H. Piezonka

the Institute of Prehistory and Protohistory at Kiel University, Kiel, Germany

The World's Oldest Pots: On the Dispersal of the Ceramic Innovation among Eurasian hunter-gatherers since the Late Glacial period

Abstract. The earliest ceramic vessels of the world have been produced in southern China by Late Glacial hunter-gatherers in the remote times around 18,000 calBC. Over the following millennia the new technology became known among forager communities in the Russian Amur region, in Japan, Korea, Transbaikalia and ultimately appeared also in the Urals and in eastern and northern central Europe. Contrary to common views of pottery as part of the "Neolithic package", the Eurasian hunter-gatherer ceramic tradition is an innovation that developed completely independent of other Neolithic traits such as agriculture, animal husbandry and sedentary lifestyle. The paper explores the chronological sequence of the appearance of hunter-gatherer ceramic vessel production on the basis of radiocarbon dates in northern Eurasia from the Pacific coast to the Baltic and outlines promising methodological approaches that currently play a role in researching this much-discussed topic.

Key words: Hunter-gatherer pottery, late Pleistocene, early Holocene, northern Eurasia, radiocarbon chronology, definition of the Neolithic.

For citation: Piezonka H. The World's Oldest Pots: On the Dispersal of the Ceramic Innovation among Eurasian hunter-gatherers since the Late Glacial period // *History and modern perspectives*. 2020. Vol. 2. №2. P. 66-78.

Пиецонка Х.

Альбрехтс Университет, Институт доисторической и раннеисторической археологии, г. Киль, Германия

Старейшие горшки мира: О рассеивании керамических инноваций среди евразийских охотников-собирателей со времен позднего ледникового периода

Аннотация. Самые ранние керамические сосуды мира были произведены на юге Китая охотниками-собирателями позднего ледникового периода в отдаленные времена около 18 000 до настоящего времени. В течение последующих тысячелетий новая технология стала известна среди фуражирных общин в российской Амурской области, в Японии, Корее, Забайкалье и в конечном итоге появилась также на Урале и в Восточной и Северной Центральной Европе. Вопреки распространённым взглядам на гончарное дело как часть «неолитического пакета», евразийская охотничье-собирательская керамическая традиция является новшеством, которое развивалось совершенно независимо от других неолитических черт, таких как сельское хозяйство, животноводство и сидячий образ жизни. В работе исследуется хронологическая последовательность появления производства охотников-собирателей керамических сосудов на основе радиоуглеродных дат на севере Евразии от побережья Тихого океана до Балтики и излагаются перспективные методологические подходы, которые в настоящее время играют роль в исследовании этой широко обсуждаемой темы.

Ключевые слова: Охотничье-собирательское гончарное дело, поздний плейстоцен, ранний голоцен, Северная Евразия, радиоуглеродная хронология, определение неолита

Для цитирования: Пиецонка Х. Старейшие горшки мира: О рассеивании керамических инноваций среди евразийских охотников-собирателей со времен позднего ледникового периода // *История и современное мировоззрение*. 2020. Т. 2. №2. С. 66-78.

1. INTRODUCTION: A CONTAINER INNOVATION IN THE ICE AGE

„Pot-making is perhaps the earliest conscious utilization by man of a chemical change". With these words Vere Gordon Childe in 1936 described the major innovative property the invention of ceramic vessels had, in his opinion, in human cultural history.[1]

Strictly speaking, this assumption is not entirely correct, as an intentional thermal modification of clay had already been employed by Upper Palaeolithic hunters of the central European plain millennia before the first ceramic pots were made. In the Pavlovian, a local variant of the eastern Gravettian, anthropomorphic and zoomorphic clay figurines as well as pellets and other "structural ceramics" have been produced in a complex technological process by hunters of the Late Glacial maximum, around 29,000-25,000 calBC. More than 10,000 artefacts made of fired clay are known from Moravian sites such as Dolní Vestonice, Pavlov I and II and Pžedmostí, among them "venus" statuettes and animal figurines; further examples of Gravettian fired clay artefacts have come to light on French, Austrian and Ukrainian stations.[2] At the site of Maïninskaya by the River Enisei in western Siberia, a human figurine consisting of fired clay dates to around 18,000 calBC.[3] Recently, a younger, independently invented tradition of fired clay figurative art has been suggested for the Croatian cave site of Vela Spila where 36 ceramic figurines and fragments dating to c. 15,500-13,000 calBC were discovered.[4]

These early examples of figurative art bear witness to the repeated discovery that by intentional shaping and firing of clay artificial objects including representations of humans and animals can be made. Pottery vessels with their utilitarian, symbolic and social dimensions provide a differently focused array of information on numerous aspects of the communities and societies that produced them. As part of the material culture of ancient people, pottery is of particular importance in archaeological research because it is one of the few materials that withstands decay under most depositional conditions and because clay vessels are prone to continuous, comparatively rapid typological development. These two properties make pottery an extremely valuable source for the archaeologist.

The emergence of pottery in the Old World is an intensely debated field in Stone Age archaeology.[5] From a European perspective, the introduction of ceramic vessels has long been seen as an innovation connected to the "Neolithic package": Already Sir John Lubbock in his book „Pre-Historic Times" argued that the invention of pottery formed a defining feature of the Neolithic, together with growing crops, taming animals and ground stone tools.[6] In the first half of the 20th century, the supposed association of early pottery and the transition to a farming lifestyle was further promoted by Vere Gordon Childe in his concept of the Neolithic revolution, and throughout the 20th century, "Neolithic packages" of various technological, economic, social and ideological aspects which as a baseline include domesticates and pottery have been defined.[7] This standard definition of the Neolithic as a fixed „package" of innovations has been discarded as a global concept over the last decades,[8] but nonetheless a disconnection of the history of pottery from agriculture and sendentism remained difficult in (western) archaeological thought.[9]

A very different understanding of the Neolithic prevails in parts of Eastern Europe and in Russia: Here, the main feature distinguishing the Neolithic from the previous periods is seen in the appearance of pottery vessels.[10] Various attempts have been made to solve this terminological discrepancy between western and eastern research traditions. Especially in the regions between the two spheres such as Finland, Poland and the Baltic states, various compromise labels have been coined for pottery-producing hunter-gatherers, for example "Sub-Neolithic", "Paraneolithic", "Pottery Mesolithic", etc.[11] From the Russian side there have been attempts to address the problem by equating the two different definitions of the Neolithic with two actual archaeological processes: „The Neolithic as a pan-European phenomenon resulted from at least two processes, one of which involved primarily farming, and another, pottery making. The two processes had apparently different centres of origins and were not simultaneous."[12] This way, a difference in *definition* of the terminus "Neolithic" which developed in the separated western and eastern research communities is now in danger of becoming laden with archaeological meaning and being interpreted as an actual *culture-historical reality*[13].

We know today that the earliest ceramic vessels have been produced in the remote times of the Late Glacial Maximum, around 18,000 calBC. Over the following millennia the new technology became known among forager communities in the Russian Amur region, in Japan, Korea, Transbaikalia and the Northern parts of Indochina and ultimately appeared also in the Urals and in eastern and northern central Europe. Outside Eurasia, early centres of ceramic production by hunter-gatherers also existed in Northern Africa in the Sahara, the Sahel and the Nile valley from the 10th millennium calBC onwards;[14] and on the American continent, where the earliest pottery vessels are associated with forager shell midden sites in the lower Amazonas basin in eastern Brazil dating to around 6000 calBC.[15] Thus, in many parts of the world ceramics containers were developed, produced and used entirely independent of other "Neolithic" traits such as agriculture and animal husbandry, monumental architecture and a sedentary lifestyle, and existed as a hunter-gatherer technology for many millennia.

[1] [[Childe1936]].
[2] [[Budja 2009]]; [[Hansen2007]]:41–42; [[Vandiver1989]].
[3] [[Bougard2003]]: 32.
[4] [[Farbstein2012]].
[5] [[Gronenborn2011]]; [[Hartz2013]]; [[Hommel2014]]; [[Jordan2009]]a; [[Jordan2016]]; [[Kuzmin2013]]a; [[Rice1999]].
[6] [[Lubbock1865]].
[7] For an overview and critical discussion see [[Çiliniroğlu2005]].
[8] See for example [[Budja2009]]; [[Gronenborn2015]].
[9] J. W. Hoopes and W. K. Barnett, for example, wrote in 1995 in their standard work on the emergence of pottery: "The archaeological record makes it clear that pottery was most commonly produced by sedentary, agricultural societies; most mobile, foraging societies did not have pottery […]. It is a mistake, however, to infer the existence of either sedentism or agriculture from the presence of pottery alone." [[Hoopes1995]]: 2. Beyond the narrow realms of archaeology, the knowledge that the ceramic container technology was a Pleistocene hunter-gatherer innovation is even less established in western cultural and social sciences: following the social anthropologist H. Popitz, pottery is subsumed as one variant of thermal modification of materials, setting in from c. 6000 BC as part of the "first technological revolution" which also involves agriculture and the founding of urban settlements even in recent publications such as [[Weyer2008]] (108-113); see also [[Popitz1995]].
[10] [[Chairkina2009]]: 210; [[Ошибкина2006]].
[11] See for example [[Webart1998]].
[12] [[Dolukhanov2009]], 238; see also [[Kuzmin2013]]b; [[Mazurkevich2015]], 28-31; [[Yanshina2017]].
[13] [[Piezonka2017]].
[14] [[Close1995]]; [[Hommel2014]]; [[Huysecom2009]].
[15] [[Roosevelt1995]].

In this paper, the successive introduction of pottery vessel production among hunter-gatherer communities since the late Pleistocene is traced across eastern and northern Eurasia, and current research questions connected to the chronology of this technological innovation, its significance and functions are discussed.

2. EARLY HUNTER-GATHERER POTTERY IN EASTERN AND NORTHERN EURASIA

When in the 1960s at the Japanese cave site of Fukui remains of ceramic vessels were for the first time associated with radiocarbon dates from the Late Glacial period, the scientific community had great difficulties accepting such an old age for pottery.[16] It was only since the 1990s that the idea of a very ancient North Eurasian pottery tradition that was completely independent from the Near Eastern Neolithic began to become more widely acknowledged.[17] Today it is possible to sketch a supra-regional picture of this early hunter-gatherer pottery although this picture still has a lot of blurred parts and even large gaps in some regions which are mainly due to the uneven state of research in the various parts of northern Eurasia[18] (Fig.1, 2).

