Origins of Chinese Food: Neolithic Innovations and Early Dynasties

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Abstract

Chinese food today is the product of thousands of years of development, involving, among other things, borrowing hundreds of crops from western Asia, India, Southeast Asia, and most recently the New World. Even things like Maya cactus fruit have appeared on the Chinese market. But before all this, there was a long period of development, involving the independent invention of agriculture, the domestication of millets and rice, the coming of ancient Near Eastern crops, and the development of an agrarian civilization based on highly innovative Chinese technology. Many important new findings on this early period have appeared recently.

Otherwise uncited statements below are summarized from my new book *Food and Environment in Early and Medieval China*, University of Pennsylvania Press.

“One adept at learning is like the king of Qi who, when eating chicken, was satisfied only after he had eaten a thousand feet: if he were still unsatisfied, there would always be another chicken foot to eat” (Lü 2000:129).

Origins: Before Civilization

There is an old joke about a history PhD thesis titled “the history of British trade before there was any.” I am doing something like that now, in the first part of this paper: I am talking about Chinese food before there was any.

That is, I am going to talk about what people ate in the days long before the Qin Dynasty unified and gave its name to the core of what we now know as China. For the first part of this paper, then, I am using the word “China” in a purely geographical way.

China in that sense began a very long time ago. Interior south China is a very ancient part of the earth’s surface, one of the older continental land masses. Over time, it has stayed more or less the same while all around it has gone through dramatic changes. The most dramatic change of all may have been the slow-motion crash of India into Asia. Moving north after the breakup of Gondwanaland, India ran into Asia a few million years ago. India is being progressively pushed under Asia. The result is the Himalayan and west Chinese ranges and the Tibetan Plateau, the highest places on earth. Another result is the huge and horrific earthquakes that affect China. They are produced by the stress of the collision. They include the most destructive natural disasters in history. From quite early times, Chinese science correctly saw these earthquakes as due to flows of energy within the earth, and correctly located many major fault zones as lines of the flow of qi. The more folk-type explanation of the earthquakes was that dragons in the earth were squirming around. Observation showed that the dragons were given to
squirming at particular places, which we now know to have been active earthquake fault sites. So even this belief was useful in helping people avoid building on such places.

Another effect of the collision is the proverbial west-to-east flow of water in China. Early Chinese writers saw it as a natural fact of life, almost a geographical rule.

Humans of some sort have been in the area for a long time. Among the earliest and most famous *Homo erectus* finds were the many skulls and limb bones from the Zhokoudian site near Beijing. These became known as “Peking man” and date to around 500,000–750,000 years ago. There are indications that the individuals in question ate local game and fruit, but the finds are from caves where animals and Peking men may have fallen in by accident or been dragged in as prey of hyenas. One or more of the skulls shows marks that are sometimes described as due to cannibalism, but are very likely due to hyenas instead. There are also indications of fire, but again this may mean that Peking men cooked their food or that a wildfire got into the cave material. We really don’t know.

After this come a series of skulls about which almost nothing is known because the Chinese are currently not allowing much access. There were early humans, probably of several types, but we know little until the appearance of fully modern humans by 20,000–40,000 years ago (possibly earlier). By 30,000–40,000 years ago there were different stone tool traditions in north China, showing advanced cultures with local adaptation and diversity (Li et al. 2014). By 15,000 years ago, people were hunting game and gathering plant foods throughout Asia, including what is now China.

At that time, the Ice Age was in full swing. Glaciation peaked 18,000 years ago, with vast ice sheets covering much of the world. East Asia had nothing comparable to the European and North American ice sheets, but large ice sheets did cover the mountains of Siberia and Tibet, while glaciers and local ice sheets decorated the mountains of China down to fairly low latitudes and altitudes. The Qinling range, for instance, was glaciated, and below the glacier level it sported a fine boreal spruce forest like those of southern Siberia today (Zhao et al 2014). Much of north China was dry, cold, and windblown, like the Gobi (which itself was even drier and colder than it is now). South China was forested, but with a cool-weather forest, much of it coniferous.

One result of the dry windy climate was the buildup of enormous amounts of windblown dirt in north China. (On this and the next couple of paragraphs, the best books are still the old veterans: *Land of the 500 Million* by George Cressey, 1955, and *China* by Yi-fu Tuan, 1969. Updates must be scavenged from arcane scientific journals.) This became the loess that is now so basic to agriculture there. It is fertile, easy to work, and good at holding water; it is, however, easily eroded. This erosion contributes to floods, landslides, and soil loss. In the meantime, the rainy climate was progressively breaking down the igneous and sedimentary rocks of south China into soils that are usually fairly fertile and at best extremely so. Lush forest cover led to buildup of leafmold and development of soil profiles well suited to agriculture. The stage was set for the intensive agriculture that was to develop.

With the end of the Ice Age, the glaciers disappeared, and the core—the “eighteen provinces”—of China rapidly became covered by dense, rich forests, except on the loess plains of the northwest, which were shrub steppe or grassland. The forests were apparently dominated in the north by oaks and similar trees, in the south by an incredible variety of plants of all sorts. Nitrogen was fixed by leguminous plants, algae, and other life forms, rapidly enriching the soils. Southwest China is *by far* the most biodiverse area of the temperate zone. South China and northern southeast Asia also have the distinction of being among the most productive region
on the planet in terms of sheer growth—primary production of biomass. The forests produce fully 8% of the natural growth in the world (Yu et al. 2014).

The Qinling Range, on the border of north and south, had a forest of oak, alder, and other warm-temperate trees. After 2000-1000 BCE it cooled down somewhat, with more firs, hemlocks, and other evergreens (Zhao et al. 2014). Today, global warming is rapidly changing the vegetation through hotter, drier conditions.

Throughout lowland China, vast wetlands were among the most bioproductive areas on the planet. The vast lakes, sloughs, marshes, swamps, salt marshes, and slow winding rivers were extremely nutrient-rich, and were vast incubators of life, from water plants and algae to fish, turtles, and alligators. They have largely turned into ricefields now, but unfortunately they are even more recently turning into pollution sinks, with consequent loss of production (Anderson 2012).

