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■ SOULTANA MARIA VALAMOTI

OLD WORLD GLOBALIZATION AND FOOD EXCHANGES

As changes in subsistence, economy, and social organization during the Neolithic period spurred the growth of populations and social complexity, new urban formations and extensive trade networks began to emerge in parts of the Old World by the mid-Holocene. These trade networks, and the increasingly organized systems of exchange and commerce that emerged in concert with them, enabled the flow of a range of commodities across the Old World, as well as people, technologies, and ideas. Another key category of goods to move around the new routes of trade and travel was food.

Food moved along the networks of an increasingly globalized Old World in a variety of forms, ranging from containers of fully processed commodities like olive oil and wine to live crop plants and domesticated animals. While tracing food shipments is sometimes possible, it is the dispersal of domesticated species to new regions through trade that is the most archaeologically accessible feature of these food exchanges. Historical sources also provide insights.

Foods and agricultural species were moved for a variety of purposes. In many cases, food and new species were initially valued as exotic and often symbolically or ideologically meaningful entities. Diplomatic and other important visits in the ancient world often involved the transfer of rare and exotic plants and animals as gifts or tribute. But new crops also found uses as, for example, staple foods, condiments, beverages, medicines, dyes, perfumes, and fodder. Introduced domestic animals also were sources of food but additionally helped to improve local breeds, control pests, and provide traction.

While the geographic range of agricultural species expanded from the outset of the Neolithic, rates and distances of dispersal increased significantly under processes of proto-globalization. Species traveled along both terrestrial and maritime routes, moving via a range of forms of transit and often passing through several intermediaries before reaching their final destinations. But the agents who moved foods and agricultural species did not just include traders and political envoys. Many types of people traveled in the ancient world, for a wide variety of purposes, and the translocation of species and cuisines to new regions was aided by sailors, pilgrims, slaves, monks, colonists, and explorers. Species translocations might be deliberate, or the unintended consequence of food left over at the end of a journey.

States and other diverse types of societies were drawn into early processes of food globalization. More mobile groups assisted with transport and provided access to food and species from a wider range of ecological zones. For example, many of the prized spices of the ancient world initially had to be obtained from the forested regions of South and Southeast Asia, and ethnohistorical and ethnographic evidence suggests that foragers had a significant role to play. Pastoral nomads also helped transport foods and agricultural species—for example, across the arid regions of central Asia.

Bronze Age

The first long-distance plant and animal translocations that we can trace to processes of proto-globalization (as opposed to farming expansion) in the Old World currently date to the third millennium BC. They include a set of crop translocations along what has sometimes been referred to as the proto–Silk Road. East Asian domesticates like broomcorn millet and foxtail millet moved west, reaching Europe as early as the first half of the second millennium BC, while southwest Asian domesticates like wheat and barley traveled east, finding their way to East Asia by 2500–2000 BC. Central Asian evidence provides insights into both the agents and context of these movements. Pastoral nomadic sites in eastern Kazakhstan contain evidence of wheat and broomcorn millet in ritual contexts, suggesting that perhaps the use of these crops as symbolically meaningful prestige goods, especially among more nomadic peoples, motivated their spread across central Asia. Domesticated animals also were part of these early exchanges, including taurine cattle, which were introduced to East Asia during a similar timeframe.

Various new plants and animals also entered into South Asia in this time period. These included broomcorn millet, foxtail millet, apricots, peaches, and the *japonica* subspecies of rice from the east, as well as horses, camels, cannabis, almonds, and walnuts from central Asia. Flax, safflower, and several pulses (lentil, pea, chickpea, grass pea) also traveled from southwest to south Asia by the Harappan period, as did cultivated Mediterranean-zone fruits like grapes and hackberries. Donkeys arrived from Africa via Arabia. Many of these transfers probably flowed along emerging routes of trade and travel that began to link up the increasingly complex societies of Middle Asia and produced what some have referred to as a "Middle Asian Interaction Sphere." These routes extended into the sea, and maritime trade between the Bronze Age civilizations of the Indus Valley and Mesopotamia via the Persian Gulf is clearly attested by both archaeological and textual sources. Food and other organic products like wood also were among the goods that moved, along with species such as zebu cattle, a South Asian domesticate that appears on Gulf sites by the second millennium BC, and sesame, a South Asian crop that is in Mesopotamia by 2000 BC. Zebu, as well as chicken, may have traveled as far as Egypt by the second millennium BC, although more robust evidence is needed, and routes of movement remain unclear. Date palm, an eastern Arabian domesticate, reached Egypt and Nubia by the start of the second millennium BC.

