3 ORIGINS OF POTTERY

The word 'ceramics' is derived from the Greek word *keramos*, which means 'clay'. *Keramikos* denotes a product made of clay, while *keramike tekhne* indicates the skill of firing ceramics (Miloglav 2011; 2014). In English, the word 'pottery' is used. 'Pottery' designates all ceramic products, and it is also used with reference to the potter's skill or art. Often pottery manufacturing is not an isolated activity of a single person; rather, several people within a community can be tasked with different steps within the production process (procurement of raw material and tempers, vessel shaping, treatment and decoration, firing). Regardless of the possible participation of several people in the manufacturing of ceramics, there is usually one person who is in charge of the vessel's final appearance and characteristics – the potter.

Pottery is among the most common materials processed and analysed by archaeologists. One of the reasons could be the fact that potsherds are statistically the most numerous finds recovered from archaeological sites. There are several important factors which contribute to such a situation. Clay is certainly one of the most abundant, cheap and adaptable materials available in nature, recognized a long time ago as a useful and exploitable raw material (Rice 1987: 7). Two further factors, certainly no less important, are the short period of its use and its resistance to many mechanisms present in the archaeological context, such as oxidation and bacteriological decay (Banning 2000: 161).

Ceramics are a combination of the four main elements: earth, fire, water and air. The transformation of clay into ceramic objects was preceded by wooden, stone and bone objects, which does not mean that clay and its properties had not been known and recognized already at that time. Some of the earliest items made of clay suggest that three important principles of use of this raw material had been recognized. The first is the understanding that moist clay is plastic and can be shaped, and that it will retain its shape when dried. The second important turning point in the exploitation of clay was the discovery of fire as a thermal source that transforms clay into a hard and durable product. Adding various materials to clay to improve its quality and hardness has led to the final understanding of all the possibilities clay can offer as a material suitable for further processing and maximum usage in everyday life (Rice 1987: 8). However, it remains unclear when pottery production became important in human history and gained prevalence in the manufacturing of utilitarian objects for everyday use. It is known that communities of hunter-gatherers began manipulating clay more in the Late Pleistocene and Early Holocene (Rice 1999). Still, the production of ceramic vessels and other utilitarian objects saw a more significant development with the occurrence of neolithization, sedentary lifestyle, plant cultivation and animal domestication. Ceramics are fragile and difficult to transport, and thus they were probably less important among hunter communities which were constantly on the move. On the other hand, ceramic vessels are best suited for thermal processing of food using water, and this method of preparation of foodstuffs such as seeds and grains allowed their easier consumption (Sinopoli 1991: 1–2).

THE OLDEST POTTERY

There are many theories about the emergence of pottery – that is, the realization that clay, if exposed to fire, can produce a hard and durable object. Until recently, the traditional view was

that the emergence of pottery was linked to the so-called Neolithic package, and that the first ceramic vessels were produced by sedentary populations at the time when they began cultivating plants and domesticating animals.

For a long time, our understanding of the history of technology and technological changes fell under the influence of social evolutionary notions of progress which emerged in the middle of the 19th century. The power of the idea of the Neolithic revolution had become so influential that archaeologists found it hard to distinguish between the discovery of pottery technology and the Neolithic package, or general processes associated with early agriculture (Jordan & Zvelebil 2010a: 45–47).

The current state of research and data obtained in the last several years by radiocarbon dating have shown that ceramics were used independently, for a long time, as early as the end of the Pleistocene, long before any farming activities were undertaken in the Holocene (Chi 2002; Kuzmin 2002; 2010; Bougard 2003; Keally et al. 2004; Kuzmin & Vetrov 2007; Boaretto et al. 2009; Jordan & Zvelebil 2010; Wu et al. 2012; Craig et al. 2013). The emergence of the earliest pottery vessels in China, Japan and Russia indicates that ceramics have an independent technological history, which is not associated with the beginnings of agriculture in the Neolithic, and that it was initiated by hunter-gatherer communities of the Upper Palaeolithic. After the discovery of pottery in eastern Asia, the practice was slowly incorporated into the social life of hunter-gatherer communities of various periods and in various ways, as it spread to eastern and western Siberia and eventually to eastern and northern Europe. These notions about the early history of pottery in northern Eurasia break the link between communities of hunter-gatherers and farming communities, established by European archaeologists of the 19th and 20th centuries (Jordan & Zvelebil 2010a).