SOUTHERN CHINA

The earliest evidence for ceramic containers in the world is, according to our current knowledge, associated with Paleolithic hunter-gatherers living in Southern China during the Last Glacial Maximum.[19] At the cave site of Xianrendong in the Yangtse basin, Jiangxi province, remains of simple-shaped pots with rounded bases have been found in layers that yielded radiocarbon dates on bone and charcoal between 20,750 and 17,210 calBC.[20] In the cave of Yuchanyan, Hunan province, likewise located in the Yangtse basin, bones and charcoal from the earliest layers with pottery have been radiocarbon dated between 16,350 and 15,660 calBC. From this site also stems one of the oldest date directly associated with a ceramic vessel: organic crust adhering to a potsherd yielded an age of 16,150-14,930 calBC.[21] Further direct dates on pottery (on charred crust and on humic acid from the ceramic fabric) come from the cave site of Miaoyan, Guangxi province, not far to the south of Yuchanyan, and cover a period between 17,620 and 16,450 calBC.[22]

NORTHERN CHINA, KOREA, MONGOLIA

In northern China and Korea the earliest pottery complexes are several thousand years younger than the Southern Chinese examples. At Nanzhuangtou, Hebei province, on the northern Chinese plain context data on wood and charcoal from the early ceramic layer are not older than 10,760 -9,460 calBC[23], and on the site of Hutouliang, potsherds yielded a thermoluminiscence date of 11.870±1720 bp.[24] The oldest dated complex with ceramic vessels on the Korean peninsula is Gosanni on an island off the South Korean coast, yielding a direct date on pottery between 10,180 and 9,470 calBC; other dates of the same ceramic complex are substantially younger.[25] In Mongolia, information on the early ceramic horizon is still very rare. At the moment the oldest direct dates on pottery stem from the site Tolbor-15 in the northern part of the country. Layer 1 contained fragments of pottery vessels decorated with horizontal impressed lines which were associated with a microblade lithic industry. Radiocarbon dates on organic material preserved in the fabric of two pottery fragments range between 6,590 and 5,570 calBC.[26] Especially in eastern Mongolia, several sites are known with a Late Palaeolithic industry that technologically resembles the inventories of early ceramic-bearing complexes further north and east, and further research is needed to clarify whether the late Pleistocene pottery traditions recorded in Transbaikalia and the Russian Far East extended south-west onto the Mongolian plateau.[27]

[16] [[Sagawa2004]]:127.
[17] [[van Berg1997]].
[18] [[Gibbs2013]]; [[Jordan2009]]a; [[Jordan2016]]; [[Hommel2014]]; [[Kuzmin2015]]. The dating results referred to in this paper have been calibrated using OxCal v 4.2.4 [[Bronk Ramsey2009]] and the IntCal13 [[Reimer2013]] calibration data, with date ranges corresponding to 95.4% probability and rounded to the nearest 10 years.
[19] [[Cohen2013]]; [[Dikshit2012]]; [[Lu2010]]; [[Zhao2000]].
[20] West section, layer 3C1B, east section, layers 2B1 and 2b; oldest date: UCR-3440: 18,520±140 bp, youngest date: BA-10263: 16,030±55 bp [[Wu2012]]. While Y. Kuzmin ([[Kuzmin2015]]:2-4) regards the stratigraphic association of the radiocarbon dating samples and the early pottery at Xianrendong as not sufficiently proven, D. J. Cohen ([[Cohen2013]]:62) states that the series of data is consistent in itself and stems from stable stratigraphic contexts. According to him it can therefore be regarded as reliable.
[21] Layer 3H, dates on bone and charcoal, oldest date: BA-06867: 14,975±60 bp, youngest date: BA-06863: 14,610±55 bp; date on pottery charred crust: BA-95057b: 14,390± 230 [[Boaretto2009]].
[22] Humic acid from potsherd: BA-94137a: 15,120± 500 bp; organic residue from potsherd: BA-94137b: 15,220± 260 bp [[Zhao2000]].
[23] Bottom of zone T1, BK-87088: 10,510± 140 bp, BK-87075: 10,210± 110 bp [[Zhao2000]]; [[Yang2012]].
[24] [[Lu2010]].
[25] [[Cho2009]].
[26] PLD-18654: 7685±30 bp, PLD-18655: 6725±30 bp [[Гладышевinprint]].
[27] [[Piezonka2015]]c; [[Tsydenova 2015]].

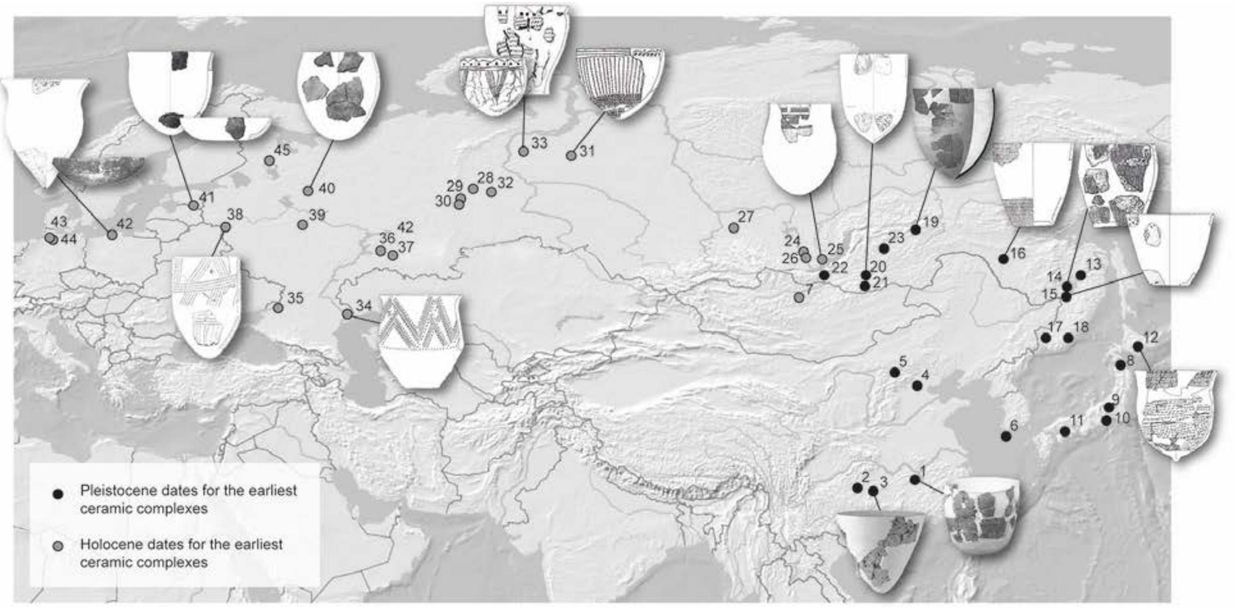

Figure 1. Sites with early hunter-gatherer ceramic vessels in eastern and northern Eurasia mentioned in the text. 1 – Xianrendong, China; 2 – Miaoyan, China; 3 – Yuchanyan, China; 4 – Nanzhuangtou, China; 5 – Hutouliang, China; 6 – Gosanni, South Korea; 7 – Tolbor 15, Mongolei; 8 – Odai Yamamoto 1, Japan; 9 – Maeda Koji, Japan; 10 – Kitahara, Japan; 11 – Kamikuroiwa, Japan; 12 – Taisho 3, Japan; 13 – Khummi, Russia; 14 – Gasya, Russia; 15 – Goncharka, Russia; 16 – Gromatukha, Russia; 17 – Chernogovka, Russia; 18 – Ustinovka 3, Russia; 19 – Ust'-Karenga 12, Russia; 20 – Studenoe 1, Russia; 21 – Ust'-Menza 1, Russia; 22 – Ust'-Kyakhta 3, Russia; 23 – Krasnaya Gorka, Russia; 24 – Gorely Les, Russia; 25 – Sagan-Zaba 2, Russia; 26 – Ust'-Khayta, Russia; 27 – Ust'-Kazachka, Russia; 28 – Ust'-Vagilsky Kholm, Russia; 29 – Koksharovsky Kholm, Russia; 30 – Beregovaya 2, Russia; 31 – Et-to 1, Russia; 32 – Sumpanya 6, Russia; 33 – Amnya 1, Russia; 34 – Kairshak 3, Russia; 35 – Rakushechny Yar, Russia; 36 – Chekalino 4, Russia; 37 – Ivanovskaya, Russia; 38 – Serteya and Rudnya Serteyskaya, Russia; 39 – Sakhtysh 2a, Russia; 40 – Veksa 3, Russia; 41 – Kääpa, Estonia; 42 - Dąbki 9, Poland; 43 – Kayhude LA 8, Germany; 44 – Schlamersdorf LA 5, Germany; 45 – Pindushi 3, Russia.

JAPAN

In Japanese archaeology, the appearance of pottery vessels marks the beginning of the oldest, Incipient phase of the Jomon culture. Contemporary aceramic sites with a microblade lithic industry are regarded as belonging to the final phase of the Upper Palaeolithic.[28] To date, more than 80 Incipient Jomon sites are known all across Japan from Kyushu in the south to Hokkaido in the north, covering a period from the Late Glacial to the Pleistocene-Holocene transition around 9,250 calBC. The pottery of the Incipient Jomon has been subdivided on chronological and typological grounds into four sub-phases: 1) undecorated ware, 2) pottery decorated with linear relief or bulges, 3) ceramics ornamented with pits, dots and fingernail imprints and first cord-impressed wares, and 4) pottery with cord rollings and several other specific types of decoration.[29]

The earliest absolute dates of a ceramic complex in Japan come from the site of Odai Yamamoto 1 in Aomori prefecture at the northern tip of Honshu.[30] Fragments of undecorated, possibly flat-based vessels were found here in association with a lithic industry of Mikoshiba-Chojakubo type, characterized by the absence of microblades. AMS radiocarbon dates on charred crusts adhering to the pottery cover a period between 15,240 and 12,400 calBC.[31] Other sites where undecorated ceramics have been found in association with Mikoshiba-Chojakubo lithic inventories include Maeda Koji in Tokyo (radiocarbon dates on peat and wood: 14,660-12,250 calBC)[32] and Kitahara in Kanagawa prefecture in central Honshu (radiocarbon dates on charcoal from cultural layer 1: 14,020-8,580 calBC).[33] Among the earliest sites with linear relief ware, the oldest decorated pottery in Japan, is the cave site of Kamikuroiwa in Ehime prefecture. Its relevant layer 9 yielded a radiocarbon date of 13,150-11,520 calBC.[34] Another important site with early decorated ceramics is Taisho 3 in the city of Obihiro on Hokkaido. Fragments of at least five pointed-based vessels decorated with imprints and bulges were found here together with a specific lithic industry without microblades which stands out among the cultural environment on Hokkaido and more closely resembles materials from Honshu.[35] Radiocarbon dates on charred organic crusts from the pottery vessels cover a period between 13,060 and 11,840 calBC.[36]

[28] [[Cohen2013]].
[29] [[Cohen2013]]; [[Sato2011]].
[30] [[Kaner2009]].
[31] Oldest date: NUTA-6510: 13,780±170 bp, youngest date: NUTA-6506: 12,680±140 bp [[Nakamura2001]].
[32] [[Cohen2013]].
[33] Oldest date: Beta-105401: 13,060±100 bp, youngest date: Beta-105399: 9,480±80 bp [[Nakamura2001]].
[34] 12,530±40 bp (no laboratory number provided) [[Sato2011]].
[35] [[Sato2011]].
[36] Oldest date: Beta-194629: 12,420±40 bp, youngest date: Beta-194631: 12, 100± 40 bp [[Nakazawa2011]]; [[Шевкомуд2006]].

