from globalized PIG BREEDS
TO CAPITALIST PIGS: A STUDY IN ANIMAL CULTURES AND EVOLUTIONARY HISTORY

ABSTRACT
This article examines the history of how Chinese pig breeds came to Europe and later America. While Asian hogs were domesticated for feeding on waste and agricultural by-products, ancient European hogs had to range in forests for mast, producing a leaner, more wild type. As European forests were cleared, mast feeding came under recurring pressure, creating incentives for improved swine management and breeding. In the eighteenth century, as Northern European agriculture intensified, Chinese pigs were imported to create improved varieties first in England and then in America. These new breeds, with their enhanced capacity for rapid weight gain, played a vital role in the pig’s transformation from a small-farm subsistence animal into an industrial meat producer. The article analyzes this history of pig breeds as a microcosm of early modern globalization and the emergence of industrial capitalism, as well as a case study of how interdisciplinary evidence and evolutionary perspectives can contribute to the emerging field of animal studies.

SOME TIME ROUGHLY three hundred years ago, in a significant but little-known act of globalization, Chinese pigs came to Europe. Unlike other animal transfers of the era, this was neither the invasion of a foreign species nor a mere shuffling of regional breeds. Rather, this exchange reunited two suid lines divided for over nine thousand years by separate acts of domestication under diverging ecological conditions. Although seldom appreciated, the coming of Chinese swine stock, with its enhanced capacity for rapid weight gain, played a critical role in transforming Western pigs from peasant subsistence to industrial meat production.

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Studying the nature and timing of this transfer opens a peculiar but illuminating window on the broader history of livestock domestication and breeding, and even globalization itself. Taking a long view of the porcine past, this article explores how the process of swine separation and introgression illustrates interacting environmental, evolutionary, and economic forces in history. The first section explains how millennia of diverging patterns of land use in Europe and China produced distinct evolutionary pressures on pigs, creating remarkably different types. The article then examines how resource pressures in the classical Mediterranean and high medieval Northern Europe drove efforts to improve Western swine stock but demonstrates that a decisive breakthrough had to await the arrival of Asian genetic input. Drawing on new mitochondrial DNA studies, the article traces the introduction of Chinese pig breeds to England around 1700, arguing that this period of incipient global commerce and converging ecological pressures across Eurasia opened a unique window of opportunity for biological exchange. Yet as the following sections explain, these converging ecological pressures also came at a time of an economic “great divergence” in the late eighteenth-century world, with the emergence of capitalism and industrialization in Britain and later America. These developments ensured that the newly introduced Chinese pig would not continue its traditional role as a small farm animal, but would instead facilitate the transformation of Western hogs from a household animal into an industrial commodity.

DOMESTICATIONS AND DIVERGENCE

Over the past two decades, ongoing archaeological and genetic research has revolutionized the study of animal domestication and the formation of breeds. New excavations on the one hand and mitochondrial DNA studies on the other have proven particularly illuminating for the history of pigs, uncovering important information about their distinct domestications in Europe and Asia and their subsequent genetic separation and introgression. Although seemingly far removed from the modern history of hog breeding, this Neolithic background reveals how these two lines of pigs diverged so completely, underlining the significance of their reunion once Chinese pig breeds were imported to the West.

On its face, the domestication of the pig presents a puzzle. Unlike sheep, goats, and cattle, pigs are not ruminants that convert inedible cellulose into edible meat. In the wild, their omnivorous diet overlapped with that of people, creating a natural source of conflict with human settlements. Their long-term success as domesticates, therefore, has hinged on their finding an ecological niche that complements rather than competes with that of their domesticators. Recent archaeological evidence suggests the first service that pigs provided humans was probably not food conversion but simply food storage. As depositories for surplus calories, pigs provided a unique method
of preserving, sharing, and exchanging wealth; their keeping became a marker of status, as found in Neolithic burial excavations in both southern China and the Near East, where they were separately domesticated.\(^3\)

