

A Tale of Two Wares: An Unusual Type of Late Neolithic Vessels from Gansu Province, China

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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

相映成趣：甘肃新石器时代晚期的夹砂—细泥复合陶器试析

摘要：在甘青地区的一些新石器时代马家窑时期遗址中出土了的一类特殊的陶器。这类陶器通常由两部分组成。器身的一部分为表面粗糙的夹砂陶，而另一部分则为质地细腻的泥质陶，且表面抛光并有彩绘。我们将此种陶器称为复合陶器。安德森在其西部考察中曾收集到一些此类陶器，目前藏于斯德哥尔摩东方博物馆。Bylin-Ahltin 和 Sommarström 在研究中就注意到了这些器物，但并未深入探讨。复合陶器的特殊之处在于传统的制陶师往往会使用同种胚料以防止材料收缩率不同造成晾干和烧制过程中的开裂，而复合陶器与这种理念恰恰相反。本次研究中，我们在十五件复合陶器上取样进行岩相分析。结果表明陶器两部分的材料确实为经不同配制的胚料，而衔接处则采用多种不同的防开裂处理。由此，我们可以推测同一位工匠或许同时参与夹砂、泥质和复合陶器的制作。目前所有已知的复合陶器均为遗址采集物，且大多为大型容器（如带流盆、双耳罐）的残片。近年来，马家窑遗址的再次发掘也出土了此类器物。该地区的其他遗址中或许也会有所发现。鉴于这类器物的特殊性，我们认为有必要在发掘报告中将其单列。复合陶器虽然制作较复杂，但其体现了工艺和设计的紧密联系，因此这类陶器的存在必然有一定的合理性。今后的研究应重点关注这类器物背后的文化含义。

关键词：制陶工艺 西北地区 新石器 彩陶 复合陶器 泥质陶 夹砂陶 岩相分析 麝和料水洗 马家窑 罗汉堂

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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, 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 untempered material shrinks more significantly.³ An untempered 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

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-Guption Publications, 2003).

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 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

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.

⁶ Wang Hui 王輝, "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.

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 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°C¹⁶ 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

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 谢端琚, *Ganqing diqu shiqian kaogu 甘青地区史前考古 [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 半山与马场彩陶研究 [Research on Banshan and Machang painted pottery]* (Beijing: Beijing Daxue Chubanshe 北京大学出版社, 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顏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”.

The kilns found so far at Majiayao sites are horizontal or vertical updraft kilns as seen at Baidaogouping, Linjia, and Xipogu, the latter of which have diameters of 0.4 to 1.3 m.¹⁹ Considering that Majiayao-style vessels tend to be rather large with vessel diameter 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

¹⁹ Gansusheng Wenwu Gongzuodui 甘肅省文物工作隊, Linxia Huizu Zizhizhou Wenhuaaju 臨夏回族自治州文化局, and Dongxiangzu Zizhixian Wenhuaquan 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 甘肅蘭州西坡瓜遺址發掘簡報 [Preliminary report on the excavation at Xipogua in Lanzhou, Gansu]," *Kaogu 考古* 9 (1960): 1–4.

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 考古與文物* 6 (2005): 85–89.

production locations.²³ For a criticism of their approach see Ren et 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 could 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.

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 王輝, and Chen Jian 陳劍, "Chuanxi Majiayao leixing caitao chanyuan fenxi yu tantao 川西馬家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.

²⁴ Ren Ruibo 任瑞波, Chen Wei 陳葦, and Ren Yunjian 任贊娟, "Chuanxi caitao chandi lai yuan 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".

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 that the Majiayao fine ware is 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 (Ts 10-11). 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

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”.

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.

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 the shape of some of the sherds covering the fine-ware/coarse-ware-transition remind him of painted fine-ware vessels.³⁶ 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.³⁷ 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.³⁸ 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.³⁹ Together with a tendency 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.⁴⁰

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.⁴¹ 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.⁴² 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

³⁶ Ibid., pl. 48:3.

³⁷ Ibid., pl. 48:2 and 6a.

³⁸ Luohantang published by Margit Bylin-Althin, “The Sites of Chi Chia P’ing and Lo Han T’ang in Kansu”.

³⁹ 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).

⁴⁰ 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.

⁴¹ 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.

⁴² Owen S Rye, *Pottery technology: principles and reconstruction*.