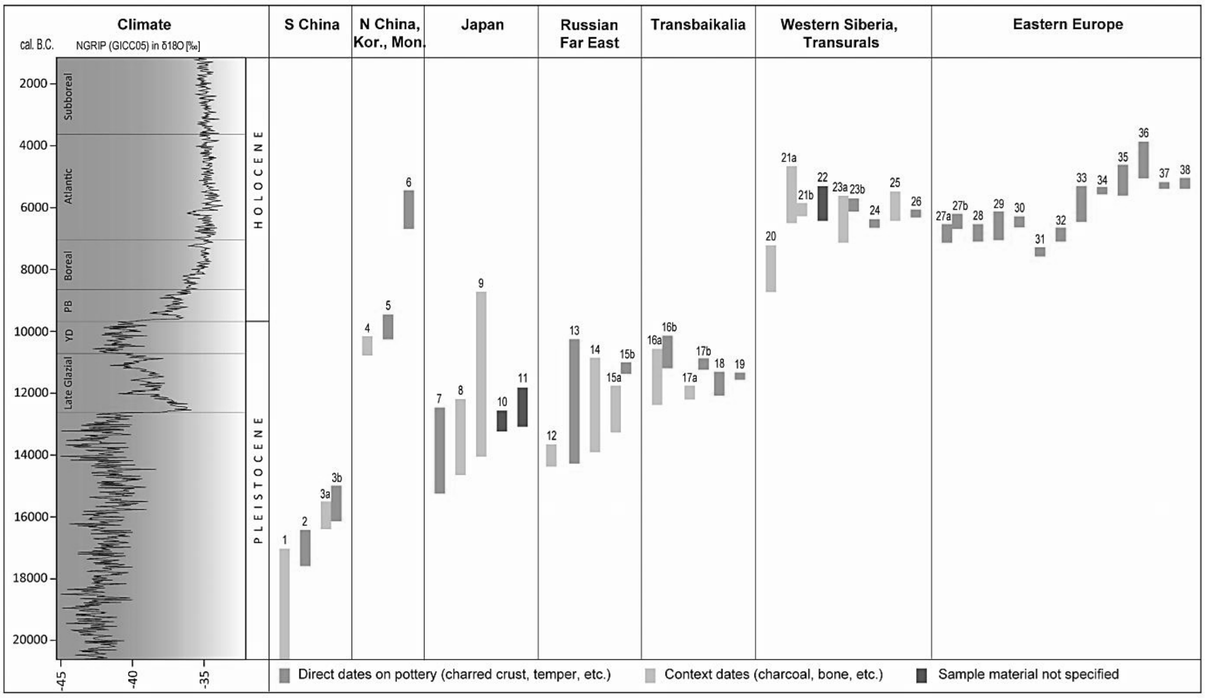

Figure 2. Radiocarbon-dated complexes with early ceramic vessels in eastern and northern Eurasia. The age ranges refer to the earliest archaeological unit with pottery (layer, horizon etc.), respectively (for details: see text). 1 – Xianrendong, China; 2 – Miaoyan, China; 3a – Yuchanyan, China (dates on bone and charcoal); 3b – Yuchanyan, China (dates on pottery charred curst); 4 – Nanzhuangtou, China; 5 – Gosanni, South Korea; 6 – Tolbor 15, Mongolia; 7 – Odai Yamamoto, Japan; 8 – Maeda Koji, Japan; 9 – Kitahara, Japan; 10 – Kamikuroiwa, Japan; 11 – Taisho 3, Japan; 12 – Khummi, Russia; 13 – Gromatukha, Russia; 14 – Gasya, Russia; 15a – Goncharka, Russia (dates on charcoal); 15b – Goncharka, Russia (dates on pottery charred crust); 16a – Ust'-Karenga 12, Russia (dates on charcoal); 16b – Ust'-Karenga 12, Russia (dates on organics from pottery); 17a – Krasnaya Gorka, Russia (dates on charcoal and bone of terrestrial animals); 17b – Krasnaya Gorka (dates on pottery charred crust); 18 – Studenoe 1, Russia; 19 – Ust'-Menza 1, Russia; 20 – Gorely Les, Russia; 21a – Sagan-Zaba 2, Russia (dates on bone of terrestrial animals); 21b – Sagan-Zaba 2, Russia (dates on organic content of soil samples); 22 – Ust'-Khayta, Russia; 23a – Koksharovsky Kholm, Russia (dates on charcoal); 23b – Koksharovsky Kholm, Russia (dates on organics from pottery); 24 – Ust'-Vagilsky Kholm, Russia; 25 – Et-to 1, Russia; 26 – Beregovaya 2, Russia; 27a – Kairshak 3, Russia (dates on bulk organics from pottery fabric); 27b – Kairshak 3, Russia (dates on pottery charred crust); 28 – Rakushechny Yar, Russia; 29 – Chekalino 4, Russia; 30 – Ivanovskaya, Russia; 31 – Serteya 14, Russia (date on foodcrust that has probably been influenced by a substantial freshwater reservoir effect, see [[Mazurkevich2015]]: 26); 32 – Rudnya Serteyskaya, Russia; 33 – Sakhtysh 2a, Russia; 34 – Veksa 3, Russia; 35 – Kääpa, Estonia; 36 – Dąbki 9, Poland; 37 – Kayhude LA 8, Germany; 38 – Schlamersdorf LA 5, Germany. The results have been calibrated using OxCal v 4.2.4 [[Bronk Ramsey2009]] and the IntCal13 [[Reimer2013]] calibration data, with date ranges corresponding to 95.4% probability and rounded to the nearest 10 years. References to sites, complexes and dates: see text.

RUSSIAN FAR EAST

Another focal point of Late Pleistocene pottery production is the Amur basin of the Russian Far East just west of the Japanese archipelago with which it was linked by a land bridge via Sakhalin up until the Late Glacial period.[37] The oldest pottery is connected to the Osipovka culture, a late Pleistocene complex characterized by a lithic industry with microblade and bifacial technologies which continues Palaeolithic traditions. In contrast to the early, rounded- or pointed-based wares of the neighboring regions, most of the ceramics of the Amur basin has flowerpot-like shapes with flat bases.[38] The oldest dates for pottery-bearing complexes come from sites at the lower course of the Amur River in Khabarovsk region, most of them are charcoal dates while direct dates on pottery are rare. At Khummi, the oldest relevant stratigraphic unit yielded a charcoal date between 14,300 and 13,700 calBC;[39] three dates from Gasya range from 13,930 to 10,700 calBC.[40] The well-investigated site of Goncharka has yielded a range of dates for the Osipovka culture complex, starting around 13,120-12,350 calBC.[41] Especially interesting are four dates from a lens of burned material in trench 3: while the dates on charcoal cover a time frame of 10,440-9830 calBC, the two dates on pottery charred crust are c. one thousand years older, ranging between 11,410 and 10,860 calBC. A reservoir effect might be responsible for this offset.[42]

In Primorye region south of the lower Amur, pottery starts to appear somewhat later, with the sites of Chernigovka 1 and Ustinovka 3 yielding direct dates on ceramic vessels between 10,830 and 6,230 calBC. Further west at the middle course of Amur River, the earliest ceramic finds are associated with the Gromatukha culture, connected to a stone industry with microblade and bifacial technologies which is regarded more archaic than the lithic complex of the Osipovka culture.[43] The eponymous site of Gromatukha has yielded

[37] [[Sato2011]]: 94.
[38] [[Шевкомуд2012]]; [[Kuzmin2015]].
[39] AA-13392: 13,260±100 bp [[Buvit2011]]: 384-386.
[40] Oldest date: Le-1781: 12,960±120 bp, youngest date: AA-13391: 10,870±90 bp [[Buvit2011]]: 384-386.
[41] Oldest date: 12,500±60 bp; dates from hearth no. 2, layer 3Б: dates on charcoal: AA-25438: 10,280±70 bp, AA-25439: 10,280±70 bp, dates on pottery charred crust: TKa-15004: 11,390±60 bp, TKa-15003: 11,110±60 bp [[Шевкомуд2012]]: 54-56.
[42] [[Шевкомуд2012]]: 53.
[43] [[Шевкомуд2012]]: 228.

dates on pottery temper from its lower layer between 14,240 and 10,160 calBC.[44]

TRANSBAIKALIAN SIBERIA

The region east of Lake Baikal provides some of the earliest pottery assemblages outside the initial ceramic-producing areas in the Far East.[45] Already since the middle of the 1970s a group of archaeological complexes from the Pleistocene-Holocene transition have been uncovered in the upper Vitim basin, located at the confluence of the Vitim and Karenga rivers close to the border of the Republic of Buryatia and Zabaykalsy Krai. Among them, the most important site for the study of early pottery is Ust-Karenga 12.[46] Its layer 7 yielded fragments of more than 30 bag-shaped, pointed-based ceramic vessels decorated with comb stamps which share typological characteristics with early pottery of the Amur region and southwestern Transbaikalia. This pottery is associated with an archaic lithic industry based on microblade technology that continues Palaeolithic traditions.[47] Radiocarbon dates on charcoal from layer 7 range between 12,300 and 10,630 calBC, and dates on organic samples from the pottery itself cover a time frame from 11,130 and 10,200 calBC.[48]

Comparatively early dates also exist for pottery-bearing complexes of the multi-layered sites of Studenoe 1 and Ust'-Menza 1 in southwestern Transbaikalia. An early age of the pointed-based, bag-shaped pottery had already been suspected on the basis of context data from the surrounding stratigraphy and of the archaic character of the stone industry, and recently a number of charred crust datings on the pottery itself have backed up this assumption: The five dates from Studenoe 1, layers 9G and 8, lie between 12,080 and 11,330 calBC, and pottery from Ust' Menza, layer 8, yielded a date of 11,530-11,340 calBC.[49]

Another early date of 11,600-11,190 calBC has been reported for the ceramic-bearing layer 1 of Ust'-Kyakhta 3 on the right bank of the Selenga River close to the Russian-Mongolian border, although the stratigraphic association had been marked with an uncommented question mark in the publication by Kuzmin and Orlova.[50] Yaroslav Kuzmin himself later doubted the reliability of the association of the date with the early ceramic phase and in a recent publication ceased to mention it altogether.[51] The associated lithic assemblage cannot be reliably judged on the basis of the existing publications,[52] but the use of ostrich egg shell as tempering material in the pottery does point to an early chronological position, as ostrich remains are rarely found in contexts younger that the early Holocene in this region.[53]

Another site on which pottery fragments have been found in association with an archaic microblade industry is Krasnaya Gorka in the Eravnoe lake region in central Transbaikalia.[54] The ceramics in its most ancient cultural horizon, layer 2 (lower part) are mostly undecorated, pointed bases are present. A first charred crust sample from one of the potsherds had produced a date of 7,540-7,190 calBC,[55] however, due to the very small carbon content in the sample the result must be rendered not entirely reliable. The results of new excavations at this site show that this ceramic complex, too, takes up an equally early position as the above-described oldest pottery in northern and southern Transbaikalia: a charred crust sample from an undecorated pottery wall sherd produced an AMS-date of 11,169-10,905 calBC, and animal bone and charcoal samples found only a few centimeters from the dated ceramic fragment yielded even older dates of 12,036-11,786 and 12,101-11,792 calBC, respectively.[56]

WESTERN SIBERIA AND TRANSURALS

On the chronological map of early Eurasian pottery, Lake Baikal forms a border or "halting line", because in contrast to the well-attested late Pleistocene pottery of Transbaikalia, the earliest ceramic complexes on the western side of the lake are much younger and only set in the 8th millennium calBC.[57] To date, the oldest radiocarbon dates for a pottery-bearing complex in this region have been put forward for Gorely Les by the River Angara. In layer 7a of this site, 16 fragments of one vessel were found which was decorated with stamped and incised zigzag patterns and probably had a rounded base. Radiocarbon dates place this layer within a timeframe of 8,780-7,140 calBC, however, these dates are not rendered reliable for dating this complex by all researchers.[58] Layer 6 following above contained later pottery including cord-impressed ware of the Khajta type and yielded dates between 7,040 and 5,300 calBC, which is in accordance with the chronological sequence.[59]

A key stratigraphy for this region has been investigated at the multi-layered site of Zagan-Saba 2 on the western bank of Lake Baikal. Here, pottery of the Khajta type represents the oldest ceramics, it is associated with layer 6.[60] As a result of an extensive dating programme, 16 radiocarbon dates in animal bone and soil samples have been generated for this layer. Four of the five samples on terrestrial animal bones cover a very tight timeframe between 6,200 and 5,930 calBC, while the bone samples of the Baikal seal are on average c. 700 year older, indicating a substantial fresh water reservoir effect in these aquatic animals.[61] The six soil samples are chronologically wider dispersed, ranging from 6,470 to 4,580 calBC.[62] On the eponymous site Ust'-Khajta in the lower Angara basin, layer 5 corresponds to the described complexes with Khajta pottery. Two radiocarbon dates from this layer are quite far from each other and thus cover an extended period from 6,430 to 5,300 calBC.[63]

