanwhile, compositional analysis has also been adopted by other researchers as a routine method for studies of Chinese ceramics.[7] In the present paper, I will revisit the case study of Southwest Sichuan painted pottery for two purposes. Firstly, I want to shed new light on this pending question of the origin of the Sichuan painted pottery. Secondly, I hope that this paper can encourage discussion about the methods we use in future provenance studies.

Archaeological Background

The initial discovery of painted pottery in Northwest Sichuan took place only a few years

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[4] Here I use the chronology by Andrew Womack and Wang Hui, "Formation and function of Majiayao and Qijia pottery: analysis of manufacturing marks and use-alteration on vessels from the Tao River Valley," *Asian perspectives* 59 (2020): 2–32; Liu Li and Chen Xingcan, *The archaeology of China: from the late Paleolithic to the early Bronze Age* (Cambridge: Cambridge University Press, 2012), 216. Radiocarbon dates see Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo 中国社会科学院考古研究所, *Zhongguo kaoguxue: xinshiqi shidai juan* 中国考古学: 新石器时代卷 [*Chinese archaeology: Neolithic*] (Beijing: Zhongguo Shehui Kexue Chubanshe 中国社会科学出版社, 2010), 820–21.

[5] Chen Jian 陈剑, "Chuanxi caitao de faxian yu chubu yanjiu 川西彩陶的发现与初步研究 [The discovery and preliminary research on painted pottery from West Sichuan]," in *Gudai wenming* 5 古代文明 (第5卷) [*Ancient civilization* 5], ed., Beijing Daxue Zhongguo Kaoguxue Yanjiu Zhongxin 北京大学中国考古学研究中心 and Beijing Daxue Zhendan Gudai Wenming Yanjiu Zhongxin 北京大学震旦古代文明研究中心 (Beijing: Wenwu Chubanshe 文物出版社, 2006), 17–30; Han Jianye 韩建业, "Caitao zhilu."

[6] Hung Ling-Yu 洪玲玉 et al., "Chuanxi Majiayao leixing caitao chanyuan fenxi yu tantao 川西马家窑类型彩陶产源分析与探讨 [A provenance study of the Majiayao painted pottery found in western Sichuan Province]," in *Nanfang minzu kaogu* 7 南方民族考古 (第七辑) [*Southern ethnology and archaeology* 7], ed., Sichuan Daxue Bowuguan 四川大学博物馆, Xichuan Daxue Kaoguxuexi 四川大学考古学系, and Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究所 (Beijing: Kexue Chubanshe 科学出版社, 2011), 1–58.

[7] Cui Yifu et al., "Early ceramic trade in Gansu and Qinghai regions, Northwest China: a comparative elemental analysis on sherds of Majiayao culture, Yangshao culture and Qijia culture," *Journal of archaeological science: reports* 3 (2015): 65–72.

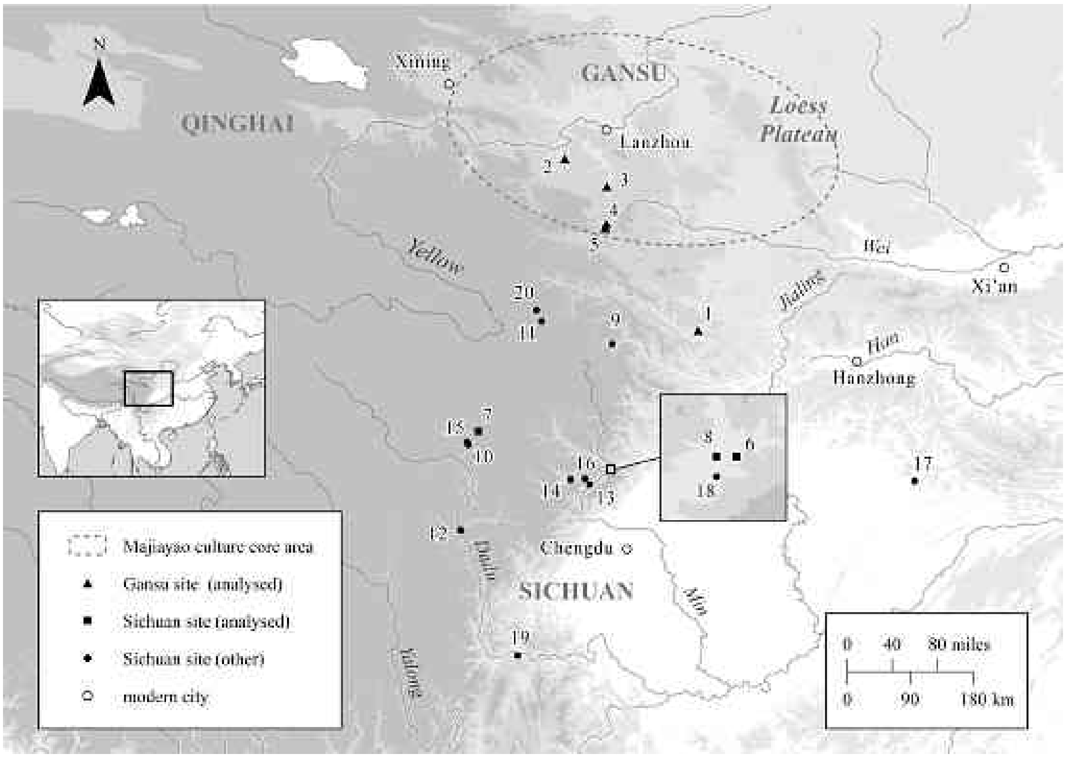

Figure 2. *Map of the painted pottery yielding sites mentioned in the text. Gansu sites analysed by Hung et al.: 1: Dalijiaping* 大李家坪*; 2: Linjia* 林家*; 3: Majiayao* 马家窑*; 4: Shimenkou* 石门口*; 5: Sixiachuan* 寺下川*. Sichuan sites analysed by Hung et al.: 6: Boxi* 波西*; 7: Haxiu* 哈休*; 8: Yingpanshan* 营盘山*. Other Sichuan painted pottery sites: 9: Ashaonao* 阿梢脑*; 10: Baishe* 白赊*; 11: Dazhaisi* 达札寺*; 12: Han'eyi* 罕额依*; 13: Jiangweicheng* 姜维城*; 14: Jianshanzhai* 箭山寨*; 15: Konglongcun* 孔龙村*; 16: Lanbucun* 兰布村*; 17: Luojiaba* 罗家坝*; 18: Shawudu* 沙乌都*; 19: Shizishan* 狮子山*; 20: Xie Manaye* 协马纳也.

after Andersson discovered painted pottery in Henan and Gansu.[8] Unlike in Gansu where plenty of unbroken vessels are found, intact painted pots are relatively rare in Sichuan and most finds are potsherds collected during field surveys. Sites reported with painted pots and potsherds are mainly located along the Upper Min River and the Upper to Middle Dadu River Valleys (Figure 2). In early surveys, researchers noticed that some Sichuan painted pottery motifs resemble, but not identical to, those from the Upper Yellow River and Wei River Valleys. Since the sites in the latter region are well dated, the Western Sichuan painted pottery was initially assigned the same date, roughly 3500–2500 BC (Figure 3).

Since the 1990s, systematic excavations have been conducted at several sites in Sichuan with known painted pottery finds, including Boxi and Yingpanshan in Mao County, Jiangweicheng in Wenchuan County, and Han'eyi in Danba County.[9] During a recent exca-

[8] See review: Chen Jian 陈剑, "Chuanxi caitao 川西彩陶."

[9] Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究院 et al., *Maoxian Yingpanshan: xinshiqi shidai yizhi* 茂县营盘山: 新石器时代遗址 [*The Neolithic site of Yingpanshan, Mao County*], 3 vols. (Beijing: Wenwu Chubanshe 文物出版社); Jiang Cheng 蒋成, Chen Jian 陈剑, and Chen Xuezhi 陈学志, "Sichuan Maoxian Yingpanshan yizhi shijue baogao 四川茂县营盘山遗址试掘报告 [Report of the test-excavation of Ying-

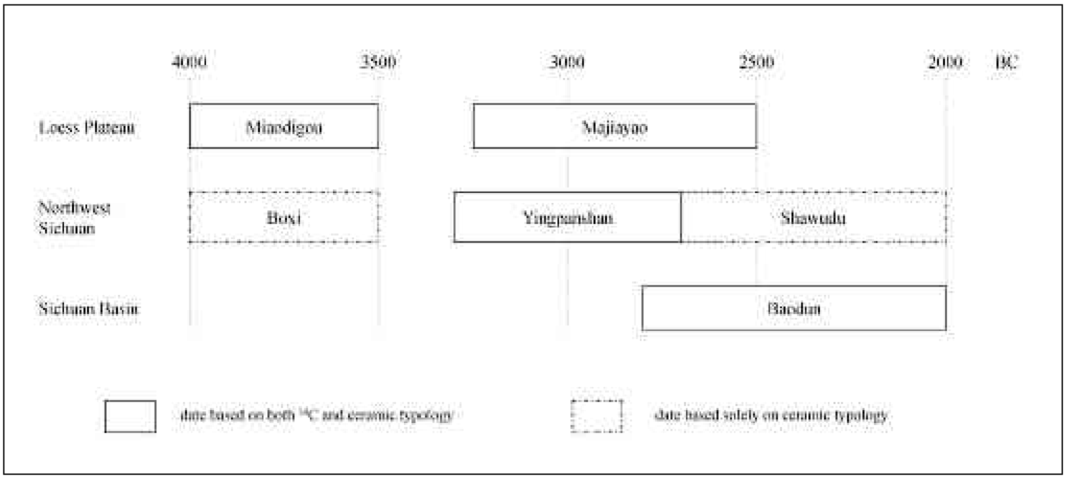

Figure 3. *Chronological framework of Northwest Sichuan ceramic typology in comparison with the those from nearby areas.*

vation, a few painted potsherds were also found at Luojiaba in Xuanhan County, Northeast Sichuan.[10] Five radiocarbon dates are obtained from charcoal samples at Yingpanshan. The range is from 3300 to 2700 cal. BC,[11] although these dates may be older than their archaeological contexts due to the "old wood problem" of dating by charcoal.[12]