It would appear, however, that as agriculture developed and as larger human settlements put increasing pressure on land and resources, pigs were forced to evolve into new roles. In China, this adaptation took the form of eating human scraps and refuse, first as foragers and later as true farm animals—a transition they achieved around eight thousand years ago.\(^4\) In this role, they were separated from their traditional habitats and feeding habits. Raised in sties and fed at troughs, they were spared the usual evolutionary pressures that had governed the shape of their wild progenitors and were left instead to the priorities of human breeding. Across East Asia round, pale, short-legged, and pot-bellied varieties long predominated, with many traditional regional breeds persisting to the present day.\(^5\)

In the West, however, the first scavenger pigs failed to make the same easy transition to the farm. After a period of early exploitation dating back to the ninth millennium BC, denser Neolithic settlements in the Fertile Crescent began to reject the animals, perhaps as a nuisance to crops or as competition for other scarce resources such as water. As recent genetic studies have confirmed, the first pig exploitation in Anatolia hit a dead end, leaving few if any traces in the later domesticated swine populations.\(^6\) Instead, over the following millennia, various European populations independently developed techniques of mast feeding, herding swine in the still abundant forests and feeding them on beechnuts and acorns of only marginal value for human subsistence.\(^7\)

This practice, known as pannage, kept early European swine under many of the same evolutionary pressures that had governed the shape of their wild forebears. Mast-fed pigs still had to range deep into the woods and fend off predators and competing boars. So long as these animals roamed about for a substantial part of the year, controlled breeding remained difficult or impossible. Often, they even interbred with wild swine. Through the first millennium AD, the Western pig generally remained a fierce and agile creature, lean and long-legged, with ridges of bristles and residual tusks.

These distinct patterns of pig keeping complemented and perhaps also encouraged diverging patterns of population and land use in China and the West. The former’s higher population density and more intensive agriculture began to put greater pressure on woodland resources, particularly once population began to shift to rice-growing regions of central and southern China in the first millennium AD, while also creating more opportunities to fatten pigs on farm and household by-products.\(^8\) The relative scarcity of sheep, goats, and cattle also created more demand for pig manure, and better interior communications and denser settlement created better local markets for swine flesh—far and away the dominant meat of traditional China.\(^9\) In Europe, by contrast, population densities would remain generally lower and agriculture more extensive and reliant on ruminant livestock through the early middle ages. Pigs
typically fit into a pattern of peasant subsistence rather than specialized market production, a role that would persist even in parts of England into the early twentieth century.10

Such differences in the rearing and physiognomy of Chinese and Western pigs endowed the animals with vastly dissimilar cultural associations, perhaps reinforcing their diverging roles in agriculture and the rural economy. In China, as in much of Southeast Asia, the pig became indelibly linked to ideas of small-farm prosperity, to the point that the Chinese character for “home” remains the sign of a pig under the sign of a roof. Even in contemporary China, where peasant farms are giving way to rapid urbanization and industrial agriculture, the “golden” pig year of 2007 inspired such a wave of celebration that state officials fretted over a coming spike in birth rates to take advantage of the rare and lucky zodiac sign.11

In Europe, through medieval times, swine maintained unusual cultural and symbolic roles now long forgotten in an age of factory farming. Perhaps deriving from Indo-European religious and cultural traditions, pigs came to be associated with ritual feasting, with chthonic rites, and with fertility rituals.12 In the Vikings’ Valhalla, for instance, the fallen heroes fed every night on the boar Saehrimnir, who magically grew back the following day. In ancient Greece, among other sacrificial rituals, piglets were cast into pits in the fields and their bones dug up later as an offering to the goddess Demeter for the success of the harvest. With the decline of paganism and rise of Christianity, pigs suffered an inevitable loss of status as their former religious roles were neglected.13 Nevertheless, if no longer revered, the creature still inspired a wary respect among medieval and early modern Europeans. Murderous boars and sows figured prominently in animal trials, with scores
or even hundreds going to the gallows from the twelfth down to the eighteenth century. Pigs and pig trials came to play a role in European anti-Semitic lore, with its strange libels of Jews born from sows, and possible instances of swine executions as effigies for Jews. Finally, the basic seasonality of mast feeding endowed pigs and pig keeping with a sense of yearly ritual now lost in the days of intensive livestock production. The animals went to pannage on a regular calendar, usually corresponding to saints’ days, and their slaughter became so firmly associated with the end of autumn it was used to illustrate the months of November and December in calendars and almanacs.

