The First Emergence of Ceramic Production in Africa

HUYSHECOM, Eric

Abstract

The discoveries at Ounjougou (Mali), an open-air site in the Dogon Country, shed new light on the “early Neolithic” in Africa. The stratigraphic sequence and a cluster of absolute dates established a terminus ante quem of 9400 cal bc for ceramic sherds associated with a small bifacial lithic industry. The emergence of this typo-technical complex corresponds to one of the wet phases of the Pleistocene–Holocene transition in West Africa, most probably that of the climatic upturn at the beginning of the Holocene, between 10,200 and 9,400 cal bc. Paleoenvironmental results, particularly archaeobotanical ones, indicate that the landscape was in a state of change and that, for several millennia, the surfaces covered by desert overlapped an open steppe with grasses, some of which were edible. This environmental situation allowed the dispersion of prehistoric groups over the continent and probably encouraged a new behavior: the practice of intensive selective gathering (i.e., the targeted and rational harvesting of wild grasses for their seeds). However, not only must seeds be kept dry and protected from rodents, they must [...]
Summary and Keywords

The discoveries at Ounjougou (Mali), an open-air site in the Dogon Country, shed new light on the “early Neolithic” in Africa. The stratigraphic sequence and a cluster of absolute dates established a terminus ante quem of 9400 cal BC for ceramic sherds associated with a small bifacial lithic industry. The emergence of this typo-technical complex corresponds to one of the wet phases of the Pleistocene–Holocene transition in West Africa, most probably that of the climatic upturn at the beginning of the Holocene, between 10,200 and 9,400 cal BC. Paleoenvironmental results, particularly archaeobotanical ones, indicate that the landscape was in a state of change and that, for several millennia, the surfaces covered by desert overlapped an open steppe with grasses, some of which were edible. This environmental situation allowed the dispersion of prehistoric groups over the continent and probably encouraged a new behavior: the practice of intensive selective gathering (i.e., the targeted and rational harvesting of wild grasses for their seeds). However, not only must seeds be kept dry and protected from rodents, they must also be processed through cooking or fermentation. This process helps the human body to assimilate the starch, as the digestive enzymes necessary for its digestion are not naturally present. Ceramics would have been particularly useful in this process. Ceramics emerged in sub-Saharan Africa and seem to have spread toward the central Sahara during the early Holocene at the end of the 10th and the beginning of the 9th millennium cal BC, while the desert zone became increasingly greener. It has yet to be understood whether the Nile Valley was an important corridor for the diffusion of this technology or if ceramics appeared as the result of a second independent process of innovation.

Keywords: ceramics, Neolithic, invention, intensive selective harvesting, edible grasses, cooking, storage

Technical Innovations in Africa?

The act of reflection upon the emergence of different technical innovations on the African continent is not a neutral one. There still exists a large non-African public, whether from the academic world, the ruling classes, or a wider audience, who believe “that the African has not fully entered into history: in his imagination where everything is constantly repeating, there is space neither for human venture, nor for the idea of progress” (Sarkozy
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2007). Yet research carried out over the past few decades has shown that Africa was, to the contrary, the cradle of numerous innovations throughout its long and diverse history. Whether one thinks of the emergence of perforated shell beads during the Middle Stone Age (such as at El Mnasra in Morocco [Nespoulet and El Hairaoui 2015] or in Blombos Cave in South Africa [Vanhaeren et al. 2013]), bone harpoons (such as at Katanda [Yellen et al. 1995] or once more at Blombos [Henshilwood et al. 2001]), certain major inventions of the Holocene period, such as the firing of shaped clay material (in Mali [Huysecom and Sanogo 2008]), the smelting of iron ore (in western and eastern Africa [Descoeudres et al. 2001; Robion-Brunner 2018]), or the domestication of certain grasses, tubers, or legumes (in different areas [Fuller and Hildebrand 2013]), Africa shows that its history is not static compared to that of other continents. This article concentrates on the emergence of ceramic vessel production. However, it is not enough simply to review archaeological discoveries, even though most remain little known—the concrete significance and implications of this mastery of fire must be considered, as well as the very use of the concept of the Neolithic on the African continent.