Except for Yingpanshan, there is so far no absolute dates of other painted pottery sites in Northwest Sichuan.[13] Therefore, the chronology of other sites is merely based on the

panshan, Mao County, Sichuan]," in *Chengdu kaogu faxian (2000)* 成都考古发现 (2000) [*Archaeological discoveries of Chengdu (2000)*], ed., Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究所 (Beijing: Kexue Chubanshe 科学出版社, 2002), 1–76; Jiang Cheng 蒋成 et al., "Sichuan Maoxian Boxi yizhi 2002 nian de shijue 四川茂县波西遗址2002年的试掘 [Report of the test-excavation of Boxi, Mao County, Sichuan in 2002]," in *Chengdu kaogu faxian (2004)* 成都考古发现 (2004) [*Archaeological discoveries of Chengdu (2004)*], ed., Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究所 (Beijing: Kexue Chubanshe 科学出版社, 2006), 1–12; Huang Jiaxiang 黄家祥, "Sichuan Wenchuanxian Jiangweicheng xinshiqi shidai yizhi fajue jianbao 四川汶川县姜维城新石器时代遗址发掘简报 [Excavation of the Neolithic site of Jiangweicheng in Wenchuan County, Sichuan]," *Kaogu* 考古 [*Archaeology*] 11 (2006): 3–14; Chen Zujun 陈祖军, and Wang Lumao 王鲁茂, "Danbaxian Zhongluxiang Han'eyi yizhi fajue jianbao 丹巴县中路乡罕额依遗址发掘简报 [Preliminary report of the excavation of Han'eyi, Zhonglu Town, Danba County]," in *Sichuan kaogu baogaoji* 四川考古报告集 [*Archaeological reports of Sichuan*], ed., Sichuansheng Wenwu Kaogu Yanjiusuo 四川省文物考古研究所 (Chengdu: Wenwu Chubanshe 文物出版社, 1998), 59–77.

10 Chen Weidong 陈卫东 et al., "Sichuan Xuanhanxian Luojiaba yizhi 2015–2016 niandu xinshiqi shidai yicun fajue jianbao 四川宣汉县罗家坝遗址2015–2016年度新石器时代遗存发掘简报 [The Neolithic remains excavated at Xuanhan Luojiaba site in 2015–2016]," *Sichuan wenwu* 四川文物 [*Sichuan cultural relics*] 4 (2018): 5–17.

11 Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究院 et al. *Maoxian Yingpanshan* 茂县营盘山, 512.

12 Dong Guanghui et al., "A comparative study of 14C dating on charcoal and charred seeds from Late Neolithic and Bronze Age sites in Gansu and Qinghai Provinces, NW China," *Radiocarbon* 56 (2014): 157–63.

13 Another dated site which also yielded painted pottery is Shizishan. The type of ceramic assemblages from this site is similar to the one from Yingpanshan, but the dates of the former, 4416–3915 BP, is much later: Zhongguo Shehui Kexueyuan Kaogu Yanjiusuo Shiyanshi 中国社会科学院考古研究所实验室, "Fangshexing tansu ceding niandai baogao (19) 放射性碳素测定年代报告 (一九) [Report of 14C dates (19)]," *Kaogu*

comparison of stratigraphy and typology between Yingpanshan cultural layers and those at other sites. In this way, Chen Jian suggests a three-phase chronology for Neolithic Western Sichuan (Figure 3).[14] His defines such chronology by the material assemblages from three sites: Boxi, Yingpanshan and Shawudu, all in today's Mao County of Sichuan. These three sites are very close to each other, within an area of about 4 km^2. At Boxi, the Neolithic cultural layers can be further divided into lower ones and upper ones. Ceramics in the upper layers are typologically close to those at Yingpanshan, while those in the lower layers, presumably older in age, show some similarities with the Miaodigou type ceramics found on the Loess Plateau. Therefore, the lower Boxi layers are defined as Chen's first phase, with a suggested date around 4000–3500 BC according to the date of Miaodigou ceramics. Pottery, stone tools, and bone and jade ornaments were also discovered at this site. The proportion of painted pottery is very low; among about six hundred collected potsherds, only three were painted with black bands.[15]

In the second phase, Yingpanshan came to be the largest site in the region. Five seasons of excavations have revealed Neolithic layers at four locations. The cultural layers were grouped by the excavators into four phases, covering the whole time period from 3300 to 2700 BC. Five kilns were found (Phase I: 2; Phase III: 1; Phase IV: 2). Three of them (from Phases I and III) revealed pottery sherds but no painted pottery.[16] The discovery of these kilns suggests that at least some ceramics, especially the plain, unpainted ones, may have been made locally. However, considering the number of the kilns, Yingpanshan was not likely to be a production centre which can have provided large quantity of ceramics to others. Besides, potsherds were also collected from ash pits, dwellings, and ditches across the site, but about 95% of the sherds are unpainted.[17] The excavators noted that, compared to the unpainted ones, most painted sherds were made from finer clays and fired at higher temperatures, indicating more effort were put into the production. However, it is unknown whether the clays were tempered. Jiangweicheng is another contemporaneous site. It is close to Yingpanshan, with similar material assemblage uncovered, but the site is much

考古 [*Archaeology*] 7 (1992): 655–62. Some scholars believe this result is not reliable: Chen Wei 陈苇, "Ganqing diqu yu xinan shandi xian Qin shiqi kaoguxue wenhua ji hudon guanxi 甘青地区与西南山地先秦时期考古学文化及互动关系 [The archaeological culture and interactive relationship between Gansu & Qinghai and Southwest mountain regions in the pre-Qin period]" (Ph.D. diss., Jilin University, 2009), 86. Since the materials of Shizishan have not been published, it will not be discussed further.

14 Chen Jian 陈剑, "Boxi, Yingpanshan ji Shawudu: qianxi Minjiang shangyou xinshiqi wenhua yanbian de jieduanxing 波西、营盘山及沙乌都——浅析岷江上游新石器文化演变的阶段性 [Boxi, Yingpanshan and Shawudu: on the development of Neolithic cultures in the Upper Min River Valley]," *Kaogu yu wenwu* 考古与文物 [*Archaeology and cultural relics*] 5 (2007): 65–70.

15 Chen Jian 陈剑 et al., "Sichuan Maoxian Boxi yizhi 2008 nian de diaocha 四川茂县波西遗址2008年的调查 [Report of the survey of Boxi, Mao County, Sichuan in 2008]," in *Chengdu kaogu faxian (2008)* 成都考古发现 *(2008)* [*Archaeological discoveries of Chengdu (2008)*], ed., Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究所 (Beijing: Kexue Chubanshe 科学出版社, 2010), 1–24; Jiang Cheng et al., "Sichuan Maoxian Boxi."

16 Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究院 et al. *Maoxian Yingpanshan* 茂县营盘山, 510–11; 747–48.

17 Jiang Cheng 蒋成, Chen Jian 陈剑, and Chen Xuezhi 陈学志, "Sichuan Maoxian Yingpanshan 四川茂县营盘山"; Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究院 et al. *Maoxian Yingpanshan* 茂县营盘山, 18–21.

smaller in size.[18] Sites of this phase also include Haxiu in the Upper Dadu River Valley.[19]

The Neolithic layers at Shawudu are attributed to the third phase. Although Shawudu and Yingpanshan are only 800 m from each other, ceramics at the two sites are very different. Also, high-temperature ceramics and painted pottery vessels are absent at Shawudu.[20] So far, there is no direct stratigraphic evidence to suggest the chronology of Yingpanshan and Shawudu. The excavators suggest that the ceramics at Shawudu resemble those at Baodun in the Sichuan Basin, while the latter are dated by radiocarbon to around 2800–2000 BC.[21]

In terms of the painted pottery, most early studies focus on the similarities shared by the ceramics from Northwest Sichuan and those from the Loess Plateau.[22] Chen Jian, however, points out that in Sichuan and the Wei River Valley, painted pottery was used differently. First, the percentage of painted pottery in Sichuan assemblages was below 5%. In the Wei River Valley, painted pottery made up 20% of the ceramic assemblages. The stark differences in proportions show that the importance of painted pottery in the material culture of the two areas was different, argues Chen. Moreover, Chen notices that in Sichuan, local types of ceramics gradually replaced those "Loess Plateau type" ones in a trend he called "ceramic localisation." Therefore, Chen suggests that Sichuan painted pots were mainly local imitations instead of imports.[23]

Nevertheless, to understand how and why painted pottery was adopted by different communities, we need to ask what exactly was passed on in cultural interaction. There are at least two perspectives to be considered. On the one hand, physical things can be transported geographically. For example, painted pots may be manufactured at one site; people may then carry the pots with them when migrate to other areas. People may also exchange the pots or give them as gifts to other people when moving around. Under these circumstances, the appearance of painted pots in a new region reflects the establishment

18 Huang Jiaxiang 黄家祥, "Wenchuan Jiangweicheng fajue de chubu shouhuo 汶川姜维城发掘的初步收获 [On the excavation of Jiangweicheng, Wenchuan County]," *Sichuan wenwu* 四川文物 [*Sichuan cultural relics*] 3 (2004): 6–9; Huang Jiaxiang 黄家祥, "Sichuan Wenchuanxian 四川汶川县."