The data obtained to date suggest that ceramics appeared in Japan around 13,500 BP (around 16,750-15,700 cal BP), in southern China from around 14,800-14,000 BP (18,500-17,500 cal BP) (Boaretto et al. 2009), and in Russia from around 13,300 BP (around 16,500-14,900 cal BP) (Keally et al. 2004; Kuzmin 2010). The dates recently obtained in China (Xianrendong Cave) are the oldest obtained to date in relation to the use of pottery, ranging between 20,000 and 19,000 cal BP (Wu et al. 2012). Those vessels, the earliest that we know of, were fired at low temperatures (between 400 and 500°C). Their shapes are simple, mostly with rounded bottoms, and they are decorated with lines, cord impressions with textile patterns. Most of them display traces of soot on their external surfaces, indicating that they were used over a fire (Keally et al. 2004; Boaretto et al. 2009; Jordan & Zvelebil 2010a; Wu et al. 2012). An analysis of phytoliths recovered from the cave have shown remains of wild and cultivated rice, suggesting that cultivated rice was a part of the regular diet of the period (Chi 2002: 31). Similar to what has been seen at other sites, the prevailing remains are those of various types of fish and molluscs (Chi 2002). Analyses of organic remains from the earliest vessels of the Japanese Jomon Culture (15,000-11,800 cal BP) have uncovered traces of fresh-water and sea products on the vessel walls, suggesting that the early pottery was used to prepare such food, especially seafood (Craig et al. 2013).

As far as pottery technology and pottery paste go, differences can be observed in ceramics originating from the three distant regions. The earliest pottery from Japan displays simple forms with flat or conical bottoms, organic tempers (plant fibre) and surface decoration executed by impressions and incisions (Keally et al. 2004: 349). In Russia (in the River Amur area), vessels were of similar shapes, with thick walls and a clay matrix tempered with grass, while they were

decorated with vertical grooves, zig-zag lines and cord impressions (Keally et al. 2004: 349). In southern China, the vessels had rounded bottoms, they were tempered with coarse quartzite grains, and their surface was mostly hand-smoothed (Chi 2002: 32; Keally et al. 2004: 349). A very interesting temper has been discovered in a small number of sherds recovered from the Xianrendong Cave – grog, or crushed ceramics (Chi 2002: 33). This discovery pushes the limits of deliberate tempering with grog. Interestingly, the pottery of northern China – somewhat younger – was different in both shape and paste composition. Here, all the shapes can be classified as jugs, and the tempers used included quartz, sand, shells and mica, which testifies to different cultural traditions (Chi 2002).

The above demonstrates that the earliest vessels emerged in different regions, very distant from one another, and culturologically independent of one another, but in almost the same period of time. In view of the different methods of shaping, decorating and tempering, it is likely that pottery development in each of these regions progressed independently, rather than as a result of migrations or technological exchanges (Keally et al. 2004).

NEW TECHNOLOGY – THE REASONS FOR THE EMERGENCE OF POTTERY

As early as the end of the 19th century, Henry Lewis Morgan defined the emergence of pottery within the framework of social and cultural development, i.e. as a difference between barbarism and savagery. Morgan did not associate pottery with agriculture; in his mind, the invention of pottery was a separate step in the social and technological evolution of mankind, from savagery to barbarism. It was only Sir John Lubbock who, in 1865, made the connection between plant cultivation, animal domestication and the discovery of pottery, as interrelated elements which together marked the Neolithic. In western Europe, his arguments were generally accepted and, thanks to Gordon Child, they became very influential and incorporated in the definition of the 'Neolithic package'. (For an overview, see Jordan & Zvelebil 2010a: 45–48).