Pottery and the Idea of the Neolithic in Africa

For many authors, the issue of the appearance of ceramic vessels is directly linked to the issue of the designation of the term “Neolithic.” In order to put into perspective the archaeological discoveries that are discussed in this article, it is first necessary to consider the various definitions of the term Neolithic in the context of Africa.

For Europe or the Near East, the term Neolithic generally denotes sedentary societies whose economy is based upon a system of production of foodstuffs. Apart from some rare exceptions, the Neolithic can be characterized by the adoption, in no specific order, of animal domestication, agriculture, ceramic production, and sedentarization, a process ending, for cereal-producing societies, in urbanization (Guilaine 2015).

In Africa, however, the process of “neolithization” differs markedly from region to region, even between different groups of humans, and the differential quality of research does not facilitate a global understanding. Two currents of thought predominate, one giving primacy to material culture, the other to the ensemble of economic activities (Huysecom 2012). In the first case, the presence or absence of ceramics is considered a necessary distinction in order to define those material assemblages prior to the advent of metals as being Neolithic, ceramics being an excellent diagnostic object, usually very well preserved thanks to its physical properties (particularly solid and rot-resistant). It therefore presents itself as a clear solution to the typology of societies, and the term Neolithic is thus used without considering the economic particularities of the populations studied. In the second case, the term Neolithic denotes those cultural ensembles prior to the appearance of metals for whom a true production economy can be proved, that is, activities consisting in creating goods through the combination of resources, as well as the results of these activities, according to the model proposed for the Near East and for Europe (Huysecom 1996). While this second approach, which takes into account the economic charac-
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Characteristics of societies, is more satisfying from a conceptual point of view, the qualification of the term Neolithic in the global sense cannot simply be transposed to the African continent without considering the preservation conditions of the remains and without adapting the production models in question. Thus, organic macro-remains, such as bones or seeds, are often badly preserved in the tropical sub-Saharan acidic and iron-rich soils and, in these conditions, it is common not to be able to detect the practice of livestock breeding or agriculture. In addition, societies with extremely diverse and complementary economic systems developed in Africa by mechanisms that are quite different from those of other areas in the east or west. There exist in Africa, even in the early 21st century, ceramic-producing societies that do not conjointly practice sedentism or the domestication of plant and animal species, and even in the 21st century cannot be characterized as Neolithic in its traditional sense (Huysecom 1996).

To resolve this problem, numerous scholars of this second school no longer use the term Neolithic for Africa south of the Sahara, precisely due to its Eurocentric connotations and its inadequacy or confusion when applied to an African context. These Africanists instead speak of the “first food-producing Holocene societies.” This complex issue of an “African Neolithic” is at the root of an important decades-old debate, and it is not the aim of this article to settle for one or the other of these sides.

Ceramics: Technical, Economic, and Social Significance

It is important, however, to emphasize that the invention of ceramics was an incredibly important step in the transformation of the natural elements by humans and their mastery of the environment, as witnessed by the creative shaping of clayey materials and their firing in order to produce vessels for the conservation, fermentation, or cooking of foods and liquids.

In particular, it is worth remembering that, as humans do not possess the necessary digestive enzymes to break down the starches contained within foraged grasses or cultivated cereals, these molecules must be subjected to a transformation so that they can be assimilated by amylase (Stahl 1989). Cereals must undergo a heat treatment, whether that be through boiling or grilling or by fermentation. The use of ceramic thus opens considerably the range of exploitable food resources by allowing for the consumption of wild, and subsequently domestic, cereals. The mastery of pottery thus allows societies to reinforce their food security and diversify their diet. From that point onward they can practice intensive selective foraging, in other words, targeted, systematic, and rational harvesting of certain wild plants and comestibles, in particular grasses, which can be considered by their importance as a true food acquisition strategy (Huysecom 2012). In the process of historical evolution, intensive selective foraging precedes true agriculture, characterized by the selection of seeds and the practice of ploughing. This “proto-agricultural” economic form may lead not only to new landscape management techniques, such as significant and regular brush clearings, often by fire, which encourages the regrowth of sought-after
plants and their nutritional properties, but also to a certain semi-sedentism, with populations making seasonal stays in areas of high foraging potential (Huysecom 2012; Lespez et al. 2011; Willcox 2016). Thanks to ceramics, humans may also be able to protect their harvests from predators, such as insects or rodents, against which vessels made of perishable materials would not be sufficient.