19 Chen Jian 陈剑 et al., "Sichuansheng Ma'erkangxian Haxiu yizhi 2003, 2005 nian diaocha jianbao 四川马尔康县哈休遗址2003、2005年调查简报 [Preliminary report of the survey of Haxiu, Mao County, Sichuan in 2003 and 2005]," in *Chengdu kaogu faxian (2006)* 成都考古发现 *(2006)* [*Archaeological discoveries of Chengdu (2006)*], ed., Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究所 (Beijing: Kexue Chubanshe 科学出版社, 2008), 3–14.

20 Jiang Cheng et al. 蒋成, "Sichuan Maoxian Shawudu yizhi diaocha jianbao 四川茂县沙乌都遗址调查简报 [Preliminary report of the survey of Shawudu, Mao County, Sichuan]," in *Chengdu kaogu faxian (2004)* 成都考古发现 (2004) [*Archaeological discoveries of Chengdu (2004)*], ed., Chengdu Wenwu Kaogu Yanjiusuo 成都文物考古研究所 (Beijing: Kexue Chubanshe 科学出版社, 2006), 13–19; Jiang Cheng 蒋成 et al., "Sichuan Maoxian Baishuizhai he Shawudu yizhi 2006 nian diaocha jianbao 四川茂县白水寨和沙乌都遗址2006年调查简报 [Preliminary report of the survey of Baishuizhai and Shawudu, Mao County, Sichuan in 2006]," *Sichuan wenwu* 四川文物 [*Sichuan cultural relics*] 6 (2007): 3–12.

21 Jiang Cheng 蒋成 et al., "Sichuan Maoxian Baishuizhai 四川茂县白水寨."

22 Deng Shaoqin 邓少琴, "Gudai Bashu yu Zhongyuan Huanghe liuyu caitao nanliu de youguan wenti 古代巴蜀与中原黄河流域彩陶南流的有关问题 [On the role of ancient Ba and Shu in the southern dispersal of painted pottery from the Central Plains]," *Zhonghua wenhua luntan* 中华文化论坛 [*Journal of Chinese culture*] 2 (1999): 19–22; Chen Jian 陈剑, "Chuanxi caitao 川西彩陶."; Han Jianye 韩建业, "Caitao zhilu 彩陶之路."

23 Chen Jian 陈剑, "Boxi, Yingpanshan ji Shawudu 波西、营盘山及沙乌都."

of a network in which objects were circulated. On the other hand, the spread of a material culture may represent the spread of intangible things such as knowledge or beliefs—expressed in decoration motifs or vessel function—rather than real objects. If people in a community found painted pots owned by a foreigner aesthetically appealing, they may have tried to produce their own painted pots, either by imitation based on eyesight from afar or close observation alone or by communicating with the owner or producer of the pot. Provenance studies aiming to decide the production centre of a certain type of objects is often the fundamental for such discussion of cultural interaction and material exchange.

Geological Background

Before discussing the results of the provenance studies on prehistoric painted pottery, we also need to review the geological background of the Loess Plateau and Northwest Sichuan, especially the characteristics of the clays in both regions.

Clays are the major raw material of pottery making. They are from the weathering product of different rocks and thus have different inclusions and chemical compositions. In Gansu, two major clay types are loess and the Tertiary red clay. Loess, on the one hand, is an aeolian sediment with 50–80% wind-blown silts.[24] In North China, the Loess Plateau in the modern provinces of Shaanxi, Shanxi as well as parts of Henan, Gansu, Ningxia and Inner Mongolia is the main area where loess can be found. However, loess is also available in a few areas in Sichuan, where this type of clay is commonly known as the "Chengdu Clay." The red clay in Gansu, on the other hand, was also known as the "Hipparion Red Clay" since the occurrence hipparionine horses in it. Nowadays, it is commonly called "Tertiary red clay."[25] Tertiary red clay is probably also produced by aeolian processes.[26] It is usually located under the loess layers. In Hung et al.'s paper, the authors suggest that there may also be red clays in Western Sichuan. Besides these two commonly discussed types of clays, Ma et al. also point out the potential of fluvial secondary loess to be used in pottery-making.[27]

[24] Liu Dongsheng 刘东生, *Huangtu yu huanjing* 黄土与环境 [*Loess and environment*] (Beijing: Kexue Chubanshe 科学出版社, 1985), 4.

[25] Johan Gunnar Andersson, *Essays on the Cenozoic of Northern China*, Memoirs of the Geological Survey of China, Series. A, (Beijing: Ministry of Agriculture and Commerce, The Geological Survey of China, 1923); Lawrence John Flynn et al., "Observations on the Hipparion Red Clays of the Loess Plateau," *Vertebrata PalAsiatica* 49 (2011): 275–84; Otto Zdansky, "Fundorte der Hipparion-Fauna um Pao-Te-Hsien in NW-Shansi [The localities of the Hipparion fauna of Baode County in Northwest Shanxi]," *Bulletin of the geological survey of China* 5 (1923): 69–82; Pierre Teilhard de Chardin, and Young Chung Chien, *Fossil mammals from the late cenozoic of Northern China: Palaeontologia sinica*, series C, vol. 9 (Beijing: Geological Survey of China, 1931).

[26] Ding Zhongli 丁仲礼 et al., "Huangtu gaoyuan hongniantu chengyin ji shangxinshi beifang ganhanhua wenti 黄土高原红粘土成因及上新世北方干旱化问题 [Eolian origin of the red clay deposits on the Loess Plateau and implications for Pliocene climatic changes]," *Disiji yanjiu* 第四纪研究 [*Quaternary sciences*] 17 (1997): 147–57; Liu Xiuming 刘秀铭 et al., "Gansu disanxi hongniantu cixue xingzhi chubu yanjiu ji gu qihou yiyi 甘肃第三系红粘土磁学性质初步研究及古气候意义 [Magnetic properties and sense of paleoclimate of tertiary red clay in Gansu]," *Zhongguo kexue (D): diqiu kexue* 中国科学 (D辑): 地球科学 [*Science in China (series D)*] 31.3 (2001): 192–205.

[27] Ma Hongjiao et al., "The geology of Tianshui-Qin'an area of the western Loess Plateau and the chemical characteristics of its Neolithic pottery," *Geoarchaeology* 35 (2020): 611–24.

Due to the "natural levigation" of the fluvial process, this clay is very fine-grained and thus suitable for pottery.

One remarkable characteristic of both loess and the Tertiary red clay is their high calcium contents. Studies based on Gansu clay samples show that loess contain 7–10% calcium oxide, while the Tertiary red clay, 8–13%.[28] The latter often have higher calcium content than the former since calcium tend to deposit.[29] In general, high calcium content deteriorates the plasticity of clays while also increases the chance of deformation during firing.[30] Indeed, previous studies of the pottery samples show that most samples from the eastern part of the Loess Plateau are low-calcium, while samples from the western Loess Plateau are often high-calcium.[31] So why did potters choose high-calcium clays for their pots? I think there are probably two reasons. Firstly, there was probably no easy access to low-calcium clays on the western Loess Plateau. On the eastern Loess Plateau, Quaternary red clay, another type of red clay but with much lower calcium content, was widely available. However, this type of red clay is not common on the western Loess Plateau.[32] Secondly, the workability of the clays is affected by many factors. Although the calcium content of loess and Tertiary red clay is relatively high, these two clays also contain high content of aluminium oxide, which improves plasticity.[33] Grain size is another important factor. Clays with small grain tend to have better plasticity. This is probably the reason why aeolian loess is usually not used to make vessels.[34] By contrast, Tertiary red clay and fluvial

28 Chen Yang 陈旸, Chen Jun 陈骏, and Liu Lianwen 刘连文, "Gansu Xifeng wan disanji hongniantu de huaxue zucheng ji huaxue fenghua tezheng 甘肃西峰晚第三纪红粘土的化学组成及化学风化特征 [Chemical composition and characterization of chemical weathering of late Tertiary red clay in Xifeng, Gansu Province]," *Dizhi lixue xuebao* 地质力学学报 [*Journal of geomechanics*] 7.2 (2011): 167–75; Liu Dongsheng, *Huangtu.*

29 Diao Guiyi 刁桂仪, and Wen Qizhong 文启忠, "Huangtu fenghua chengtu guocheng zhong zhuyao yuansu qianyi xulie 黄土风化成土过程中主要元素迁移序列 [The migration series of major elements during loess pedogenesis]," *Diqiu yu huanjing* 地球与环境 [*Geology geochemistry*] 1 (1999): 21–26; Sun Yubing 孙玉兵 et al. "Xifeng poumian tansuanyan hanliang de bianhua jiqi gu qihou huifu 西峰剖面碳酸盐含量的变化及其古气候恢复 [The change of carbonate concentration on the Xifeng section and the reconstration of palaeoclimate]," *Kuangwu yanshi diqiu huaxue tongbao* 矿物岩石地球化学通报 [*Bulletin of mineralogy, petrology and geochemistry*] Z1 (2007): 213–17.

30 Li Wenjie 李文杰, *Zhongguo gudai zhitao gongyi yanjiu* 中国古代制陶工艺研究 [*A study of the pottery-making technology in ancient China*] (Beijing: Kexue Chubanshe 科学出版社, 1996), 1.

