Ingestion and Food Technologies: Maintaining differences over the long-term in West, South and East Asia

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Andrew Sherratt's interpretation of a Bronze Age world-system emphasised flows of materials, ideas and people in the integration of large regional systems. In this paper the authors complement this stance and Andrew's recognition of the social importance of food with a focus on long-term boundary maintenance and how these are maintained even with evidence of large-scale flows in other contexts through a focus on long-term continuities of food systems. Ritual and cosmological ideas, foodstuff selection and technologies of preparation and consumption (including pottery usage) indicate stable culinary or food zones over millennia despite the movement of food items: roasting/grinding technologies in western Eurasia (the Near East and Mediterranean); boiling/steaming of foods in eastern Eurasia (China and the Far East); with an alternative overlapping food world in South Asia.

> "Calories don't *cause* people to do things; calories *allow* them to do things they want to do for other reasons"
>
> Andrew Sherratt (1995, 8)

> "Although masquerading as a neutral, descriptive term, 'subsistence' is in fact heavily freighted with intellectual baggage…. 'mere subsistence' implies just enough to keep body and soul together: enough to stay alive without transmitting messages about social superiority. The very employment of the term implies the constant danger of behaviour which it forbids. Such motives also underlie its more general usage: the whole concept is actively constructed in opposition to an accurate depiction of everyday reality. It is, in short, a rhetorical rather than a scientific term: a utopian representation of a world without ostentation and cupidity."
>
> Andrew Sherratt (1999, 13)

Introduction: substances, sacrifice and more than subsistence

Food is a fundamental cross-cultural category of consumption combining biological need with socially charged symbolism. In all societies commensality, the sharing of food, is a way of establishing closeness and refusal to do so is usually seen as a sign of distance or enmity (Bloch 2005, 45).Cultural anthropology and archaeology have long explored food in the ethnographic present or the distant past, but with rather different emphases. Archaeologists have tended to discuss "subsistence," and the means by which past human groups procured enough to eat, from foraging or food production. As the late Andrew Sherratt (1999) emphasized, the standard archaeological use of the term "subsistence" is problematic, since in more general usage it implies a bare minimum of necessary sustenance, as in "subsistence-level" farmers, and tends to preclude much consideration of food as a source of surpluses for social exchange, as through feasting or trading in valued foodstuffs. More recently, there has developed a focus on feasting as ritualised acts of commensality involving food sacrifice, conspicuous consumption and luxury foods in

marking differences within social hierarchies, *i.e.* commensal politics (*e.g.* Dietler 1996; Dietler and Hayden 2001; Bray 2003; van der Veen 2003; Jennings *et al.* 2005). Such a focus still maintains a distinction of the feast from more mundane acts of food consumption. This can be thought of as an explicit counterpart to habituated *taste,* in the sense explicated by Bourdieu (1984, 173–193) as embodied class culture in which social position is indicated through self-fulfilling preferences.

Anthropologists have instead, developed a discourse on substances, with food as part of the 'natural' components that make up bodies, like blood defined by Schneider as 'a *fact of nature'* or those ingested, like liquids and food, or excreted, like semen or saliva (Schneider 1980; Bloch 2005; Warnier 2007). An anthropological attention to how the body and its substances are understood has highlighted different cultural schema in terms of what is basically immutable, what is mutable and what is partible (Strathern 1988). There is frequently a rich set of symbolic beliefs surrounding most culinary systems, linking these to conceptions of the body, kinship and society (*e.g.* Beardsworth and Keil 1997; Bell and Valentine 1997; de Boeck 1994; Lèvi-Strauss 1978). As has been often discussed by anthropologists bodily substances (semen, breast-milk, blood *etc.*) may be conceived to combine in different ways with 'natural' substances to create body differences, reproductive differences and contrasting conceptions of sexuality (Strathern 1992; Battaglia 1995). Cultural differences in the understanding of food and bodily substances have been largely discussed in an ahistorical, ethnographic present, and we would like to combine this approach with the more subsistence focused work of archaeologists, by considering the long-term material practices of food preparation and consumption which can be accessed by archaeology (Jones 2007).

Archaeology, history and ethnography together provide access to long-term and apparently quite stable patterns in food preparation and cuisine. We will argue that there is a long-term additive process in the development of culinary systems, in which new foods are added to existing repertoires, or new cooking techniques are adopted as elaborations, but essential regional traditions are maintained. These regional technologies of food, culinary systems, may themselves play a role the in the selection of appropriate foodstuffs, acting as templates to additions and changes in food. There are also examples of cultural traditions of taste and preparation acting on the genetic changes of food plants to better fit with cultural traditions of cuisine. Thus cultural systems of understanding and valuing food can be argued to have conditioned biological selection on certain species, just as much as it conditioned technological evolution.

We will focus on a particular contrast between boiling and roasting regimes, like those of east Asia and west/central Asia respectively. In developing our understanding of a bread-focused and roasting culinary system of west Eurasia, we will point towards the overlaps and differences with adjoining south Asia and northern Africa. Work along these lines has already been done by Haaland (2006; 2007) who has drawn contrasts between northeast African porridge and Near Eastern bread cuisines, but we will expand this over larger Eurasian and north African geography and explore relationships of food preparation regimes, food texture, and systems of ritual and supernatural understanding. Roasting and baking, for example, are strongly linked to notions of sacrifice in which smoke 'feeds the gods' (*cf.* Vernant 1989). Roasting and bread based cuisines, associated with west Eurasia and northern south Asia, seem to correlate with cosmologies invoking distant gods/spirits for whom sacrifice is a means of propitiation. By contrast in east Eurasia, with a focus on China, techniques of boiling, elaborated into steaming, were long fundamental to cuisine and linked with commensality and regimes of feeding ancestors by living descendants. Boiling, as recognized by Levi-Strauss (1978, 482) is well-suited to representing commensality through a cooking process that seals in substances. Such practices suit, cosmologies in which good spirits and gods are meant to be attracted to reside close to the living lineage members. We will also explore the division within the rice eating world between the sticky rice zone of eastern Asia, and the non-sticky area of south Asia, which foregrounds a major culinary frontier between east and west Eurasian food systems. The combination of technological traditions engrained within cosmological frameworks may make for very powerful forces of technological and subsistence conservatism. We argue that there is a deep level of conservative tastes that link basic ideas of feeding the body, *i.e.* the taking or ingesting of food, to notions of ritual efficacy, of 'feeding' the invisible (ancestors/gods), and to long term patterns of culinary practices.

Pottery versus grinding: pre-agricultural functional alternatives

Archaeologists have long focused on the origins of food production as a fundamental change in subsistence, what Childe (1936) called the "Neolithic Revolution". As noted by Sherratt (1995) this assigned a priority to calorific values, in which the shift in obtaining food, through domestication of plants/animals is given primacy over changes in settlement pattern, social organization and ritual (for recent surveys see Bellwood 2005; Barker 2006). While factors such as the ability to produce larger surpluses and feed more people have no doubt been important, we wish to highlight that there is more to food and always has been. Economic and

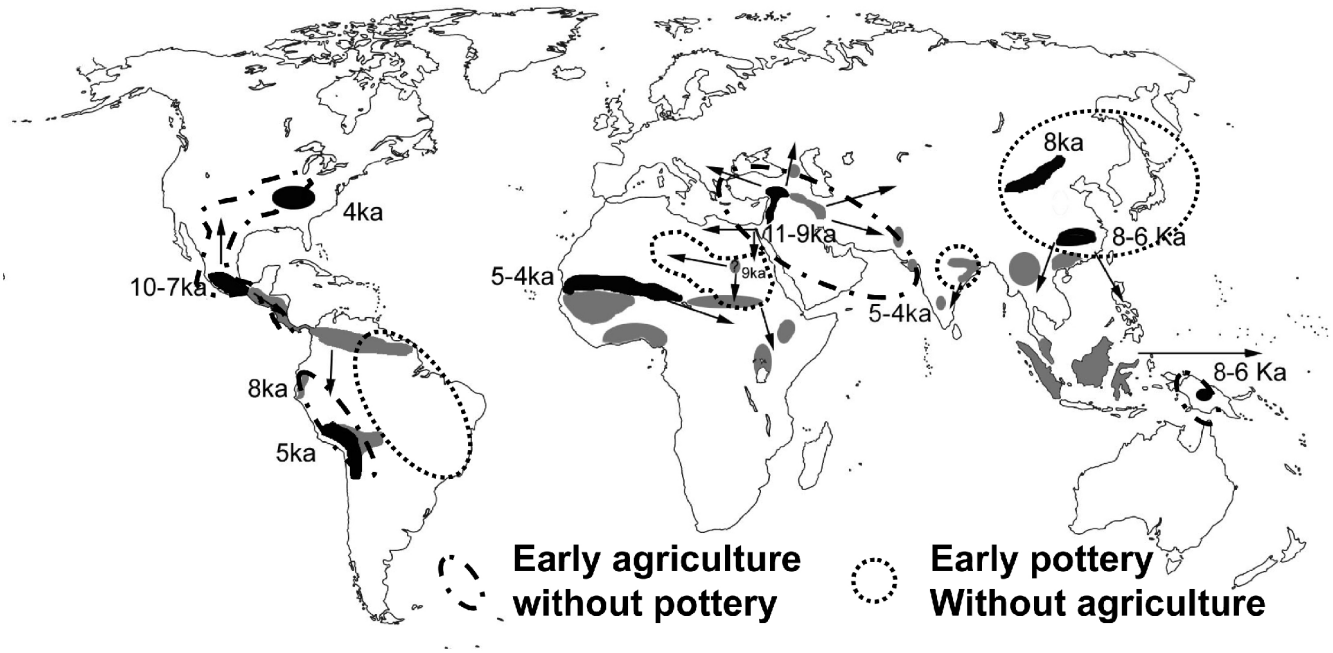

Figure 5.1. Map showing contrasting regions where pottery preceded agriculture (dotted outline) versus those where agriculture preceded pottery (dash & dot outline). These broad zones are overlaid on an updated map of centres of crop domestication (after Purugganan and Fuller 2009). Black indicates areas of accepted primary domestication, while grey indicates possible centres or areas important for secondary domestications of additional species. Ka: approximate age of early agriculture in 1000s of years before present.

social motivations have also been explored in various ways by archaeologists (*e.g.* Bender 1978; Hayden 1990; Hastorf 1998; Sherratt 1999; Marshall and Hildebrandt 2002), but mainly as alternative prime-movers in driving subsistence and increasing food production, without altering the focus on food as subsistence or commodity (as critiqued by Sherratt 1991; 1999). Instead we would like to consider the long-term connections between food and cultural tradition, which have contributed to some of the macro-geographical patterning in material culture traditions. As a starting point we would like to consider contrasts in the technology and techniques of food preparation, the presence of tools for intensive grinding versus those of boiling (and later steaming), as an aspect of the material record of archaeology that is particularly well-documented in several prehistoric regions.