In short, what is now China was, shortly after the end of the Ice Age, something close to paradise on earth for the hunting and gathering population. In fall, the oaks and chestnuts literally covered the ground with highly nutritious food. Fruit trees, game, and fish abounded. Resources were varied; China’s hilly, river-dissected land produced countless ecological niches, each with its own communities of plants and animals.

This rapid expansion of food should have satisfied everyone, but instead it led to the beginnings of agriculture. Many people assume that agriculture must have been invented because people needed the food (see esp. Barker 2006 for a review of theories of agriculture). Not so. Agriculture requires a long period of experimentation, during which time it is unlikely to produce much; therefore, it is most likely to be invented by people who are reasonably well fed and have time to play around with plants. Carl Sauer (1952) thus thought it was probably invented by settled people, with good plant and fish resources, somewhere in southeast Asia. In fact agriculture was first in the Near East, but China was a close second, and indeed the people were sedentary and were rich in a wide variety of resources.

However, there is one more thing to add: the incentive to cultivate in the first place. Brian Hayden (2001) has proposed that this may have been feasting; one needs resources for that. However, some of us with China experience think it was trade (McNeish 1991). The smoking gun is a map of where agriculture was invented, worldwide and in eastern Asia: it is always first seen at major trade nodes—places where trade routes cross. People in plant-rich areas had to trade seeds and roots for salt, stone tools, and animal products, and must have found it convenient to raise the seeds and roots near their homes.

In China, that meant the central parts of the Yellow and Yangzi river valleys. Agriculture seems to have first come about when millets were domesticated in the hills and bottomlands around the great bend of the Yellow River. Two species of millets were involved: Foxtail millet (Setaria italica) and broomcorn millet (Panicum miliaceum). This was an area where people were happily eating acorns, and also wild seeds, fruit, and game (Liu 2012). They gradually came to sow millet, and then to depend more and more on it. Oak trees grow too slowly; if you want a quick return, millet gives it—maturing a large crop under almost any circumstances and in just a couple of months. These millets are C4 plants, which means that they are adapted to high heat, growing and flourishing under tropical and subtropical conditions. They were domesticated by 7000-8000 BCE, among the earliest domesticated foods in the world.

Rice was soon domesticated, but in a separate area: the lower and middle Yangzi valley (Gross and Zhao 2014). In contrast to millets, is a C3 plant, better adapted to cooler regimes, but to
make up for this and make it the staple of the tropics it has a uniquely active form of chlorophyll, enabling it to fix more carbon with less sunlight. This gives it the distinctive golden-green color so loved by southeast Asian peoples and by photographers. More to the point, it makes it the most productive grain of them all, especially under the cloudy conditions of the summer monsoon.

Rice may have been independently domesticated in India, and a different species of it was independently domesticated in Africa, but so far the earliest domesticated rice in the world is from the Yangzi drainage around 6000 BCE (Gross and Zhao 2014). (Some even earlier rice, back to 10,000 BCE or more [see Li 2013:24], may not be domesticated.) By 5000 it was a fairly widely grown crop; large stores of seeds have been found. Both the common forms, short-grain (japonica) and long-grain, were domesticated by then; they may go back to different wild forms. (True indica rice, the modern long-grain, was apparently developed in India at a later time through hybridization of Chinese domesticated rice with native Indian rice, which may have been independently domesticated around 4000 BCE; Gross and Zhao 2014.)

Peter Bellwood has developed a theory, based partly on Chinese data, that the widespread language families and language phyla of today reflect early spreads of agriculture. According to this theory, the speakers of a given language built up large populations and radiated out, taking their crops with them, and overwhelming and assimilating other people they met on their travels. This theory was developed from Bellwood’s studies of the Austronesian peoples, who started from southeast China about 3000–4000 BCE, colonized Taiwan, and spread from there throughout Oceania. Austronesian languages are extinct on the mainland, but the Taiwan aborigines still speak very ancient branches of that language phylum. Language and archaeology studies show that the Austronesians spread south into the Philippines and thence throughout Oceania. Most of the languages of Indonesia, and all the languages of the Philippines, Micronesia, and Polynesia, belong to the Malayo-Polynesian branch of Austronesian. It seems clear that they did indeed radiate along with agriculture. They met a quite separate agricultural world in New Guinea, however. The New Guinea peoples had invented agriculture independently. Naturally, the Austronesians and the Papuans merged as peoples, and merged their agricultural systems too, so that—for example—the agriculture of Polynesia reflects Papuan patterns as well as southeast Asian. (See Bellwood 2002, 2005, 2009; Bellwood and Renfrew 2002.)

It was thus tempting to see the spread of Chinese agriculture on the mainland in similar terms. The fit of millet agriculture and the spread of the Sino-Tibetan (or Tibeto-Burman) phylum is so perfect, in terms of time, extent, inferred migration patterns, and everything else, that it could not escape attention, and G. Van Driem (1999, 2002) has hypothesized that the Tibeto-Burman phylum spread along with millet agriculture. I rather cautiously concur. Less clear is the spread of rice agriculture, which in time and geography seems to be associated with not only the Austronesian peoples but also the Thai, Hmong (Miao), and Mian (Yao). My own personal feeling is that the Thai (technically, the Thai-Kadai phylum) were the major players. They were in the right place at the right time, and they radiated with spectacular success along with agricultural spreads in south China and southeast Asia. Of course the Hmong, Mian and Austronesians may have been involved too. However, Hmong traditions put them far to the north, where they were more plausibly associated with early millet; Van Driem (2002) cautiously maintained that the Tibeto-Burmans differentiated in what is now Sichuan and the Hmong were closer to the millet origin area. Parenthetically, claims that the initial spread of agriculture in the Near East and Europe was via Indo-European and Semitic languages are false. Agriculture spread there long before these groups emerged.
As of about 6000 BCE, then, we have two centers of agriculture in China: a millet-growing area in the Yellow River valley and a rice-growing one in the Yangzi (the best current introductions to these matters are Li 2013 and Liu and Chen 2012). We do not know if these were connected or in touch with each other. Very possibly the idea of agriculture spread from one to the other, or even was created jointly. At present, the evidence seems to favor, very slightly, two independent inventions.