In sum, by the time Chinese pigs came to Europe, these two suid branches were separated by millennia of genetic and cultural divergence. Therefore, to understand the remarkable success of these new pig breeds in the early modern West, we first need to examine pressures on European pannage and the innate possibilities of an introduced line of pigs bred exclusively for the trough and sty.

PRESSURES AND INTENSIFICATION

Pannage, while it had the virtue of turning mostly inedible mast into edible meat, relied on the maintenance of extensive woodlands. According to modern studies, hogs in a good acorn forest will typically range up to 6 kilometers per day, burning about a third of their energy consumed just getting about and converting calories at a rate of perhaps 10:1 (as opposed to less than 3:1 for modern industrial production). This movement meant that
forest pigs remained leaner, gaining weight less easily than their sty cousins. Furthermore, the seasonality of mast and the irregular production of good mast harvests meant that farmers still had to supplement their animals’ diet with other food for much of the year. Pannage remained an inherently limited practice except in the most ecologically permissive circumstances.

And so pig keeping came under mounting pressure wherever European population densities began to rise and the forests were cleared. When mast feeding proved inadequate, some pig farmers would inevitably look for alternative ways to raise their animals, intensifying feeding and production. Recent zooarchaeological studies along with literary and pictorial evidence allow us to follow this pattern of improvement in two early case studies: classical Rome and high medieval England and the Low Countries. On the one hand, both cases illustrate how resource scarcities and growing markets intensified swine husbandry; on the other hand, both also demonstrate the inherent difficulties Europeans faced in establishing improved pig breeds without imported genetic material.

**CLASSICAL ROME**

Building upon earlier works based in classical sources, recent scholars have begun to systematically combine the written, visual, and physical records of ancient Mediterranean livestock to develop a fairly comprehensive picture of the development of Greek and Roman swine. From late Archaic times, accelerating with the demographic and commercial boom of the fifth century BC, the historically high population densities of the Hellenic world and consequent pressure on woodland resources appear to have encouraged more intensive forms of pig raising. While not yet confirmed by zooarchaeology, artistic representations seem to indicate sporadic attempts at improved breeding, particularly short-legged, round-bodied varieties. Although Greek literary evidence on pigs is rather thin, Aristotle’s *History of Animals* also makes a passing reference to supplementing the usual mast feeding with chickpeas and figs.

The first definite improved variety emerged some three centuries later in the late Roman republic, as the affluent capital city of nearly a million created an unprecedented market for animal products. By the first century AD, Columella’s advice book for farmers encouraged them not to rely on acorn foraging alone but to make use of legumes for fattening as well. Consequently, he also advised breeding for a new type of pig more suitable for rapid weight gain than for ranging in the woods: “Pigs should be sought whose bodies are exceedingly wide, but squarish rather than long or round, with a protruding belly and large rump rather than tall legs or hooves, a broad glandulous neck, and a short upturned snout.” While Columella’s description should not be taken to mean that Romans had already made the transition from forest pigs to sty pigs, his observations demonstrate that farmers of the time were aware of the animal’s potential to be bred for fattening and raised on agricultural products.
Furthermore, an analysis of pig remains around ancient Rome has provided clear evidence for an improved variety alongside the more traditional lean types. According to the author of the study, the new fatter, rounder breed may have been reserved for urban markets and sacrifices while most rural households still made do with the old-fashioned sort.\(^\text{25}\)