Pottery and the beginnings of agriculture, although linked through the notion of a "Neolithic revolution" (Childe 1936), have no intrinsic link. The archaeological evidence is more varied, however, and suggests that early ceramics had different purposes in different regions, and ultimately played a variable role in terms of technologies of cooking and in the basic formation versus elaboration of cuisine (Rice 1999; Fuller 2006, 60). Archaeologically we can draw broad regional traditions in which ceramics precede agriculture versus those where ceramics were added to technologies that already included food production and domesticated plants or animals (Fig. 5.1). The differing regional chronologies and orderings of the elements of Childe's Neolithic package are clear when evidence for grinding, ceramics, domesticated plants and animals is plotted on a time-space chronological chart for Asia and North Africa (Fig. 5.2).

In some regions pottery appeared after the beginnings of agriculture, and provided new elaborations of food preparation. This was true in the Near East and eastern Mediterranean, Pakistan (Jarrige *et al*. 2006; Fuller 2006, 20–22, 27–28), the American Southwest (Crown and Wills 1995; Plog 1997), eastern north America (Smith 1992; 1995). On the western desert coast of Peru, plant cultivation precedes ceramics by at least a millennium, while in the highlands probable animal domestication is similarly pre-ceramic (Burger 1992, 28–33, 42–45; Pearsall 1992). The Near East, one of our foci in this paper, is especially well-documented, with pre-ceramic evidence for domesticated crops and livestock certainly by 8000 BC (*e.g.* Bar-Yosef and Meadow 1995; Moore, Hillman and Legge 2000; one can argue details about where to draws the line, whether with the very first

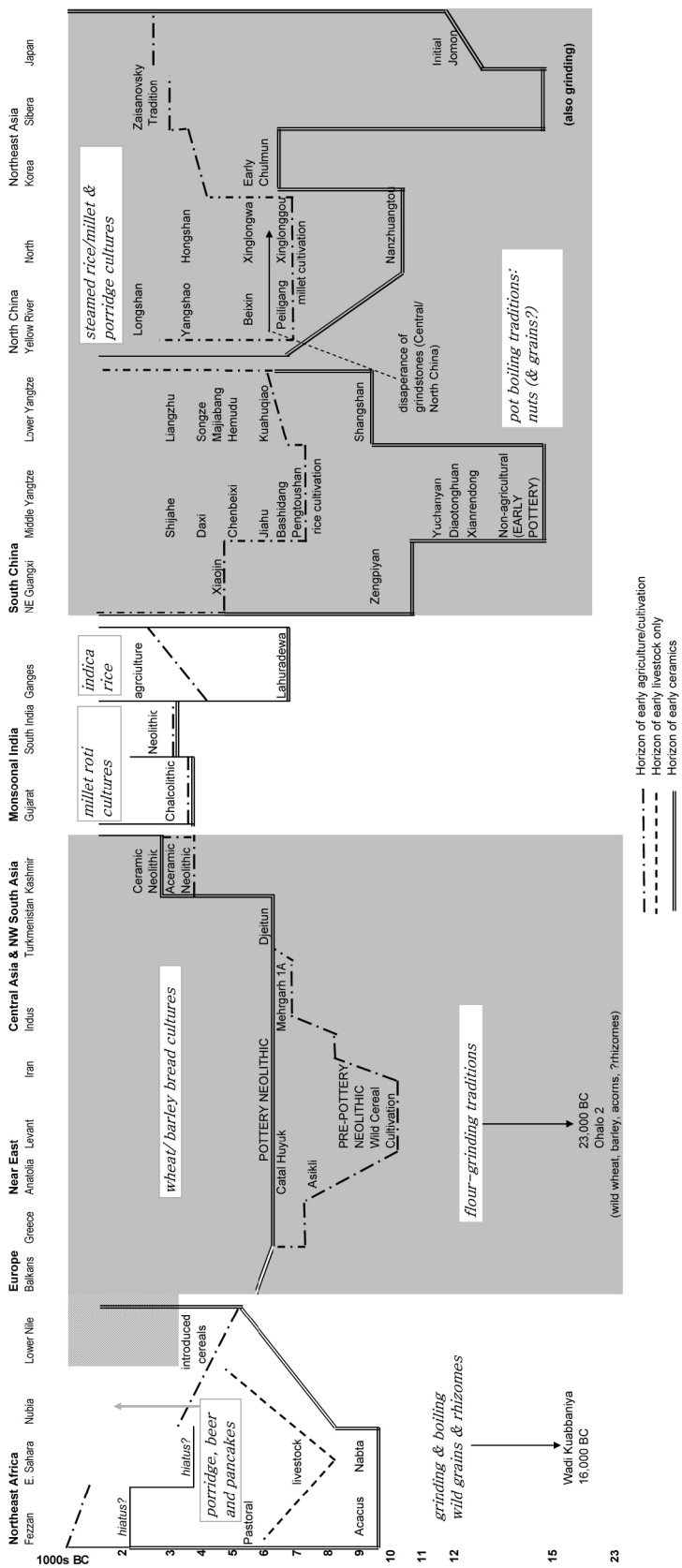

Figure 5.2. Chronological chart for Eurasia and northern Africa indicating the relative timing of the development of plant cultivation, pastoralism, pottery, and the presence of grinding. Shaded are the two core areas for distinctive Asian worlds of food processing, body substance and sacrificial practice.

domesticated plants or with the dominance of domesticated plants, which itself is a slow transition, see Fuller 2007). Here the exploitation of wild cereals and evidence for the preparation of flour with grinding stones dates back to *ca.* 23,000 cal. BP at Ohalo II, where plant remains indicate the use of wild emmer, wild barley and small-seeded grasses along side acorns (Kislev *et al.* 1992; Weiss *et al.* 2004; 2008), while starch grains confirm that preparation of barley flour was carried out (Piperno *et al.* 2005). We return below to the long-term development of this grinding tradition.

In other regions pottery seems to have developed early amongst hunter-gatherer-fishers for whom agriculture developed later, often 1000s of years later. Indeed Rice (1999) suggested that this was the more common pattern for the emergence of ceramics. In the tropical lowlands of South America pottery begins in some local traditions *ca.* 4000–3500 BC, amongst forager-fishers (Roosevelt 1995; Oyuela-Catcedo 1995). Perhaps the best known Old World example is that of the Jomon cultural complex of Japan, where pottery was made in the late Pleistocene (13,000 bp),[1] prior to evidence for clearly domesticated crops by perhaps 10,000 years (Imamura 1996; Crawford 1997; Kobayashi *et al.* 2004; Habu 2004). Even earlier pottery in the Russian Far East (Tsutsumi 2002, 247–249; Kuzmin 2006), and comparable Late Pleistocene dates are available for pottery in south China from at least 15,000 bp (Yasuda, 2002; Yan, 2002; Zhang 2002; Kuzmin, 2006), and perhaps as early as 18,000 years ago when radiocarbon dates are calibrated (Boaretto *et al.* 2009).

Early pottery of the Sahara precedes domestic plants and animals in many regions, although it may have initially developed in the Eastern Sahara in the context of hunter-cattle-herders who gathered wild grasses (Close 1995; Marshall and Hildebrandt 2002; Jesse 2003; Neumann, 2004; Jousse, 2004). As explored by Edwards (2003; 2004) in the context of Nubia, and Wengrow (2006) in the context of Neolithic Egypt the early ceramics, together with grinding technology, in the Nile valley seems to be connected to making porridges and beers. Bread appears to be an adopted/imposed tradition of Late Predynastic Egypt and part of a larger set of shared stately symbols drawn from the west Asian/Mesopotamian tradition. Ancient Egypt then formed a frontier for fusion between the grinding and bread world of the Middle East and the porridge and beer zone of the Sahel and eastern savannahs, as explored in recent papers by Haaland (2006; 2007). A similar situation may hold for the Middle Ganges region of India, where recent work at Lahuradewa puts pottery back to *ca.* 7000–6000 BC, before clear evidence for agriculture that is some millennia later, perhaps after 3000 BC (see discussion in Fuller 2006, 39–46).

Ceramics and grinding are essentially functional alternatives for making foods more edible, for the "post-harvest intensification" of food stuffs (*cf.* Wollstonecroft 2007), but they also provide a means of creating varied tastes. Both provide means for processing and cooking may enhance edibility by increasing the bioacessibility and bioavailability of nutrients, in which the quantity of absorbable nutrients is increased, and they may be important in removing toxins. The use of food processing technologies like grinding, leaching and various forms of cooking to alter the nutritional content of foods has of course been widely documented (*e.g.* Friedman 1992; Stahl 1989; Yen 1975; Wollstonecroft *et al.* 2008). Processing affects the extent to which the wide spectrum of nutrients trapped inside a food are digestible or 'bioaccessible', and constitutes a significant recent topic of interest amongst clinical nutrition researchers (Ellis *et al.* 2004, Parada and Aguilera 2007; Hotz and Gibson 2007; Berry *et al.* 2008), with important implications for understanding prehistoric food (Wollstonecroft 2007; Wollstonecroft *et al.* 2008). Some of these processing techniques may be understood as forms of resource intensification, since they permit increasing quantities of digestible calories to be extracted from an equivalent quantity of food stuff through processing (Stahl 1989; Friedman 1992; Wright 1994; Wollstonecroft 2007). Although particular plant species will react differently to simple heating, boiling or pulverisation, or combinations of these techniques (*e.g.* Ellis *et al.* 2004; Hotz and Gibson 2007; Wollstonecroft *et al.* 2008), in broad functionalist terms ceramics and grinding techniques may be alternative adaptations. This raises the question as to under what circumstance cultural groups may have preferred one or the other, or whether the choice was predetermined by culturally-inherited matters of taste or ritual understanding in which food was embedded.