A fermented beverage made of rice, honey, and grape and/or hawthorn fruit left residues in a pot dating to 7000-6600 BC at Jiahu, a Neolithic site in central China. Patrick McGovern has examined and analyzed the residue (McGovern 2009 and pers. comm.; Zhang and Hong 2013). This is as early as any cultivated rice in the world. Perhaps the drinkers were already writing songs to the moon and the flowers. The drink was reconstructed by Dr. McGovern, working with Dogfish Head Brewery, under the name of “Chateau Jiahu.” It is now occasionally available for sale, after almost 9000 years. I cannot say it is the best beer I ever tasted, but it is by far the oldest brew in the world.

From this time on, the record demonstrates a slow, steady intensification of agriculture in central and north-central China, and a similarly slow and steady spread of agriculture throughout eastern Asia. Agriculture spread from its initial centers, and was soon found in all parts of what would later be the Eighteen Provinces by about 4000 years ago. It spread onward to Korea and southeast Asia, at a rate similar to that seen in the western world, very roughly one kilometer per year. That is what you would expect if villages grew slowly and steadily, and established daughter communities nearby.

This slow, steady spread is now well documented archaeologically. It is now quite definitively established that agriculture spread and intensified through millions of small steps: a village would first adopt the idea of sowing some grain, then slowly get more dependent on it, then perhaps begin to experiment with domesticating a favorite local food. There were no great breakthroughs, no revolutions, but no periods of stasis and resting on one’s accomplishments, either. This is a really key point about human beings as well as about agriculture: given the chance, people will work to improve their lot gradually, and will make countless small innovations to do that. Change and progress are not dramatic. They do not come by revolution, or by the leadership of “great men.” They come through the efforts of millions of unsung hard-working humans, who humbly labor to make the world better for their families and neighbors.

Intensification involved growing more crops, growing the main crops on a much larger scale, developing more productive varieties of them, and taming animals. This last involved domesticating pigs, over a wide front, and domesticating chickens in the core rice-growing area. The fact that almost everybody in eastern Asia uses some form of the Thai word for “chicken,” kai (Blench 2007), is reasonably conclusive evidence that we owe the domestic chicken to Thai efforts. Dogs had long been domesticated, from European and/or Siberian wolves, many thousand years earlier.

We have absolutely no record of when particular plants were domesticated, and archaeology is usually silent too. One of the things that always saddens me is realizing that the greatest benefactors of humanity are totally unknown to us. We do not know their names, or where they lived, or when they worked (see below). All we know is that somebody domesticated millets, rice, and all the other foods we depend on. In China, those slowly became a truly vast number of domesticates. These included roots such as taro and Chinese yam, berries such as the now-famous goji berry, fruits including peach and jujube, vegetable crops such as Chinese cabbages
and snake gourds, and many herbs and spices including Chinese brown pepper, smartweed, and southernwood (sagebrush). Animals domesticated in China may include the water buffalo, but India has a very strong claim there. More certainly Chinese are the various carps found in Chinese pond culture. The Chinese in early times even domesticated insects: not only the silk insect and others. The Chinese bee is different from the western species, but beekeeping is probably an early western introduction, since the word for “honey” is Indo-European, mi from the Indo-European root that survives in our familiar \textit{miel}.

One interesting observation is that many plants were independently domesticated in east and west. (For a definitive, encyclopedic study of Chinese food plants, see Hu 2005.) For example, the western cherry was domesticated in Turkey or nearby, but the Chinese separately domesticated a number of other cherry species. (The Native Americans of Mexico domesticated still another.) Chinese apples, quinces, pears, plums, and chestnuts are also different species from western equivalents. Among domestic animals, west and east domesticated different species of geese.

With rising agricultural productivity, settlements got larger and more differentiated. Early Neolithic cemeteries show that everyone was buried with more or less similar goods—a few pots and beads. Over time, more and more people are buried with less and less, while fewer and fewer are buried with more and more. This is, of course, the same story that we read in the newspapers today; over time, other things being equal, the rich get richer and the rest get poorer.

By 3000 BCE, large towns existed, and complex religion is attested by appearance of such historically important symbols as the dragon and tiger. These appear, traced out in shells, in the grave of an individual who may have been a shaman. Shamanism involves sending one’s soul on long and often dangerous journeys to other worlds, to talk with spirit beings there and thus find cures for illness and bad luck. It is endemic to Siberia and is known to have flourished in ancient China. It still thrives among several minority nationalities.

The next major event was the coming of west Asian plants and animals. Wheat and barley reached China some 4000 to 4500 years ago. Sheep and goats appeared at about the same time—sheep rather earlier. All four had been spreading from the Near East through central Asia at the usual rate, but there is a lot of ground to cross. Wheat may have been involved in the world’s first noodles: a well-preserved knot of them from a Neolithic village 4000 years old. Usually reported as millet, they may be wheat (Li 2013:38); it holds together better and makes better noodles. Noodles did not appear in the west till about 400–600 CE (well before Marco Polo, note).

Far more momentous was the rise by 2000 BCE of genuinely complex cultures—plausibly considered true civilization, though without writing (so far as we know). The most impressive is the Erlitou culture, which overlaps the last Neolithic cultural phases in the area of the great bend of the Yellow River. The site of Erlitou is a genuine city, holding perhaps 24,000 people at its maximum size. It had impressive walls and a diversified economy with evidence of trade and manufacturing specialization. Its cultural influence extended over a large area. All indications are that we are dealing with a genuine state with a real capital city—the first in eastern Asia. The temptation is irresistible to equate it with the legendary Xia Dynasty, especially since there is archaeological evidence that it was conquered by the Shang Dynasty, who founded their own regional capital nearby. China’s earliest history works record the Shang conquest of Xia, and the records fit the story of Erlitou so perfectly that it seems pedantic to question the equation.

With the Shang Dynasty (ca. 1600–1050 BCE), Chinese society enters the light of written history. There are early history books, but they date from the following Zhou Dynasty and may
contain a good deal of legend. Less debatable are the written records of the Shang themselves. They wrote down questions for oracles to solve, and often recorded the answers. Another source consists of inscriptions on bronze vessels. When a king or high official gave a major donation or promotion, the lucky recipient was supposed to commission a beautiful bronze vessel to commemorate the event. The vessel would have an inscription recording the donation. Several important generalizations can be made about Shang Dynasty food, as revealed by comparing archaeological evidence with this considerable written record.