---

[44] SNU02-002: 11,320± 150 bp, AA-38108: 10,450± 60 bp [[Buvit2011]]: 385.
[45] [[Jordan2009]]b: 69; [[Kuzmin2000]]; [[Kuzmin2015]]; [[Tsydenova2015]].
[46] [[Hommelinprep]]; [[Kuzmin2007]].
[47] [[Tsydenova2015]]: 106-107
[48] Dates on charcoal: oldest date: AA-60210: 12,180±60 bp, youngest date: GIN-8067: 10,750±60; dates on pottery temper: oldest date: AA-38101: 11,070 bp, youngest date: AA-21378: 10,600±110 bp [[Buvit2011]]: 384.
[49] Studenoe 1: oldest date: TKa-15554: 11,960± 80 bp, youngest date MTS-16734: 11,570± 60 bp; Ust'-Menza 1: MTS-16738: 11,550±50 bp [[Разгильдеева2013]]: 172.
[50] [[Kuzmin2000]]: 359.
[51] [[Kuzmin2015]]; see also [[McKenzie2009]]: 181, 183.
[52] [[Tsydenova2015]]: 107-108.
[53] [[McKenzie2009]]: 183.
[54] [[Цыденова2006]]; [[Tsydenova2015]].
[55] KIA-42073: 8,345±66 bp [[Hartz2012]].
[56] Pottery charred crust: AAR-21437: 11,155±50 bp, bone fragments: Poz-68608: 12,010±60 bp, charcoal: Poz-68609: 12,020±60 bp [[Tsydenova2017]], see also [[Piezonka2015]]c.
[57] [[Hommelinprep]].
[58] KRIL-234: 8,830±300 bp, Ri-51; 8444±144 bp [[McKenzie2009]]: 186-187.
[59] (No laboratory number): 7,890±80 bp, To-4839: 6,510±100 bp [[McKenzie2009]]: 187.
[60] [[Goriunova2015]].
[61] Oldest date: OxA-22357:7,203±37 bp, youngest date of the four: OxA-22374: 7,147±38 bp [[Nomokonova2013]].
[62] Oldest date: SOAN-6597: 7,380±135 bp, youngest date: SOAN-7151: 5935±90 bp [[Nomokonova2013]]: 114.
[63] [[Novikov2011]].

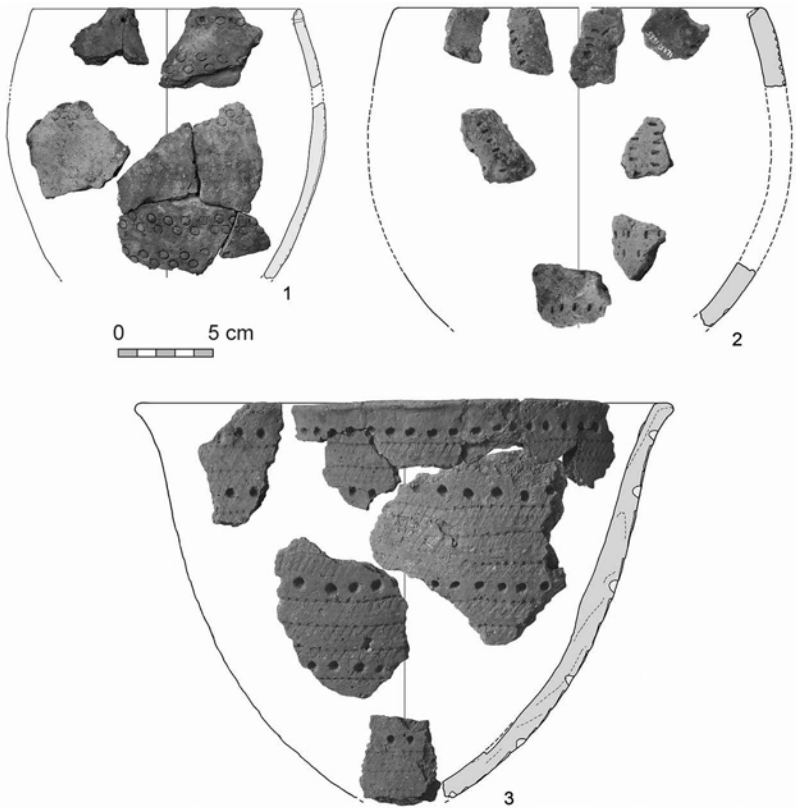

Figure 3. Examples of Stone Age hunter-gatherer pottery in northeastern Europe. 1 – Early Upper Volga culture ware, Veksa 3, Russia; Narva culture ware, Kääpa, Estonia; Sperrings ware, Pindushi 3, Russia.

While in the western Baikal region pottery thus started to come into use probably from the first half of the 8th millennium calBC onwards, evidence for early Holocene pottery is almost completely absent in the extensive forest and steppe regions of southern and western Siberia. In Elenevka cave at the middle Enissei in Krasnoyarsk region, the oldest pottery-bearing layer with cord-impressed ware yielded two radiocarbon dates between 6,010 and 5,370 calBC; on the site of Ust'-Kazachka in the same region a terminus post quem (6,200-5,390 calBC) and a terminus ante quem (5,980-5,230 calBC) exist for the layer with the earliest, likewise cord-impressed pottery.[64]

Further west, in the eastern foothills of the Ural mountains, the earliest reliable dates for pottery set in around the middle of the 7th millennium calBC. At the multi-period site of Ust'-Vagilsky Kholm in the middle Transurals three radiocarbon dating samples on charred crust from pottery vessels of the Satyga type have provided well-corresponding results between 6,640 and 6,390 calBC.[65] At Koksharovsky Kholm, charcoal dates from building 15 containing pottery of Koshkino type have provided a time span of 7,020-5,520 calBC, and direct dating of the associated ceramics yielded a result of 6,050-5,730 calBC.[66] Far to the north at the site of Et-to, charcoal samples from house 4 date the early pottery complex to 6,360-5,550 calBC.[67] At Beregovaya 2, a peat bog site in in middle Transurals, charred crust samples from pottery of Koshkino type yielded dates between 6,250 and 6,070 calBC.[68] Very early dates from sites such as Sumpanya 6 (from c. 9,750 calBC) and Amnya 1 (from c. 8,620 calBC) have been repeatedly mentioned in the literature and have also been used in dispersal modellings;[69] however, the reliability of their association with the early pottery phase at the respective sites is under question.[70]

EASTERN EUROPE

Pottery has also been widely used over millennia by hunter-gatherer-fishers in the west of northern Eurasia, from the western Urals to the Baltic Sea and northern central Europe (Fig. 3). In contrast to many of the above-described regions of northern and eastern Asia, our knowledge of the early pottery phase west of the Urals is much better due to a higher density of investigated sites, a fast-growing sequence of radiocarbon dates, numerous regional studies and also new supra-regional summarizing works providing comprehensive documentation of the ceramic material itself.[71]

The oldest pottery of Eastern Europe appears in the first quarter of the 7th millennium calBC in the northern Caspian region and by the lower Don, it thus predates the introduction of ceramics into main-

[64] Elenevka: SOAN-3998: 6,900± 115 bp, SOAN-2907: 6,530± 60 bp [[McKenzie2009]]: 191-193.
[65] Oldest date: AAR-14840: 7,735±40 bp, youngest date: AAR-14838; 7583±38 bp [[Kosinskayainprep.]]
[66] Charcoal: oldest date: Le-7880: 7,560±200 bp, youngest date: Le-7887: 6,900±160 bp; organics from pottery: Ki-15915: 7010±90 bp [[Шорин2011]], 249-254.
[67] Oldest date: Le-6595: 7200± 120 bp, youngest date: Le-6594: 6740± 65 bp [[Косинская2005]], 20.
[68] KIA-42074: 7320±40 bp, AAR-14833: 7,320±38 bp [[Kosinskayainprep.]]; [[Жилин2015]].
[69] [[Gibbs2013]]; [[Hommel2014]]
[70] [[Kosinskayainprep.]]
[71] [[Mazurkevich2015]]; [[Piezonka2015]]a; new research conducted by the ERC Advanced Grant project INDUCE (PI: Carl Heron, London).

land south-eastern Europe.[72] The earliest dates stem from round- or flat-based pottery decorated with incised geometric patterns found in the steppes and semi-deserts north of the Caspian Sea. The organic contents of ceramic fabric from Kairshak 3 provided ten radiocarbon dates between 7,080 and 5,770 calBC.[73] More reliable as to the actual association of the sampled carbon with the time of use of the pot is a date on organic crust from pottery, providing an age of 6,680-6,500 calBC.[74] Animal bone and charcoal from the complex yielded younger dates between 6,080 and 5,330 calBC.[75] At the multi-layered site of Rakushechny Yar, a key site for the prehistory of the northern Black Sea region, four samples of organic crust on undecorated pottery from layer 20 yielded dates between 7,030 and 6,050 calBC.[76] Still in the first half of the 7th millennium, undecorated, pointed-based ceramic ware also appears on the early sites of the Elshan culture by the middle Don. Two of the oldest dates include the result for a sample of the organic content of ceramics from Chekalino 4 which provided a radiocarbon age of 7,050-6,100 calBC, and the dating result for pottery from Ivanovskaya of 6,570-6,250 calBC.[77] A fourth region with very early dates for pottery-bearing complexes is located many hundred kilometres further north-west in the Dvina-Lovat' region of western Russia. Here, undecorated and sparsely decorated wares with incised patterns have been grouped into several typological phases, with the phases "a-1" and "a" being the oldest.[78] While one extremely ancient date of organic crust from a phase "a-1" vessel from Serteya 14 is regarded not reliable due to a likely distortion by a freshwater reservoir effect,[79] a phase "a" vessel from Rudnya Serteyskaya provided an organic crust date of 7,050-6,510 calBC.[80] From the same site, wood associated with phase "a" material was dated to 6,500-5,810 calBC.[81]

During the second half of the 7th millennium early pottery often decorated with small notches and flat as well as pointed bases spread along the rivers towards the west and north-west, reaching the Kama and upper Volga regions and the Sukhona region around 6000 calBC. One of the oldest series of dates for the Upper Volga culture, the earliest pottery-producing culture central Russia, stems from layer IIg of the site Sakhtysh 2a. Seven charred residue samples and one uncharred plant sample attached to a sherd cover the period between 6,350 and 5,310 calBC.[82] It is suspected, however, that freshwater reservoir effects have distorted at least some of these dates, resulting in too old ages.[83] Further north, the oldest date on pottery charred crust from the multi-layered site of Veksa 3 in the Sukhona basin stems from a sparsely decorated vessel found in layer 9, it ranges between 5,640 and 5,550 calBC (Figure 3: 1).[84]

Younger developments encompass the spreading of comb-decorated styles from an easterly direction which became established in the second half of the 6th millennium in the forest zone up to northern Fennoscandia, and the development of the Narva culture with a specific coarse organically tempered pointed-based pots and oval lamps in the eastern Baltic region.[85] Some of the earliest direct dates on pottery come from the Estonian site of Kääpa, six dates on charred crust from Narva vessels range between 5,620 and 4,580 calBC (see Fig. 3: 2).[86] However, it is not clear to what extend these dates might have been distorted by a reservoir effect.[87]

At the southern Baltic coast, a comprehensive series of radiocarbon dates on organic crusts from pointed-based hunter-gatherer pottery and oval clay lamps has been conducted for the Polish site of Dąbki 9, encompassing a time frame between 5,050 and 3,970 calBC.[88] In the western Baltic and southern Scandinavia, hunter-gather pottery is associated with the younger phase of the Ertebølle culture.[89] The oldest absolute dates for this forager ceramics which also include pointed-based vessels and oval lamps come from inland sites in Schleswig-Holstein, northern Germany: a charred crust sample from Kayhude LA 8 has produced an age of 5,480-5,340 calBC, and three charred crust dates from Schlamersdorf LA 5 range between 5,480 and 4,940 calBC. Ertebølle sites at the coast have produced younger dates for the onset of pottery use, starting around 4,700 calBC. It is suspected that the absolute dates from the mentioned inland sites have been affected by a freshwater reservoir effect and thus appear too old, and that an onset of pottery production around the middle of the 5th millennium calBC also at the inland sites is more likely.[90] Thus, pottery technology became established among hunter-gatherer-fisher groups of the circum-Baltic region in the late 6th and early 5th millennium calBC. Based on the current evidence it is very likely that the new container technology reached the Baltic from the east as part of the wider Eurasian forager pottery tradition described above.[91]