While we may often find these two technologies, grinding and pottery, together, archaeologically we can find regions that early on emphasised one or the other, and these early food-processing regimes seem to have established long-lasting culinary traditions (Fig. 5.3). What is of particular interest is that these seem to show particular longevity from the Late Pleistocene or Early Holocene (from prior to the beginnings of agriculture). Thus in southwest Asia the earliest ceramics dates to 6500–6000 BC (Moore 1995), some 1000–2000 years after cereal domestication, and perhaps as much as 5000 years after the beginnings of cultivation (*cf.* Moore *et al.* 2000). In East Asia, as we have noted ceramics are present from the late Pleistocene (Kuzmin 2006; Boaretto *et al.* 2009), and while grinding stones are also present, they seem to become less important over time especially in the Middle Neolithic (after 6000 BC), when cultivation is more clearly established (*cf.* Lu 1999; Crawford 2005; Fuller, Harvey and Qin 2007; Fuller *et al.* 2008) and ceramic technologies have been improved and elaborated (see below). It can be suggested that these approaches to food are more than just

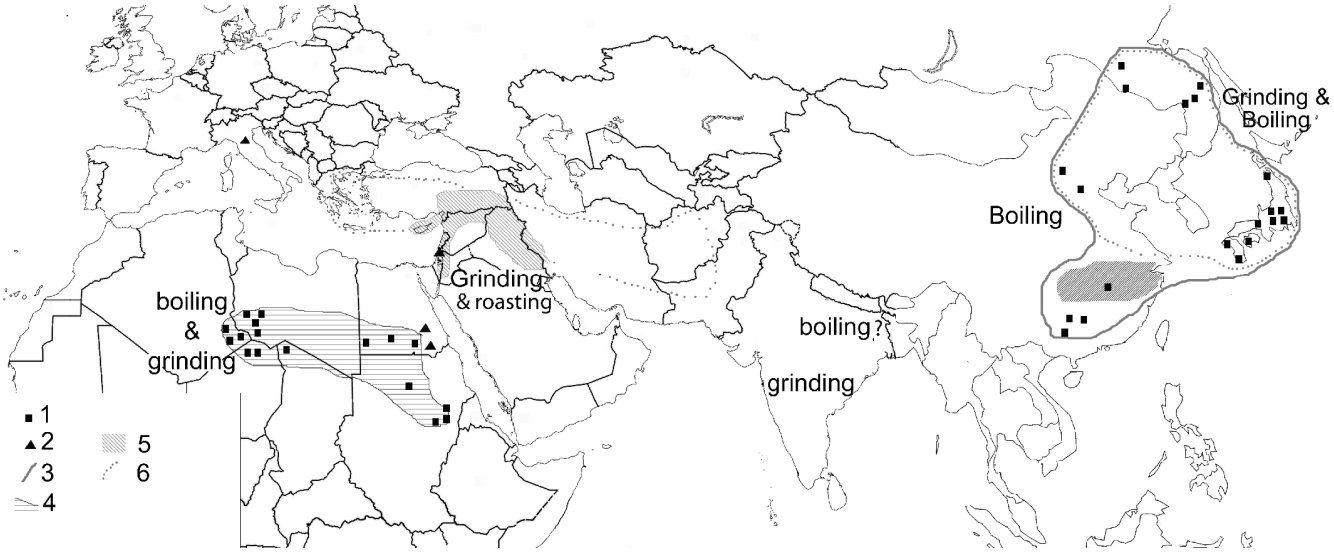

Figure 5.3. Map showing early food worlds: a boiling zone in east Asia, a grinding zone in west Asia as well as south Asia, and grinding-cum-boiling tradition that had developed in the southern Sahara in the early Holocene. Key: (1) Representative sites with early, pre-agricultural pottery; (2) Sites with early pre-agricultural and pre-ceramic quernstones, including Wadi Kubbaniya, Toshka in Nubia, Ohalo II in Israel, and Bilancino in Italy; (3) Greater distribution area of late Pleistocene to Initial Holocene ceramics in eastern Asia with probable tree-nut use; hatched in the Yangtze zone of early rice agriculture; (4) Distribution of early Holocene ceramics of the Sahara-Sudanian zone of the Dotted Wavy Line/Aqualithic complex; (5) The 'fertile crescent' where agropastoralism was established by the middle Pre-Pottery Neolithic period. (6) In west Eurasia: indicates the core grinding zone where there was an aceramic Neolithic based on wheat/barley agriculture; in northeast Eurasia: an area where flat grinding stones were present through the early to mid- Holocene together with ceramics.

technologies for nutrition but have become embedded in cultural traditions of 'what food is', and cosmologies in which food is usually embedded. As new foods and technologies have become available they have more often than not been adjusted and added to these existing traditions in ways which add elaboration and choice to the existing systems without fundamentally changing them. The linkage to cosmologies and relations to sacrificial rites suggests a strong psychology of food and eating which is about far more than just calories, but about understandings of the substance of individuals, social units and cultural tradition.

Grinding and bread: the basis of the west Eurasian culinary tradition

In west Eurasia, including the Near East, north African and the Mediterranean, there was an early application of grinding technology to the processing of plants. In Italy, grinding stones are known from the Gravettian Upper Palaeolithic, apparently used for making flour from wild plants, including wild grasses and cattail/ reedmace tubers (*Typha*) (Aranguren *et al.* 2007). In the Nile Valley and the adjacent Sahara grinding stones dating back to the late Pleistocene have been found at Upper Palaeolithic sites in the Nile Valley and the Sahara, for example (Kraybill 1977; Midant-Reynes 2000; Wendorf 1968). It is now clear that these were employed by broad spectrum hunter-gatherers who exploited a range of small seeds, though with a probable focus on the grinding of small tubers, especially from wetland sedges, as evident at Wadi Kubbaniya at 16,000 bp (Hillman 1989). In both of these instances it is clear that grinding was a technique used by hunter-gatherers on a range of wild foods, which can be expected to have made foods such as sedge tubers edible (*cf.* Wollstonecroft *et al.* 2008), as well as making possible the preparation of doughs or batters.

In the Levant, the earliest Epipalaeolithic, best documented at Ohalo II, included the use of grindstones, which have been demonstrated from starch grain analysis to have been employed in the grinding of wild barley and other grasses (Piperno *et al.* 2004), as part of a wider subsistence strategy that relied heavily on small seeds together with some other fruits and nuts (Kislev, Nadel, and Carmi 1992; Weiss *et al.* 2004; 2008). During the course of the Epipalaeolithic and continuing into the Neolithic, groundstone tools (querns, mortars and pestles) show a net increase in numbers across

sites in the region, as well as increasing signs of elaboration (Wright 1994; Wright 2000; Dubreuil 2009). Food processing by milling appears to have been central to the organisation of settlement space from the Natufian through the Neolithic (Wright 2000).

In all three of these areas, grinding stones therefore precede the domestication of cereals by more than 10,000 years. It is clear that grinding was applied to a wide range of potential food stuffs including sedge tubers and wild grasses, and in parts of the Levant including wild barley and wheats. Grinding implies the creation of flours and plausibly bread-making. While there may be an adaptive role for grinding in making new foods edible and intensifiable, it nevertheless structured the way in which foods were prepared and consumed, leading to bread, pancakes and other batter-based cooked products. This seems to have set up a tradition of finished food products and texture which has persisted to the present day, through economic transformations, the domestication of species and the introduction of new food species. As noted by Lyons and D'Andrea (2003) the cereals domesticated in southwest Asia (wheat, barley, rye) all contain the protein gluten, providing for the possibility of leavened breads and "doughy" preparations. A situation that can be contrasted with sub-Saharan Africa, or indeed east Asia, where millets, sorghum or rice lack such gluten. This is therefore suggestive that one factor in the choice of these grains for intensification, cultivation and ultimate domestication was that they had textural characteristics that fit into existing culinary traditions, of taste and texture, linked to preparation through grinding. While the usual explanation for selection of these grasses for domestication is that these species possessed especially large grains (Blumler 1996; Diamond 1997: 139) – and no doubt it may be a contributing factor – elsewhere extremely small-grained millets (such as Ethiopian tef or West African fonio) have been preferred. We may thus speculate that the particular grasses selected for domestication in the Near East (wheat and barley) and later in Europe (oats and rye), were selected from amongst the range of grasses in part for their potential flour and bread making qualities.

The emphasis on breads is hard to explain on purely ecological or nutritional grounds. Although gruels and porridges may also have been made by heating flours with water in baskets or skins, by addition of hot rocks – a technique implied by evidence for bone-boiling in the Natufian of the Near East (Munro and Bar-Oz 2005) – subsequent culinary developments focused on the elaboration of breads, in contrast to neighbouring regions further south. Ovens, of the *tannur* type, which allow the baking of flat breads (or *pita* or *naan* type) developed early in the Near East. The earliest ovens were pebble-filled cylindrical pits at Mureybit (9500–900 BC), which are suggested to have been used for communal meat roasting (Cauvin 2000, 41). At Mureybit the ovens are associated with a circular radial building, a distinctive type on a number of sites that is suggested have had a central social function like an ethnographic *kiva,* and perhaps associated with feasting (Stordeur 2000; Peltenberg 2004: 78). Oven finds become more widespread in later Pre-Pottery Neolithic settlements (from *ca.* 7000 BC), such as Maghzalia, a domed brick oven at Ali Kosh in Iran (*ca.* 7000 BC) and the early ceramic era (Maisels 1990, 101, 110, 114). Of similar date was a domed oven found at pre-ceramic Mehrgarh in the Indus valley region (Possehl 2002, 25–26). Such cylindrical or domed *tannur* ovens (Sumerian *tinûru*: Bottero 2004, 47) are a tradition that extends through the urban civilizations of Mesopotamia, Egypt, and the Indus valley down to the present day (Curtis 2001, 125, 207–208).