With the decline and fall of the western Roman Empire, however, this initial experiment in porcine improvement came to a sudden end. The large, round varieties vanished along with the last of the Caesars, and the average pig size soon regressed to preclassical proportions.\(^\text{26}\) While early medieval writers continued to plagiarize advice from Columella among other ancient exemplars, pictorial and zooarchaeological evidence strongly argue against major improvements in pig breeding and husbandry until at least the high middle ages.\(^\text{27}\) According to Sándor Bökényi, in the fifth to twelfth centuries, on the whole “animal husbandry was extremely primitive showing almost no trace of the Roman practices that had once been so highly developed.”\(^\text{28}\) While there is little doubt that medieval farmers continued to feed their swine on agricultural and household by-products, it appears they still relied on good mast seasons to fatten the animals, providing them with the majority of weight gain needed to make the whole operation worthwhile. Consequently, the animals’ ecological role remained unchanged and evolutionary pressures for ranging and foraging still determined the shape of the beast, as found in scores of medieval manuscripts, paintings, and tapestries that scarcely distinguish the wild and domesticated Sus scrofa except by size. Indeed, through the eleventh century and beyond pigs remained so closely associated with mast feeding that forests would still be measured by the number of pigs they could feed.\(^\text{29}\)

**HIGH MEDIEVAL BELGIUM AND ENGLAND**

As in classical times, renewed impetus for improvement came from rising pressure on forest resources, particularly in the later thirteenth century. In England and the Low Countries above all, deforestation had reached a point where traditional pannage had become difficult or even impossible in places, forcing land owners to adapt or abandon their swine. In the former, the traditional foraging range and season were sharply restricted;\(^\text{30}\) while in the latter, recent studies of animal remains have revealed that pork consumption was increasingly restricted to elite households.\(^\text{31}\) Yet also as in ancient Rome, rising population pressure presented opportunities as well as restrictions. More intensive agriculture and growing urban markets created openings for enterprising farmers to accelerate pork production for wealthier consumers. In Belgium, zooarchaeological evidence indicates that even as rural consumption dropped off, pig bones turned up in urban cesspits with greater frequency over the late 1200s and early 1300s and the average of age at slaughter weight fell, implying a shift to more intensive production for burgeoning town markets.
As the authors conclude, “During the late Middle Ages … deforestation and conflicting options regarding the use of the remaining forest forced pigs to become farm animals, which must have changed their economic and symbolic meaning.”

Nevertheless, as in classical times, these improvements would still fall short of a decisive breakthrough. With the great famines and epizootics of the 1310s
and the Black Death of the 1340s, the tremendous loss of human and livestock populations would once again take pressure off forest resources, undermining previous steps toward intensification. As nations across Europe failed to recover their preplague levels until the sixteenth century, farm wages rose and agricultural markets suffered, reducing incentives for intensive production. In England (which will now become the focus of our study because it witnessed the next major breakthrough), agricultural manuals continued to associate hogs with forest mast through Tudor times. In 1523, for instance, John Fitzherbert’s manual on surveying discussed woods in terms of potential hogs and still described the traditional pannage from Michaelmas to Martinmas. More than half a century later, even as population growth picked up its pace, the English adaptation of Conrad Heresbach’s manual explained fattening on mast as a matter of course, while at least acknowledging the possibility of feeding on peas and beans. Well into the 1600s, the best swine were still associated with the best woods of acorns and beechnuts, particularly in the New Forest of Hampshire.

Therefore, looking over these past pig cycles from classical to late medieval times, it appears Europeans must have faced considerable difficulties establishing a modern breed with the genetic material at hand. Pig farmers were by no means ignorant of ways to select more efficient types, but as long as they wished to take any advantage of mast feeding, these breeding imperatives competed with evolutionary pressures selecting for more effective ranging and scavenging in the woods. Hence regional breeds evolved in a combination of natural and artificial selection for optimum survival in the local environment. Even when pig owners did manage to create truly sty-raised farmhouse varieties, they faced the constant danger of accidental mixing and regression to traditional type unless they could control breeding absolutely, all the more so in the generations before real understanding of genetics or progeny testing. Furthermore, when the rural economy went into decline—especially the deep declines of late antiquity and the late middle ages—and farmers switched back to less intensive husbandry, pigs revealed an alarming propensity to revert to ancestral feeding habits and physiognomy. As Pliny had observed in Roman times, and as contemporaries can still witness in the monstrous escaped hogs of the American South, a few generations can turn a thoroughly domesticated breed into a fierce feral animal.