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.⁴³

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.⁴⁴ 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.⁴⁵

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.⁴⁶ 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.⁴⁷

⁴³ Pers. obs. Ole Stilborg.

⁴⁴ Owen S. Rye, *Pottery technology: principles and reconstruction*, 39–40.

⁴⁵ 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?”

⁴⁶ Pers. comment Alexandre Livingstone-Smith.

⁴⁷ 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).

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 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.⁴⁸ 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 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 Zhujiashai held in the collections of the MFEA, identified only a small number

⁴⁸ Bo Sommarström, "The Site of Ma-Kia-Yao," 88.

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, 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 added. Three of the 15 samples in total come from the site of Luohantang and 12 from the site of Majiayao. An additional 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 the FW as too little of the vessel was preserved.⁴⁹ 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 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.

⁴⁹ 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.

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 between the two ware parts 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 FW part which may represent added temper but could even be naturally occurring organics in the clay (Fig. 5). The potential organic temper in the FW 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.⁵⁰

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 chose to solve the problem.⁵¹ 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 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-technique⁵²): A slanting overlap of the FW and CW parts (Fig. 6) is the most common technical solution being used in 7 of the 15 samples (K11998:166; 132; 391 and 486; K11999:079 and 471; 2014GLMH1.4:04).

⁵⁰ Pers. comment Evgenia Dammer.

⁵¹ 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.

⁵² 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 Soldatorpet in Scania, Sweden," *Lund archaeological review* (2001.6): 31.

Type II. Wedging (i.e., extreme U-technique⁵³): 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).

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). In one instance (K11998:028), the use of different fine clays for the FW and CW respectively allows for more details to be observed. A ca. 1 cm wide, slightly slanting (N-technique) zone represents a coil made from a mixture of the two fine clays with 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).

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 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.

⁵³ Birgitta Hulthén, *On ceramic technology during the Scanian Neolithic and Bronze Age*, 35.

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.⁵⁴ 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 BC.⁵⁵ Only one sample had a combination of red and 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 extent continuing into Qijia,⁵⁶ 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

⁵⁴ e.g., Chen Wei 陳葦, *Xianqin shiqi de Qingzang gaoyuan donglu 先秦时期的青藏高原东麓* [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 任贇娟, "Chuanxi caitao chandi lai yuan 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.

⁵⁵ We see these especially in Majiayao Culture Phase II and to a lesser extent 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, "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).

⁵⁶ Andrew Womack, "Crafting community, exploring identity and interaction through ceramics in late Neolithic and early Bronze Age Northwest China," 251.

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.⁵⁷ 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.⁵⁸ Among them are spouted basins (3 examples from Layer 5;⁵⁹ Fig. 11.1) very similar to some of the examples discussed by Sommarström,⁶⁰ spouted vessels without paint⁶¹ (Fig. 11.4 and 11.5), vessels with a combination of paint, rustication, and appliqué⁶² (Fig. 11.11 and 11.8), and two high-shouldered double-handled vases⁶³ (Fig. 11.12 and 11.13). They appear throughout all phases of the site, though they 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 傅家門 lacking paint may also be Double-Wares⁶⁴ (Fig. 11.6). There are several examples of spouted basins from other sites as well such as Xipogua 西坡瓜 (Fig. 11.3⁶⁵), Caojiazui 曹家咀 (Fig. 10.10⁶⁶) and Yan'erwan 雁兒灣 (Fig. 11.2⁶⁷), all of which are located in Lanzhou, Gansu. Xipogua additionally furnished a fragment similar to Majiayao K11998:486⁶⁸ (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

⁵⁷ Personal communication Guo Zhiwei.

⁵⁸ Gansusheng et al., “Gansu Dongxiang,” 111–161.

⁵⁹ Ibid, e.g., F19:2.

⁶⁰ Bo Sommarström, “The Site of Ma-Kia-Yao,” Fig. 1.10, 1.11, and 1.13.

⁶¹ 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],” F21.6 and T52.3.

⁶² Ibid., T15.4 and H59.31.

⁶³ Ibid., H9:1 and H9:2.

⁶⁴ Zhongguo Shehui Kexueyuan 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],” *Kaoguxue jikan* 考古學集刊 16 (2006): T2.3:76.