31 Ma Hongjiao et al., "The geology of Tianshui-Qin'an."

32 Wang Xiaojuan 王小娟, Nan Puheng 南普恒, and Guo Yintang 郭银堂, "Hequ Pingtou yizhi Longshan shiqi taoqi jiqi zhitao yuanliao de huaxue chengfen fenxi 河曲坪头遗址龙山时期陶器及其制陶原料的化学成分分析 [Chemical analysis of pottery and clay raw materials from the Longshan period at the Pingtou site in Hequ County, Shanxi Province]," *Wenwu baohu yu kaogu kexue* 文物保护与考古科学 [*Sciences of conservation and archaeology*] 4 (2015): 61–69; Ma Hongjiao et al., "The geology of Tianshui-Qin'an."

33 Li Wenjie 李文杰, *Zhongguo gudai zhitao* 中国古代制陶, 1.

34 Li Xiangsheng 李湘生, "Shixi Yangshao wenhua caitao de niliao, zhizuo gongyi, lunhui jishu he yishu 试析仰韶文化彩陶的泥料、制作工艺、轮绘技术和艺术 [Some insights about the clay, manufacturing crafts and artistic values of colour painted pottery of Yangshao culture]," *Zhongyuan wenwu* 中原文物 [*Cultural relics of central China*] 1 (1984): 53–59; Zhou Ren 周仁, Zhang Fukang 张福康, and Zheng Yongpu 郑永圃, "Woguo Huanghe liuyu xinshiqi shidai he Yin Zhou shidai zhitao gongyi de kexue zongjie 我国黄河流域新石器时代和殷周时代制陶工艺的科学总结 [Studies on the technology of Neolithic and Yin and Zhou pottery unearthed in the Yellow River Valley]," *Kaogu xuebao* 考古学报 [*Acta archaeologica Sinica*] 1 (1964): 1–27.

second loess both have much smaller grain.[35] Therefore, regardless the high calcium content, the latter two types of clays are still quite suitable for pottery making.[36] In addition, the quality of clay is not merely decided by the raw material but can also be improved by additional treatments such as levigation and tempering.

Thus, we may speculate that the high-calcium ceramic vessels were made from either Tertiary red clay or fluvial second loess. This seems to provide us a direction to determine the provenance of the vessels. However, there are still several problems. First, geological formations are largely by nature and that the same process may be working on largely identical raw material in different parts of the world or even in different regions within the same broader area. This is particularly significant if we are dealing with aeolian clays since they can be transported by wind to hundred kilometres in extension. In this way, even if we can confirm that the vessels are made from Tertiary red clay or loess, it is usually not very helpful for answering archaeological questions since we still do not know the precise location of the production centre.

Second, the composition of clays from the same location may vary more remarkably than clays from two locations but with similar geological conditions. For example, the difference between batches of clays taken from the same location but at varying depth can be greater than the difference between batches of clays taken from locations several tens or hundreds of kilometres away from each other if the geological layout is similar. For Tertiary clay and loess, their content of calcium also depends on depth. This issue is shown in Qiao et al.'s research. When several clay samples from the same area were analysed, the result shows that the percentage of calcium oxide content can vary from 0 to about 30%.[37] Therefore, instead of suggesting different geographic origins of the clays, the difference in calcium levels may suggest at what relative depth the clays were obtained at the same location.

Furthermore, the compositions of clays are also affected by production and post-burial processes. This has been confirmed by ethnoarchaeological studies. For instance, in a study of pottery-making in the highland Philippines, the researchers notice that two nearby villages have distinct cultural practices and thus make compositionally different pots.[38] Research on the Dadiwan site in Gansu also shows that pots produced at the same site but during different time periods, had significant discrepancies in calcium content. Ma Qinglin suggests that this is because of differences in the processing of raw clays.[39]

[35] Lu Huayu 鹿化煜, and An Zhisheng 安芷生, "Huangtu gaoyuan hongniantu yu huangtu guturang lidu tezheng duibi: hongniantu fengcheng chengyin de xinzhengju 黄土高原红粘土与黄土古土壤粒度特征对比——红粘土风成成因的新证据 [Comparison of grain-size distribution of red clay and loess-paleosol deposits in Chinese Loess Plateau]," *Chenji xuebao* 沉积学报 [*Acta sedimentologica Sinica*] 17.2 (1999): 226–32.

[36] Ma Hongjiao et al., "The geology of Tianshui-Qin'an."

[37] Qiao Yansong et al., "Variations of geochemical compositions and the paleoclimatic significance of a loess-soil sequence from Garzê County of western Sichuan Province, China," *Chinese science bulletin* 54 (2009): 4697–703.

[38] Miriam T. Stark, Ronald L. Bishop, and Elizabeth Miksa, "Ceramic technology and social boundaries: cultural practices in Kalinga clay selection and use," *Journal of archaeological method and theory* 7 (2000): 295–331.

[39] Ma Qinglin 马清林, "Gansu xinshiqi shidai yu qingtong shidai zhitao gongyi taoqi yanliao ji taoqi chengfen fenlei yanjiu 甘肃新石器时代与青铜时代制陶工艺陶器颜料及陶器成分分类研究 [On the compositional classification of Gansu Neolithic and Bronze Age pottery and colourant]" (Ph.D. diss., Lanzhou University, 2000), 36–49.

In particular, processes in production such as the selection and mixing of clays, levigation, and tempering can all change the chemical composition of the finished products. In the recent studies published by Womack on Majiayao- and Qijia-type ceramics, the author mainly relies on petrography to reconstruct the production process of the ceramics. His studies show that temper was commonly added to the clays to improve the workability.[40] To better understand the impact of production processes on objects, we need to consider the suitable methodological approaches for the analysis, as will be discussed in the next section. Meanwhile, we also need to understand the chaîne opératoire of object production, that is, their life history from selecting the raw materials to using and disposing.[41] In all, a good analysis must take both the natural factors as well as the "behavioural issues" into account.[42]

Methods

For ceramic provenance study, two major approaches are thin-section petrography and chemical compositional analysis. Both methods have been to some extent adopted in the studies of prehistoric ceramics in China. In this section, I will briefly discuss both methods and their potential and issues, as well as the benefits of using these two analytical methods together as a holistic approach.

Ceramic petrography focuses on the microscopic structures of thin sections prepared from ceramic samples. To do this, the visual characteristics of inclusions, clay matrices and voids are observed with polarising light microscopes. The presence and absence of certain inclusions, their shapes, and the distribution patterns are used as indications of where the raw clays came from.[43] In general, petrography is a qualitative analysis which depends on experience through long-term practice as the researcher has to be familiar with different minerals and inclusions in thin sections. This method also requires background knowledge in geology so that the characteristics of a thin section can be related to the local geology. As inclusions and matrix can appear in a variety of different states depending on both natural and man-made processes interacting in complex manners, at present petrographic analysis cannot be operated by computer algorithms but at best be supported with image analysis software. Even with the help of such software, the analysis is time-consuming and requires considerable expertise, limiting the large-scale application of this method. There are certainly some attempts to improve petrography by introducing more quantitative measurements and computer automation.[44] But so far, petrography still mainly relies

[40] Andrew Womack et al., "A petrographic analysis of clay recipes in late Neolithic north-western China: continuity and change," *Antiquity* 93 (2019): 1161–77; Andrew Womack, "Crafting community: exploring identity and interaction through ceramics in late Neolithic and Early Bronze Age Northwestern China" (Ph.D. diss., Yale University, 2017).

[41] Robert Cresswell, "'A new technology' revisited," *Archaeological review from Cambridge* 9 (1990): 39–53; Mark R. Edmonds, "Description, understanding and the chaîne opératoire," *Archaeological review from Cambridge* 9 (1990): 55–70.

[42] Prudence M. Rice, *Pottery analysis: a sourcebook* (Chicago: University of Chicago Press, 2015), 347–49.

[43] Petrography in general, see Patrick Sean Quinn, *Ceramic petrography: the interpretation of archaeological pottery related artefacts in thin section* (Oxford: Archaeopress, 2013).

[44] E.g., Quinn, *Ceramic petrography*, 103–06; Miguel-Angel Cau et al., "Exploring automatic grouping procedures in ceramic petrology," *Journal of archaeological science* 31 (2004): 1325–38.

on researchers' personal judgement.

Chemical compositional analysis, on the other hand, is to reveal the compositional patterns of the clay-based samples so as to identify the raw materials and the techniques used in making the ceramics. Chemical analysis can be further divided into two types: geochemical (such as INAA, XRF, and ICP-MS) and mineralogical (such as XRD). Geochemical methods provide results of the concentration of each chemical element, while mineralogical methods focus on the concentration of particular chemical compounds.[45] Geochemical and mineralogical methods share the same goal, but each method has its own resolution levels and detection limits for elements. In reality, those with the highest resolution and the lowest detection limits do not always offer better explanatory power.[46] For example, Wallis and Kamenov point out that for analysing coarse, inhomogeneity samples, INAA (Instrumental Neutron Activation Analysis) and ICP-MS (Inductively Coupled Plasma Mass Spectrometry) may suggest very different results. Thus, such samples should be first examined by petrography before analysing their chemical composition.[47] In particular, another commonly used analytical method is scanning electron microscope equipped with energy-dispersive X-ray spectroscopy (SEM-EDS). A clear benefit of SEM-EDS is that this method can provide both visual detail and compositional information of a sample. Hence, SEM-EDS may be somehow considered a combination of thin-section petrography and chemical analysis. Nevertheless, SEM-EDS also has clear shortages. This method is time- and labour-intensive. Also, SEM-EDS cannot detect trace elements at the same level as ICP-MS is able to do. For these reasons, some researchers suggest a complementary analysis, with SEM-EDS for primary elements and ICP-MS for trace elements.[48] For future research on Chinese painted pottery materials, this method may also be an option to consider.