By Shang times, the agricultural regions of China had been more or less integrated into one system. Millets, especially foxtail millet, were all over the south, while rice had moved north into the Yellow River drainage. Vegetables and fruits had been domesticated. Wheat and sheep were common (though not barley or goats), and had become accepted as true Chinese foods. Pigs were by far the commonest domestic animal, making up about 90% of the meat. Wheat was apparently a rather elite food; millet was the common dish of everyone. Greens such as mallow leaves were cultivated. Wild nuts, fruits, greens, and roots continued to be important. Fish and turtles were major articles of diet, indicating China's dependence on riverine habitats. The oracles were usually taken by carving a question on an animal's shoulderbone or a turtle shell; the animals in question were evidently eaten first, so we know from this as well as from archaeological residues that pigs, sheep, cattle, and turtles were common food items.

Shang gave way to Zhou (1050-221 BCE), a dynasty that lasted a long time but held real power only until the conquest of its heartland in 771 by the Rong peoples, a non-Chinese group. At this point, we have actual food residues in the bronze vessels. These residues show that vessel types traditionally called stewpots did indeed contain stews—rich ones with meat and vegetables. Vessels traditionally called wine jars and wine-serving pitchers did indeed contain Chinese wine, which is technically ale—fermented grain mash—not wine.

A very revealing bronze inscription from around 800 BCE was cast to thank the king for giving the following proclamation: “I order you to assist Rong Dui in comprehensively managing the Inspectors of the Forest of the four directions so that the temple-palaces be supplied” (von Falkenhausen 2011:243; his translation). The individual ordered to assist Rong Dui cast the vessel in gratitude for this promotion. What matters to us today is that forest conservation had reached such a high point that there was a whole bureaucracy overseeing it, and getting enough pay to afford the casting of expensive bronze items. This indicates a level of environmental responsibility that was rare in the world at the time—though similarly brief but revealing passages in the Bible, the Epic of Gilgamesh, and elsewhere show that the cedars of Lebanon and other rare Near Eastern groves were being managed.

For Zhou, however, we have much more than this. The Book of Songs (Shi Jing), China’s great collection of early folk and court songs, was supposedly edited by Confucius himself around 500 BCE. It mentions 55 food plants, 31 of them cultivated or probably so. Millets are by far the most important ones; six varieties are named often. Three of these are probably foxtail and three broomcorn. 93 animal species are mentioned, but most were not for food; in fact three were imaginary (dragon, phoenix and unicorn). Food animals were largely pig, cattle, sheep and horse, as well as deer, dog, hare, turtles, and many minor items. Of the 35 birds mentioned, most were probably available as food (not the phoenix, however). This is an impressive record of natural history; the far longer Hebrew Bible mentions a comparable number. A much later poetry collection, the Songs of the South (Chu Ci), adds many more food and ornamental plants to the list. It also records a number of dishes, including feast dishes made from dog and other less usual animals.
A final interesting source is ritual text. Several ritual manuals from Zhou survive, but were heavily edited—if not reconstructed outright—in the following Han Dynasty (206 BCE-220 CE). They provide recipes for stews, fried foods, and barbecues. Roel Sterckx has provided noble service in describing these texts (Sterckx 2005, 2011). As Stercks points out, the ancestors, gods, spirits, royalty, nobles, elders, and indeed everyone had to have their proper dishes—in graduated scales of fineness and richness. Offending custom in this regard could get you in serious trouble. Gods punished rulers who did not sacrifice enough, often sending plagues. On a more mundane scale, Liu Xiang (2014), a member of the Han royal family, recounts that a noble throwing a dinner party gave each guest a turtle, but one got a very small one. That guest sarcastically commented “I will wait till this turtle is grown up to eat it.” The host’s wife had to bail him out, by telling him how to fix the social situation, as countless billions of wives have done with socially slow husbands throughout the world since the beginning of time.

The Han Dynasty seems to have added several items to China’s food universe. Not only did grapes and alfalfa enter China from the west, but the wok appears at this time, possibly a borrowing from India, but possibly a local invention. Cast iron had been invented and popularized in Zhou, and woks are really best when made from that metal, though pottery ones are common in the record. It seems highly likely that stir-frying was invented after the wok became widespread. We certainly have no indication of it from pre-Han times, but, actually, we have none from Han either; it seems implied in recipes in the Qi Min Yao Shu from around 550 CE. Bean curd was apparently invented in Han, and probably distillation as well, though apparently only for small-scale medicinal purposes (Huang 2000).

A far more important innovation in Han was genuine agricultural and medical science. The most impressive thing is the development of systematic government-run case/control experimentation, the first by far to be documented in the world (except perhaps for Daniel 1:8-16). It involved tests of drylands agricultural innovations; alternate strips were managed as experiments and as controls. Fan Shengzhi recorded this in another world milestone: the world’s first agricultural extension manual, from the first century BCE (Shih 1973).

Closely related is the rise of medical science, as seen in the Shang Han Lun of Zhang Zhongjing (1981), the Yellow Emperor’s Classic (Unschuld 2003; Veith 2002) and in the first well-known comprehensive herbals (bencao). Medical science is directly relevant to my talk, because at least since the early Zhou Dynasty, the Chinese have recognized that nutrition is the first and most important line of medicine. Zhou texts (or at least their Han recensions) indicate that the court dietitian was the most important and eminent medical practitioner of the realm—of which more below. This is still true. One of the most consistent findings of modern research on Chinese medicine is that Chinese everywhere usually resort to food and dietetics first, not only to treat illness but to stay healthy. Modern bioscience confirms this approach, and has found that many of the classic “nutraceuticals” are indeed filled with vitamins, minerals, and antioxidants. Moreover, Zhang Zhongjing describes vitamin B1 deficiency and its cure through fresh foods, and also oral rehydration for diarrhea.