3. WHEN? HOW? WHY? RESEARCH PROBLEMS AND METHODOLOGICAL APPROACHES

The overview given in the previous chapter has shown how heterogeneous the current state of research into the early Eurasian hunter-gatherer pottery is. For some regions (i.e. Japan, Eastern Europe) a good data base and a growing corpus of analytical results help to draw an increasingly detailed picture of the early ceramic period, while in other regions large gaps still remain in the archaeological record due to the lack of relevant sites (i.e. western Siberia). Irrespective of this uneven distribution of the evidence, it is possible on the basis of the current knowledge to identify a number of "halting lines" or borders in the spatio-temporal continuum.[92] One of these "halting lines" separates the Ice Age ceramic-producing centers of southern China, Japan and the Russian Far East from the Inner Asian expanses of northern China and Mongolia and the Korean

72 [[Dolukhanov2009]]: 239-240; [[Mazurkevich2015]]; [[Выборнов2008]]; [[Vybornov2012]].
73 Oldest sample: Ki-14133: 7950±90 bp, youngest sample: Ki-16400: 7290±180 bp; ; [[Mazurkevich2015]]: Fig. 5.
74 Ua-41359: 7775±42 bp [[Mazurkevich2015]]: Fig. 5.
75 Animal bone: SPb-316: 7030±100 bp, Ki-14634: 7010±80 bp; charcoal: GIN-5905: 6950±190 bp [[Mazurkevich2015]]: Fig. 5.
76 Ki-6476: 7930±40 bp, Ki-6477: 7860±130 bp, Ki-6475: 7690±110 bp, Ua-37097: 7290±50 bp; [[Mazurkevich2015]]: Fig. 4.
77 Chekalino 4: SPb-424: 7660±200 bp; Ivanovskaya; SPb-587: 7560±70 bp [[Mazurkevich2015]]: Fig. 5.
78 [[Mazurkevich2015]]: 25-28, Pl. 6.
79 Ua-37099: 8380±55 bp, the $\delta^{13}C$ value of the sample was with -33.8 ‰ extremely low, indicating a high content of freshwater aquatic material in the sample; [[Mazurkevich2015]]: 26.
80 Le-5260: 7300±180 bp; [[Mazurkevich2015]]: Fig. 5.
81 Ua-37100: 7870±100 bp; [[Mazurkevich2015]]: Fig. 5.
82 Oldest sample: KIA-39310: 7356±30 bp, youngest sample: KIA-39313: 6371±30 bp; [[Hartz2012]]: Table 1.
83 [[Hartz2012]]; [[Piezonkainpress]].
84 MAMS-25493: 6677±25 bp [[Недомолкинаinpress]].
85 [[Piezonka2015]]: 244-253.
86 Oldest sample: KIA-35897: 6540±40 bp, youngest sample: KIA-49792: 5798±21 bp [[Piezonkainpress]].
87 [[Piezonkainpress]].
88 [[Kotula2015]]: 118-123, Tab. 1.
89 [[Hartz2011]].
90 [[Philippsen2014]]; [[Philippsen2015]]b.
91 [[Hartz2011]]: 241; [[Piezonka2015]]: 254-256; [[Povlsen 2013]].
92 [[Hommelinprep.]]; see also [[Kuzmin2015]], Fig. 14.

peninsula that apparently remained aceramic for several millennia. A second, very distinct border is formed by Lake Baikal: east of it, pottery is already well-established in the Late Glacial period, while on its western side ceramic vessels start to appear millennia later in a developed phase of the early Holocene. Further west, the earliest pottery in the north Caspian region and by the Lower Don and Lower to middle Volga seems to slightly predate the initial ceramic wares in the Urals.

Against the background of this current state of evidence, a central question concerning the Eurasian hunter-gather-pottery is the problem whether a) the knowledge of pottery technology was dispersed continuously from the oldest core centres on China, Japan and the Amur region towards the west across Siberia and ultimately to the Urals and further into Europe,[93] or whether b) pottery was independently invented several times by different hunter-gatherer communities in this vast region.[94]

In order to gain a better understanding of this problem, research into the early hunter-gatherer ceramic traditions of Eurasia currently centers on the following questions:

– When was the innovation of ceramic vessels introduced in the various parts of Northern Eurasia?
– How was the innovation introduced? Was it invented independently in a given region, or did the knowledge come from elsewhere? How was the knowledge transferred (neighbours, wider cultural contacts, migrations, etc.)?
– Why was the innovation of ceramic containers adopted? What functions and roles did the early pottery have, what benefits caused the integration into a groups'cultural property?

To address the question **when** the ceramic innovation first reached a certain area, reliable regional chronologies need to be worked out on the basis of well-documented stratigraphies and absolute dates (radiocarbon, thermoluminiscence etc.).

An important field of discussion in this respect which already has been mentioned in the previous chapter concerns aquatic reservoir effects in radiocarbon dates on charred crusts.[95] Charred residue adhering to the surface of ancient potsherds in most cases stems from burnt foods that were prepared in the vessels (hence the alternative terminus "foodcrusts"), although other uses, for example as grease lamps, can also produce charred surface residues. These charred organic remains provide very valuable dating samples due to the unquestionable association of the sample with the ceramics. There is, however, a danger of the radiocarbon dates from such crusts being too old. This can be the case when aquatic food stuffs (e.g. fish, mollusks) were cooked in the vessels because aquatic resources tend to be depleted in radiocarbon. In freshwater systems, this is caused by the dissolution of ancient carbonate minerals from the bedrock. Aquatic plants introduce this ancient carbon into the foodchain, leading to reservoir effects in fish, molluscs and aquatic mammals. In marine systems, the old carbon stems from deep sea water which gets intermixed with surface water containing more atmospheric carbon. In pottery foodcrusts, the age offsets caused by aquatic reservoir effects can account to several hundred years. Currently archaeologists and scientists attempt to systematically estimate reservoir ages in foodcrust dates by way of various archaeological and archaeometric methods (paired dates, bulk isotopic measurements of carbon and nitrogen, lipid biomarker analysis, single-compound carbon isotope determinations).[96] Especially promising in this respect are studies of experimentally made foodcrusts because here, both the components and the formation of the samples are known.[97] Due to the problem of possible reservoir effects which are often hard to identify and to quantify, the radiocarbon dates on pottery charred crusts quoted in this article and presented in Figure 2 must be regarded with caution, as some of the dates might be too old.

A current line of research aiming to trace and visualize the chronology of the dispersal of early pottery is the application of mathematical modelling on radiocarbon data sets. Since the late 2000s a team around the English archaeologist Peter Jordan has successively developed this approach for early Eurasian and African pottery, gaining results on the location of early centers of pottery production in Eurasia and northern Africa and on the timing, pace and direction of the further diffusion of the ceramic technology.[98] On the basis of the modelling results it is suggested that an East Asian hunter-gatherer and an African/circum-Mediterranean farmer ceramic tradition eventually converged from the 7th millennium calBC onwards along a line from northern central Europe via the Black Sea, the Caucasus and across the Caspian Sea into southern Asia and that the adoption of pottery in the Near Eastern Neolithic might have arrived from northern Africa.[99] These very inspiring continent-wide scenarios need further analysis and verification, and methodical problems resulting for the model itself and from the varying reliability of the radiocarbon dates in the database must be addressed in the future in order to further develop this promising approach.

The question **how** the process of introduction of the first ceramic vessels took place in a given region and what mechanisms were at play in this process can be followed up on a regional scale by way of systematic typological studies of the pottery itself. Based on technological, morphological and stylistic similarities and differences it is possible to identify continuities and breaks/borders in the distribution and dispersal of early pottery traditions. The origin of a certain ware (local production vs. import) can be traced, for example, by petrographic analysis of the fabric. For the investigation of technological and morphological traits various physical and chemical methods can be employed (i.e. x-rays, thermic methods, XRF scans).[100] Experimental approaches have proven useful to better understand different decoration techniques used on hunter-gatherer pottery.[101]

A promising line of research involves the application of multivariate statistical analysis such as correspondence analysis.[102] This approach is suited to overcome the problem that often, single criteria such as raw material and tempering or particularities of the decoration are being used to draw far-reaching conclusions on cultural connections and even migrations of populations. The main advantage of multivariate analysis in pottery studies is the possibility to investigate the complex interrelation of a multitude of characteristics for a large set of specimen (i.e. vessel units). It thus enables the mathematical identification of organizing principles within the data set that cannot be recognized by a mere impressionist consideration or by statistical analyses of single characteristics. The characteristics to be analyzed include technological traits such as temper, moulding technique and surface treatment, formal criteria such as mouth diameter, wall thickness and rim shape, and particularities in the exe-

[93] [[Gibbs2013]].
[94] [[Kuzmin2009]]; see also [[Hartz2012]]; [[Kuzmin2013]]; [[Hartz2013]].
[95] [[Philippsen2014]]; [[Philippsen2015]]a; [[Philippsen2015]]b; [[Piezonkainpress]].
[96] [[Philippsen2014]]; [[Heron2015]]; [[Philippsen2015]]b;
[97] [[Philippsen2013]].
[98] [[Jordan2009]]a; [[Gibbs2013]]; [[Jordan2016]]; [[Silva2014]].
[99] [[Jordan2016]]
[100] [[Молодин/Мыльникова2015]].
[101] [[Дубовцева2011]].
[102] See for example [[Spatz1996]]; [[Schneeweiß2007]]; [[Piezonka2015]]a¸ [[Piezonka2015]]b.

cution and design of decoration. As a result, structuring factors in the data set such as regional stylistic and technological traditions can be identified. The method therefore can be used to detect continuities and breaks in the dispersal of the early ceramics as well as information on chronological developments. A case study on early hunter-gatherer pottery complexes from 17 sites to the north and east of the Baltic Sea has led to the distinction of two large typological entities which are sub-divided into smaller groups, to the re-evaluation of the cultural attribution of the ceramics from several sites and to the recognition of previously unknown spatio-temporal continuities, partly over large distances.[103]

Further methodological approaches to the question of how early pottery was invented, dispersed and adopted include studies of the cultural environment in which ceramics first appeared. Such studies can show whether the new technology was adopted within an otherwise stable cultural continuum, or whether pottery came as part of a larger set of novelties and was associated with cultural change. Anthropological and palaeogenetic studies of the people involved investigate whether population shifts and migrations might have been connected to the introduction of the first ceramic vessels.

The question **why** the ceramic innovation was incorporated into new cultural environments touches on the fields of pottery use and function, and on a more general level on the social and cultural dimensions of early pottery as a specific technological innovation.

That many of the early vessels were used for the preparation of foodstuffs and/or for the thermic transformation of other materials is deductible from the charred crusts frequently covering the inside of the pots and from soot adhesions on the outside. There are two major hypotheses on the function of early ceramic vessels: 1) Early pottery was utilized as a means to detoxify foods and make them more palatable and to open up new resources (i.e. to cook mollusks, produce fish oil, prepare weaning foods);[104] and 2) Early pottery was used as a prestige good (i.e. to impress guests at reciprocal feasts either with the pots themselves or with special foods prepared in them).[105] Bioarchaeological studies provide promising approaches to these problems: Measurements of carbon and nitrogen isotope ratios in the charred crusts and the analysis of organic residue within the pottery fabric can yield information on foodstuffs and other materials processed in the pots.[106] In various regions of eastern and northern Eurasia, among them Japan and central Russia, the results are in accordance with the observation that the appearance of early ceramic vessels seems to broadly coincide with an intensification of the exploitation of aquatic resources.[107] Furthermore, excavations at stratified sites with good organic preservation yield material for archaeobotanical and archaeozoological investigations of the associated complexes in order to understand the early pottery in its economic and environmental context.