The compositional data obtained from the analysis is further interpreted by statistical approaches. Among them, multivariate analyses such as Principal Components Analysis (PCA), Cluster Analysis (CA) and Discriminant Analysis (DA) are often used for identifying and distinguishing compositional patterns.[49] In this way, chemical compositional analysis often give people an illusion that this method is straightforward and objective, as once the samples are analysed, all data can be processed and grouped by statistical software. However, this does not mean that compositional analysis is entirely objective. From its first step, how a sample is selected and pre-treated is certainly subjective. Besides, as previously discussed, different analytical methods may suggest different compositional

[45] Quinn, *Ceramic petrography*, 1.

[46] See also A. Mark Pollard, "Data analysis," in *Greek and Cypriot pottery: a review of scientific studies*, ed., R. E. Jones (Athens: British School at Athens, 1986), 56–89;

[47] N. J. Wallis and G. D. Kamenov, "Challenges in the analysis of heterogeneous pottery by LA-ICP-MS: a comparison with INAA," *Archaeometry* 55.5 (2013): 893–909.

[48] R. Scarpelli et al., "The provenance of the Pompeii cooking wares: Insights from LA–ICP-MS trace element analyses," *Microchemical Journal* 119 (2015): 93–101; Barbara Wagner et al., "Complementary analysis of historical glass by scanning electron microscopy with energy dispersive X-ray spectroscopy and laser ablation inductively coupled plasma mass spectrometry," *An international journal on micro and trace chemistry* 162 (2008): 415–24.

[49] For more details about multivariate analysis, see James E. Doran, and Frank Roy Hodson, *Mathematics and computers in archaeology* (Cambridge, MA: Harvard University Press, 1975); P. H. A. Sneath, and Robert R. Sokal, *Numerical taxonomy: the principles and practice of numerical classification* (San Francisco: W.H. Freeman, 1973); George A. F. Seber, *Multivariate observations* (New York: Wiley, 1984); Pollard, "Data analysis."

results. For the data processing, the selection of algorithms may also bring subjectivity. Therefore, there is probably no universal straightforward way for chemical analysis. For each case study, we should think carefully of the selection of methods and the treatment of samples so as to find the most suitable approaches for our materials and research goals. Furthermore, the advantage of compositional analysis—the convenience for the chemical data to be interpreted "automatically"—may not be as reliable. One significant problem, especially for the use of PCA in data processing, is that when the multivariate data is converted to principal components, all that we can see is the new, statistically-meaningful but geologically-meaningless parameters generated by the automatic computer processes. As Beier and Mommsen suggest, people "can rarely see what is really going on in the process."[50] It is even more risky if we simply assume that the chemical composition of the ceramic samples is identical with the chemical composition of the clays, because in this way, we actually fail to recognise the impact of human actions on the composition. In fact, it is one of the advantages of petrography to identify certain behavioural patterns, such as tempering.[51]

For these reasons, many scholars have recommended a holistic approach, that is, to conduct both petrographic and compositional analyses on the same samples, and to interpret the results side-by-side.[52] There have been some promising applications of this mixed-mode approach. For example, Schubert compares petrography and chemical analysis in his study of sherds from Neolithic Switzerland. He argues that for the identification of temper compositions, petrographic analysis is more helpful since the minerals, not just the elements, can be observed directly.[53] In another case study, Day and Kiriatzi conduct both INAA and thin section analyses on Cretan pottery. They note that the chemical variation, as observed by INAA, is caused by both the source difference and behavioural reasons. For the latter factors, petrography is a more suitable research tool.[54] In a recent paper by Hein and Stilborg, the authors combine both thin-section petrography and portable XRF in analysing the ceramic samples from prehistoric sites in Northwest China. Their result shows that although the same type of clay was used through time, revealed by P-XRF, some Late Bronze Age vessels were produced with radically different tempering behaviour from Early Bronze Age ones, as suggested by petrography.[55]

Therefore, like in many other research fields, there is probably no single tool which can solve all provenance problems. As the pros and cons of petrographic and compositional analyses are both obvious, the most ideal approach is to use these two methods together. It should also be pointed out that these approaches can only suggest potential produc-

[50] T. Beier and H. Mommsen, "Modified Mahalanobis filters for grouping pottery by chemical composition," *Archaeometry* 36 (1994): 287–306.

[51] Wallis, and Kamenov, "Challenges in the analysis."

[52] Quinn, *Ceramic petrography*, 113.

[53] P. Schubert, "Petrographic modal analysis: a necessary complement to chemical analysis of ceramic coarse ware," *Archaeometry* 28 (1986): 163–78; see also Womack et al., "A petrographic analysis."

[54] Peter M. Day et al., "Group therapy in Crete: a comparison between analyses by NAA and thin section petrography of early Minoan pottery," *Journal of archaeological science* 26 (1999): 1025–36.

[55] Anke M. Hein, and Ole Stilborg, "Ceramic production in prehistoric northwest China: preliminary findings of new analyses of old material from the Museum of Far Eastern Antiquities, Stockholm," *Journal of archaeological science: reports* 23 (2019): 104–15.

tion centres, either by geological characteristics or by statistical significance, but cannot pinpoint production centres with absolute certainty. Whether these suggestions can be corroborated archaeologically needs to be examined separately. As in the case study of Sichuan painted pottery, I will discuss the related archaeological implications in the final section.

Re-evaluating Research Result Presented by Hung and Colleagues

For their 2011 study, Hung et al. collected potsherds from five Gansu sites (Figure 2: 1–5) and three Sichuan sites (6–8). The Sichuan sherds are from three sites: Yingpanshan, Haxiu and Boxi.[56] The authors divided all the sherd samples into four groups, first by region and then by whether they are painted or not. The contents of 12 elements of the sherds were tested by LA-ICP-AES.

Principal Component Analysis is conducted on 6 major elements (Na_2O, MgO, CaO, Fe_2O_3, Al_2O_3, K_2O). The scatter diagram is created based on the first two PCs. The authors suggest that two clusters can be observed from the diagram. One cluster includes most samples from Gansu and all painted ones from Sichuan. These samples contain higher magnesium (Mg), calcium (Ca) and strontium (Sr) oxides than samples in the other cluster. Most Sichuan unpainted sherd samples contribute to the other cluster. Those samples are in general with higher iron (Fe) and titanium (Ti) oxides. The researchers believe that those high magnesium/calcium painted samples in the first cluster were made on the Loess Plateau from either loess or Tertiary clay, both characterised by high calcium and magnesium contents. Meanwhile, unpainted Sichuan samples were probably made locally since these samples are compositionally very different from Sichuan painted samples.

The PCA diagram also suggests that the Sichuan painted samples from Yingpanshan and Haxiu fall into two subgroups. To further investigation the reason behind this result, the researchers examine the samples by microscope. It shows that most painted samples from Yingpanshan contain 10% 0.25–0.1 mm inclusions, while Haxiu samples contain 5% less than 0.5 mm inclusions. The difference between Yingpanshan and Haxiu painted samples, as interpreted by the researchers, indicates that those samples probably came from two production centres on the Loess Plateau, so there may have been multiple sources and routes for the dispersal of prehistoric painted pottery.

Hung et al.'s paper led to debate over its archaeological implication as well as the reliability of the archaeometric methods used in the paper. Two review papers followed, one written by Ren Ruibo and colleagues and the other by Xiang Jinhui.[57] After comparing the high-calcium features of Gansu and Sichuan samples more carefully, Ren et al. argue that 70% of the Gansu painted samples contain more than 8% calcium content, while among Sichuan painted samples, only 30% of them contain more than 8% calcium content. The

56 Yingpanshan: 16 painted, 22 unpainted; Haxiu: 3 painted, 9 unpainted; Boxi: 12 unpainted, no painted.

57 Ren Ruibo 任瑞波, Chen Wei 陈苇, and Ren Yunjuan 任赟娟, "Chuanxi caotao chandi laiyuan xinshuo jiantao 川西彩陶产地来源新说检讨 [Rethinking the provenance study of western Sichuan painted pottery]," *Sichuan wenwu* 四川文物 [*Sichuan cultural relics*] 2 (2013): 40–45; Xiang Jinhui 向金辉, "Chuanxi Majiayao wenhua caitao laiyuan zaijianshi: yi taoqi huaxue chengfen fenxi wei zhongxin 川西马家窑文化彩陶来源再检视——以陶器化学成分分析为中心 [Rethinking the provenance of Majiayao culture painted pottery in western Sichuan: on the chemical compositional analysis of the pottery samples]," *Sichuan wenwu* 四川文物 [*Sichuan cultural relics*] 4 (2018): 81–90.

different distribution of calcium levels suggest that Gansu and Sichuan painted samples may have different provenance. Also, the compositional difference between Sichuan painted and unpainted samples may be better explained by either the difference among Sichuan local clays or the differences in raw material processing. Xiang further points out that the difference between Yingpanshan and Haxiu samples may not reflect two production centres. As Haxiu samples are chronologically earlier than Yingpanshan samples, Xiang suggests that, at the beginning, some Gansu-produced painted pots might have been introduced to Sichuan, while these imports were later replaced by local products.