Evidently medicine had a prior history, known only from Han sources, but it seems fairly clear to me that it was during Han that this field reached a level we can call science; earlier medicine was too full of demons, spirits, and magic to count (see Unschuld 1985). The books cited above are completely different. Not a word about demons. The theories seem quaint and exotic to modern biomedical researchers, but the theories were as good as anyone could come up with 2000 years ago; they fit the observed facts and allowed deduction as well as systematization of recorded
knowledge. Chinese Traditional Medicine practitioners still use these old theories, in modernized forms, with apparent success.

The *Ling Shu* section of the Yellow Emperor’s Classic is particularly impressive in its scientific approach (see Wu 1993). Intriguingly, western medicine was undergoing the same development at the same time: Galen systematized and theorized medical knowledge and practice in a fully scientific way, while Dioscorides collected and systematized herbal medicine. The parallels are striking. Direct contact between the Mediterranean world and Han did not exist (see Hansen 2012), so we are forced to conclude that the progress of science had created one of its astonishing cases of parallel invention.

The Han Dynasty also saw the development, or culmination, of a fascinating science of environment, climate and soil, but I have no time today to explore this (see my new book *Food and Environment in Early and Medieval China*).

Once again, I must emphasize that most of the developments I am describing were done by individuals whose names have been forgotten. We do not even know the names of the people who compiled the Yellow Emperor’s Classic; they hid behind an ascription to a purely mythical individual. I am sure they knew he was a myth. (This was, after all, the age of the arch-skeptic Wang Chong and many like him.) They wanted a sacralized title, not personal glory. The early *bencao* and sexual medicine texts, known from Han tomb finds, are all anonymous. As is too usual in history, we know the names of every murderous general, every treacherous rebel, every court scoundrel, and every lying betrayer of the country, but hardly a single name of the people who benefited the empire through development of agriculture and medicine. As Heinrich Heine so beautifully put it, “The tree of humanity forgets the labour of the silent gardeners who sheltered it from the cold, watered it in time of drought, shielded it against wild animals; but it preserves faithfully the names mercilessly cut into its bark.” Heinrich Heine, 1833 (as quoted in Gross 1983:323)

Also in Han, true tea as we know it today seems to have appeared for the first time. Its early history is an almost complete mystery, because the Chinese word *cha* evidently referred to any and every herbal tea in ancient times. *Camellia sinensis* (a.k.a. *Thea sinensis*) is native to what is now southwest China, as well as northeastern India and northern Burma, but that part of China was acquired long after Han. Tea appears to have slowly but surely gained popularity, finally breaking through as an elite drink with a cult following in the Tang Dynasty (620–907 CE). A factor in this was the Chinese fondness for very early morning court sessions, which were made much more bearable by the existence of a caffeine-rich drink.

The connoisseur Lu Yü wrote a Classic of Tea (1974, Chinese orig. ca 800 CE) that established tea as a drink that not only kept one awake, it was exquisite and refined, worthy of serious cultivation. He recommended procedures to bring out the best in it. The stage was set for the development of tea-drinking as an art form with its own rituals and ceremonies (see Anderson 2003; Blofeld 1985; Hohenegger 2009); this led ultimately to the Tea Ceremony (**cha no yu**) of Japan, so famous in literature and culture. In China, tea quickly became a specialty of the southeastern and southwestern mountains, where it finds ideal growing conditions. It spread to Japan very early, but in India—though it is native there—its popularity and wide growth is of very recent origin, largely a function of the death of coffee trees from blight in the late 19th century; tea was a good replacement. By Song, tea was counted a necessity, and was so abundant that the Song court sent 20,000 catties of it a year to the Xi Xia as part of a peace deal (Ebrey 2014:375).
Parenthetically, it is rather interesting to trace the word for “tea” around the world. It has been borrowed worldwide in three forms, each one betraying a particular route of migration. Tea is cha in most of China, and that is the form found in Korea, Japan, and other nearby countries. The southern Fujian pronunciation, however, is te, and since Fujian is a center of tea production and trade, this was the form first encountered by western Europeans when they came to China. Tea is te, or a derivative of it, in all western European languages. (“Tea” was pronounced “tay” originally, as it still is in parts of Ireland.) Finally, tea in Central Asia was picked up by Iranian speakers, and acquired an Iranian nominative ending, –i, thus giving us chai. That pronunciation is a sure indication that tea reached the area in question through the Central Asian route. It is the pronunciation found from Mongolia throughout all Central and West Asia and on into Russia and India. The whole history of the tea trade makes a fascinating study in itself, but is outside the scope of the present paper (see Anderson 2003).

The fall of the Han Dynasty, after a 400-year run (interrupted by a few coups), led to disunion that lasted almost another 400 years. During this period, China changed radically in one important way: it opened up to the rest of the world. It was no longer a united realm under a powerful ruling family. Outsiders could and did take over vast tracts, as the Toba Turks did in creating the Wei Dynasty, which ruled the north for most of the period of disunion. Many of China’s other local rulers also had Central Asian roots. Moreover, when China was finally reunited (with reduced boundaries), the conquerors who founded the Sui and later the Tang Dynasties (581–620, 620–907, respectively) had Central Asian backgrounds; they were generals serving on the northwest frontiers, and they had Central Asian blood—some say they were largely Turkic by descent, but this is uncertain.

Meanwhile, from Han times onward, the famous Silk Road was becoming a major corridor linking the great civilizations of east and west. The term “silk road” was coined by the German geographer von Richtofen in the 19th century (Hansen 2012), but it is appropriate, although there were actually many parallel routes and silk was only one commodity.

Among the other commodities were foods. How much Chinese food went west is still unclear, but the coming of western foods to medieval China was monographed in detail as early as 1919, by Berthold Laufer. He drew on herbals and encyclopedias from the time. He described some 53 foods and medicines, ranging from grapes and Persian walnuts (which came early) to carrots and watermelons (which came late—or at least were not recorded until around 1300). Many familiar Chinese spices, such as coriander, cumin, and fenugreek, came at this time. Sun Simiao, in his great medical works of the 7th century CE, already recognized the medicinal value of many of these, and incorporated at least eight of them into his cures; he also incorporated more than a little western medical theory (Engelhardt 2001). About the only western herbs not borrowed by 1300 were the ones such as lavender and rosemary that are hard to grow away from the Mediterranean and its distinctive climate.