EARLY MODERN CONVERGENCES AND IMPORTS

In the later seventeenth and eighteenth centuries new environmental and economic conditions at last brought about a decisive shift to more intensive pig raising in England, paving the way for the successful introduction of Chinese breeds. As described by historian Kenneth Pomeranz, this period witnessed a convergence of ecological pressures across Eurasia, as rising populations pushed against the limits of arable land and of forests and fuel, especially in
the core economic zones of Northern Europe and the lower Yangtze. Moreover, as Pomeranz and others have noted, this broad ecological convergence came during an era of incipient global trade, as well as an age of remarkable parallels in technological and living standards among the states and empires of the early modern world. These contacts and convergences marked a first stage or precursor to globalization—a new era of cultural and biological exchange building up to the modern integration of markets.

Consequently, the study of animals may offer unique insights into this early modern phase of globalization. Beginning with the work of Alfred Crosby, historians have recognized invasive animals as pioneers of European colonization and the creation of “Neo-Europes” in the Americas, Australia, and New Zealand. More recent research has also begun to look at the transfer of domesticated animal breeds and cultures across the Old World as a revealing aspect of this age of global exchange. In this regard, the study of early modern horses has proven especially illuminating: Arabian breeds constituted a particularly valuable and symbolic item of trade between early modern Europe and the Ottoman Empire, while at the same time European horses and horse cultures were imported into Romanov Russia as a sign of refinement. Meanwhile imported warhorses emerged as military tools and status symbols of emerging imperial cultures in early modern West Africa and the Sahel and in Southeast Asia, as well as in early colonial cultures in the Americas and South Africa. In England, in particular, imports formed the genetic basis for improved racehorses and cavalry.

Although not as well studied as their equine counterparts, early modern pigs provide a similarly revealing instance of this pattern of global convergence and exchange. Across much of Western Europe, rising population densities and ongoing deforestation created similar ecological pressures to those long prevalent in China, which would have created similar incentives for more efficient and intensive pig husbandry. By the early seventeenth century, shortages of mast forests once again encouraged renewed sty raising and some improved breeding, particularly in southeastern England. Urban growth, especially the rapid rise of London, encouraged the increasing use of pigs as urban scavengers. Brewery and dairy waste provided the first major sources of concentrated fodder, and agricultural advice manuals soon seized upon these new possibilities to fatten pigs quickly and cheaply without or in addition to the use of mast. The introduction of potatoes from the Columbian Exchange also offered a new source of pig fodder even before most Europeans decided the new tuber was fit for human consumption, which provided a lifeline for the family hog in regions losing access to pannage.

Over the following generations, amid the relatively rapid development of English agriculture, pig raising moved in new directions. Around the turn of the eighteenth century, English agricultural manuals suggest that farmers around Leicestershire had managed to produce the first improved breed of national renown. Although mast feeding was preferred and remained the
norm in some regions, this variety started a distinct trend of both feeding and fattening on peas and beans, supplemented by brewery and dairy waste, especially around cities and in the region of Leicestershire and Northamptonshire.53 In particular, these new sty-raised animals may have served the growing London market and the demands of the Royal Navy for fresh and salt pork.54 The new breed, while by no means comparable to a modern hog, was still distinctly rounder and fattened more quickly than the medieval sort.