Thus, it is perhaps not surprising that when ceramics were developed in the west Eurasian region, they were adapted to the production of bread, which could now be leavened in ceramic containers. Ceramics do not emerge in the Near East until millennia after the beginnings of cereal agriculture (Gopher 1995; Moore 1995), during which time plant cultivation and animal herding became established over a wide area, from Pakistani Baluchistan to the Peloponnesus in Greece. Moore (1995, 47–48) suggests that pottery marks new elaborations in cuisine, with mixed meat and plant dishes cooked as casseroles and stews being added to existing traditions of meat roasting.

By contrast in the boiling-and-grinding Sahara, preparation of cereals differed. Within the Sahara where ceramics were also present from *ca.* 8000 BC, and thus invented some one or two thousand years before the Near East, porridges and fermented foods (like beers) may have featured. The gluten-free cereals, such as sorghum and wild millets that came to be cultivated in the Sahel and Savannah, lent themselves to such preparations, and fermentation into beers, which seems to have developed and persisted as a distinct Sudanic cuisine that differed from the bread world of the Near East (Edwards 2003; Haaland 2006; 2007). Griddle cakes in the trans-Saharan region, stretching from Ethiopia and Sudan in the east (Lyons and D'Andrea 2003) to the Morocco in the west (Bruneton 1975), have also often been based on fermented doughs. By contrast, in the absence of pottery, as in the Near East and pre-Neolithic Europe, we expect flours to be turned into bread-like products, and this suggests a co-evolutionary feedback between technologies of preparation and taste in particular foodstuffs. This correlation, we would suggest, is the product of embedded understanding of how food is embodied in individuals and communities and related to the supernatural.

In the grinding zone, the staple foods for the masses of the riverine civilizations of Egypt and Mesopotamia were breads, and breads also served as offerings to the gods. Grinding and

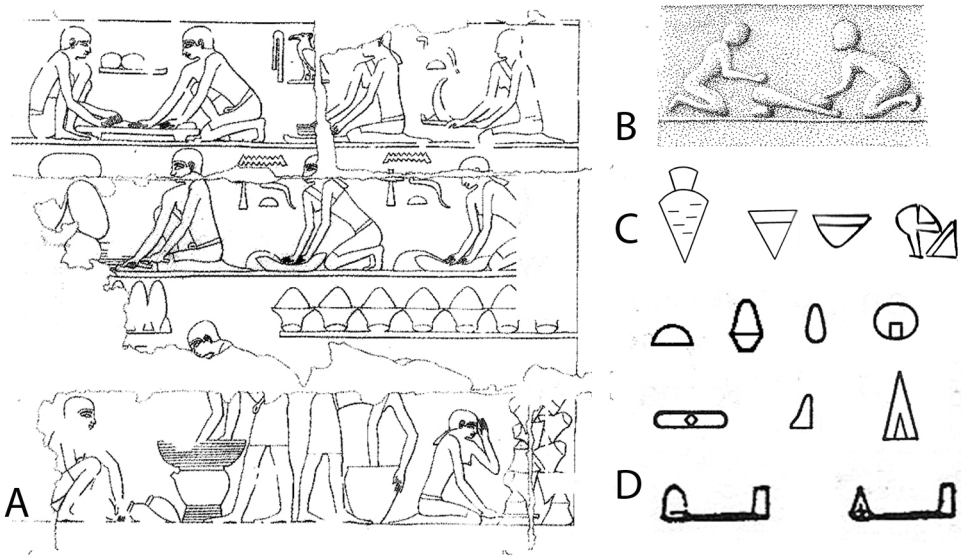

Figure 5.4. Exemplar representations of the centrality of grinding and bread to Near Eastern civilizations. A. Scene of a bakery from the Egyptian 5th Dynasty Tomb of Re'emkuy, showing from top to bottom, kneading dough, and man cooking flat breads and women grinding grain, men making beer and a woman heating bread moulds (after Curtis 2001). B. Scene of women grinding with a quern from a Mesopotamia cylinder seal (after Hodges 1970). C. Sumerian pictograms representing kash beer, 2 forms of ninda bread (=food), and a head with bread indicating ku 'to eat' (after Curtis 2001 and Roaf 1990).

breads were central to the repertoire of signs that recorded and reinforced routine life (Fig. 5.4). It is clear from archaeology as from the earliest inscriptions that bread was the staple around which subsistence was elaborated (Limet 1987; Kemp 1994; Curtis 2001; Samuel 2000; 2001; 2002). In the earliest pictographs of Mesopotamian writing signs for 'mouth' and 'bread' were joined to indicate eating, and the Akkadian words for bread and 'to eat' were homophones (Bottero 2004, 38; see also Chazam and Lehner 1990). Similarly in Egypt amongst the basic hieroglyphic signs were a number of bread loaf shapes, which were key determinatives in writing the words of 'to eat', 'provisions' and 'food offerings' (Gardiner 1957, 531–533; Curtis 2001, 108). In both Near Eastern civilizations bread and beer were basic staples by which institutions paid their workers (Kemp 1994; Samuel 2000; Pollock 2003; Wengrow 2006, 92–97), and they were components of offerings provided to the dead or the gods (Kemp 1994; Curtis 2001, 111; Bottero 2004, 111–113).

Ceramics allowed the extension of breads into beers. It is hypothesised, for example, that the development of fruit arboriculture and vine planting in the early ceramic Neolithic led to advances in fermentation that were extended to beer making and then the use of yeasts in leavened breads (Sherratt 1997, 9–10). In turn, these leavened loaves and associated coarse ceramics became widespread hallmarks of early Mesopotamian and Egyptian civilization from the fourth millennium BC (Chazan and Lehner 1990; Wengrow 2006, 31, 92–98). It is perhaps telling that some Mesopotamian recipes for beers often started from baked breads, 'beer loaves' (Curtis 2001, 215; Jennings *et al.* 2005), although it is equally clear that Egyptian beer recipes did not (Samuel 2000; 2005).

Bread, roasting and sacrificial propitiation

Bread has long had a symbolic role in western Eurasia (Haaland 2006; 2007). This is clear enough from the centrality of breads (leavened or unleavened) in the world religions that emerged in this region (Judaism, Christianity, Islam). Victor Turner draws attention to the linkage of bread flour and sacrifice: the word 'immolation' derives form the Latin to sprinkle with sacred flour (Turner 1992, 90). As indicated by Anatolian peasant ethnography, bread also provides powerful metaphors for the family and social reproduction, and Delaney argues that bread is seen as made using the 'male' grain and the woman's labour much as sons are reproduced (Delaney 1991: 159). A prehistoric parallel might be suggested in the carved, phallic shapes and imagery on stone pestles, which would have been used in dehusking grains in deep-hole mortars on many Pre-Pottery Neolithic sites, such as PPNA Wadi Faynan 16 (Mithen 2007).

As bread and roasting go together in food preparation, they also often co-occur in ritual food. As baking requires heat, and often ovens, rather than cooking containers, so too

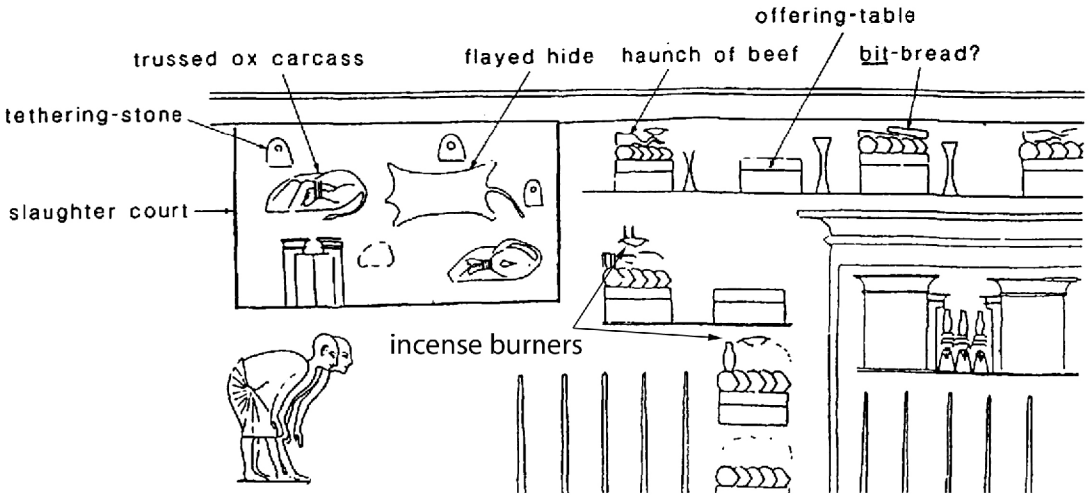

Figure 5.5. Idealized representation of offerings and altars of the Aten temple (Amarna, Egypt) from the tomb of Panhesy, indicating cuts of meat, incense burners, and bread loaves (after Kemp 1994).

does roasting, in which meats are cooked largely in their own juices. The very nature of roasting in which smoke rises from the cooking of meat, provides a potent index to relationships with the invisible. Traditions like those of Sumer, Judaism or ancient Greece involved roasting sacrificial meats (Lewis 2001) in which the smoke rises towards distant gods or spirits that must be propitiated. Such deities are very distant, but nevertheless interventionist in human affairs, like the distant, and vengeful Hebrew Yahweh. Sacrifice is as much about propitiation, keeping a distant god favourable, as it is about getting what one wants. This argument is made by Jean Pierre Vernant on Ancient Greek sacrifice:

> "The ritual sets the incorruptible bones aside for the gods and sends them, consumed by the flames, on high in the form of fragrant smoke and gives men the meat of an already lifeless animal, a piece of dead flesh, so that they may satisfy for a moment their constantly awakening hunger" (Vernant 1989, 25)

While the smoke and odours provide propitiatory nourishment for distant gods, the shared meat provides a potent symbol and literally embodied (ingested) substance for reaffirming community solidarity for the human participants. This appears to have been true of Mesopotamian temple cooking for gods (*cf.* Bottero 2004), where the sumptuous banquets of religious festivals involved sharing food for the gods amongst the living, including royalty, priests and the community (Schmandt-Bessarat 2001, 398; Pollock 2003). Meanwhile other feasts were reserved for elites, and the accumulated procedures of sharing out and excluding access to these foods served to reinforce social distinctions within society as with an implicit divine sanction. Similar practices are known from Egypt, well-exemplified by the well-documented archaeological and Egyptological case of Tell el-Amarna, although in Egypt rather than roasted left-overs, raw cuts of meat or preserved meats were first offered to the god with burning incense (Fig. 5.5), and adjacent altars of bread and fruit, which was subsequently shared out (Kemp 1994). Nevertheless, after the offering had been made the food was shared out to the community through the hierarchy of temple and royal servants. Thus the redistribution of sacrificial food at a trans-community (rather than kin group) level provided a basis for commensal politics, after the gods were appeased, and thereby reproduction of the social system which extended to the maintenance of the invisible ('supernatural') world, but one in which gods and ancestors were distant.