In addition to these products, Central Asian and Indian milk consumption habits flooded into China, largely with the Turkic and part-Turkic conquerors. In Wei and Tang, milk was important, and north China became famous for milk product consumption. Liquid milk was little used, because of lactose intolerance, but yogurt, butter, ghee, kumiss, qaymaq (the skin from boiled milk and cream), and other products abounded (Sabban 2011; Schafer 1977). Most of this was Central Asian in origin, but Tibetan habits spread in the west and southwest, and China probably also received some of the influences of Indian milk culture that spread with Hinduism and Buddhism in southeast Asia (Wheatley 1965).

Valerie Hansen (2012) has recently maintained that the Silk Road was actually very little traveled,
being used only by a few caravans a year. Her work reminds me of Charles Wesley’s cynical description of the road of wisdom as “a narrow path with here and there a traveler” (from Wesley’s 18th-century hymn “Broad Is the Road that Leads to Death”). Hansen is clearly wrong. The enormous influence of west and east Asia on each other between 500 and 1400 BC speaks for itself.

China was also learning from southeast Asia. The Nanfang Caomu Zhuang (Li 1979) of 304 CE records a large number of plants China acquired from there. Many actually were native to what is now China, and were new only because the Han Dynasty had captured their homelands. Others were truly exotic, like the areca palm, known then and today by its Malaysian name pinang (borrowed through southern Fujianese as pinnang, now variously pronounced in modern China).

By the time the Mongols first united west and east, both ends of the Silk Road had hundreds of domesticates. The west was, and is today, much slower to pick up Chinese crops than China was at picking up western ones. Europe has always been rather conservative about foodways. Only with massive immigration from eastern Asia have Americans learned the delights of Chinese cabbage, Chinese pears, goji berries, smartweed (rau ram of Vietnamese markets), and many others, and even these are little known away from cities with large Asian-American communities. All or most citrus fruit are Chinese or southeast Asian. Otherwise, outside of rice, there really are very few common western foods that come from China. China is much better at learning these things than Europe has been.

My own work in Chinese food history has for many years been as a sort of back-up to Paul Buell’s work on the Mongol Empire and its Chinese manifestation the Yuan Dynasty (1279-1368). Together we translated the Yinsban Zhengyao, the court nutrition and food manual of the Yuan Dynasty, compiled by the court nutritionist (or dietitian) Hu Sihui (Buell, Anderson and Perry 2010). It is a particularly revealing work, because most of the recipes (except for very simple ones for herbal tea) are Near Eastern or Central Asian. The silk road had done its work. Recipes traceable to Baghdad, Kashmir, and the Persian Gulf area, as well as to Mongolia and Turkestan, are found, as well as Chinese recipes. Most interesting are some unusual recipes that seem to be blends of various traditions. There are some cases of mere substitution of Chinese ingredients for hard-to-get Near Eastern ones, but I refer to more complicated recipes. Those Silk Road cooks were learning from each other. The “Strange Delicacies of Exotic Flavors” section—the main recipe section—contains some 21 Near Eastern recipes, another 21 Central Asian, 11 Chinese, and 42 that represent blended traditions.

Dr. Buell and I are now working on the Huihui Yaofang, “Muslim Remedies,” a vast medical encyclopedia of Near Eastern medicine compiled under the Yuan Dynasty. About 500 pages survive of an original 3500 or 4000 (in a Ming reprint). The medicine is state-of-the-art Mediterranean-area medicine of the time, as we have found through comparing cures with documented cures from the same period in France, Egypt, and elsewhere. Fortunately, one part that survives is the table of contents of the section on foods and health—alas, the section itself is lost. It, and the material that survives, allows us to count 148 food items are mentioned in this work. These are extracted from a full herbal list involving about 287 plant taxa, 68 animals, and 26 minerals. There are actually more species of plants represented, because the terms in the Huihui Yaofang often lump two or three similar species into one category. This can be confusing, as when quinces are simply “quinces,” and we can only guess that the Chinese quince was used in place of the similar Mediterranean one. The compilers were strikingly good scientists, though; they rarely combine species, even very similar ones, if the medicinal indications were different. A
few serious mistranslations did occur, when Chinese names were ambiguous.

The book is apparently a translation or compilation of Central Asian medical works. It is not always appreciated that the “Arab” medicine of the medieval world, so influential on European practice, was more Central Asian Iranian than Arab. Many of the greatest exponents—al-Bīrūnī, Avicenna (Ibn Sinā), Al-Samarqandi, and others—were from that origin (for them, and for the glory days of Central Asia, see Beckwith 2013; Starr 2013). Avicenna's work in particular became the defining medicine of the medieval and Renaissance West. But it also influenced China, via the *Huibui Yaofang*.

Food as medicine is less featured in this work than in Chinese sources, because western medicine did not feature food as much as the Chinese traditions did. However, food and diet therapy are by no means lacking. This awaits further study.

Unfortunately, the *Huibui Yaofang* was too identified with the hated Mongols to last as an influence. The Ming Dynasty did reprint it, early on, but then it and most other recent Near Eastern influences simply disappeared. They were lost and forgotten. Late Ming medicinal and dietary works like the writings of Gao Lian (which we are now studying; see Anderson 2013) have a few random Central Asian recipes, but nothing like the influence seen in Yuan works.

We close this rather breathless survey with some notes on the Ming Dynasty. Ming is sadly notorious for its authoritarian rule and its increasing censorship, a censorship that the Qing Dynasty initially relaxed but later tightened again. For decades, many Sinologists have maintained that China’s achievements in science, medicine, and technology were as impressive, rapid, and genuinely scientific as those of the west—until Yuan and Ming, when increasingly authoritarian rule slowed progress. Various versions of this idea are widespread in the literature, from Joseph Needham (1958) to today (and including my own writings; Anderson 1988, etc.). The main counter-theories have been that China *always* progressed slowly and steadily, with no special inflection after 1400; or that China was so trapped in mystical and other-worldly dogma that it could never be scientific (Needham somewhat accommodated this view, but for an extreme version, see Wolpert 1993). The great historian of the world, Geoffrey Parker, is the latest to weigh in unequivocally in favor of a serious shutdown of Chinese progress through late Ming and Qing autocracy (Parker 2013:660, 666–667), rather than just a steady slow progress.