There is some evidence to suggest maritime translocations along the northern Arabian Sea by the second millennium BC, perhaps as part of exploration or trade activities. Broomcorn millet seems to have traveled by maritime routes, from the northwestern part of the Indian subcontinent along the southern Arabian coast, reaching Yemen and Sudan by the third millennium BC. More remarkable, and still mysterious, is the eastward translocation of at least five African crops—sorghum, pearl millet, finger millet, cowpea, and hyacinth bean—that reached India by the second millennium BC and subsequently entered into small-scale cultivation in various regions of the subcontinent. The absence of these crops from Arabian peninsular archaeobotanical assemblages until millennia later suggests that they traveled by maritime routes. The mechanisms of these various maritime transfers remain obscure, however, since they appear to be unaccompanied by any other

type of material evidence, such as ceramic sherds or precious trade goods, that might provide insights into how they moved such great distances.

Rare finds suggest that the beginnings of the spice trade may also be traced to the last millennia BC. Pepper, a South Asian plant, for example, has been identified in the mummy of the pharaoh Ramses II, which dates it to around 1200 BC. Possible cinnamon residues have also recently been identified from Phoenician flasks in Israel, dating to the 11th to mid-9th century BC. Farther east, sandalwood, an Island Southeast Asian tree and later spice route commodity, reached south India by the second millennium BC. Areca palm, whose betel nuts have traditionally been used in Asia as a stimulant, probably also arrived in south India more than 2,000 years ago from prehistoric origins in Island Southeast Asia. Other Southeast Asian tree crops that seem to have reached India in this period include citron (precursor of the lemon) and mango, both of which likely originated in the borderlands of northeastern India and mainland Southeast Asia. The movement of all of these plants at this stage was probably as high-value prestige goods, and foraging societies must have played some role in moving some of them from inaccessible forests into wider exchange networks.

Iron Age

Long-distance trade in the Old World began to intensify and expand into new regions in the mid- to late first millennium BC, leading to increasing globalization of foods and agricultural species. Trade and other links between South and Southeast Asia across the Bay of Bengal in the mid-first millennium BC, for example, resulted in the transfer of South Asian crops like mung and urd beans to Thailand, while the *indica* subspecies of rice spread this way somewhat later. New crops were perhaps established by diaspora communities of Indian merchants, craftsmen, and others, as suggested by some archaeological evidence. Figurative depictions potentially also place the arrival of zebu cattle from India in southern China in the mid- to late first millennium BC (though some argue for its arrival up to a millennium earlier). Genetic evidence indicates that these later migrated north and interbred with Mongolian taurine cattle (introduced from the Near East to northern China in the Bronze Age) in the plains of central China, creating new Chinese hybrid cattle.

In the mid- to late first millennium BC, a variety of new plants and animals also moved westward, initially primarily via terrestrial routes. Various new Southeast Asian spices and aromatics, for example, seem to have reached India, including nutmeg, mace, and aloeswood, although most were probably not cultivated for many more centuries or even millennia. Hellenistic trade with India meanwhile brought spices like pepper, cassia, cinnamon, and nard to Europe, with crops like South Asian rice, cucumber, and citrons possibly traveling along the same routes. Exotic birds like South Asian parakeet, peafowl, peacock, and crow are also attested in Hellenistic sources, and chicken seems to have reached Greece via Persia by the seventh century BC. Also probably traveling via Persia were coriander and cumin, native spices of the Mediterranean and the Near East that were introduced to India by the second half of the first millennium BC, when they are attested by Sanskrit names. Watermelons had also spread from early Egyptian origins to India by this time.

The consolidation of power across an enormous area of Eurasia by Rome, Parthia, and China in the last centuries BC, together with infrastructure and transport innovations, further intensified trade. Some of the best archaeobotanical and zooarchaeological evidence for the resulting increase in food transfers comes from European sites of the Roman period. This suggests both the arrival of new plants and animals as well as the increased commonness of previous arrivals, probably as a result of reintroductions. Chickens became much more common, for example, while new breeds were imported to diversify traditional herds of sheep, goats, cattle, asses, horses, and mules. A large number of crops, including fruits, nuts, and vegetables, also were imported, with many entering into cultivation. In the latter category were apple, pear, cherry, plum, medlar, walnut, peach, and Asian bottle gourd. The nut and fruit trees were particularly significant introductions in that they also indicate the arrival of new agricultural technologies (for example, grafting, possibly introduced from China or central Asia) and new kinds of agricultural spaces like orchards. Other plants that moved, but perhaps did not enter into cultivation, included rice, pistachio, date, and watermelon. Spices like black pepper, cinnamon, cardamom, and cassia also were imported.