⁶⁵ Yan Wenming 嚴文明, and Zhang Wangao 張萬高, “Yan'erwan yu Xipogua 雁兒灣與西坡瓜 [Yan'erwan and Xipogua],” *Kaoguxue wenhua lunji* 考古學文化論集 3 (1993): T13:23

⁶⁶ 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).

⁶⁷ Yan Wenming 嚴文明, and Zhang Wangao 張萬高, “Yan'erwan yu Xipogua 雁兒灣與西坡瓜 [Yan'erwan and Xipogua],” H1:103.

⁶⁸ Gansusheng Bowuguan 甘肅省博物館, “Gansu Lanzhou Xipogua yizhi fajue jianbao 甘肅蘭州西坡瓜遺址發掘簡報 [Preliminary report on the excavation at Xipogua in Lanzhou, Gansu],” 4.

rusticated body below⁶⁹ (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.⁷⁰ 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, 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. Skillful potters are not necessarily professionals, though. That the solutions to the problem of joining two different wares 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 wares 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 ware quality in members of the two vessel categories. Alternatively, there might be other, technological reasons that we are not aware of.

⁶⁹ Yan Wenming 严文明, and Zhang Wangao 张万高, "Yan'erwan yu Xipogua 雁儿湾与西坡圜 (Yan'erwan and Xipogua)," H10:5.

⁷⁰ Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," 443.

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.⁷¹ 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.

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 wares 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.* 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 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

⁷¹ 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.

a uniformly quartz tempered ware may be a parallel to the two vessels from Majiayao and the vessel from Dashiquan.⁷²

A further interesting pair of samples is K11998:132 and K11999:471 – both belonging to Sommarström's group named "plain fine-and-coarse ware".⁷³ 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.⁷⁴ 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 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. 6), 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

⁷² Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," 443 and pl 43.3.

⁷³ Bo Sommarström, "The Site of Ma-Kia-Yao," 87f.

⁷⁴ See Margit Bylin-Althin, "The Sites of Chi Chia P'ing and Lo Han T'ang in Kansu," 433.

sites.⁷⁵ 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.*

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

⁷⁵ See Womack et al. this volume.

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.⁷⁶ 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.

⁷⁶ Pers. comment Edward Matenga.

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This study has only been possible with the support and openness of the Museum 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.

List of Figures

Figure 1 Double-Wares identified by Bylin-Althin and Sommarström:⁷⁷ 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).

Figure 2 Map showing sites where actual and/or potential Double-Wares have been identified. Sampled sites are marked with a star.

Figure 3 Microscope photos of the coarse tempered CW (right) and the finer tempered FW (left) of the Double-Ware sample K11998:116.

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.

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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.⁷⁸

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; looks 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).

⁷⁷ 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).

⁷⁸ 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 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;⁷⁹ 2. Yan'erwan H1:103;⁸⁰ 3. Xipogua T13:23;⁸¹ 4. Linjia F21:6;⁸² 5. Linjia T52:3;⁸³ 6. Fujiamen T2.3:76;⁸⁴ 7. Xipogua T13.2;⁸⁵ 8. Linjia H59:31;⁸⁶ 9. Linjia H59:31;⁸⁷ 10. Caojiazui;⁸⁸ 11. Linjia T15:4; 12. Linjia H9:1;⁸⁹ 13. Linjia H9:2;⁹⁰ 14. Xipogua H10: 5.⁹¹

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.

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.

Figure 15 Double-Ware sherd from 2018 Majiayao excavation (2017GLMG1, layer 6).

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⁷⁹ 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.

⁸⁰ Ibid, fig. 3.1.3-7.7

⁸¹ Ibid, fig. 3.1.3-5.8

⁸² Gansusheng Wenwu Gongzuodui 甘肅省文物工作队, 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.

⁸³ Ibid, fig. 24.12.

⁸⁴ Zhongguo Shehui Kexueyuan 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.

⁸⁵ Gansusheng Bowuguan 甘肅省博物館, "Gansu Lanzhou Xipogua yizhi fajue jianbao 甘肅蘭州西坡瓜遺址發掘簡報 (Preliminary report on the excavation at Xipogua in Lanzhou, Gansu)," fig. 4.2.

⁸⁶ Gansusheng Wenwu Gongzuodui 甘肅省文物工作队, 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.

⁸⁷ Ibid., fig. 24.10

⁸⁸ 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.

⁸⁹ Ibid., fig. 26.21.

⁹⁰ Ibid., fig. 28.9.

⁹¹ 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.

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