As I read the evidence (and I admit others do not agree) China progressed with considerable speed in all areas of science during Han, Tang and Song and on into Yuan, and continued to progress somewhat in Ming, but that after mid-Ming, China really did not keep up the momentum. One clear case that concerns us here is botany. Li Shizhen’s *Bencao Gangmu*, when it appeared in 1593, was comparable to the greatest herbals in the west at that time. It even anticipated many later developments in western science. But then the West forged ahead, while China remained faithful to Li’s magistral but increasingly obsolete text. Li mentions 67 western plants that had been introduced to China, but most had been in China since Tang and Song. He does not deal with the New World plants that were flooding into China at that time. China’s countless borrowings from the rest of the world continued, but unsung and rarely incorporated into medical tradition. Chinese medicine did not quite freeze in place, but it did tend to close ranks around Li’s herbal and the Yellow Emperor’s Classic, though western medicine and then international bioscientific medicine came in due course (Unschuld 1985). Biomedicine revolutionized Chinese practice, but Chinese study of herbal medicine and other indigenous traditions has only recently revived, and still struggles with ancient dogma. Agriculture hit similar snags. Development was not spectacular during Qing, in spite of the rapid advance of the New World food crops and other introductions.
Over the long term, China’s agriculture was and is characterized by what Yujiro Hayami and Vernon Ruttan (1985) called “biological” development. Higher and higher yield crops were developed. More and more fertilizer and compost were used. More and more productive agricultural practices were deployed. More and more labor was poured into the fields. Akira Hayami (2009; I wonder if he is related to Yujiro) called this an “industrious revolution,” a term now widely borrowed in western historical literature for other cases (Parker 2013:487; Parker notes Hayami invented the term in 1977). Biological development and harder work led to Chinese agriculture in 1900 being about five times as productive per acre as American agriculture (cf. King 1911). Unfortunately, increased production merely kept pace with population increase. Thus, people worked harder and harder, but did not get any more food per capita. This produced a situation that Philip Huang (1990) called “agricultural involution,” using a term coined by Clifford Geertz (1963) to describe Java.

Today, with productive land shrinking worldwide, we have to borrow China’s biological development concepts. This has been done most conspicuously in Bill Mollison’s concept of permaculture, which is based on Chinese farming principles. It involves the development of highly efficient, biologically intensive cropping methods for all world systems.

China managed, through intensification, to feed its hundreds of millions of people over thousands of years. By the late Qing Dynasty, China had 400 million people but was self-sufficient in food. However, enormous famines were regular occurrences by then. Normal weather fluctuations were catastrophic in a country desperately overcrowded and depending on traditional agriculture. It is not true to say that China at that time was “backward” or “underdeveloped”; it actually had a far more productive agriculture and food economy, in terms of supporting many people on little land, than the western world did (see esp. King 1911; also Anderson 1990).

Progress in agricultural change stalled in the Republican period, and resumed after 1949. However, erratic policies and too-rapid change led eventually to the great famine of 1958–62 (Dikotter 2010; Yang 2012). After that, progress resumed—still erratic, but fairly steady until recently.

Unfortunately, progress is now checked by the catastrophic decline of the Chinese environment (Anderson 2012, updated as of May 2014 on my website). This impacts food production through the damage to soil, water, and air. The Chinese government has recently become aware of the seriousness of the problem, and promised to improve. However, the situation is dire.

The worst problem is the degradation of farmland by pollution, erosion, and desertification. China has lost a quarter or more of its farmland in the last 50 years. In the last couple of decades, at least 12 million hectares have become too polluted to be farmed safely. Much of this pollution is heavy metals—arsenic, mercury, cadmium, lead, etc.—that make the land unusable for geologic time spans. Desertification has lost China millions of acres, much of it in Inner Mongolia; traditional grazing preserved the grasslands, but ill-advised farming schemes led to rapid soil loss. Deforestation, especially during the 1950s and 1960s, led to massive erosion. An equally massive reforestation campaign, and banning of much logging from 1998 onward, has restored huge areas to healthy forest, but even more land has become too degraded to be easily restored; trees die or grow very poorly (personal observation supplemented by poring over Google Maps and by conversations with Nicholas Menzies, an expert on China’s forestry).
Urbanization is another problem. China is developing rapidly, with resulting expansion of suburbs, airports, roads, factories, shopping centers, and other uses at the expense of farmland. China is currently losing about 860,000 hectares a year to these. Since China’s cities were, quite naturally, located in the midst of the best farmland, the resulting costs to agriculture are disproportionately high. There is no hope of making this up by bringing further land under cultivation; China’s agriculture is already overextended onto unsuitable soils. Traditional Chinese culture frowned on urbanizing farmland (though it happened anyway), but today there are no controls enforced, though recent concern has been expressed.

Irrigation is affected by overdraft of rivers. The Yellow River no longer comes even close to the sea. Water pollution makes many waterways dangerous to use, even if water is available.

In addition to impacts on agriculture, China’s combination between rapid economic expansion and rapid pollution increase has led to decimation or even destruction of fisheries. Worst hit are inland fisheries, but nearshore fisheries are devastated and even deep-sea ones within reasonable sailing range are severely stressed.

To counter this, China is taking a lead in clean energy development, including solar panel production. Attempts to lower China’s huge release of greenhouse gases are well under way (see e.g. Liu et al. 2013). China is also investing in mass transit, including state-of-the-art rapid trains. Improvements to China’s Environmental Protection Law have been recommended by the National People’s Congress in 2011, but were rejected in 2013 (He et al. 2013). The Communist Party has adopted the idea of “ecological civilization,” a civilization based on “man-nature, production-consumption harmony” (He et al. 2013). In early 2014, the government renewed a commitment to cleaner air, taking a no-nonsense position with allowable levels set (Qiu 2014).