One might suggest that earlier examples of such belief structures, and practices might be found through much of the ancient Near East and extending through the Aegean. Bachhuber, for example, identities two feasting contexts in Blegan's excavations at Troy (II); one, that he identifies as 'the ledge', is a rock cut basin filled with an enormous volume of banqueting equipment, faunal remains, and burnt food stuffs as well as stone figures and axes (Bachhuber *pers. comm.*; Blegan 1950: 270–277). He suggests these are related to feasting and sacrificial activities and the result of the deliberate destruction of ritual equipment. Unfortunately there is not much detail on actual deposition, but elsewhere Hamilakis and Konsolaki give more details for burnt animal sacrifice at a Mycenaean sanctuary and show that flesh (i.e.

the soft perishable parts) was removed from the bones and presumably eaten and the hard bones were sacrificially burnt, consistent with Vernant's description for later periods in Greece (Hamilakis and Konsolaki 2004).

The origins of this tradition, or complex of related traditions, must be sought in the Neolithic transformations of the Near East at the Pleistocene-Holocene transition, where the origins of humanoid god representations lie. As has become a focus of much recent archaeological theorization, this was a key juncture in terms of the human use of symbols: people become more entangled with material symbols and external 'symbolic storage' of cognitive information (see, *e.g.* Renfrew 2001; Hodder 2004; Mithen 2007). The Pre-Pottery Neolithic, including sites without or preceding the evolution of domesticated crops, is witness to an explosion of representations of wild animals (in the northern Levant), human and sexual imagery (in the southern Levant) and later more widespread anthropomorphic imagery. Cauvin (2000) argued this represents the "Birth of the Gods" in the sense that invisible human-like masters were seen at work in the world instead of the animal and plant-inspired spirits of earlier eras. So too Helms (2004) sees a Neolithic shift from animal gods to ancestors and to human gods. If this is indeed the case then sacrificial/propitiatory acts and related redistributive feasting can be conjectured to have developed from this time, as suggested by evidence for feasting both from communities with incipient cultivation, such as Jerf el Ahmar or the meat roasts from Mureybit (on the evidence for cultivation: Willcox *et al.* 2008), and from contemporary communities that did not use cereals or apparently cultivate such as Hallam Cemi, but where there was nevertheless evidence for feasting including large scale grinding and (wild?) pig and sheep/goat consumption (Rosenberg and Redding 2000; on plant use: Savard *et al.* 2006). Such examples suggest that there was indeed a development of sacrificial and feasting rituals that developed within the nexus of the established grinding/roasting tradition. While these practices of food preparation and sacrifice were reinforced and intensified by the eventual domestication of plants and animals suitable to these practices, there was no necessary link to agriculture *per se.* Rather we can propose that the development of agriculture and the elaboration of sacrificial practices both were constrained by and elaborated upon an existing tradition of how food substances were prepared and consumed.

Boiling and steaming: the basis of the east Eurasian culinary tradition

As already noted, eastern Eurasia shows a different pattern as pottery is developed as early as, or earlier than, grinding technology, and ceramics have proved far more archaeologically visible and widespread in east Asia. In China, Korea and Japan, pottery is apparently in advance of agriculture (*cf.* Crawford 2005; Lu 2006; Fuller, Harvey and Qin 2007). By contrast, grinding stones are rare and small and seem to decrease in presence and importance through time, especially in China; hence the presence only of nearly flat, legged grinding stones often illustrated from Early Neolithic sites in central or northern China, such as Cishan, Peiligang or Jiahu cultures (Chang 1986, fig. 49; Henan PIA 1999, pl. 18). Their generally small size, by comparison to querns encountered in the Near East, the Nile valley or India, suggests that they were unlikely to have been effective for producing large amounts of flour. Experimental research and microwear studies conducted at Kyushu University suggest that such flat slabs may have had a role in de-husking millets, rather than grinding (Kazuo Miyamoto, *pers. comm.*). This might imply that they functioned in de-shelling and partial break-down of nuts as well as removing husks from grasses. The disappearance of these through time in the Chinese Neolithic suggests that dehusking moved to other means (such as wooden pestles and earthen hole mortars). In later periods, when present in quantity, grinding stones appear to have been employed for craft activities, such as preparation of ground stone axes, rather than food-processing. This is clearly the case, for example, at Yangshao Xipo (3500–2500 BC), where large numbers of grinding slabs are associated with evidence for processing the red mineral pigment cinnabar, which was widely used in Yangshao ceramic decoration (Liu 2004, 84–85).

In the Middle and Lower Yangtze region from even earlier grinding stones are rare and unlikely to have food-related functions. At sites such as Bashidang, Kuahuqiao or Hemudu one is struck by the apparent absence of querns (*cf.* Zhejiang PIACR 2003; 2004; Hunan PIACR 2006). When encountered, they are usually small, with nearly flat profiles, suggesting a lack of intensive and prolonged use (Chang 1986, fig. 64; Guo and Li 2002, 197; Lu 1999, 176, 178); and it seems likely that most were used in craft activities, like the polishing of axes (observation made by D. Fuller at Tianluoshan and Hemudu). As systematic archaeobotany has increased, it has become clear that early Chinese agriculture, at least in the rice zone, was developed on the base of a nut-gathering tradition (Fuller, Harvey and Qin 2007; Fuller, Qin and Harvey 2008). Earlier Neolithic sites, are often dominated by evidence for acorns and *Trapa* water chestnuts and the foxnut (a kind of water lily, *Euryale ferox*), which persist in large quantities into the period when rice is being cultivated and undergoing domestication. At the site of Tianluoshan, for example, acorns and water chestnut shell outnumber rice spikelet base waste suggesting that early cultivated rice was just part of food systems based on nuts, but was gradually moving towards

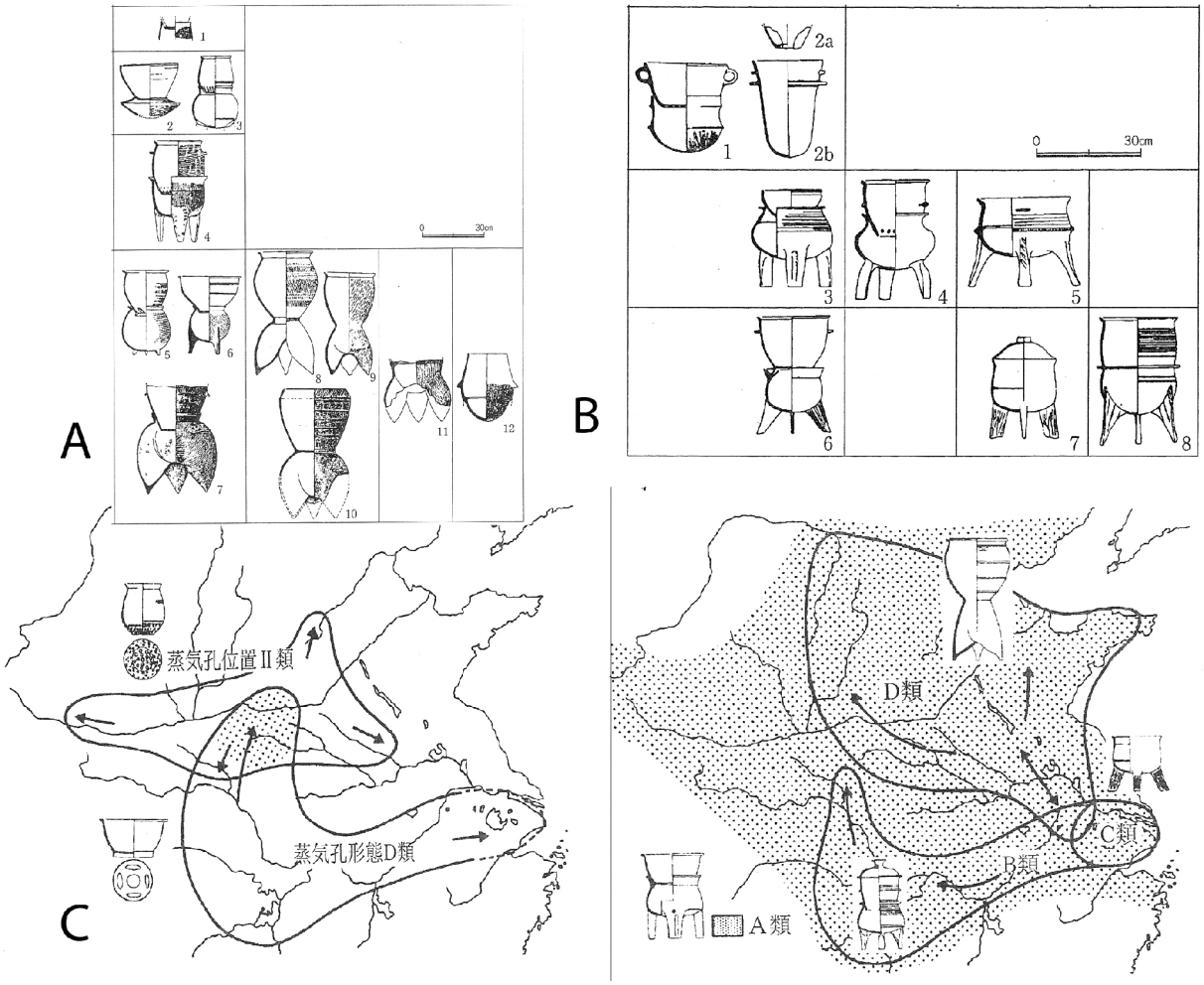

Figure 5.6. Representative examples of the early development of ceramic steaming kits from Neolithic China (after Makibaiyashi 2008). (A) Yellow river region, in four phases, from top to bottom: Jiahu (7000–6000 BC), Yangshao (5000–2500 BC), Early Longshan/Maodigou II (2500–2200 BC), Late Longshan (2200–1850 BC). (B) Lower Yangtze river region, in three phases: Majiabang (5000–4000 BC), Songze (4000–3300 BC), Liangzhu (3300–2200 BC). (C) Distribution maps showing inferred diffusion routes of different steaming vessel types in the Late 4th Millennium BC.

replacing those nuts (Fuller *et al.* 2009). This site has no clear quernstones, but lots of pottery. Early processing was therefore by boiling, or even steaming, grains and nuts, and many ceramic forms were clearly geared towards extensive boiling – a technology which would have been useful for removing the high tannin contents (and sometimes other toxins) of nuts.