There are numerous theories about the origin and emergence of pottery. One of the assumptions is that pottery-making was inspired by cracks in the earth which appeared when the soil dried off after abundant rain (Goffer 2007: 239–240). Other theories can be generally summarized as the 'architectural' hypothesis and the 'culinary' hypothesis, social/symbolic elaboration and the notion of resource intensification. (For an overview, see Rice 1999; also Miloglav 2011).

The ***'architectural hypothesis'*** is based on comparisons between use of clay for the production of structural elements needed for construction, and the construction of pottery vessels. According to this theory, the first ceramic vessels were created as an imitation of architectural techniques which had been used for the construction of houses, and these included mixing of clay and straw to obtain a type of plaster, and the method used for the production of clay blocks which were also used for construction (mudbricks, or unfired bricks dried in the sun).

The proponents of the ***'culinary hypothesis'*** believe that ceramic vessels were created once people realized that clay left exposed to the sun hardened and could be used for preparing and storing food and liquids. They associate the invention of pottery vessels with clay used to line the inside of baskets, after which such containers were left in the sun to dry and become impermeable. Furthermore, it has been emphasized that clay was used for lining stoves or firing pits used to heat up stones, and this had already resulted in the realization that clay hardened when dried or heated.

The use of hot stones for heating liquids and cooking food in baskets, animal skins or wooden vessels has been registered in many archaeological and ethnological examples. This method of early food preparation could not achieve high and long-lasting temperature of the liquid used to cook food of plant or animal origin, nor could such objects be used over a long time. The technique required a large amount of fuel to heat up the stones and make it efficient for cooking. The stones were placed next to the fire source or directly in the fire, and, when hot, they were put into baskets or containers made of bark or wood, which also contained liquid and foodstuffs. Heat would be transmitted from the stones to the liquid, and the whole process would be repeated until the liquid was heated to the temperature needed for the food to be cooked (Nelson 2010).

Unlike the containers mentioned above, which were mostly made of organic material, pottery could be placed directly over a fire, and presented no difficulties in terms of maintaining high temperature in vessels containing large amounts of liquid. This is precisely the reason why some authors believe that pottery became widely used: when compared to stone-boiling in baskets or animal skins, it required less attention during food preparation. From this viewpoint, ceramic vessels represented a technological simplification which eventually made it possible for people to devote their time to other tasks and daily activities. In this respect, it has been emphasized that the link between cooking and food is less important than the link between time and energy invested in overseeing the cooking vessel (Schiffer & Skibo 1987; Eerkens 2008).

The concept of **'*resource intensification*'** corresponds to a certain degree to the **'*social/symbolic elaboration*'** of the emergence of the first ceramic vessels. It regards changes in daily activities and social organization within a community of hunter-gatherers at the end of the Pleistocene and in the early Holocene. Mobility was declining, and sedentarization was on the rise, accompanied by linear growth in the demand for food storage. This theory links the first pottery vessels to food used for some special social activities – for example, for ceremonies and offerings – and on special occasions. The symbolic function of such special-purpose objects has been analysed through their surface decorations and the various (symbolic) motifs that can be found on them. One of the theories that are often quoted in this interpretational field of the invention of pottery regards the notion of "prestigious technology", within the meaning of an economically-oriented socio-political scenario, and its originator was Brian Hayden. The emergence of the first ceramic vessels is explained as a result of the need for common feasting and/or the impressing of guests, with a view to hierarchical differences within the society, and the emphasizing of status, welfare or power. (For an overview, see Budja 2010). Hayden later suggested that the first pottery was used for the preparation of special (luxurious) meals, implying that the new technology was used for the production of prestigious products (Hayden 2010). Hayden also lists several types of meals, such as soups and stews, and ingredients such as fish oil, sea-mammal oil, animal fat, nut oil and alcohol. All these foodstuffs required a lot of effort and energy, fuel and large quantities of ingredients – especially for oil extraction – which brought him to the conclusion that such meals had been prepared for special occasions.