It remains to be seen whether all this will work. China’s government has great power, but foot-dragging by local officials, often corrupted by local development interests, has been a major problem for implementing environmental protection.

One place they might be well advised to turn is to the accumulated wisdom of the Chinese people, including the minority nationalities. Doing so was once a priority of the Communist regime, but such is apparently no longer the case. Given the extreme population density over centuries, the various nationalities of China had to work out ways to live with nature and with an intensively managed agricultural environment.

Han Chinese have traditions, going back more than two thousand years, of conserving game, protecting forests, and protecting agricultural land from too much alienation for buildings and other purposes. Some of these traditions were embodied in the folk science of site planning known as fengshui. Others stem from Confucian and Daoist thinking or from the imperial practices of the Zhou and Han Dynasties. (I have described these in some detail in my recent book, Anderson 2014.) Later, Buddhism added to existing beliefs in the sacredness of old and venerable trees. Temple groves and fengshui groves became the major way of conserving forests in the more crowded areas of China. They were extremely effective, protecting millions of hectares of woodland—most of it adjacent to villages, temples, and towns, where it was most needed for shade, fuelwood, forage, forest products, and timber (trees were harvested sustainably). I saw Chinese conservation at work in the New Territories of Hong Kong 50 years ago, when they were under Qing Dynasty law and custom. Resources were not ideally managed, but there were still large groves, abundant wildlife, abundant wild herbs, and many other goods from the land. Villages did not sprawl onto good agricultural land. Construction and clearing were done conservatively. The major environmental problem was wildfire, set for various reasons and devastating to grass and brush resources. Organic pollution was also a serious concern.
Many of the minority nationalities have even more stringent conservation rules. I had long read accounts of the good conservation practices of the Mongol peoples, specifically in regard to grassland and forest (Metzo 2005; Williams 1996a,1996b, 2000). Experience traveling widely in Mongolia showed me that this extends to animals, minor plant resources, and even rocks; a young nomad girl told me she likes to collect pretty rocks, but does not do it because it would be disrespectful to the rocks to move them around for so minor a reason. The concept of respect (shuteekh or other words) is the basis of environmental protection in the Mongolian world. One must respect people and their needs, but also the trees, mountains, rocks, animals, and spirit powers that constitute the environment. This is often shown by wrapping a sacred blue silk scarf round the venerated item—usually an old tree, a small grove of trees, or a sacred cairn (ovoo or oboo—thought to bring luck and protection). Away from the exploding metropolis of Ulaanbaatar, Mongolia is incredibly well-managed.

The Koreans share China’s ancient cults of sacred mountains and trees, as well as the fengshui system; these beliefs persist in Korea apparently better than in China (see e.g. Zozayong 1975). Tibet has a long tradition of nonviolence, due to Buddhist influences. Soil and water were protected, and forests where they occur. Mountains were sacred, and the most revered ones served as natural wildlife and forest sanctuaries (Huber 1999). Animals were not hunted traditionally, or at least not hunted unsustainably. With modernization, this is no longer the case. Both Han and Tibetan hunters have impacted the game.

The Gold Tungus of the China-Russia border were memorably described by Arseniev (1996, Russian orig. ca. 1900). Arseniev’s account is romanticised, but his descriptions of Gold environmental practice jibe perfectly with more sober recent accounts of Mongol and Tungus practice, as well as with my own experiences in Mongolia. The Gold have the same general beliefs in environmental spirits, the need for respect, and the personhood of animals, plants and winds.

Other groups are poorly known, at least as far as their presence in China goes. There is apparently no description of environmental beliefs and practices in Xinjiang or for most of the Sichuan minorities. Research is ongoing into several minorities in Sichuan and Yunnan, however, and one example may stand for the whole.

The Akha of far southern Yunnan have been described in a brilliant Ph.D. thesis by my student Jianhua “Ayoe” Wang (2013). They share with other south Chinese and Southeast Asian peoples a belief that the world is divided into the realm of humans—the villages and fields—and the realm of spirits, the forests and mountains. People and spirits move freely in each other’s domains, but must be careful and respectful. Again, the concept of respect—taqheeq-e in Akha—is basic. Since the Akha stem ultimately from northwest China, this is probably an ancient belief system shared with the Mongols. On the other hand, the same concept exists among North American Indians, so independent invention seems to happen.

The spirits punish those who harm forests, landscapes, or the very large number of species of plants and animals that are sacred. In practice, these religious and ritual rules made it impossible to use the land and its resources unsustainably. Of course there were always scofflaws who broke the rules, but they were judged negatively by their neighbors, and any misfortune they suffered might be blamed on their conduct. So they could not be too disruptive. Again, modernization has led to abandoning much of this ancient body of rules. The fact that it is justified by religion should not be held against it; it is equally justified by common sense and obvious pragmatic success. It joins the vast number of sensible rules—from helping your neighbor to washing your hands—that human beings everywhere elevate to the level of religious teaching but that are
followed by any reasonable human in any case.

We may contrast these ancient but pragmatic and reasonable teachings with the western ideas of dominating or “struggling against” nature that have informed Chinese practice in more recent decades. Far from being progressive or economically sound, these beliefs are based on the Biblical charge to exert “dominion” over the earth (Genesis 1:26). This passage and other domination beliefs in the west go back to the slave-run or serf-run estates of ancient Mesopotamia, Greece and Rome. It is ironic to see them held up as progress. Westernization does not equal progress.

Also, for those who might oppose “spiritual” teachings to “modern rational economics,” one can only respond that modern economic policies are based on neoclassical economic theory, which assumes humans are totally rational, interested solely in maximizing immediate returns, have perfect information, and make decisions on the basis of errorless calculus of maximizing utility. These assumptions are patently false and lead to policies that can only be described as insane. Belief in tree spirits at least leads to saving trees. China must take into account the pragmatic wisdom of these minority traditions if it is to continue to feed its people.

In short, China’s success in feeding its hundreds of millions of people over thousands of years was due to policies that may have been far from perfect and far from scientifically well-informed, but at least were successful and intelligent enough to keep the system functioning. China’s success at economic growth today is based on measures that are devastating China’s food production system. This is unsustainable and will soon end. What will happen then depends on choices that China is making today.