Over the course of the Neolithic in China we see the elaboration of ceramics for boiling, with the addition of steaming. The latter is indicated by the addition of perforated bowls, which can fit over the top of vessels for steaming. The earliest example of this are associated with the Peiligang culture of the middle Yellow River valley (7000–6000 BC), (see Fig. 5.6), with two distinct regional traditions of boiling and steaming ceramic kits developing in subsequent cultures (Makibayashi 2008): one associated with the Yangtze and eastern China (Shandong) and the other with the Middle and Upper Yellow river region (Fig. 5.6). These vessels provided a means for steaming whole grains, vegetables and meat, but also provided a basis for elaborate beverage boiling and perhaps distillation. These vessel types continued into the Bronze Age where elite bronze vessels were added to the repertoire (Fig. 5.7). As noted by Chang about Bronze Age pottery the "types included, prominently, sets of vessels for containing, warming and drinking alcoholic beverages. The same types of vessels were made in bronze" (Chang 1986, 363). Typologies for these, which are aided by ancient labelling of some bronze vessels themselves (O. Moore

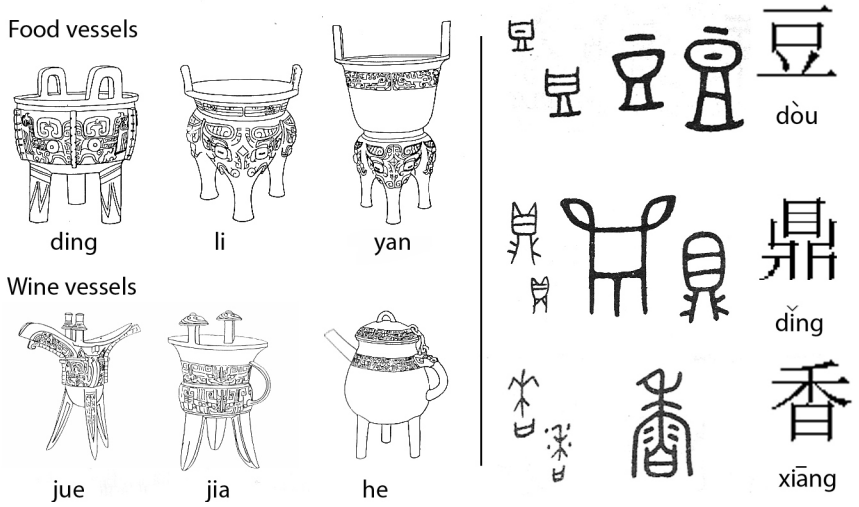

Figure 5.7. Chinese vessels and characters: At left, a few example of ceremonial bronze vessel types for food and wine from Bronze Age China, often recovered from burial contexts and associated with funerary/ancestral feasting rites (after Rawson 1980); at right, a few example of early Chinese characters derived from boiling/ steaming vessels (dou, now used to refer to beans , ding, a tripod vessel, and xiang, meaning "fragrant" showing a cereal plant about to be placed intoa cooking pot); examples are shown from oracle bones, bronze vessels and modern standard forms (after Wang 1991).

2000), make it clear that some were for food, and others for wine, but very much in the manner of hot pots, kept warm (*e.g.* Rawson 1980; Nelson 2003). During this period graves, especially of the elites, were well-provisioned with vessels for food and wine. These finds appear to reflect both graveside feasting as well as gifts for the dead, aimed at securing and maintaining the support of family ancestors (Liu 2000; Nelson 2003).

Whereas in the Near East bread was a basic semantic category, reflected in early writing (see above), in Early Chinese there is a plethora of boiling and steaming vessel characters (Wang 1991). A few examples are shown in Figure 5.7, indicating their evolution from the Bronze Age to modern standard forms. By contrast, basic characters for bread or grinding are absent.

Boiling technologies are the basis of East Asian "wines" in which grains or other starch sources are boiled, fermented and distilled (Simoons 1991, 448–454). Thus conventional Chinese "white wine" *Bai jiu* is normally made of sorghum today, while other wines are made of rice. In Japan, typical wines, *sho ju,* can be made from a wide range of food species: sweet potato (*imo*), barley, sesame, rice, buckwheat, or chestnut. What all share in common is a boiling and fermenting process which releases sugars that are turned into alcohol. While in modern Japan it is sweet potato (*imo*) and barley (*mugi*), which are most often encountered, this list of possible species includes some which could extend back well into prehistory, such as chestnut, which was a major focus of Early and Middle Jomon diet, and must have been a managed tree if not perhaps "domesticated" (Habu 2004, 117; 2008). For grain wines, it is often the sticky (waxy) varieties of cereals which seem to be preferred (Simoons 1991).

When applied to starches, such as grains or the earlier nuts, boiling technologies in eastern Eurasia were the first step in alcohol production or else produced soft and cohesive foods (with stir frying in China a relatively recent introduction, at perhaps *ca.* 200 BC, see Anderson 1988, 43). Foods produced through these cooking methods introduced types of food that people preferred and valued, and which were and are embedded in symbolism, feasting and sacrifice.

Sticky foods as cultural preference

Sticky pastes, that underlie many Chinese sweets or Japanese *mochi*, require both a genetically determined stickiness on the part of grains, as well as processing techniques of boiling and repeated pounding. We would suggest that the boiling traditions of east Asia provide the basis for a regional cultural preference for sticky or "glutinous" cereals. Technically these cereals are waxy, with true "gluten" found in wheat. As mapped by the Japanese ethnobotanist Sakamoto (1996) this food type is geographically focused on east Asia, including China, Korea, Japan and northern southeast Asia (Fig. 5.8). Yoshida (2002) suggested that the origins of this taste may lie in the hunter-gatherer processing of starchy nuts and tubers, *i.e.* the Late Pleistocene boiling traditions. It is clear that this cultural preference has subsequently acted

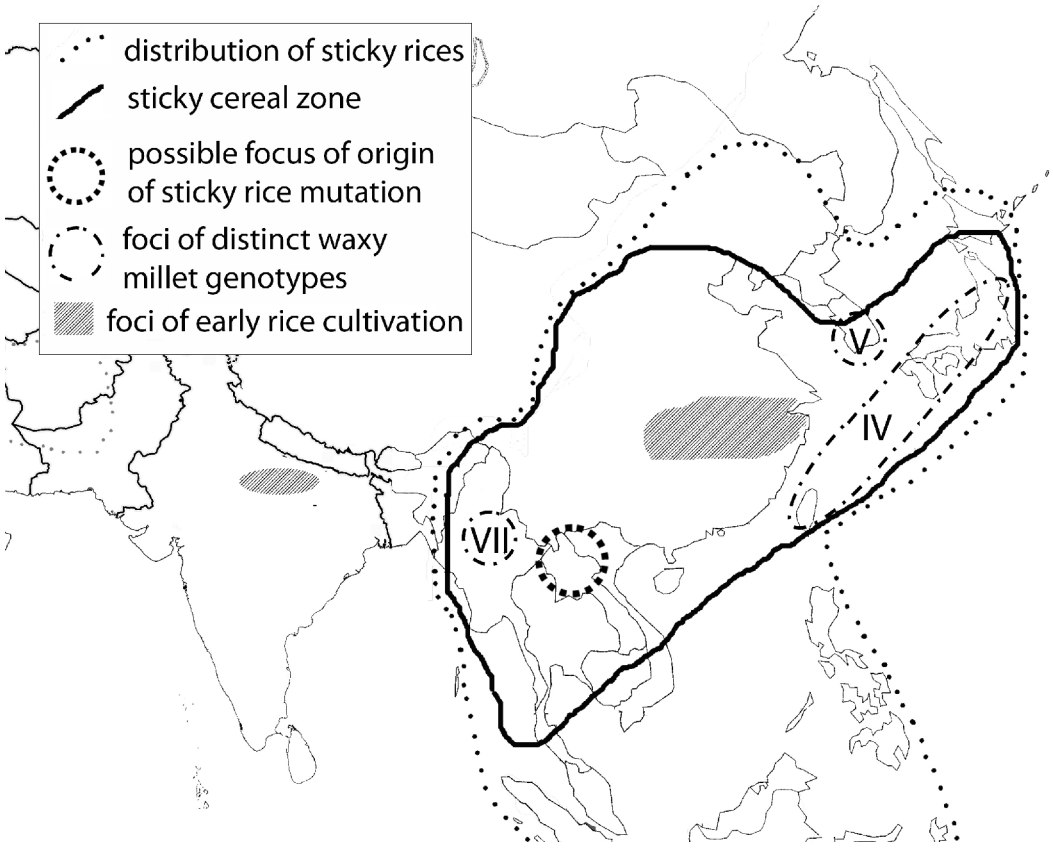

Figure 5.8. Map of the sticky cereals of Asia. Indicated is the distribution of 'glutinous' rice; the core sticky cereal zone, within which upto 7 additional sticky cereal species are reported (after Sakamoto1996); a putative northern Southeast Asia focus for the origins of the sticky grain mutation (wx) in rice (based on Olsen and Purugganan 2002); three foci putative origin of distinct sticky mutations in Setaria italica (based on Fukunaga et al. 2002); core regions of the earliest rice cultivation/ rice use in the Yangtze and the Ganges valleys.

as a strong selective force on the genetics of crops. In east Asia today, eight crop species are known to have glutinous varieties (*Oryza sativa, Panicum miliaceum, Setaria italica, Coix lachryma-jobi, Hordeum vulgare, Sorghum bicolor, Zea mays, Amaranthus hypochondriachus*). Available evidence suggests that the preference developed early amongst rice consumers, and that other crops were gradually adapted to it. Of particular note are the existences on this list of species that originated far from east Asia, and which over much of their range are not known in sticky varieties. Things like barley and sorghum spread over large geographic areas, arriving in east Asia and then having sticky varieties artificially selected by farmers who favoured this change in texture. In the case of maize and *Amaranthus,* both of Mesoamerican origin, with reported sticky varieties in Japan, these have occurred recently in just the past few centuries.