Finally, the last, but not least, aspect to take into consideration is that the invention of ceramics must have had some repercussions on the social division of labor and knowledge, given the expertise necessary to judge the quality of clays and tempers, as well as to master the techniques of production and firing parameters. If one adds the fact that the occupation of the potter is not greatly compatible with a high level of mobility, particularly due to access to clay sources and the constraints implied in the transport of raw clay or finished vessels, the regular practice of this craft must have involved a certain rupture with the more nomadic and opportunistic ways of life of the hunter-gatherers at the end of the Paleolithic.

The Emergence of Ceramics in Africa

Before considering the multiple discoveries recognized as shedding some light on the emergence of ceramic production in Africa, it is not without interest to recount the story of the realization of its antiquity. Similarly, it is relevant to recall the multiple regions providing evidence of ceramics at the end of the early Holocene or the middle Holocene in the Saharan and sub-Saharan zones.

The Acknowledgment of Early Ceramics in Africa and the Paleoenvironmental Context

Since the end of the 1960s and the beginning of the 1970s, certain discoveries have indicated a particularly early emergence for ceramics in the southern part of the Sahara, notably in southern Algeria and Libya north of the central Saharan massifs, independent of the centers of origin in the Near East and Nile Valley. Research led here, particularly by G. Camps and B. Barich, has demonstrated, on the strength of stratigraphic context and carbon-14 dating techniques, that from the end of the 9th and beginning of the 8th millennium cal BC, ceramics were present at Ti-n-Torha or Uan Tabu in Libya and at Site Launey and Amekni in Algeria (Barich 1974; Camps 1969). The diversity of decoration techniques was remarkable given that within one level at Amekni was found decoration by incision, perforation, pivoting, and normal impressions, as well as shapes that were obtained by flexible or rigid straight and threaded cords. This diversity of decorative techniques, combined with homogenous firings and the use of a carefully calibrated temper, spoke to scholars at the time of an already well-controlled technique, thus implying that there must have existed further centers of origin to discover (Camps 1969).