A question which still remains open is why people began using 'containers' made of clay, when they were using those made of other materials. Perhaps one of the answers is that pottery provided a new technology which made it possible for some new foodstuffs to be prepared in impermeable vessels. Vessels made of fired clay offered many advantages, among which are (Rice 1999: 8):

1. increased efficiency of preparing new foodstuffs, especially grains (barley, wheat), which could be boiled over a fire or roasted

2. increased capacity and durability of food storage
3. enhanced quality of food resulting from the preparation of fresh ingredients – destruction of harmful bacteria, improved digestion
4. reducing of the time necessary for overseeing food cooked in ceramic vessels, as compared with that cooked in the previously used containers made of stone, bark, animal skins or basketry
5. the ability to consume food containing toxins, which could not be consumed in the everyday diet if not thermally treated.

The invention of pottery has not been completely resolved, and it remains to be seen whether it ever will be. There could have been several reasons for it, and they must be considered bearing in mind the wide range of changes which occurred at the end of the Pleistocene and in the early Holocene. The need for a new technology was probably prompted by a number of existential, climatic and environmental factors. Ethnoarchaeological studies conducted in 862 communities have shown that pottery making is very rare in non-sedentary and very small communities (only 12%) (Arnold 1985).

As regards pottery production, hunter-gatherer communities whose lifestyle was semi-sedentary or sedentary had several advantages: they were not limited by the time needed to make a vessel (the process takes between several days and several weeks), or by weather conditions which impact the making and drying of pottery. Bearing in mind the seasonal moves of distinctly mobile communities, pottery making there depended on other activities performed in the community, which did not allow sufficient time for the production of ceramic vessels. This relates primarily to gathering fruit which ripened during the dry season, making its collection and storage a higher priority for the community (Eerkensen et al. 2002; Eerkensen 2008). Whatever the key reasons for exploitation of clay in everyday life, the understanding that clay and fire manipulation could bring about products that could be used for cooking/preparation/storage of food and liquids was especially important. The appearance of pottery represents a concentration of human experience and knowledge relating to the choice of material, technological processes and needs. It represents a compromise between the needs and characteristics of available resources, design, production technology and final usage (Rice 1999).

Although the reasons which led to the first use of pottery vessels remain unclear, I can agree with those who believe that the creation of pottery was conditioned by the utilitarian need for a water-resistant object that could be used for food storage and preparation over a fire. The technological innovation provided a new object with all the features that were missing in containers such as baskets, and those made of skin or wood. Traces left on the vessels by fire suggest that pottery was used for cooking 'from day one', and that there was no technological transition or adjustment to its use. Given their primary use for thermal preparation of food, pottery vessels were particularly suitable for preparing soups and stews, since they could maximize nutritional values and hold in the juices and taste, resulting in a better, higher-quality diet. Although cooking facilitates meat digestion, most of its nutritional values are lost during its roasting over an open fire. Slow simmering of meat, for example, in a goulash, in a water-resistant container, prevents the loss of nutrients and conserves high-calorie fats. The use of fire was important for the extraction of oil, plant juices and animal fats from ingredients, but it also made it possible for those oils and juices to seal the pores in the pot, making it impermeable (Rice 1999).

Whatever the reasons for the emergence of pottery, one thing is certain: it contributed to a higher quality of life in every aspect. At the simplest level, it improved dietary habits and activi-

ties relating to the preparation, storage and transport of food. As active objects, pottery vessels were used in religious and burial practices and for communal feasting; they demonstrated the power, status and identity of the community; and they were, and still are, a part of the continuous and uninterrupted social and cultural interaction.