An interesting observation concerns the fact that early hunter-gatherer pottery often shares a specific set of typological traits, including a bag-like shape with the widest diameter at the mouth, a rounded or pointed base, and a structuring or roughening of the surface, i.e. by dense impressed ornaments, cord rollings or brush marks (see Figure 1). These features characterize not only much of the early Eurasian pottery described here but can for example also be found on Woodland period hunter-fisher pottery in north-eastern North America,[108] and on early wares of the sub-Saharan region.[109] One common assumption holds that pottery containers were first developed on the basis of pre-existing organic container technologies, namely basketry, woven or net bags.[110] But it is also possible that functional requirements inherent to the mobile foraging Stone Age lifestyle have led to the repeated development of this specific set of traits. The open shape and conical base could be useful for storage (hanging?) and transport (stacked? in nets?), and maybe the rough surface helped to more easily handle the pots when packing and moving.

4. INNOVATION REVERSED: ARCHAEOLOGICAL AND ETHNOHISTORICAL EVIDENCE ON THE ABOLITION OF POTTERY

An intriguing question concerns the fact that fired clay containers were not made by the Upper Palaeolithic communities of central Europe, mentioned at the beginning of the article, although they were able to shape fresh clay into desired forms and transform it into "artificial stone" by firing. We know today that high mobility and unfavorable climatic conditions have not hindered the adoption and use of pottery vessels by hunter-gatherer communities in later times, so there traits of life style and living conditions cannot be taken as the (only) explanation for the lack of pottery vessel technology among these Ice Age big game hunters.[111]

On the other hand, there is various archaeological and ethnohistorical evidence for the abolition of pottery technology in contexts where it was previously well-established. In northern Finland, for example, the earliest local pottery type Säräisniemi 1, a regional variant of comb-pitted ware, disappeared at the end of the 5th millennium calBC, after having been produced for more than one millennium. In the following thousand years, this region in the far north of Europe was aceramic, and only around 3,000 calBC pottery technology reached the area again from the neighboring regions.[112]

An interesting ethnohistorical example from the North American northeast coast has been recorded by the anthropologist Frank Speck in the first half of the twentieth century.[113] The Penobscot, a Native American ethnic group in central Maine, did not use pottery vessels but traditionally cooked in birch bark vessels before they more and more began to adopt European cooking pots. To cook in the birch bark vessels, both heating with hot stones and direct heating over the fire was employed. However, archaeological sites in the area are abundant with pottery sherds, showing that ceramic vessels have been known and widely used in the region in the pre-contact period. The Penobscot informants that were asked by Speck had no memory of any tradition of pottery making, but their term *se'ski·dju* which was used for the bark vessels and dishes literally means "earthen container". Even though Speck himself was not sure whether this linguistic observation really reflected the forgotten use of pottery vessels, the Penobscot example shows that ceramics can under certain circumstances be given up in favor of simply-made but not so durable organic containers.

These two brief examples illustrate instances of abolition of the ceramic technology in hunter-gatherer societies, a possibility that should also be borne in mind when investigating the dynamics of early pottery traditions of Eurasia.

103 [[Piezonka2012]]; [[Piezonka2015]]a; [[Piezonka2015]]b.
104 [[Lu2010]]; [[Craig2013]].
105 [[Hayden2009]]; [[Hayden2014]]: 654-658.
106 [[Heron2015]]; [[Philippsen2015]]b.
107 [[Craig2013]]; [[Piezonka2015]]c; see also [[Hommel2014]]: 682.
108 See for example [[Mason1981]].
109 [[Huysecom2009]].
110 [[Hommel2014]]: 666-669.
111 [[Hommel2014]]: 668-669.
112 [[Pesonen2009]].
113 [[Speck1997]]: 100-103.

5. CONCLUSIONS

Research results of the last decades have confirmed the Pleistocene age of the world's oldest pottery in eastern Asia. Ceramic vessels were subsequently made by mobile hunter-gatherer-fishers of northern Eurasia over many millennia completely independent of a «Neolithic» based on agriculture and animal husbandry. The density and quality of currently available archaeological information in the vast space between the Pacific and the Baltic still remains very heterogeneous, and new targeted research is needed to complete the picture, to close the gaps and to better understand the mechanisms behind the adoption and dispersal of this important technological innovation.

In addition to the building of a reliable archaeological data base, a better contextual understanding of early hunter-gatherer ceramic traditions is necessary that also considers aspects of the integration of ceramics into the existing hunter-gatherer ways of life, of its interrelation with cultural changes and with changes in the human-environment relations. Methodically, new multidisciplinary approaches involving various scientific disciplines offer valuable opportunities to receive more detailed results on these issues. New field research especially on multi-layered sites is necessary to collect new material from well-stratified contexts, and an especially important task is the generation of more absolute dates from samples securely associated with the early pottery phase. Connected with this, further research is needed on the problem of reservoir effects in charred crust dates, their identification and quantification. Biomolecular analyses including isotope studies and analyses of organic residues in charred crusts and the fabric itself offer evermore detailed information on vessel contents and uses, and multi-variate statistics as well as computer modelling are being increasingly employed for the regional and inter-regional integration of the data.

Irrespective of the answer to the problem whether the Eurasian hunter-gatherer pottery should be seen as one single tradition or whether it represents the result of several independent inventions of ceramic vessels, it is clear that it forms part of a set of large-scale, long-term processes shaping the cultural developments on the Eurasian continent in the late Pleistocene and early Holocene. Due to its good archaeological visibility, pottery is especially well suited to investigate these processes in space and time, and the chances are good that the increasing interest in this topic among eastern and western archaeologists and especially their collaboration will lead to far-reaching new insights not only on remote Siberian hunter-fishers communities but also on the origin and genesis of Neolithic developments in western Asia and beyond.

ACKNOWLEDGEMENTS

The overview presented here on early Eurasian pottery would not have been possible without the cooperation with Russian colleagues. I would like to thank Dr. Nadezhda Nedomolkina, Vologda, and Natalya Tsydenova, Ulan-Ude, for the fruitful collaboration in our field projects on early hunter-gatherer pottery in Russia and Mongolia. The research is funded by the Deutsche Forschungsgemeinschaft (grant no. PI 1120/2-1) and the Gerda Henkel Stiftung (grant no. AZ 18/ZA/13). For interesting and stimulating discussions on the topic I thank Dr. Andrei Mazurkevich and Ekaterina Dolbunova, St. Petersburg, and Peter Hommel, Oxford. A thank you also goes to the organizing team of TOPOI and the German Archaeological Institute of the conference "Contextualising Technical Innovations in Prehistory" in Berlin 2014 for the invitation to present a first version of this work.

Статья проверена программой «Антиплагиат».

Reference list:

1. Boaretto, Elisabetta and Wu, Xiaohong and Yuan, Jiarong and Bar-Yosef, Ofer and Chu, Vikki and Pan, Yan and Liu, Kexin and Cohen, David and Jiao, Tianlong and Li, Shuicheng and Gu, Haibin and Goldberg, Paul and Weiner, S. Radiocarbon dating of charcoal and bone collagen associated with early pottery at Yuchanyan Cave, Hunan Province, China. Proceedings of the National Academy of Sciences of the USA 106(24), 2009, pp. 9595-9600.
2. Bougard, Estelle. Ceramics in the Upper Palaeolithic. In: Gibson, Alex (ed.), Prehistoric pottery : people, pattern and purpose. Prehistoric ceramics Research Group: Occasional Publication. BAR Int. Ser. 1156. Oxford: Archaeopress, 2003, 29-34.
3. Bronk Ramsey, Christopher, 2009. Bayesian analysis of radiocarbon dates. Radiocarbon 51(2):337–60.
4. Budja, Mihail. Ceramic trajectories: From figurines to vessels. In: Peter Jordan, Marek Zvelebil M. (eds.), Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers. Walnut Creek: Left Coast Press, Inc., 2009, pp. 149-166.
5. Buvit, Ian and Terry, Karisa. The twilight of Paleolithic Siberia: Humans and their environments east of Lake Baikal at the late-glacial/Holocene transition. Quaternary International 242, 2011, 379-400.
6. Chairkina, Natal'ia M., Kosinskaya, Lubov', Early hunter-gatherer ceramics in the Urals and Western Siberia. In: Peter Jordan, Marek Zvelebil M. (eds.), Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers. Walnut Creek: Left Coast Press, Inc., 2009, pp. 209-235.
7. Childe, Vere Gordon. Man Makes Himself. London: Watts & Co., 1936.
8. Cho, Daeyoun and Ko, Ilhong. Hunter-gatherer ceramics of Neolithic Korea. In Jordan P., Zvelebil M. (Hrsg.), Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers. Walnut Creek: Left Coast Press, Inc., 2009, pp. 149-166.
9. Çiliniroğlu, Çiler. The concept of "Neolithic package": considering its meaning and applicability. Documenta Praehistorica XXXII, 2005, 1-13.
10. Close, Angela E., Few and far between. Early ceramics in North Africa. In: William K. Barnett, John W. Hoopes (eds.), The Emergence of pottery. Technology and Innovation in Ancient Societies. Washington and London: Smithsonian Institution Press, 1995, 23-37.
11. Cohen, David J. The advent and spread of early pottery in East Asia: new dates and new considerations for the world's earliest ceramic vessels. Journal of Austronesian Studies 4, 2013, pp. 55–92.
12. Craig, Oliver E. and Saul, H. and Lucquin, A. and Nishida, Y. and Taché K. and Clarke L. and Thompson A. and Altoft D. T. and Uchiyama J. and Ajimoto M., Gibbs, Kevin and Isaaksson, Sven and Heron, Carl P. and Jordan, Peter. Earliest evidence for the use of pottery. Nature 496, 2013, 351-354.
13. Dikshit K. N. and Hazarika, Manjil. The earliest pottery in East Asia: a review. Purātattva 42, 2012, pp. 227–237.
14. Dolukhanov, Pavel M. and Mazurkevich, Andrei M. and Shukurov, Anvar M., Early pottery makers in Eastern Europe: Centres of origin, subsistence and dispersal. In: Peter Jordan, Marek Zvelebil M. (eds.), Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers. Walnut Creek: Left Coast Press, Inc., 2009, pp. 237-253.
15. Farbstein R, Radić D, Brajković D, Miracle PT (2012) First Epigravettian Ceramic Figurines from Europe (Vela Spila, Croatia). PLoS ONE 7(7): e41437. doi:10.1371/journal.pone.0041437
16. Gibbs, Kevin and Jordan, Peter. Bridging the Boreal Forest Siberian Archaeology and Emergence of Pottery among Prehistoric Hunter-Gatherers of Northern Euroasia. Sibirica 12(1), 2013, pp. 1-38.
17. Goriunova, Olga I. and Novikov, A. G. Neolithic ceramics from the settlements of the Cis-Ol'khon region (Lake Baikal). The questions of periodization and dating. In Ta La (Hrsg.), Ancient Cultures of the Northern Area of China, Mongolia and Baikalian Siberia, Band 2. Hohhot 2015, pp. 42-48.
18. Gronenborn, Detlef. Early pottery in Afroeurasia – Origins and possible routes of dispersal. In: Hartz S., Lüth F., Terberger T. (Hrsg.), Early Pottery in the Baltic – Dating, Origin and Social Context. International Workshop at Schleswig from 20th – 21st October 2006. Bericht der Römisch-Germanischen Kommission 2008 (2011), pp. 59-80.
19. Gronenborn, Detlef and Scharl, Silviane, Das Neolithikum als globales Phänomen. In: Revolution Jungsteinzeit. Archäologische Landesausstellung Nordrhein-Westfalen. Schriften zur Bodendenkmalpflege Nordrhein-Westfalen Band 11,1. Hrsg. von Otten, Thomas and Kunow, Jürgen and Rind, Michael M. and Trier, Marcus. Darmstadt: Theiss, 2015. 58-71.
20. Hansen, Svend. Bilder vom Menschen der Steinzeit: Untersuchungen zur anthropomorphen Plastik der Jungsteinzeit und Kupferzeit in Südosteuropa. Mainz: Philipp von Zabern, 2007.
21. Hartz, Sönke. From pointed bottom to round and flat bottom – tracking early pottery from Schleswig-Holstein. In: S. Hartz, F. Lüth and T. Terberger (eds.), Early pottery in the Baltic – Dating Origin and Social Context. Bericht der Römisch-Germanischen Kommission, Band 89 (2008), 2011, 241-276.
22. Hartz, Sönke and Kostyleva, Elena and Piezonka, Henny and Terberger, Thomas and Tsydenova, Natalya and Zhilin Mikhail G. Hunter-gatherer pottery and charred residue dating: new results on early ceramics in the north Eurasian forest zone. In: Proceedings of the 6th Radiocarbon and Archaeology Symposium, held in Paphos, Cyprus, 10–15 April 2011. Radiocarbon 54(3 4), 2012, pp. 1033-1048.
23. Hartz, Sönke and Piezonka, Henny. North Eurasian hunter-gatherer ceramics as an