Research in the 1990s supported this hypothesis: excavations led with great enthusiasm by French teams from ORSTOM (Office de la recherche scientifique et technique outre-mer; today known as the Institut de recherche pour le développement or IRD), particular-
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ly by J.-P. Roset, demonstrated that in the central Sahara humans had already mastered ceramic technology close to 1,000 years earlier, notably at Tagalagal and Adrar Bous 10 in Niger (figure 1 [2, 3]; Close 1995; Roset 1996). These ceramics of the Air massif (Niger) and its foothills were completely covered in decoration, made with tools such as a flexible threaded cord and a stick, with those of Tagalagal presenting a particularly large variety of motifs, shapes, and techniques. Some thirty carbon-14 and thermoluminescence (TL) dates situated this appearance at the beginning of the 9th millennium cal BC (Roset 1983A, 2000; Close 1995; Jesse 2003, 2010), contemporaneous with the beginning of climatic improvement during the early Holocene (Nelson et al. 2002).\(^1\) One thing was certain at the beginning of the 21st century: given the great diversity of ceramics at Tagalagal, it was likely that an even earlier origin should be sought for Saharan ceramics. This origin of the first African ceramics, clearly linked to repopulating of the Sahara after the arid phase of Oxygen Isotope Stage 2, also known as the Ogolian, was nevertheless hotly debated. Two scenarios were generally proposed. The first, resting on the degree of technological evolution of Saharan ceramics and on largely paleoenvironmental, environmental, and archaeological considerations, suggested an origin in the regions south of the Sahara (Close 1995). The second, resting only upon theoretical considerations, believed more likely that this was an invention of populations surviving in refuge zones in the Sahara during the hyper-arid climatic conditions at the end of the Pleistocene (Jesse 2003, 2010). In parallel, during the 1980s and 1990s, the E-79-8 deposit at Bir Kiseiba in the Nile Valley produced three ceramic sherds discovered in excavation in sandy sediments (Connor 1984), located just below the surface, as well as at 10 cm and 60 cm in depth. In the publication, the excavator indicates in this latter case that “it is possible that the sherd might have been moved to this depth by traffic over the surface of the site” (Connor 1984, 240). Three other sherds had been discovered on the surface nearby. The seven carbon-14 dates obtained from charcoal fragments found in the excavated sector at a short distance from the sherds unfortunately present large margins of error and consequently a large dispersion of the calibration, which stretches between the end of the 11th and the beginning of the 8th millennia cal BC (between 9820 ± 380 BP and 8920 ± 130 BP). In the absence of any stratigraphic context allowing the three sherds and the dates to be correlated, it is not possible to go further in the interpretation of this site in terms of dating the emergence of ceramics. It is nonetheless sure that from the 9th millennium cal BC onward, ceramics are well-attested on multiple sites in the Nile Valley in Egypt and Sudan, such as Nabta Playa E-06-1, Sarurab 2, Wadi el Akhdar, and the Kerma region (figure 1 [4, 5, 6]; Connor 1984; Khabir 1987; Schön 1996; Jórdeczka et al. 2013; Honegger and Williams 2015).
However, to the south of the 15th parallel north, the earliest indications of the presence of ceramics do not stretch back beyond the 8th millennium cal BC. The oldest sherds currently known were found in stratigraphy at the site of Ravin du Hibou at Ounjougou in Mali. These are decorated with rolled impressions, probably made by a flexible threaded cord, and a simple impression with a toothed comb (Huyscom et al. 2004). Sherds were also found at the site of Lothagam in the Turkana region of Kenya, apparently non-decorated (Robbins 1972; Goldstein et al. 2017). In other regions of sub-Saharan Africa, the oldest known ceramics appear later (e.g., in West Africa in the 6th millennium cal BC, at Shum Lake in Cameroon, and Konduga in Nigeria [Lavachery 2001; Wotzka and Goedicke 2001], in the middle of the 5th millennium in eastern Senegal at Toumboura 1A [Ndiaye and Huyscom 2019], and at the turn of the 5th to the 4th millennia at Kouroukorokale in Mali and at Bosumpra in Ghana [MacDonald 1997; Shaw 1985]). The decoration of these different ensembles includes impression with simple, threaded, and pivoting combs, and sometimes with incised or perforated geometric shapes.

The Discovery of Early Holocene Ceramics at Ounjougou

The discoveries between 1997 and 2009 of ceramic sherds in the early Holocene levels of two sites in the Ounjougou deposit in Mali brought new data to the question of the emergence of pottery in Africa. This deposit is located in the Dogon Country of the Niger bend, on the Bandiagara plateau (figure 1[1]), some 15 km to the east of the town of the same name (Huyscom 2014). Researchers discovered more than one hundred archaeological sites here, within the drainage basin of the Same River, a tributary of the Niger. Topographically, the area in question is characterized by a series of ravines cut into a succession of wind-blown, alluvial, and colluvial quaternary formations, with a stratigraphic sequence that reaches 16.5 m in places (Lespez et al. 2011). The sediments also seal abundant plant remains (pollen, leaves, charcoal, wood, seeds, etc.), of which the state of preservation is exceptional. Consequently, the deposit offered the possibility to correlate human occupations with climatic and environmental variations over a long chronological
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The ceramic sherds were discovered in stratigraphy over the course of several field seasons in early Holocene levels at two distinct adjacent ravines: at 13 m depth at the Ravin du Hibou and at more than 15 m depth at Ravin de la Mouche (Huyssecom et al. 2004, 2009; Soriano and Huyssecom 2012). The discovery at Ravin du Hibou relates to the beginning of the 8th millennium cal BC and has already been discussed; consequently, the chronologically older Ravin de la Mouche is considered here. The well-established stratigraphy at Ravin de la Mouche (Rasse et al. 2006; Neumann et al. 2009; Lespez et al. 2008), as well as the numerous carbon-14 and OSL dates that allowed the dating of the levels containing archaeological material, gave a terminus ante quem of 9400 cal BC for the oldest ceramic sherds. These sherds are very thin, varying between 4.5 and 7 mm. One of the sherds presents a rolled decoration, which could not be identified more precisely. Microscopic analysis of two samples revealed that they contained a silicate matrix, without carbonates, and with 20–30 percent non-plastic inclusions. These are constituted principally of well-rounded quartz monocrystals with a recrystallization edge of a thin to very thin diameter. These quartz inclusions are absolutely similar to those found in the local clays and sandstones. The mineralogical analysis by X-ray diffraction of clays from the closest known deposits revealed the presence of kaolinite, whose absence in ceramics indicates a firing temperature higher than 550°C. The raw clay material was prepared using non-calcareous clays with no preliminary preparation, as is shown by their somewhat chaotic texture. Their serial structure implies that no temper was added except for one sherd which contains several fragments of grog, of maximum diameter 4 mm. However, their scarcity rather implies that they were involuntarily incorporated during the preparation of the clay recipe. Only one pot form can be reconstituted with help from a particularly large sherd, which seemingly formed part of a straight-edged hemispheric bowl with an opening diameter of 21 cm. The surface of this sherd does not show any decoration. While the function of the receptacle cannot be determined with any certitude, one can in any case exclude that it was used for the cooking of cereals by boiling in water, as the contents would have inevitably spilled over. However, a transformation of grains by grilling or fermentation is plausible for this type of bowl. The fragments of pottery from Ravin de la Mouche are associated with a lithic industry, including characteristic and very original bifacial armatures of small dimensions (Soriano and Huyssecom 2012). These armatures are found neither in the earlier nor in the later levels.