It was in the course of this important transition that Chinese breeding stock arrived, allowing it to play a key role in the transformation of the English hog. While we may never be able to trace the precise path of the first Asian pigs into Europe, a combination of genetic and literary evidence allows us to narrow down the range of chronological and geographic possibilities. Studies of mitochondrial DNA suggest the exchange must have taken place sometime around 1700 and certainly not much earlier,55 putting a definite end to speculation on possible links in classical times.56 Furthermore, more detailed examination of European and Chinese haplotypes finds two separate introductions, each from a different Chinese variety, the one ancestral to the Large White and Berkshire and the other to the later Swedish Landrace, Duroc, and Welsh. All of these breeds, moreover, share more genetic material with their Asian counterparts than with traditional European pigs still found in parts of the Mediterranean, which contain little or no Chinese input at all.57

For other details, we must rely on contemporary writings on farming and breeding, and their occasional descriptions of the new imports. As early as the 1720s, writers began to note the growing presence of a small black

variety in England, which appears to match contemporary descriptions of those Chinese and Southeast Asian pigs that had already excited the interest of travelers to the Far East.58 The earliest definitive statement that Chinese pigs had arrived in the West appears to come from the Swedish naturalist Osbeck writing in the 1750s, who compared them favorably with European scavenger varieties.59 Overall, the enthusiasm with which writers described the new variety indicates both their characteristic eighteenth-century admiration for things Chinese as well as the evident usefulness of these animals in the intensifying agriculture of Northern Europe.

BREEDING CAPITALIST PIGS IN ENGLAND

Nevertheless, the new Chinese breeds would take another half-century to achieve a dominant position in English agriculture. By then, their ecological role had begun to change as well, from the small-farm garbage disposal they had been in China into the commercial converter of grains and legumes into meat familiar in the modern West. In a sense, this transformation represents the other side of the coin of early modern globalization. Even as ecological pressures, technological attainments, and living standards converged across Eurasia around the early eighteenth century, underlying differences in economic systems paved the way for what Pomeranz has termed the “great divergence” between Northern Europe and Asia, leading up to Britain’s emergence as the world’s first industrial power by the 1800s.60 And so, just as the arrival of Chinese pigs in the West has provided a peculiar illustration of cultural and biological exchange across the early modern world, so their transformation in England and then America offers an unusual perspective on the unique emergence of capitalism and industry in the West.

In particular, the role of Chinese pigs in England emphasizes the significance of the so-called “Agricultural Revolution” over the late seventeenth and eighteenth centuries.61 While this “revolution” can be easily clichéd or exaggerated, the progress of pig breeding illustrates how fundamental changes in markets and technology were gradually transforming the farming economy in England. New crop rotations, especially pulses to fix nitrogen and restore the soil, also provided an ideal fodder to fatten pigs. Ongoing enclosure eliminated some of the last remaining common pastures and woodlands and discouraged the promiscuous intermingling of livestock that had undermined previous efforts at sustained breeding. The shift from subsistence to commercial husbandry created a year-round demand that traditional seasonal swine raising failed to meet. Once farmers had to think in terms of constant feed conversion rather than periodic mast, they had a stronger incentive to create more efficient animals that could reach slaughter weight at an ever younger age—still around eighteen months in the late 1600s, but better than the two to three years typical of previous centuries.62
Equally important, the scale of markets increased dramatically in line with rapid urbanization and ongoing national and international economic integration. As Margaret Derry has argued, this rise in long-distance livestock trade encouraged not only improved breeding but also more distinct and recognizable breeds marketable to distant consumers. In this respect, the contrast with China itself is revealing. Even as agriculture there reached new extremes of intensity in the late eighteenth century, the rural economy did not develop the same levels of regional specialization or economies of scale characteristic of England in the Agricultural Revolution. Instead it shifted to what is sometimes described as an “involutionary” path—a problem variously blamed on a rural “high-level equilibrium trap,” on import-substituting economic peripheries, or on segmented rural markets and local monopsonies. Hence swine husbandry in China remained primarily a small-farm subsistence strategy rather than a specialized or regionalized commercial enterprise.