archaeological source: Reply to Kuzmin (2013). Radiocarbon 55(1), 2013, p. 205.
24. Hayden, Brian. Foreword. In Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers / Jordan P., Zvelebil M. (Hrsg.), Walnut Creek: Left Coast Press, Inc., 2009, pp. 19-26.
25. Hayden, Brian. Social complexity. In: In Vicki Cummings, Peter Jordan, and Marek Zvelebil (eds), The Oxford Handbook of the Archaeology and Anthropology of Hunter-Gatherers. Oxford 2014, 643-662.
26. Heron, Carl and Craig Oliver E. Aquatic resources in foodcrusts: identification and implication. Radiocarbon 57(4), 2015, pp. 707–719.
27. Hommel, Peter, Ceramic Technology. In Vicki Cummings, Peter Jordan, and Marek Zvelebil (eds), The Oxford Handbook of the Archaeology and Anthropology of Hunter-Gatherers. Oxford: Oxford University Press 2014, 663-693.
28. Hommel Peter N. and Day, P. M. and Jordan, Peter and Vetrov V.M., Vessels on the Vitim: "Neolithic" Ceramics of the Upper Vitim Basin. In preparation.
29. Hoopes, John W. and Barnett, William, The shape of early pottery studies. In: William K. Barnett, John W. Hoopes, eds. The Emergence of Pottery: Technology and Innovation in Ancient Societies. Washington, D. C.: Smithsonian Institution Press. 1995, 1-7.
30. Huysecom, Eric and Rasse, Michel and Lespez, Laurent and Neumann, Katharina and Fahmy, Ahmed and Ballouche, Aziz and Ozainne, Sylvain and Maggetti, Marino and Tribolo, Chantal and Soriano, Sylvain (2009): The emergence of pottery in Africa during the tenth millennium cal BC: new evidence from Ounjougou (Mali). Antiquity 83: 905–917.
31. Jordan, Peter and Zvelebil, Marek (eds), Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers. Walnut Creek: Left Coast Press, Inc., 2009.
32. Jordan, Peter and Zvelebil, Marek. Ex oriente Lux: The prehistory of hunter-gatherer ceramic dispersals. In Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers. In: Jordan, Peter and Zvelebil, Marek (eds.), Walnut Creek: Left Coast Press, Inc., 2009, pp. 33-89.
33. Jordan, Peter and Gibbs, Kevin and Hommel, Peter and Piezonka, Henny and Silva, Fabio and Steele, James. Modelling the Diffusion of Pottery Technologies across Afro-Eurasia: Emerging Insights and Future Research Questions. Antiquity 90, 2016, pp. 590-603.
34. Kaner, Simon. Long-term innovation: Appearance and spread of pottery in the Japanese archipelago. In Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers. In: Jordan, Peter and Zvelebil, Marek (eds.), Walnut Creek: Left Coast Press, Inc., 2009, 93-119.
35. Kosinskaya, Lyubov' L. and Dubovtseva, Ekaterina N. and Zanina V. V. Ceramic Origins in the Trans-Urals and Western Siberia. In P. Jordan, H. Piezonka, P. Pesonen, A. Vybornov (eds), From the Urals to the Baltic Sea: Early Pottery Origins and Dispersals in North-Western Eurasia. Proceedings of the session "From the Ural Mountains to the Baltic Sea - New insights into early ceramic traditions in the northern European forest zone" held on the 12th Annual Meeting of the European Association of Archaeologists in Helsinki in August 2012. Menschen – Kulturen – Traditionen. Studien aus den Forschungsclustern des Deutschen Archäologischen Instituts. In preparation.
36. Kotula, Andreas and Czekaj-Zastawny, Agnieszka and Kabaciński, Jacek and Terberger, Thomas. Find distribution, taphonomy and chronology of the Dąbki site. In: Jacek Kabaciński, Sönke Hartz, Daan C. M. Raemaekers and Thomas Terberger (eds.), The Dąbki Site in Pomerania and the Neolithisation of the North European Lowlands (c. 5000-3000 calBC). Archäologie und Geschichte im Ostseeraum 8. Rahden/Westf.: Verlag Marie Leidorf, 2015, 113-136.
37. Kuzmin, Yaroslav The patterns of Neolithization in the North Eurasian forest zone: a comment on Hartz et al. (2012). Radiocarbon 55(1), 2013, pp. 201-203.
38. Kuzmin, Yaroslav, 2013. Two trajectories in the Neolithization of Eurasia: pottery versus agriculture (spatiotemporal patterns). Radiocarbon 55: 1304–1313.
39. Kuzmin, Yaroslav The origins of pottery in East Asia: updated analysis (the 2015 state-of-the-art). Documenta Praehistorica XLII, 2015, pp. 1-11.
40. Kuzmin, Yaroslav and Orlova L. A. The neolithization of Siberia and the Russian Far East: radiocarbon evidence. Antiquity 74, 2000, pp. 356-365.
41. Kuzmin, Yaroslav and Vetrov V.M. The earliest Neolithic complex in Siberia: the Ust' Karenga 12 site and its significance for the Neolithization process in Eurasia. Documenta Praehistorica XXXIV, 2007, pp. 9-20.
42. Kuzmin, Yaroslav and Jull A.J.T. and Burr G.S. Major patterns in the Neolithic chronology of East Asia: issues of the origin of pottery, agriculture, and civilization. Radiocarbon 51(3), 2009, pp. 891-903.
43. Lubbock, John, Pre-historic times, as illustrated by ancient remains, and the manners and customs of modern savages. New York: D. Appelton & Co. 1865.
44. Lu, Tracey L.-D. Early Pottery in South China. Asian Perspectives 49(1), 2010, pp. 1-42.
45. Mason, R. J. Great Lakes Archaeology (New York, London 1981).
46. Mazurkevich, Andrei and Dolbunova, Ekaterina. The oldest pottery in hunter-gatherer communities and models of Neolithisation of Eastern Europe. Documenta Praehistorica XLII, 2015, pp. 13-66.
47. McKenzie, Hugh G. Review of early hunter-gatherer pottery in eastern Siberia. In Ceramics before Farming: The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers. In: Jordan, Peter and Zvelebil, Marek (Hrsg.), Walnut Creek: Left Coast Press, Inc., 2009, pp. 167-208.
48. Nakamura, Toshio and Tanioguchi, Yasuhiro and Tsuji, Sei'ichiro and Oda, Hirotaka. Radiocarbon dating of charred residues in the earliest pottery in Japan. Radiocarbon 43(2B), 2001, pp. 1129-1138.
49. Nakazawa, Yuichi and Iwase, Akira and Akai, Fumito and Izuh, Masami. Human responses to the Younger Dryas in Japan. Quaternary International 242(2), 2011, pp. 416-433.
50. Nomokonova, Tatiana and Losey Robert J. and Goriunova, Ol'ga I. and Webe, Andrzej W. A freshwater old carbon offset in lake Baikal. Siberia and problems with the radiocarbon dating of archaeological sediments: Evidence from the Sagan-Zaba II site. Quaternary International 290-291, 2013, pp. 110-125.
51. Pesonen, Petro and Leskinen, Sirpa. Pottery of the Stone Age hunter-gatherers in Finland. In: Jordan, Peter / Zvelebil, Marek (eds.), Ceramics before farming. The dispersal of pottery among prehistoric Eurasian hunter-gatherers. Walnut Creek: 2009, 299-318.
52. Philippsen, Bente. Der Süßwasser-Reservoireffekt in der 14C-Datierung: neue Analysen und mesolithische Kochexperimente. Experimentelle Archäologie in Europa – Bilanz (2013), 20-32.
53. Philippsen, Bente. Hard water and old food. The freshwater reservoir effect in radiocarbon dating of food residues on pottery. Documenta Praehistorica XLII, 2015, 159-170.
54. Philippsen, Bente. Isotopic analyses of food crusts on pottery: Implications for dating and palaeocuisine reconstructions. In Contact and Transition. From late hunter-gatherers to early farmers in coastal and inland environments. Workshop Greifswald, 14th-15th December 2012/ Hartz S., Kabaciński J., Raemakkers D., Terberger T. (eds), Rahden/Westf.: Verlag Marie Leidorf GmbH, 2015, pp. 307-320.
55. Philippsen, Bente and Meadows, John, Inland Ertebølle Culture: the importance of aquatic resources and the freshwater reservoir effect in radiocarbon dates from pottery food crusts. 'Human Exploitation of Aquatic Landscapes' special issue (ed. Ricardo Fernandes and John Meadows), Internet Archaeology 37, 2014. http://dx.doi.org/10.11141/ia.37.9
56. Piezonka, Henny. Stone Age Hunter-Gatherer Ceramics of North-Eastern Europe: New Insights into the Dispersal of an Essential Innovation. Documenta Praehistorica XXXIX, 2012, pp. 23-51.
57. Piezonka, Henny. Jäger, Fischer, Töpfer. Wildbeutergruppen mit früher Keramik in Nordosteuropa im 6. und 5. Jahrtausend v. Chr. Archäologie in Eurasien 30. Bonn: Habelt-Verlag, 2015.
58. Piezonka, Henny. Multivariate analysis of early ceramics in north-eastern Europe: Understanding chronology, stylistic similarities and cultural transmission. In: Neolithic Cultures of Eastern Europe: Chronology, Paleoecology and Cultural Traditions. Materials of the international conference dedicated to the 75th anniversary of Victor Petrovich Tretyakov, May, 12-16, 2015, St. Petersburg. St. Petersburg: IIMK RAN, 2015, pp. 269-276.
59. Piezonka, Henny and Tsydenova, Natal'ja and Tumen, Dashtseveg. Zwischen China und Ural: Die Entstehung der ältesten Keramiktraditionen in Transbaikalien und der Mongolei ab dem 12. Jahrtausend v. Chr. Gerda Henkel Stiftung, Sonderprogramm Zentralasien, Abschlusspublikation. Münster: Rhema Verlag, 2015, pp. 117.
60. Piezonka, Henny and Meadows, John and Hartz, Sönke and Kostyleva, Elena and Nedomolkina, Nadezhda and Ivanishcheva, Marina and Kosorukova, Natalya and Terberger, Thomas. Stone Age Pottery Chronology in the Northeast European Forest Zone: New AMS and EAIRMS Results on Foodcrusts. Radiocarbon, 2016. doi:10.1017/RDC.2016.13
61. Piezonka, Henny. Mesolithic — Sub-Neolithic — Neolithic: The problem of defining neolithization between East and West. In: Д. В. Герасимов, А. А. Выборнов, А. Н. Мазуркевич, Е. В. Долбунова, Е. С. Ткач (eds.) Культурные процессы в циркумбалтийском пространстве в раннем и среднем голоцене. Доклады международной научной конференции, посвященной 70-летию со дня рождения В.И. Тимофеева. Санкт-Петербург, Россия, 26–28 апреля 2017 г. Санкт-Петербург, 2017, pp. 97-103.
62. Popitz, Heinrich. Der Aufbruch zur Artifiziellen Gesellschaft. Zur Anthropologie der technik. Tübingen: J. C. B. Mohr, 1995.
63. Povlsen, Karen. The introduction of ceramics in the Ertebølle Culture. Danish Journal of Archaeology 2:2, 2013, 146-163.
64. Reimer P.J., Bard E., Bayliss A., Beck J.W., Blackwell P.G., Bronk Ramsey C., Grootes P.M., Guilderson T.P., Haflidason H., Hajdas I., Hatté C., Heaton T.J., Hoffmann D.L., Hogg A.G., Hughen K.A., Kaiser K.F., Kromer B., Manning S.W., Niu M., Reimer R.W., Richards D.A., Scott E.M., Southon J.R., Staff R.A., Turney C.S.M., van der Plicht J. IntCal13 and Marine13 radiocarbon age calibration curves 0–50,000 years cal BP. Radiocarbon 55(4), 2013, pp. 1869–87.
65. Rice, Prudence, On the origins of pottery. Journal of Archaeological Method and Theory 6, 1999, 1-54.
66. Roosevelt, Anna Curtenius, Early pottery in the Amazon. Twenty years of scholarly obscurity. In: William K. Barnett, John W. Hoopes (eds.), The Emergence of pottery. Technology and Innovation in Ancient Societies. Washington and London: Smithsonian Institution Press, 1995.
67. Sagawa M. Die erste Keramik. In Wieczorek A., Steinhaus W., Sahara M. (Hrsg.) Zeit der Morgenröte. Japans Archäologie und Geschichte bis zu den ersten Kaisern. Handbuch. Wolfratshausen: Edition Minerva Hermann Farnung, 2004, pp. 127-133.
68. Sato, Hiroyuki and Izuho, Masami and Morisaki, Kazuki. Human cultures and environmental changes in the Pleistocene-Holocene transition in the Japanese Archipelago. Quaternary International 237, 2011, pp. 93-102.
69. Schneeweiß, Jens. Die Siedlung Čiča in der westsibirischen Waldsteppe I: Untersuchungen zur spätbronze- bis früheisenzeitlichen Keramik, Chronologie und