Various crops also moved for the first time into north and even sub-Saharan Africa as part of the expansion of trade networks. Garamantian traders imported crops like cucumber (or melon, though the botanical evidence is not clear), pomegranate, olive, and almond, though the degree to which the latter three were grown locally is unclear. Further east, Egyptian sites of the Roman era, particularly port sites along the Red Sea, also saw the arrival of various new foods, reflecting in part the emergence of direct transoceanic trade links with south India. These included chicken and Asian plants like black pepper, rice, coconut, mung bean, and citron. Nonetheless, these foods mostly remained rare luxuries, and cuisine at these Roman-era port sites was strongly Mediterranean in flavor. Further south in Africa, the only other long-distance agricultural arrival is possibly banana, found in Iron Age pits in Cameroon dating to the mid-first millennium BC.

Numerous crop introductions to China during this phase are attested by textual evidence and occasionally archaeological finds from rich tombs. Most of these translocations occurred after the last centuries BC, when the Han Dynasty seized control of trade routes running along the northern and southern fringes of the Taklamakan Desert. In return for its silk and porcelain, China received such exotic foods as pomegranates, grapes, sesame, watermelon, fava beans, alfalfa, flax, and spices like cumin from the west, and galangal, long pepper, camphor, and cinnamon from the south. Various southern Chinese and northern Southeast Asian fruits and vegetables also became established in central China, some as local crops like aubergine, and others as valued imports, such as litchi fruits. Aromatic woods, resins, and exotic animals such as lions and peacocks also were brought to China during this period. The Chinese introduction to tea likely dates to this time; this species derives from hills of the southwestern periphery (Yunnan) and was one of the species encountered as Chinese influence and control spread southward. By the medieval period, tea was a well-established import from the south to the elites of central and northern China. Another important introduction was improved flour milling, probably derived ultimately from Mediterranean rotary querns, which in China transformed wheat from an uninspiring boiled grain into a valued staple for noodle production.

Medieval

A peak in the intensity of Indian Ocean trade led to an unprecedented scale of plant and animal translocations through maritime networks during the medieval period, causing major transformations in agricultural practices and foodways in regions around its rim. Some of the best evidence for the "Indian Oceanization" of agriculture comes from Egypt, where trading ports began receiving a new range of summer crops from South and Southeast Asia, including rice, aubergine, tree crops such as citrus, tropical vegecultural plants such as taro and banana, and cash crops such as sugarcane. The rise in importance of these crops correlates with the decline of Mediterranean crops such as lentils, wheat, and barley, which dominated subsistence in this region during the Roman period.

A similar suite of Indian Ocean crops also was adopted into foodways along the Swahili coast of eastern Africa at this time. This is seen initially in the arrival of small quantities of rice, mung bean, coconut, and possibly sesame, citrus, and Asian millets in the coastal region in the late first millennium AD, followed by a major shift to rice consumption at some trading sites in the early to mid-second millennium AD. This culinary change is linked to a broader set of social transformations in Swahili society, including increasing urbanism, cosmopolitanism, and Islamization, in which rice is likely to have taken on special significance as a prestige food. Zebu cattle also make their way to the East African coast in the medieval period, arriving around the mid- to late first millennium AD, most likely also through maritime trade connections. Direct trade links with Southeast Asia probably also brought plant and animal species such as *japonica* rice, taro, banana, Asian yam, coconut, and chicken to eastern Africa and Madagascar. Many of these species appear to have arrived as different varieties via diverse routes, and both a more circuitous northern Arabian Sea route and more direct transoceanic crossings are suggested. These multiple translocation pathways led to the development of novel crop varieties in their new regions, such as hybrids of *indica* and *japonica* rice that are unique to the highlands of Madagascar.

A wide range of new food crops also made their way into Europe during the medieval period, largely through Arab trade. During medieval times, Europeans further honed their taste for exotic spices, the demand for which drove a lucrative trade that saw large quantities shipped from Asia to European markets. Asian spices such as pepper, clove, cinnamon, cassia, and ginger, which were first introduced to European palates in Classical antiquity, continued to be popular. New arrivals include nutmeg from the Moluccas and melegueta pepper ("grains of paradise") from West Africa. Although likely present in Europe in previous eras, cardamom appears in the archaeobotanical record for the first time. The mysterious eastern origin of many spices and condiments was a large part of what made them so attractive, with this high consumer demand and sense of exoticism fueling later European expansion into Asia in direct search of their origins.