In England, by contrast, market forces and competition from other livestock forced pig raising to adapt or decline. Despite improvements with the traditional sort, swine husbandry lagged behind improvements in cattle and sheep well into the eighteenth century. Outside certain market-based operations, like those of Leicestershire, the animal remained tied to an old lifestyle of rural subsistence, now fast fading under the pressures of commercialization and incipient industrialization. Consequently, the place of pigs in English husbandry faced inexorable relative decline. By 1696, in Gregory King’s estimates, England had some 12 million sheep and 4.5 million cattle to only 2 million swine—a number which probably fell over the following century even as the human population grew. Meanwhile, the price of pork continued to rise relative to that of other meats. As Adam Smith himself observed, pig meat was giving way to beef in the ascendant commercial economy as the once ubiquitous family hog became an anachronism. In fact, the rising renown of Leicestershire hogs stemmed in part from the animal’s increasing rarity in other parts of England, particularly the Pennines and the west. Although it seems unlikely pork would have disappeared altogether from the English diet, without improved breeding it might very well have dwindled into more of a traditional country dish like goat or rabbit.

It was in this context that the introduction of Chinese breeds proved decisive. The rising pressure on the traditional family hog, along with the virtual disappearance of good mast forests, may explain the increasing acceptance of the Chinese variety seen in British agricultural manuals. In 1727, for instance, John Lawrence would still warn against the Asian type, based on smaller size and delicacy:

The little black sort with great Bellies have of late Years been introduced amongst us, and are by some much admired for the Sweetness of their Flesh, their quick and ready Feeding, and for the Delicacy of the roasting Pigs. But yet, tho’ Gentlemen, for their own use Use and Curiosity, may
think fit to indulge this Kind, yet their want of Substance makes them not the Farmer’s Choice, nor for his Profit.73

And yet by 1760 The Farmer’s Compleat Guide would emphasize instead its greater efficiency and the difficulty of finding feed for the traditional big-boned sort:

If the farmer has good convenience for feeding them, the most profitable kind is the common hog, which is large bodied and long legged; but this requires not only the best food but the greatest care. The small low bellied hog is hardier and feeds on any thing; it produces a great many young, and is in many cases preferable to the other.74

The real breakthrough, however, came in the final decades of the eighteenth century with the production of improved crossbreeds, combining the larger frame of European pigs with the rounder body and faster weight gain of the Asian newcomers. By 1797, for instance, William Henry Hall’s New Encyclopedia would note how “the breed of pigs have been greatly improved, both in the hardness of their nature, and the goodness of their flesh, by the introduction of those commonly called Chinese, or Touquin.”75 Likewise, the fourth edition of Beilbys’s General History of Quadrupeds in 1800 (best known for its engravings by Thomas Bewick) would expand its chapter on hogs to note how, “By a mixture of the Chinese black Swine with others of the larger British breed, a kind has been produced which possesses many qualities superior to either of the original flocks. They are very prolific, are sooner made fat than the larger kind, upon less provisions, and cut up, when killed, to more useful and convenient portions.”76

Figure 5. Thomas Bewick’s engraving depicts the traditional English hog still common in the late eighteenth century. Credit: From The Memorial Edition of Thomas Bewick’s Works, vol III: A General History of Quadrupeds (Newcastle-upon-Tyne: Bernard Quatich, 1885). Image courtesy of Oberlin College Library.
These improved crossbreeds, as well as the contemporary mania for improvement unleashed by such wonders as the Durham ox, produced a proliferation of pig varieties in the early nineteenth century. Over the next fifty years, the number of local and regional crosses proved “nearly infinite” as farmers experimented deliberately or haphazardly with the new genetic potential offered by Asian mixes. By the mid-1800s, a few prize breeds had emerged—particularly modern Yorkshire, Berkshire, Hampshire, and Suffolk hogs—all of which ultimately depended on crossing Chinese with a few improved English varieties, such as the Leicestershire and Lincolnshire, or with each other. While even the most carefully bred Old English types still took well over a year to fatten, the new sorts could be brought to slaughter weight in as little as nine months, ensuring their rising preeminence in market-based pork production. As William Youatt acknowledged, “Most of our smaller breeds are more or less indebted to the Asiatic swine for their present compactness of form, the readiness with which they fatten on a small quantity of food, and their early maturity.”