Technically these glutinous varieties are the result of the dominance of waxy starch in the grain (not true gluten like that in wheat) at the expense of amylose. Amylose levels of greater than 15% produce grains that cook dry and fluffy, while lower levels lead to soft and cohesive grains, and very low ones to highly sticky grains (Chang 2000, 144). The most widespread glutinous cereal is rice, and genetic data indicates a single widespread allele shared by all sticky rice, implying a single origin of this trait, perhaps in mainland southeast Asia (Olsen and Purugganan 2002; Olsen *et al.* 2006). This mutant, sticky rice is common from south China through southeast Asia in *japonica* and related *javanica* rice. This same mutation is also shared by widespread temperate *japonica* rices which have intermediate amylose levels and cohesive grains, in which an additional gene mitigates the effect of full stickiness. Once it had occurred as a mutation within early cultivated *japonica* rices, with a suggested focus in northern southeast Asia (Fig. 5.8), these varieties must have been favourably propagated and spread widely within the rice-growing regions of east and southeast Asia.

Recent genetic studies on another east Asian crop, foxtail millet (*Setaria italica*), highlight the importance of this cultural value of stickiness in driving the genetic evolution of a cereal. This and other cereals have literally become adapted to a culturally conditioned taste value. *Setaria italica* is cultivated traditionally over a wide area, including virtually all of Eurasia (except some of the more northerly parts, such as England), as well as north Africa and the Nile basin. Genetic evidence on its origins suggests two or three domestication episodes, with one or two key domestications in northern China, and a third possible domestication in Afghanistan/northern Pakistan (Fukunaga *et al.* 2006). These cereals spread to South Asia in the Bronze Age (Fuller 2003; 2006) and at a similar date to Europe (Marnival 1992; *cf.* Hunt *et al.* 2008). Across this range, as a whole, sticky varieties are rare. But within east Asia sticky and semi-sticky varieties are common. Recent genetic work has identified three distinct mutations that confer stickiness (Fukunaga *et al*. 2002), and these variants have differing geographic distributions, including variant forms in Taiwan, Korea and Japan and Burma (Fig. 5.8). Semi-sticky varieties may represent another east Asian development. The implication is that at least three separate times farmers came across sticky-grained mutants and selected for the persistence of these varieties which then spread over adjacent geographical ranges. This implies that the taste for glutinous cereals was already established prior to these mutations, presumably through the spread of sticky rice, or even earlier based on the traditions of boiling nuts. This cultural tradition of taste then exerted a strong selective pressure on the genome of these species.

These sticky cereals have significant cultural importance. While some groups, such as hill tribes in Vietnam and Laos (Chang 2000; Olsen and Purugganan 2002), use them as daily staples, amongst most populations of South China, Taiwan and Japan they are more often regarded are special status foods, and eaten during feasts, holidays and religious festivals (Chang 2000; Sakamoto 1996). The significance of sticky rice as a food also extends to other parts of the plant. Thus, for example, it is sticky rice straw that is traditionally woven to be hung in Japanese temples and as part of Japanese new year decorations, and sticky rice sweets are wrapped in bamboo leaves, blessed by shrines and then bought by individuals to be dedicated to gods and ancestors and in some cases taken home and hung atop doors, to attract good luck or good spirits.

Foods that were adopted into this system were in various ways added and adapted to it. Thus, when wheat was introduced to China, it was adapted to make rather soft and sticky noodles. As noted by Marco Polo, such wheat as was produced "they eat only in the form of noodles or other pasty foods" (Roberts 2002). The Neolithic noodles recently reported from China (Lu *et al.* 2005), although associated with millet phytoliths, date to the Longshan period, by which time wheat, and probably barley, had been adopted from the west (Crawford *et al.* 2005, Lee *et al.* 2007, Li *et al.* 2007; Fuller and Zhang 2007). One is tempted to suggest that grinding re-emerged in importance in China with the adoption of western cereals (wheat and barley) as a means of making them into a food product that could be readily boiled into a sticky product like those of whole-grained millet and rice to which Neolithic Chinese were already accustomed. It is also worth noting that it is only bread wheat (*Triticum aestivum*) that was ever adopted in China, while the less glutinous durum and emmer wheats (tetraploids, *T. diococcum* and *T.* durum), although available in central Asia and south Asia (*cf.* Vavilov 1950; Fuller 2006), do not extend further eastwards. As milling technologies improved from Han to medieval times, allowing more efficient production of noodles and doughs for dumplings, these gained in popularity and wheat became a more significant crop in China (Anderson 1988, 54). Thus the very gradual rise in the importance of wheat in Chinese agriculture was predicated on its incorporation into existing traditions of taste and philosophies of cooking.

Boiled foods, commensal substances and ancestral spirits

The cohesiveness of these foods, especially the rice and in some areas sticky millet plays a significant symbolic role in relationships with ancestors and gods and an East Asia mode of sacrifice and cosmology. Food is intrinsic to most Chinese ritual activity and food offerings have been an intrinsic part of Chinese death ritual for at least seven millennia (*cf.* Chang 1977, 23–52; Thompson 1988, 71; Liu 2000; Nelson 2003). Food plays a crucial role in relating physical discontinuity with social continuity, of turning a corpse into an ancestor (Nelson 2003; *cf.* Thompson 1988, 73). Ritual also involves exchanges between the living and the dead on more or less reciprocal bases. Feeding the ancestors depended on food prestations from the living descendants – which gives leverage to the latter – but also if neglected the anger of ancestors has severe consequences for the living. Ancestor worship was an extension to filial piety (Freedman 1965, 88; Dawson 1978, 137ff), but proper reciprocity also brings a good life to the living, *i.e.* wealth, secure harvests and offspring. A basic idea seems to be that to be Chinese is to eat Chinese style food with Chinese style implements and it is essential to do so together as a family (*cf.* Ahern 1973). As noted by Nelson (2003) unlike the classic alliance-building feasts, like those discussed from the Near East above, these feasts with ancestors were family affairs, partaken in or witnessed only by descendants and close kin. She refers to this as "feasting to create an ancestor" (Nelson 2003, 85). The aim is to attract and keep ancestral spirits close.

The veneration of ancestors is continuous with a broader pattern of proper conduct in Chinese civilization (based on Feuchtwang 1974; 2009; see also, Dawson 1978, 137–169). Chinese civilisation is a hierarchy of statuses, not of status groups, of relations among unequals, principally those of patrilineal descent, and patriarchy, analogically extended, to ruler and subject and from siblings to trusted associates, like siblings, in their networks. One model of this hierarchical asymmetry is *bào*, the gift of beneficence that must be honoured but can never be matched, a gift relationship that is used to describe the mutual obligations of parent and child and the pledge that moves a god or ancestor to reciprocate (Feuchtwang *pers. comm.*). Mutual obligation is loyalty in both directions, a responsiveness of beneficence to the offering and plight of the petitioner. Its negative is the horror of being excluded from authorisation, of abandonment or of destruction by an offended and supremely powerful authority. This is a hierarchy of unequal diads and triads, extended by analogy to larger scales, from father-son to emperor-subject, and much in between. It is a hierarchy that stimulates aspiration to acquire the social arts, including the conduct of ritual and interpersonal conduct, as well as the other arts of self-cultivation (Feuchtwang 2009).

Unlike in the west Eurasia roasting-sacrifice tradition, clear distinctions are made in China between food for ancestors and food for gods or other animistic forces, with ancestors normally being emphasized. As explored by Liu (2000) and Nelson (2003), the feasting for ancestors can be traced through archaeological grave finds developments in central China from the Neolithic through the Bronze Age, with evolving ritual kits of vessels, but always focusing on grain wines and foods. In addition to graveside feasts regular ceremonies were probably held in domestic contexts to maintain the close links with ancestral spirits, just as in ethnographic cases ancestors are worshipped through plaques in the home or through specials 'halls' (or temples) (*cf.* Freedman 1965; Dawson 1978). Archaeological evidence suggests that increasing social complexity is reflected initially through increasingly small veneration groups (*i.e.* from larger communities to smaller families: Liu 2000), and subsequently in access to ancestors altogether, as ancestors of elite families became the focus of ritual only: royal ancestors came to dominate the material and written evidence (Nelson 2003, 86; see also Chang 1980; Cottrell 1988, 28).

Nevertheless, we can hypothesize that the importance of ancestral veneration and acts of food consumption that helped to maintain ancestral substances persisted throughout Chinese history. This is suggested by the persistent opposition between ancestors and deities. In some regions ancestors are worshipped through tablets in halls, separate from temples to gods (Freedman 1965; Dawson 1978), or if under the same roof ancestral tablets are kept separate from the images of gods, and if you have a communal shrine, foods for ancestors will be on the left and for gods to right of the altar. We can hypothesise therefore that *hierarchy based on* ancestral cults both to family and to lineage altars predate and became subsumed to later Buddhist and Daoist hierarchies. From the Song dynasty ancestor worship becomes more widely available to commoners in China (Ebrey 1986), with the establishment of public cemeteries for the poor (Cottrell 1988, 177) and the re-establishment of clan and clan ancestral shrines (Dawson 1978, 156) but its prominence implies that the practices and understandings of substance on which it was based had deep, established roots.

We would suggest that the connection between boiling /steaming food technologies, gift relations in relation to statuses and ancestral rituals, lies in the emphasis on sharing foods and the emphasis on proper recognition of hierarchy through acts of commensality between living descendents and the transition of dead to ancestral status. This involves the selection for and treatment of foods – in particular rice or in the north millets (preferably glutinous) – that can be boiled collected together and shared out to emphasize possession of common ancestral substances. Rice feeds the agnatic descendants of an ancestor, quite literally as rice is regarded as providing food for bones and semen: the father's semen is believed to form the bones of the child, while rice is given as food to ancestors who are represented by bones. Thus there is a cycle of feeding which keeps the lineage together as an ideal order of patrilineal descent and patriarchy mitigated by the gift of food from affines that recognise the role of women in reproduction (Thompson 1988, 98–99). By contrast to the grinding/grain metaphors of reproduction encountered in the Near East, in early Han period, (*ca.* 2000 BP) Chinese texts on sexual relations, the woman is represented as a receptacle of *yin* essence which must be stirred to provide a vitalized habitat for the valued male *yang* to conceive a descendent (van Gulik 2004, 6–7). There is perhaps a ceramic and cooking metaphor at work.