Discussion

The main assumption made by Hung et al. is that high calcium content in ceramic samples is associated with the high calcium clays from the Loess Plateau. This assumption has been questioned by Ren et al. As pointed out above, high calcium loess and red clay are also available in Northwest Sichuan. It is also possible that the high calcium content in ceramics—rather than being the result of the use of high-calcium clay—was introduced during production or in post-burial processes. Therefore, high calcium cannot be used as a single criterion for the Loess Plateau provenance of ceramics.

Another potential problem is the analytical methods used in the paper. For all the sherd sampled in the research, twelve elements are tested and the first six (Na, Mg, Ca, Fe, Al and K) are used to conduct the Principal Components Analysis. Statistically speaking,

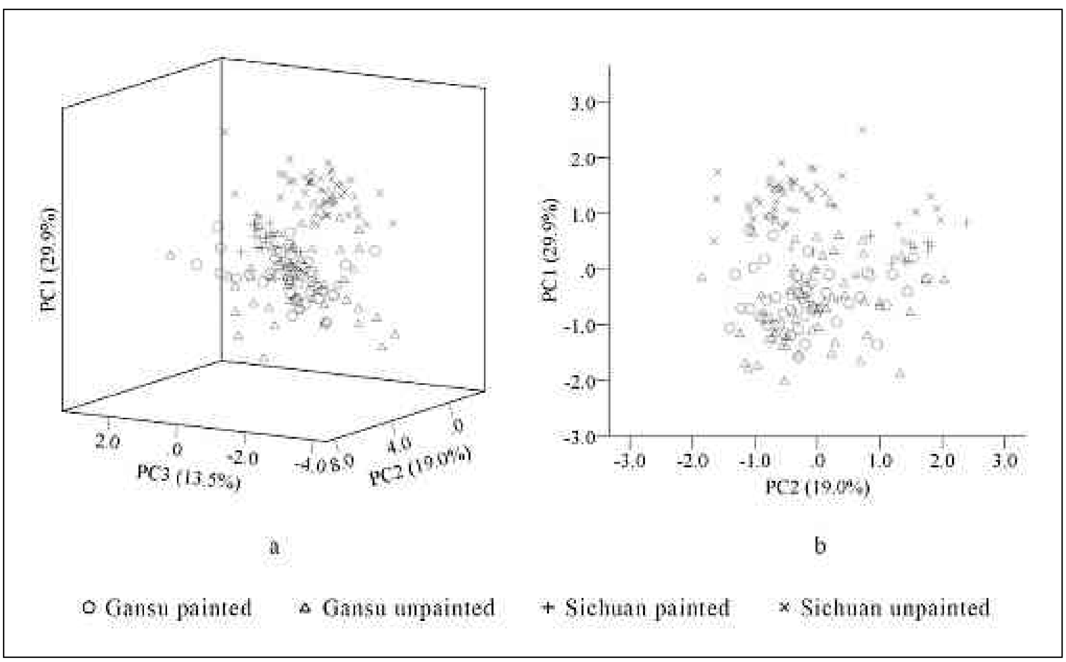

Figure 4. *PCA scatter plots of four types of samples. a: with three PCs; b: with two PCs. Each ceramic sample is represented by a dot. The distance between two dots suggests the closeness of the chemical compositions of two samples. The plots suggest that samples do not clearly cluster by type.*

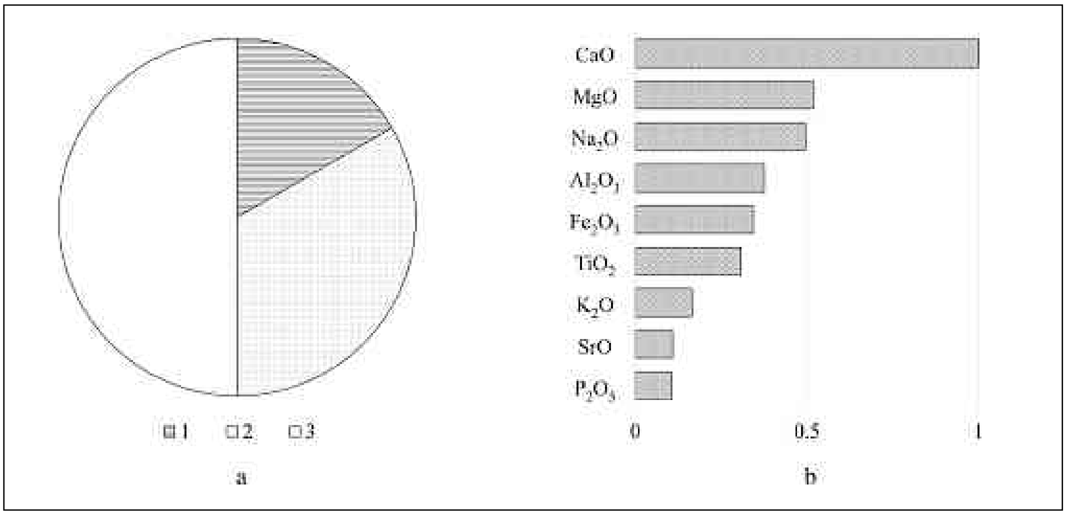

Figure 5. *TwoStep CA. Based on the chemical compositions, samples are divided into three clusters by the algorithm (see also Figure 6). a: cluster sizes; b: importance of each element (predictor) in the determination of the clustering. This shows that the differences of the calcium and magnesium levels in the samples contribute the most to the clustering result.*

choosing six elements seems to be enough since the first two PCs already contain over 70% of the total variance.[58] However, these six elements are common to all clays and thus can only suggest very large geological regions. If only these principal elements are used, the results are bound to be relatively close together. One suggestion is to include more trace elements in future studies.[59] Trace elements include more geological information about the local environment, so they can be used to indicate more specific locations. Also, a process like tempering may drastically change the concentration of some primary elements, while the concentration of trace elements may remain at the same levels in these cases.[60]

While these two problems can only be solved in future research, some progress may already be made by re-evaluating the current data. To include more elements, I choose to conduct PCA analysis with all elements but silicon, since the loss of SiO_2 on ignition is not measured in the original analysis. Without silicon, the total variance explained by the first two PCs drops to below 50%. To improve the coverage, I use the first three principal components (explaining 62% of variation) to plot the result in a 3D diagram (Figure 4a). Comparing this result with the 2D diagram (Figure 4b), it seems that most unpainted sherds from Sichuan are still distinguishable from all painted sherd samples and unpainted ones from Gansu.[61]

[58] Pollard suggests that it is a successful representation if the PCs can cover more than 70–80% of the total variance: Pollard, "Data analysis," 59.

[59] For example, Feng et al. provided the result with 42 trace elements in their case: Feng Jinliang, Hu Zhaoguo, Ju Jianting, and Zhu Liping, "Variations in trace element (including rare earth element) concentrations with grain sizes in loess and their implications for tracing the provenance of eolian deposits," *Quaternary international* 236 (2011): 116–26.

[60] Chris Doherty, personal communication.

[61] The 2D scatter plot is made with the same criteria but only the first two PCs.

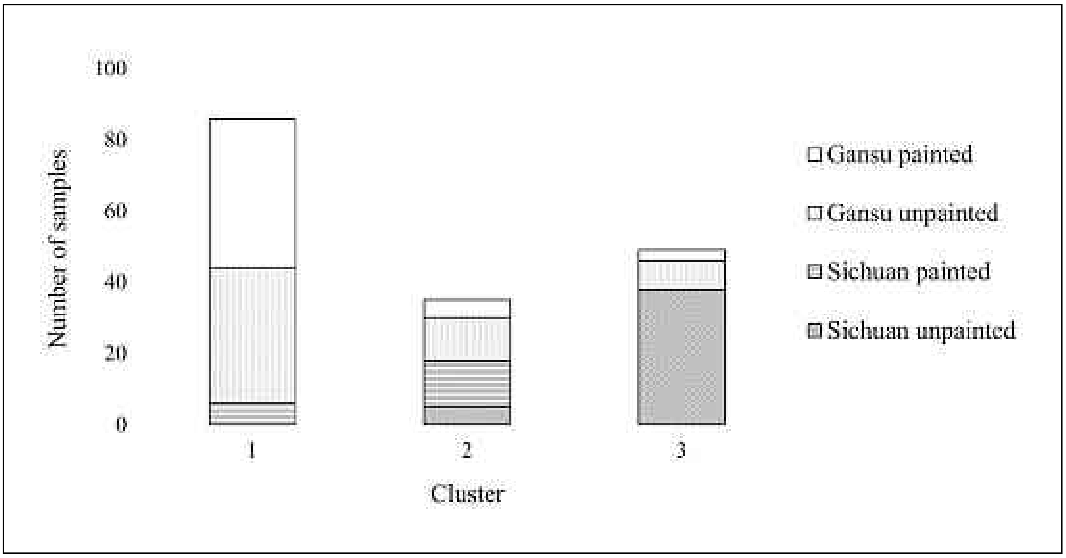

Figure 6. *TwoStep CA: sample allocation. This suggests that most Sichuan painted samples (in Cluster 2) are chemically distinguishable from both the Gansu painted samples (as most are in Cluster 1) and the Sichuan unpainted samples (as most are in Cluster 3).*

For Cluster Analysis, I choose a Two-step Clustering Component test provided by IBM SPSS Statistics v. 24. The result shows that the automatic grouping divides the samples into three clusters (Figure 5a), while the Predictor Importance chart confirms that CaO and MgO are the top two factors responsible for the clustering (Figure 5b). Most Gansu painted samples are in Cluster 1. Sichuan painted wares are in Cluster 2. Sichuan unpainted wares are in Cluster 3. Gansu unpainted sherds are in all three clusters (Figure 6). This result indicates that Gansu painted pottery, Sichuan painted pottery and Sichuan unpainted pottery probably belong to three separate compositional groups. Although painted ceramics from Gansu and Sichuan both have a higher calcium and magnesium contents than unpainted pottery from either region, these two types of painted pottery are not identical in composition. This is also shown by difference of the CaO and MgO concentrations between Cluster 1 and Cluster 2 (Figure 7).