In addition to these spices, several cereals, fruits, and vegetables arrived in Europe for the first time in this period, including sorghum, buckwheat, aubergine, citrus, borage, Spanish vetchling, liquorice, sugarcane, and mango. Many that were available in previous periods also continued to be or became more common, including pear, peach, cucumber, fig, medlar, mulberry, parsley, and fennel. A number of foreign crops such as citrus, sorghum, and also rice (which had been traded into Europe since at least Roman times)

began to be grown locally in this period, at least in southern Spain. In northern Europe, though, rice remained rare, with archaeobotanical evidence showing it was restricted largely to urban centers and thus likely a high-status luxury food rather than a staple. Differential access to exotic foods by social groups was a common theme of this period, with many imports functioning primarily in more affluent or privileged circles. Many foods that were prominent in Roman-era diets, such as olives, dates, bottle gourd, and pine nut, became much less common (and in some cases disappeared) from medieval archaeobotanical records. Other Asian crops, including southern crops like coconut, mung bean, cowpea, and tamarind, and eastern ones like soybean, Sichuan pepper, and star anise, did not arrive in Europe until sometime later in the postmedieval period.

New foods also moved east, of course, and an increase in long-distance commerce under the Tang Dynasty stimulated diffusions to China in particular. These flows were fueled by a newfound desire in Tang high culture for all things exotic, including foods, sourced from around the empire and beyond. Vegetables such as spinach as well as pistachios, dates, and figs arrived from the Middle East. Spices such as pepper and cloves, tropical fruits like bananas and mangoes, and stimulants such as areca nut and betel leaf came from South and Southeast Asia. Wine made from grapes rather than rice became fashionable and began to be locally produced. Many foods also doubled as medicines and were added to the repertoire of Chinese pharmacopoeia. This era also saw significant Chinese cultural influence on the Japanese archipelago, resulting in the introduction of traditions such as tea drinking as well as the Chinese writing system.

Conclusion

The traditional focus of archaeobotanical and zooarchaeological research on the subsistence patterns of less complex societies, and on such processes as domestication, has meant that the dietary patterns of later and, particularly, of urbanized societies are primarily known from textual sources. Yet it is increasingly clear that the application of archaeological science methods to later time periods holds much promise, not least in terms of the insights they can provide into long-distance species translocations and the extraordinary lengths that societies went to in order to obtain new and exotic foodstuffs. New methods like isotope and genetic analyses hold the potential to significantly extend our ability to explore these movements and food exchanges and the millennia of culinary and biological mixing that have preceded contemporary globalized food systems.

See also Archaeobotany; Biomolecular Analysis; Columbian Exchange; Diaspora Foodways; Food and Colonialism; Food and Status; Food Technology and Ideas about Food, Spread of; Globalization; Immigrant Foodways; Markets/Exchange; Pacific Oceanic Exchange; Pre–Silk Road Agricultural Exchange; Trade Routes; Zooarchaeology

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■ NICOLE BOIVIN, DORIAN Q FULLER, AND ALISON CROWTHER

OLDUVAI GORGE (TANZANIA)

Olduvai Gorge, commonly referred to as "The Cradle of Humankind," is renowned for Louis and Mary Leakey's remarkable discoveries of early human (hominin) fossils and concentrations of flaked stone artifacts in association with butchered animal bones, which Mary labeled "living floors." Olduvai lends its name to the Oldowan Industry, the earliest stone technology, and was the location where these primitive tools were first recognized. Its well-dated sedimentary deposits span the last two million years, coinciding with major events in human evolution such as the first appearance of *Homo erectus* and the extinction of *Homo habilis*. These deposits depict a fluctuating environment, dominated by a large lake that would have attracted the area's diverse wildlife. It is in the margin of this paleolake where the majority of the archaeological finds have been located, including the most significant discovery, the 1.8-million-year-old *Zinjanthropus* cranium, representing the type specimen of *Australopithecus boisei* and the first fossil hominin unearthed in East Africa.

Archaeology of Food

An Encyclopedia

Volume 2: L–Z

EDITED BY
KAREN BESCHERER METHENY
AND
MARY C. BEAUDRY

ROWMAN & LITTLEFIELD
Lanham • Boulder • New York • London