Food thus makes the person, which is congruent with elaborate Chinese beliefs about the health qualities of foods, as strengthening or restorative or disruptive, linked to viewing the body as a microcosm (see Anderson 1988, 187–198; Simoons 1991, 18–20; Farquhar 2002, 47–77). There is a metaphorical sense in which sticky and cohesive foods hold together society and make the ancestors stick around.

An alternative rice in a realm of bread and pollution: the south Asian culinary tradition

The world of sticky rice, and ancient boiling traditions, ends at a western frontier which seems to divide it from a very different culinary world, that of south Asia. In this area rice

and millets are still highly important, but are not sticky. Like west Eurasia, breads are also important. It corresponds to the eastern milking frontier as mapped by Simoons (1970): milk products are important in south Asia but have been avoided in east Asia. In addition this frontier generally divides the farmers who till rice with buffalo drawn ploughs (with wide tips) from cattle drawn ards with thin tips.

Archaeologically in south Asia, we can point to at least three major cores of early agricultural development, perhaps with rather different food traditions initially (Fuller 2003; 2006; 2007). In the northwest Indus region, a bread tradition and cultivation of wheat and barley links this area to the Near East and the cultivation that began in a preceramic, grinding tradition. In the Ganges early ceramics (from *ca.* 7000 BC) may indicate an early boiling tradition, in which grinding stones are fewer, although from *ca.* 2500 BC the influx of ceramic forms from the west, as well as wheat and barley, and increasing finds of querns suggest a mixing of traditions. In south India, early agriculture was based on indigenous millets and pulses, and involved large scale grinding, as well as ceramics for boiling (Fuller *et al.* 2001). One of the archaeobotanical traits that is distinctive of this region (the Indian Peninsula as well as Orissa), is the high level of use, and archaeological recovery of pulses: there seems to have been a strong interest in *dhals* or perhaps in the use of pulse flours (Fuller and Harvey 2006). It is perhaps no accident that in this region rice and other cereals are often ground to flour and mixed with pulse (*dhal*) flours to make many of the distinctive foods of this region, such as *idli, vadai or dosa* (Kimata 1989; Kimata, Ashok, and Seetharam 2000; Kimata and Sakamoto 1992; Kobayashi and Kimata 1989). Early pottery here (third millennium BC) focuses on large open bowls and globular pots (Allchin 1960; Fuller 2005). This suggests early boiling of flour-based porridges and gruels, and the serving of these in large communal containers; flat breads and pancakes were likely a later addition.

Over the course of the second millennium BC, however, ceramic vessels and the repertoire of crops underwent change, indicating the selective uptake of influence from the north and ultimately from the northwest (Fuller 2005). This initially included the adoption of wheat and barley together with necked jars, which is tempting to attribute to the spread of something like beers. Subsequent elaboration in pottery and cuisine correlated with the emergence of craft production, increased trade and social hierarchy (Boivin *et al.* 2005; Fuller, Boivin and Korisettar 2007). It included the beginnings of more mass-produced pottery which included small bowls that would have held smaller, individual portions, *ca.* 1400 BC. This is followed by the uptake of rice and flat plates (*thalis*) for the consumption of rice in the Indian style or breads over the next millennium or so (*cf.* Fuller 2005; Allchin 1959; 1960). These forms clearly have their precursors in the north and ultimately the Indus region. Thus we can see the imposition of north Indian food traditions onto existing pulse and millet flour traditions, although the resulting palimpsest that is south Indian cuisine continues to maintain heavy use of pulses flours which seems to have been established in the Neolithic.

The new foods and serving methods from the north, however, probably accompanied new concerns to food substances, and their role in social differentiation. This move from large open bowl to smaller individual sized bowls is reflected quantitatively in the size of vessels, as the massive bowls of the Neolithic disappear and smaller vessels proliferate. Instead of consuming food from communal vessels, individuals began to have personal plates and bowls, and this suggests the beginnings in south India of a concern about having ones food contaminated by others. Pollution of food and restrictions on food sharing is a characteristic trait of Indian caste, which epitomizes what Dumont (1980) termed *Homo hierarchicus.* The Indian caste system, as a hierarchy constituted by rules of purity and the avoidance of pollution, is embodied through the substance of food, which was mutable – it can be contaminated by being cooked or touched by someone of lower status, and it transmits this status as pollution when ingested by someone of higher status. What Dumont highlights is a potentially dangerous aspect of food as a substance, as something which is loose in the social world and can transmit and acquire aspects of status (purity/pollution). This may be a useful framework through which to see the role of sacrificial food and commensal feasts throughout the bread/roasting world. In propitiatory roasting traditions, food may be condoned through offering to invisible beings, with such offering then useful for redistribution in a system that reinforces social hierarchies and that reproduces habituated tastes. That Dumont did not intend his concept of ritual hierarchy to be limited to India but to be of comparative use is indicated by the contrast he draws to a *Homo aequalis* type (Dumont 1980, 236–238), which emphasized individual mobility and equality. In terms of food we might suggest a different emphasis in east Asia on food as a less mutable bodily substance, like bones and semen, involved in constituting an individual body as part of lineage.

Despite the importance of rice in south Asia, its understanding remains fundamentally different from that of east Asia. It is not meant to be sticky but dry and light and more bread like. Rice and bread are served to soak up different curry sauces, which are themselves fried and then simmered for long periods. This can be opposed to elaborations in the east Asian tradition, where the addition of frying facilitated by vegetable oils from the late Iron Age (perhaps *ca.* 200 BC, *cf.* Anderson 1988), led to rapid and minimal cooking so that vegetables and meats could be served as fresh as possible as

condiments to sticky rice. Early dishes (up to the Iron Age), as inferred by Keng (1974) presumably involved the steaming and boiling of vegetables into mucilaginous substances. While Chinese eating with chopsticks from communal dishes emphasizes communality and reproduction of patrilineage, Indian eating of rice with the hands from individual plates may be connected to food as a bodily substance which may be highly transformative and polluting if touched by others.

Conclusion: Culinary Worlds before the World System

In addition to his interest in seeing food as "meals" rather than species (Sherratt 1991), Andrew Sherratt was interested in the growth of trade networks and what might be seen as a Bronze Age world system. One of the outcomes of the development of expanded Bronze Age trade links was the transfer of technologies between east and west, as central Asian connections opened between the west Eurasian and east Eurasian centres of civilization, as explored by Sherratt (2006). Part of this exchange was in terms of crops and food stuffs: the first wheat in China at 3000–2500 BC (Li *et al.* 2007), the first cattle (*Bos taurus*) and sheep (*Ovis aries*) at *ca.* 2500 BP (Flad *et al.* 2007) mark the diffusion from the west. Meanwhile the appearance of crops of Chinese origin in central and south Asia mark the counter flow: common millet (*Panicum miliaceum*) occurs in parts of central Asia from the early third millennium BC (Kohl 2007, 145), on the Arabian peninsula perhaps by the end of the millennium (Ekstrom and Edens 2003), and in Pakistan/northwest India by *ca.* 1900 BC, together with introduced *cannabis,* probably *japonica* rice, boiling vessels, Chinese-style harvest knives (Fuller 2006, 36) as well as the first apricots and peaches (Fuller and Madella 2001, 341) of plausible Chinese origin (*cf.* Fuller and Zhang 2007; Gu 2007). Despite the clear exchange in foodstuffs more than 4000 years ago, the dominant modes of food preparation have altered little. The introduction of wheat to China did not lead to the emergence of a baguette, or pita or *roti* culture, nor did millets or rice in the west result in a grain wine and sticky '*mochi'* cuisine in the west. Rather food species have provided additive diversity to essentially stable food preparation worlds of east and west Eurasia. Parallel culinary worlds could be defined between the Mediterranean and sub-Saharan Africa (as sketched by Haaland 2006; 2007), and indeed between the African savannah cereal zone and the sticky yam zone of west-central Africa.

In this paper we have explored these long-term continuities in the nature of food preparation and placed them within representational systems. There are highly stable systems of preparing/cooking and ingesting food – going back to and often before the origins of food production. Whilst these differences are dynamic and permeable, in as much as new food and new methods for preparation have been developed and adopted, change has been preponderantly additive rather than the replacing of food elements. Change is elaborative rather than transformative. Thus food systems appear incredibly conservative and maintain stability over very long periods of time. We suggest that the context of this stability is derived largely from the ritual sphere and in particular forms of offerings/libations/sacrifice. There is overwhelming ethnographic and ethnohistorical evidence for a straightforward contrast between a nexus in East Asia between sticky rice, ancestors that are drawn close by food offerings, food shared out within famial groups, and another nexus in western Asia to north India – of sacrifice to remoter deities in which roasting and baking of foods separate odours/smoke that constitute offerings from the material substances of meat, bread, *etc.*, that are consumed by the devotees, who are themselves drawn from across a community. Issues of interpersonal pollution may be more inherent in these bread-based and extra-familial systems. The crucial basis of this stability must derive from how food is understood as a substance, as something which nourishes and maintains or transforms the body and relates to other bodily substances. Eating is an act of embodiment/incorporation hedged with feeling and emotions and "the condition of embodiment and incorporation is, to a large extent, responsible for the power and multiplicity of meanings attributed to food" (Hamilakis 1999, 39). This suggests an essential evolutionary contingency in the history of cultural traditions: as early developments in preparation and cooking helped to condition taste and understandings of substance, those vary concepts of body and substance became essential constituents of ritual systems, which reinforced and naturalized these tastes and systems of preparation, which also contributed to the nature of different food systems of early agriculture in the east and west of Eurasia. There has remained a thread of continuity through regional traditions to the present day.

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Notes

1 Lower-case bp denotes uncalibrated before present dates.

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