As the normal clustering algorithm is based on the calculation of Euclidean distance, it is also necessary to check the correlations between pairs of elements.[62] The correlation matrix of all sherd samples (Table 1.) shows that the concentrations of CaO and MgO are most strongly positively correlated ($\rho = 0.707$), followed by the pairs of Fe_2O_3 and Al_2O_3 (0.592), and Fe_2O_3 and TiO_2 (0.583). Furthermore, CaO and Fe_2O_3 are negatively correlated (-0.604), as are CaO and Al_2O_3 (-0.599), and CaO and TiO_2 (-0.591). Correlations between elements can result from either the nature of clays or production processes, such as tempering.[63] Solomon suggests that when correlations are above 0.5 (or below -0.5),

[62] Pollard, "Data analysis," 68; G. Harbottle, "Activation analysis in archaeology," in *Radiochemistry 3*, ed., G. W. A. Newton (London: The Chemical Society, 1976), 33–72.

[63] Pollard, "Data analysis."

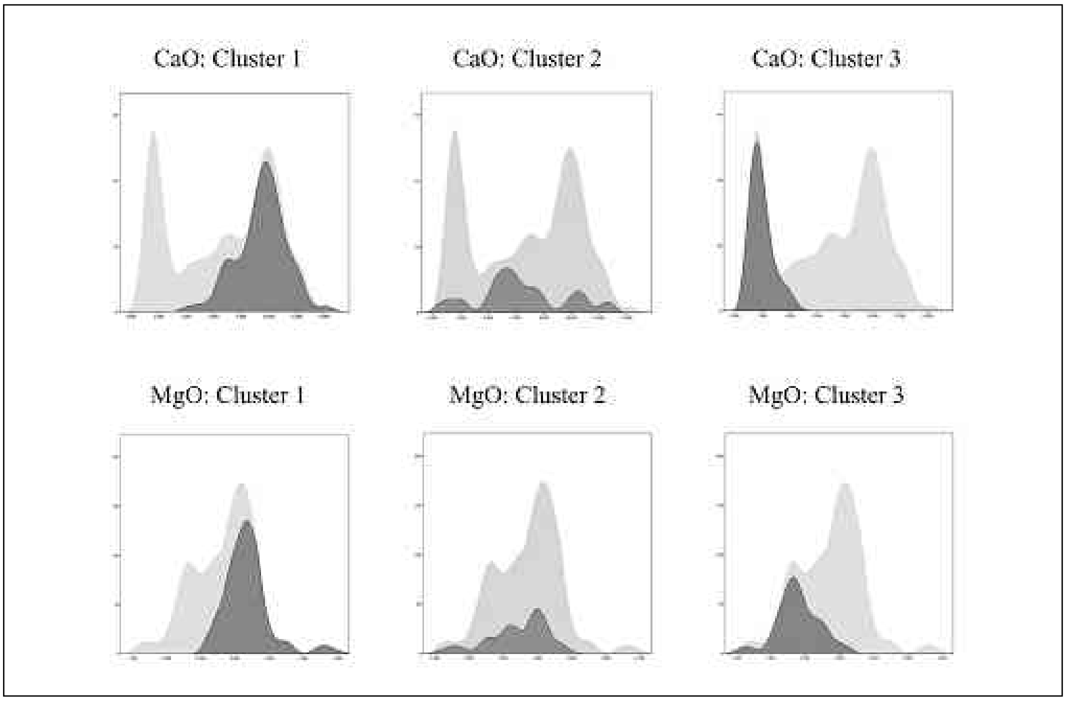

Figure 7. *TwoStep CA: concentrations of calcium and magnesium in computer-suggested clusters. This shows that ceramic samples in Cluster 1 (mainly the Gansu samples) have relatively high calcium and magnesium levels, while those two levels of samples in Cluster 3 (mainly the Sichuan unpainted samples) are relatively low.*

Euclidean distance cannot well represent the closeness of the samples.[64] To avoid this problem, Pollard suggests to use Mahalanobis D^2 for clustering if strong correlations have been identified. Therefore, I choose Mahalanobis distances with Discriminant Analysis (with the stepwise method in SPSS) as an alternative way to test whether the four groups (Gansu painted, Gansu unpainted, Sichuan painted and Sichuan unpainted) can be distinguished. The result (Figure 8) shows that Gansu sherd samples, no matter if painted (Group 1) or unpainted (Group 2), are unified in their chemical composition, while the two groups of Sichuan samples are separated, and they are both distinguishable from the Gansu samples. To explore the possible reason for the distinction between Sichuan and Gansu painted samples, I created a scatter plot of CaO and MgO. The result (Figure 9) shows that although Sichuan painted samples have higher CaO and MgO contents than Sichuan unpainted samples, their CaO content is still lower than those from Gansu samples. This confirms what we find via CA (Figure 7).

In summary, the conclusions reached in Hung et al.'s paper need to be re-evaluated. By retesting parts of the paper's statistics, it turns out that painted samples from Gansu and Sichuan are not chemically identical, suggesting that they may not have the same provenance. If high calcium clays were also available in Sichuan, it is possible that the painted pottery vessels were made locally, instead of having been imported from the Loess Plateau.

[64] H. Solomon, "Numerical taxonomy," in *Mathematics in the archaeological and historical sciences,* ed., F. R. Hodson, D. G. Kendall, and P. Tautau (Edinburgh: Edinburgh University Press, 1971), 62–81.

	Na_2O	MgO	CaO	Fe_2O_3	Al_2O_3	P_2O_5	K_2O	TiO_2	MnO	SrO	BaO
Na_2O	1.000	-0.195	-0.242	0.135	-0.122	-0.222	-0.358	0.134	0.155	-0.163	-0.015
MgO		1.000	0.707	-0.238	-0.328	0.379	0.104	-0.403	0.301	0.227	-0.041
CaO			1.000	-0.604	-0.599	0.348	-0.038	-0.591	0.113	0.275	0.032
Fe_2O_3				1.000	0.592	0.030	0.156	0.583	0.243	-0.147	0.107
Al_2O_3					1.000	-0.055	0.430	0.515	-0.099	-0.137	0.088
P_2O_5						1.000	0.284	0.015	0.314	0.169	0.017
K_2O							1.000	0.159	0.082	0.122	0.446
TiO_2								1.000	0.201	-0.098	0.045
MnO									1.000	0.045	-0.038
SrO										1.000	0.062
BaO											1.000

Table 1. *Correlation matrix of the elements. As some elements show relatively high correlation (e.g., >0.5 or <-0.5), the clustering result may be affected. Using Mahalanobis distance provides a way to reduce this risk (Figure 8).*

On the whole, chemical compositional analysis cannot fully answer the question of the provenance of Sichuan painted pottery. Therefore, I suggest three aspects of improvement in future research:

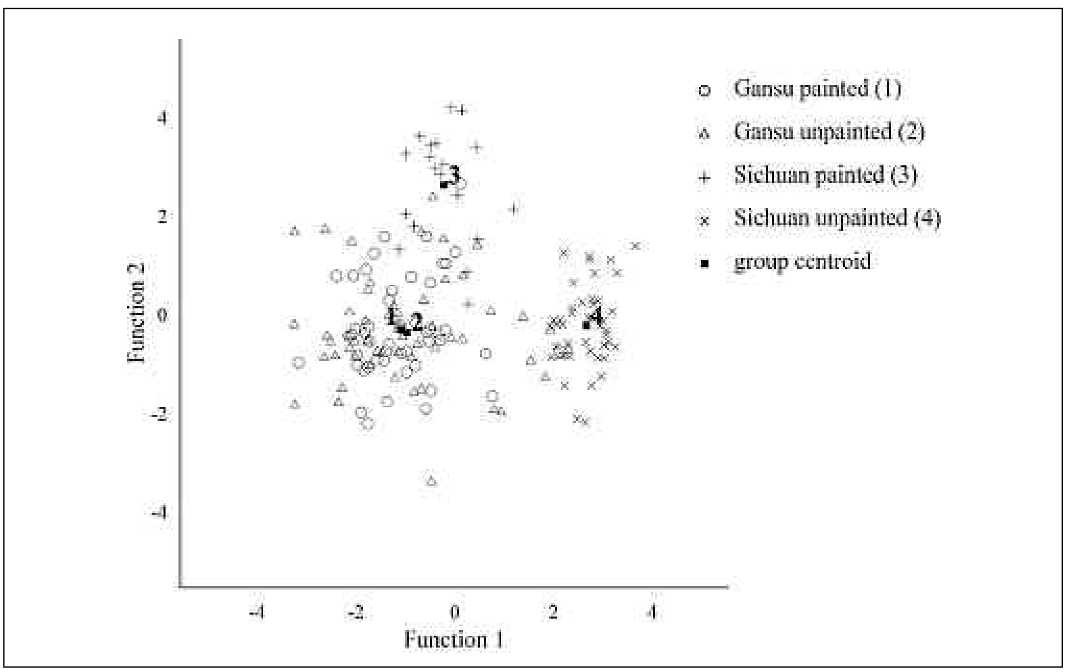

Figure 8. *DA with canonical discriminant functions in SPSS. The 2 PCs plot is calculated by Mahalanobis distance (Figure 4b: by Euclidean distance). This confirms the suggestion by the CA that the Sichuan painted samples (3) are chemically distinguishable from both the Gansu samples (1 and 2) and the Sichuan unpainted samples (4).*