Geomorphological and sedimentary analyses testify to a powerful hydrological system, which has consistently remodeled the countryside of the valley where the deposit is located. This environmental evidence suggests that the emergence of this typo-technical complex is related to the development of the more humid conditions at the beginning of the Holocene. Indeed, it can be confirmed that the monsoon front reached 14°N in latitude around 9500 cal BC (DeMenocal et al. 2000; Lézine et al. 2005; Duplessy et al. 2005; Garcin et al. 2007). Paleoenvironmental analyses indicate that the landscape was transformed, with desert areas giving way over thousands of years to an open steppe with panicoid grasses (Neumann et al. 2009). Locally, this typo-technical complex at Ravin de la Mouche evolved or was replaced from the 8th millennium cal BC onward at Ravin du Hi-
bou with the appearance of grinding apparatus alongside ceramic and the abandonment of bifacial armatures in favor of geometric segments.

This discovery lends support to the scenario put forward by Angela Close in 1995 of a center of origin for ceramics in sub-Saharan Africa, but also relates the invention of ceramic vessels and the associated characteristic bifacial armatures with the climatic oscillations of the Pleistocene-Holocene transition (see also Yasuda 2002).

The Central and Eastern Sahara: An Invention Imported by the First Populations Reoccupying the Sahara during the Holocene?

It is probable that this new typo-technological complex observed at Ravin de la Mouche subsequently rapidly diffused to the north, particularly toward the central Sahara, in concert with the northward advance of the Intertropical Convergence Zone, during which the Sahara became increasingly greener. This climatic change encouraged the development of grassed areas as well as modification in the composition of wild fauna. From an archaeological point of view, if one considers that those deposits where ceramic remains are directly associated with charcoal sampled for dating, or else where sherds have been directly dated by the thermoluminescence method, few of them have produced dates earlier than 9000 cal BC (for an overview of the dates, see Huysecom et al. 2009; Jesse 2010).

Two further deposits are close to the appearance of ceramics at Ounjougou: Temet, in the western Ténéré in Niger, and, as discussed (see “THE ACKNOWLEDGMENT OF EARLY CERAMICS IN AFRICA AND THE PALEOENVIRONMENTAL CONTEXT”), Bir Kiseiba in the southern Egyptian Sahara, both sites containing grinding apparatus.

The stratigraphic excavation of the lacustrian deposits at Temet gave a date clearly indicating their contemporaneity with the upper structures at Ravin de la Mouche, at the turn of the 10th to the 9th millennia cal BC (Roset 1983A, 1996). In addition, Temet is the only site to this day to have produced bifacial armatures comparable to those discovered in the lower formation at Ravin de la Mouche, indicating a certain relatedness between these two sites (Soriano and Huysecom 2012).