kulturellen Stellung. Archäologie in Eurasien 22. Mainz: Verlag Philipp von Zabern, 2007.

70. Silva, Fabio and Steele, James and Gibbs, Kevin and Jordan, Peter. Modeling spatial innovation diffusion from radiocarbon dates and regression residuals: the case of early Old World pottery. Radiocarbon 56(2), 2014, 723–732.

71. Spatz, Helmut. Beiträge zum Kulturenkomplex Hinkelstein – Großgartach – Rössen: Der keramische Fundstoff des Mittelneolithikums aus dem mittleren Neckarland und seine zeitliche Gliederung, Band 1. Materialhefte zur Archäologie in Baden-Württemberg 37. Stuttgart: Theiss, 1996.

72. Speck, Frank G. Penobscot Man. The life history of a forest tribe in Maine. Orono, Maine: University of Maine Press. 1997.

73. Tsydenova, Natalya and Piezonka, Henny. The transition from the Late Paleolithic to the Initial Neolithic in the Baikal region: Technological aspects of the stone industries. Quaternary International 355, 2015, pp. 101-113.

74. Tsydenova, Natalia and Andreeva, Darima and Zech, Wolfgang. Early Pottery In Transbaikal Siberia: New Data From Krasnaya Gorka. Quaternary International 441, 2017, pp. 81-90.

75. van Berg, Paul-Louis. La céramique et son décor en Eurasie. In Le Néolithique danubien et ses marges entre Rhin et Seine. Actes du 22ème colloque interrégional sur le Néolithique, Strasbourg 27-29 octobre 1995. Supplément aux Cahiers de l'Association pour la Promotion de le Recherche Archéologique en Alsace. Strasbourg, 1997, pp. 223-264.

76. Vandiver, Pamela B. and Soffer, Olga and Klims, B. and Svoboda, J. The Origins of Ceramic Technology at Dolni Věstonice, Czechoslovakia. Science New Series, Vol. 246, No. 4933, 1989, 1002-1008.

77. Vybornov, Aleksandr and Zaitseva, Ganna and Kovaliukh, N. and Kulkova, Marianna and Possnert, G. and Skripkin, V. Chronological problems with neolithization of the northern Caspian Sea area and the forest-steppe Povolzhye region. Radiocarbon 54 (3–4), 2012, 795–799.

78. Weyer, Johannes. Techniksoziologie. Genese, Gestaltung und Steuerung sozio-technischer Systeme. Weinheim und München: Juventa-Verlag, 2008.

79. Werbart, Bozena. Subneolithic: What is it? – 'Subneolithic' Societies and the Conservative Economies of the Circum-Baltic Region. In M. Zvelebil, R. Dennell and L. Domańska (eds.) Harvesting the Sea, Farming the Forest. The Emergence of Neolithic Societies in the Baltic Region. Sheffield Archaeological Monographs 10. Sheffield Academic Press, Sheffield: 1998, 37-44.

80. Wu, Xiaohong and Zhang, Chi and Goldberg, Paul and Cohen, David and Pan, Yan and Arpin Trina and Bar-Yosef, Ofer. Early pottery at 20000 years ago in Xianrendong Cave, China. Science 336, 2012, pp. 1696-1700.

81. Yanshina, Oksana V., Neolithic and Neoliuthisation. In: Berdnikov I. M., Lipinina E. A. (eds.), Eurasia in the Cenozoic. Stratigraphy, Paleoecology, Cultures, issue 6. Proceedings of 6th International academic conference «Eurasia in the Cenozoic. Stratigraphy, paleoecology, culture» (10–13 May 2017, Irkutsk). – Irkutsk: Publishing of ISU, 2017, pp. 215-219.

82. Yang, Xiaoyan and Wan, Zhiwei and Perry, Linda and Lu, Houyuan and Wang, Qiang and Zhao, Chaohong and Li, Jun and Xie, Fei and Yu, Jincheng and Cui, Tianxing and Wang, Tao and Li, Mingqi and Gea, Quansheng. Early millet use in northern China. Proceedings of the National Academy of Sciences of the USA 109(10), 2012, pp. 3726–3730.

83. Zhao, Chaohong and Wu, X, Xiaohong. The dating of Chinese early pottery and a discussion of some related problems. Documenta Praehistorica XXVII, 2000, pp. 233-239.

84. Выборнов, Александр А., Неолит Волго-Камья. Самара: Издательство самарского государственного педагогического университета, 2008.

85. Гладышев, С. А. and Табарев, А. В. Раннеголоценная керамика северной Монголии (по материалам многослойного памятника Толбор-15). Материалы международного семинара «Вопросы изучения древнейшей керамики Северо-Восточной Азии (X-V тыс. д. н. э.) методами археологии и естественных наук». In print. http://www.archaeologysakhalin.ru/up/lib/0c252ae2dcc740189509751cbe72c664.pdf

86. Дубовцева, Екатерина Н. and Косинская, Любовь Л. and Юдина Е.А. Эксперимент в археологических исследованиях (работы экспериментальной археологической экспедиции ЦАИ УрФУ в 2005-2011 гг.) / Шестые Берсовские чтения: Сборник статей Всероссийской археологической научно-практической конференции. Екатеринбург: Издательство КВАДРАТ, 2011, сс. 178–181.

87. Жилин, Михаил Г. and Савченко, Светлана Н. and Зарецкая Наталья Е. Раскопки ранненеолитических стоянок Варга 2 и Береговая II в Среднем Зауралье. In: Неолитические культуры восточной Европы: хронология, палеоэкология, традиции. Санкт-Петербург, 2015, сс. 193-197.

88. Косинская, Любовь Л. Поселение Ет-то I и некоторые проблемы неолита севера Западной Сибири. In Ямал между прошлым и будущим: приоритеты развития: материалы Всерос. науч. конф. Салехард, апрель 2005. Екатеринбург; Салехард, 2005, сс. 3–21.

89. Молодин, Вячеслав И. and Мыльникова, Людмилла Н. Теория и практика исследования древней керамики: традиционные и новейшие методы. Самарский научный вестник 3(12), 2015, сс. 122-127.

90. Недомолкина, Надежда Г. and Пиецонка, Хенни. Верхняя Сухона в раннем и среднем неолите по результатам радиоуглеродной хронологии (по материалам поселений Вёкса I, Вёкса III) In: Материалы к радиоуглеродной хронологии Восточной Европы. In preparation.

91. Новиков, А. Г. and Горюнова, О. И. Новый взгляд на неолитические комплексы многослойного поселения Тышкинэ II (озеро Байкал). Проблемы археологии, этнографии, антропологии Сибири и сопредельных территорий. Материалы итоговой сессии Института археологии и этнографии СО РАН 2011 г., том XVII, 2011, сс. 87-93.

92. Ошибкина, Светлана В. К вопросу о неолитической революции в лесной зоне Евразии. In: II Северный Археологический Конгресс, 24-30 сентября, 2006, Ханты-Мансийск. Доклады. Екатеринбург (Ханты-Мансийск 2006) 262-279.

93. Разгильдеева, И. И. and Куникита, Дай and Яншина. О. В. Новые данные о возрасте древнейших керамических комплексов западного Забайкалья. Евразия в кайнозое. Стратиграфия, палеоэкология, культуры. Вып. 2: Фундаментальные проблемы формирования разнообразия палеосреды и палеокультур Евразии. Смена парадигм : материалы II Всерос. науч. конф. Иркутск, 2013, сс. 168-178.

94. Цыденова, Наталья В. Ранненеолитические материалы стоянки Красная Горка (северо-восток Бурятии) / Материалы всероссийской конференции «Всероссийский археологический съезд». Новосибирск, 2006, сс. 320-323.

95. Шевкомуд Игорь Я. Древнейший неолит Хоккайдо (по материалам памятника Тайсо-3) / А.П. Деревянко, В.И. Молодин, Современные проблемы археологии России. Материалы Всероссийского археологического съезда (23-28 октября 2006 г., Новосибирск), том 1. Новосибирск, 2006, сс. 324-327.

96. Шевкомуд, Игорь Я. and Яншина, Оксана В. Начало неолита в Приамурье: поселение Гончарка-1. Санкт-Петербург: МАЭ РАН, 2012.

97. Шорин, А.Ф. and Шорина, А.А. Радиокарбонные даты Кокшаровского холма, Вопросы археологии Урала 26, 2011, сс. 249 –254.

ОТ РЕДКОЛЛЕГИИ РЕКОМЕНДУЕТ СТАТЬЮ ДЛЯ ПУБЛИКАЦИИ

Чаиркина Наталия Михайловна – доктор исторических наук; заместитель директора по научным вопросам Института истории и археологии УрО РАН (специальность 07.00.06)

ИНФОРМАЦИЯ ОБ АВТОРЕ

Пиецонка Хенни, профессор, DoS, Альбрехтс Университет, Институт доисторической и раннеисторической археологии, г. Киль, Германия

INFORMATION ABOUT THE AUTHOR

Henny Piezonka, Dr. phil. (Berlin), professor for Anthropological Archaeology at the Institute of Prehistory and Protohistory at Kiel University, Germany