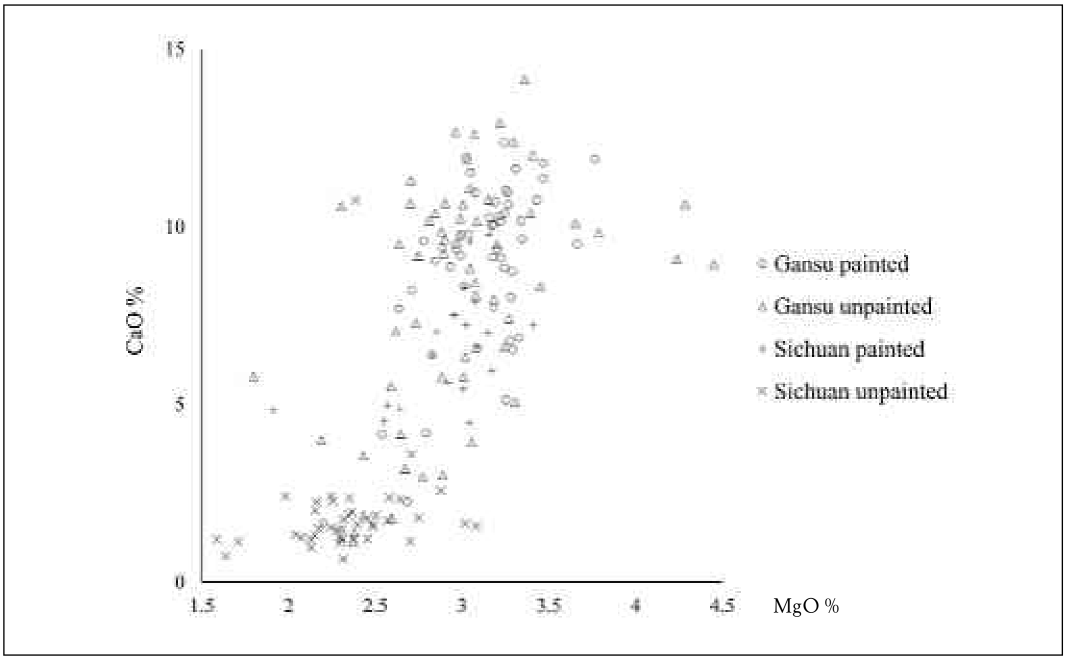

Figure 9. *Scatter plot with MgO and CaO concentrations. On average, the calcium and magnesium levels of the Sichuan painted samples are lower than those of the Gansu samples (painted or unpainted). This suggests that Sichuan and Gansu painted ceramics may have different provenance.*

First, thin section petrography should be conducted. Even if the chemical compositions of several clays and loesses are similar, different inclusions may be identified and thus help determine which type of clay was used. Petrography can also identify alterations of raw clays, such as tempering.

Second, for the compositional analysis, trace elements need to be included to improve the accuracy of the results. Since that not all forms of chemical analysis provide reliable trace elements, it may be necessary to combine several methods together, such as SEM-EDS plus ICP-MS.

Third, since the objects are painted pottery vessels, the analyses on colour pigments may also provide some clues for establishing provenance.

Conclusions and Archaeological Implication

As previously discussed, the Neolithic painted pottery vessels from Northwest Sichuan and those from the Loess Plateau (Gansu) have a clear stylistic link. In addition, some technical similarities (e.g., high calcium and magnesium contents) also suggest a potential link in ceramic technology between the two regions, such as the ways of selecting and preparing clay materials. It is not likely that these stylistic and technical links are merely coincidental, but it is reasonable to assume that there was contact between potters in the two regions. What, then, were possible ways of cultural exchange which lead to these connections? Here, I consider a few possible explanations to see whether they are supported by the results of the provenance studies.

Two forms of recipient movement, as argued by Valentine Roux, are associated with the spread of a certain type of objects: distribution and circulation. According to her definition, distribution means that the products were acquired by their users from the producers, while circulation means that the products move together with their users. Three indicators can be used to investigate how the objects were distributed or circulated: clay materials, technology (chaînes opératoires), and style. For example, local clay materials combined with foreign technical and stylistic traditions may reflect that potters from a different geographic area moved to the place where the objects in question were found.[65] In the case of the painted pottery discussed here, based on the high percentage of painted vessels in the total assemblages, the early appearance, and long continuation of painted pottery production there, the Loess Plateau seems to be the central place of development for this pottery tradition. Therefore, one possible explanation for the occurrence of a small number of painted pottery sherds of northern production in Sichuan is that immigrants may have brought a small number of painted vessels with them. The same group of people also brought their pot-making knowledge with them and continued to make pots in their new environment but using their established technology. If this was the case, it seems odd that the percentage of painted pottery in Sichuan ceramic assemblages is much lower than that in Gansu, especially if people were able to make painted pottery locally. Also, if the migrated population followed their old ways of ceramic production, why do the Sichuan painted and unpainted pots have so different compositions, while the Gansu painted and unpainted pots are compositionally identical? Thus, I think that the mass migration is not a likely explanation. However, there is another type of migration, that is, migration of single individuals who are integrated into the local community and adapt their ways of pottery making to the ways of the people they encounter there. This hypothesis goes well with the archaeological evidence on hand.

Another often suggested explanation for the occurrence of painted pottery in Sichuan and other places is that painted pottery was made in a production centre, presumably on the Loess Plateau, and reached Sichuan through direct or indirect distribution.[66] To accept this hypothesis, future provenance study must confirm that painted ceramics found in Sichuan were originally made in Gansu. What would the archaeological implication of this hypothesis be? In general, most types of objects involved in long-distance distribution in prehistory were precious and highly portable goods, such as obsidian, small metal items, and jades. Long-distance ceramic exchange may be uncommon, but it did happen among prehistoric groups in some cases. One example is shown in Jorge et al.'s provenance study of Neolithic ceramics from Mondego Plateau, Portugal. The researchers point out that even plain, mundane pots were circulated among groups as "part and parcel of the social landscape."[67] Another example are the long-distance pottery networks in Papua New Guinea.[68]

[65] Valentine Roux, C*eramics and society: a technological approach to archaeological assemblages* (Cham: Springer, 2019), 289–293.

[66] Roux, C*eramics and society*, 289.

[67] A. Jorge, M. I. Dias, and P. M. Day, "Plain pottery and social landscapes: reinterpreting the significance of ceramic provenance in the Neolithic," *Archaeometry* 55 (2013): 825–51.

[68] Simon H. Bickler, "Early pottery exchange along the south coast of Papua New Guinea," *Archaeology in Oceania* 32 (1997): 151–62.

In practice, if we want to transport large thin-walled Majiayao pots, the conveyance must be difficult and the rate of breakage is bound to be high.[69] Is it possible for people to do so? Through which routes can they travel from Gansu to Sichuan with such pots? Is there any archaeological evidence we can find to confirm such transports? These are some questions we need to further investigate.

It is also possible that painted pottery technology arrived in Sichuan not in the form of pots but as intangible knowledge. Of course, that would mean at least the movement of people if not objects from the Loess Plateau, but local people either learned the technology from Gansu potters or obtained Gansu painted pots and tried to produce similar results using their own methods. Can we tell the difference between a technology transfer and an imitation by studying the objects? I would argue that sometimes we can. One way to identify technology transfer is to study the development of the technology. A technology is developed in a particular trajectory and thus “path dependent”, that is, some previous choices will affect what can be chosen in the future.[70] Also, legacies of old methods and technologies are identifiable in the path. It is like that in our modern technology, two separate communities may both invent computer keyboard, but it is impossible for them to both invent QWERTY keyboard design independently.[71] For pottery making, there are also many technology selections which can suggest the path of the development of a given technology. In the example described in Womack’s study on Neolithic ceramics in the Tao River Valley, the crafting community kept using the same raw materials and the same clay recipes from the Neolithic into the early Bronze Age, i.e., from the Majiayao to the Qijia period.[72] For future research, we may compare the technological behaviour of pottery making in Gansu and Sichuan in order to decide whether the Sichuan craftspeople were imitating their peers.

In all, the provenance studies on Western Chinese painted pottery are very promising since the results have significant archaeological implications. Nevertheless, after reviewing the analysis by Hung et al. and considering factors such as geology, statistics and archaeology, I believe it is too early to draw the conclusion that the pottery vessels unearthed from Northwest Sichuan were made on the Loess Plateau. For further research, I would suggest that petrographic and chemical analyses should be used in tandem to analyse the same samples. It would also be helpful to include ethnoarchaeological studies to better understand the logic behind cultural dispersal and technological transfer.

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[69] Anke Hein, personal communication.

[70] See, for example, the theory of “invention cascades” by Schiffer: Michael B. Schiffer, “The devil is in the details: the cascade model of invention processes,” *American antiquity* 70 (2005): 485–502.

[71] Paul A. David, “CLIO and the Economics of QWERTY,” *The American economic review* 75 (1985): 332–37; John Hall, Iciar Dominguez Lacasa, and Jutta Günther, “Path dependence and QWERTY’s lock-in: toward a Veblenian interpretation,” *Journal of economic issues* 45 (2011): 457–64.

[72] Womack et al., “A petrographic analysis;” Womack, “Crafting community.”

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The Bulletin of the Museum of Far Eastern Antiquities

Founded by Johan Gunnar Andersson

Editor
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