However, interestingly, the only vessels found at Temet were made of polished stone, more precisely of fibrolite, all fragmented except for a straight-edged hemispheric bowl, slightly ovular in form, with an average diameter of 12 cm. Although of a smaller diameter, this receptacle is typologically close to that seen above in ceramic, discovered in the lower level of Ravin de la Mouche, although the latter is older by several centuries. The use of ceramics was presumed at Temet, but this was founded only on the discovery of a fragment of a chlorito-schiste plaquette with a retouched denticulated edge. This was interpreted as a potter’s comb due to the observation of printed shapes on the sherds discovered on the surface, not far from the test pit (Roset 1983A). However, these sherds cannot be reliably correlated with the early Holocene occupation of the site. Until proof to the contrary, in order to produce their receptacles, the populations of Temet seem to
have opted instead for shaped and polished stone and not for baked clay. This is of great interest and could be interpreted as a desire to imitate or adapt a more southern invention as grassy areas began to spread throughout the central Sahara. It is also interesting to observe, as already seen here, that only a few centuries later at the beginning of the 9th millennium cal BC, central Saharan sites began producing ceramics with elaborate shapes and varied decorations, such as those of Adrar Bous 10 and Tagalagal (Roset 1983B, 2000), demonstrating the perfect mastery of techniques of production and decoration.

As for the early ceramics of the Nile Valley discovered at Bir-Kiseiba and those that follow in the 9th millennium cal BC, such as at Nabta Playa E-06-1, Sarurab 2, or Wadi el Akhdar, do they represent a waypoint in the diffusion of the practice of ceramics from the south of the Sahara or an independent center of origin? Future discoveries will no doubt have something to say about this.

The Emergence of Ceramics in Africa: A Turning Point in History?

The mastery of ceramic production may be considered one of the major inventions of African societies. Its discovery is far from being simply anecdotal. These societies facilitated from an early stage the management of wild grasses, both their conservation and consumption following cooking or fermentation. The data seem to suggest an invention to the south of the Sahara, around the latitude of the site of Ounjougou, between the 14th and 15th parallels, during the climatic improvement of the early Holocene, that is, in the first half of the 10th millennium cal BC or a little before. This invention is clearly linked to an environmental shift, as the sub-desert landscape of the preceding arid episode gave way to the open tropical savannahs, characterized by the spread of panicoid grasses and by changes to the range of animal species frequenting these new biotopes. These new ceramic-producing societies can be distinguished by characteristic bifacial armatures, perhaps adapted for hunting small mammals that visited these grassy areas. From this southern zone, populations advanced toward the central and eastern Sahara around 9000 cal BC, and it is possible that certain receptacles were initially copied in stone, as at Temet. It is worth emphasizing that the oldest ceramic remains are clearly scarce at the archaeological sites where they have been found, which indicates a progressive adoption of this new economy, whose precise objectives remain to be identified. Scholars can put forward, however, the hypothesis that the invention of ceramics could have been motivated by the new demands of a major period of climatic improvement. This equally allowed a high degree of mobility to populations within a wider area and potentially encouraged the adoption and diffusion of this invention by different human groups. Thus, only a little time afterward, from the mid-9th millennium cal BC, ceramic production was perfectly mastered in the central and eastern Sahara as well as in the Nile Valley, where craftspeople diversified the shapes and decoration techniques, as can be seen at the site of Tagalagal. The question of the independent invention of ceramics in the Nile Valley remains to be settled,
as the discoveries and the quality of the carbon-14 dates are not sufficient. However, from the 8th millennium cal BC, ceramics are found in the zone to the south of the 14th northern parallel, on archaeological sites in association with lithic industries of the complex segment microlith tradition of the Late Stone Age. Its use begins to generalize from the 6th to the 5th millennia cal BC onward. It is currently impossible to determine if this is thanks to a return of ceramic-producing populations from the Saharan or Nilotic zones toward regions then occupied by Late Stone Age populations ignorant of its use, or a local evolution to the south of the Sahara, without discontinuity, at local centers of origin such as Ravin de la Mouche at Ounjougou.

References


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Notes:

(1.) Dating carried out by Pierre Guibert at the University of Bordeaux, IRAMAT-CRP2A, with the aim of confirming the carbon-14 dates, whose age could have derived from the “old wood effect.”

Eric Huyscom
Université de Genève