As the English pig changed its shape, it also changed its role in English culture. While the lean, dark, fearsome creature of the Middle Ages gave way to a more neotenized modern type in the sixteenth and seventeenth centuries, it shed its unusual symbolic and religious associations as well. Year-round breeding and marketing put an end to the centuries-old seasonal rituals of pannage, slaughter, smoking, and salting. With the emergence of short-legged, big-bellied Chinese breeds, pigs began to acquire their now familiar role as harmless creatures of fun or satire, metaphors for greed or filth, or simply machines for producing pork. By the late eighteenth century, for instance, their new more commodious shape became the model for the first English

Figure 6. The new improved breed of the 1790s crossed the rounder body and shorter legs of the Chinese with the larger frame of European hogs. Credit: From The Memorial Edition of Thomas Bewick’s Works, vol III: A General History of Quadrupeds (Newcastle-upon-Tyne: Bernard Quatich, 1885). Image courtesy of Oberlin College Library.
piggy banks, a toy already centuries old in Asia. Meanwhile, thanks largely to Asian genetic input, pigs managed to survive and even thrive under commercial pressures for year-round meat production.

FROM CAPITALIST PIGS TO COMMODITY PORK

Finally, Chinese breeds would play a key role in the last phase of the pig’s globalization: its transformation into a national and international industrial commodity. The first steps toward porcine industrialization had already taken place in England by the time of the first recognizable modern breeds. Out of a sense of experimentation as well as sheer eccentricity, breeders had begun to develop exceedingly large and fat varieties with the new genetic stock at hand, some scarcely capable of walking. This trend later fed into the development of lard hogs for the production of industrial quantities of oil and grease, before they came to be replaced by petroleum products at the end of the century. In the longer term, however, large-scale swine production in England turned mainly to lean bacon before largely succumbing to competition from more intensive, low-cost operations in Denmark and later the Netherlands.

The real industrialization of the pig occurred principally in the United States, where the alteration from nearly wild to mass-produced types took place in a remarkably short span of time and where the import of Chinese breeds once again proved critical. As previous authors have described, the first pigs to reach colonial America were of the traditional foraging type, well adapted to range through the woods of the old South. When the first English settlers brought similar hogs to the North, they just as quickly ran amok, providing a bounty of meat for the new colonists but also a serious threat to crops and a bone of contention with Native Americans. With the westward expansion of the frontier over the following two centuries, settlers continued to let the animals go free in the woods in expectation of hunting them later, in effect seeding the land with pork. In most cases, labor remained far too dear and land far too cheap to make any intensive production, breeding, or management worthwhile. Released from the whims of human selection and the ecological constraints of the Old World, the American hog became notoriously wild in demeanor. Fierce, lean, and long-legged, it presented to all appearances one of the world’s least likely candidates for modern industrial production.

Nevertheless, two forces were at work that would reshape the American hog market and consequently the American hog. First, by the late eighteenth century greater population density on the East Coast created new pressures for agricultural and livestock improvement and a new orientation toward burgeoning urban markets. In eastern Pennsylvania in particular, it appears that these pressures encouraged significant swine breeding programs, eventually leading to the import of Chinese breeding stock, probably from Europe. By 1799, J. B. Bordley’s Essays and Notes on Husbandry, published in Philadelphia,
would offer perhaps the first definite statement on the new crosses and their promising results: “The Chinese hog mixed with the American old breed of white hogs having stiff, erect ears, as I have experienced, gives an excellent breed, which is hardy, feeds cheap, and weighs 160 to upwards of 200.”

Second, by the early nineteenth century the extensive new farmlands of the Ohio River Valley began to turn their excess corn production into large supplies of pork for Eastern markets. In a region too remote to export crops directly, the animals concentrated, according to one quip, “fifteen or twenty bushels of corn on four legs,” offering a little more mobility and marketability for the farmers’ harvests. While most farmers just continued to round up the regional feral “razorbacks” and fatten them on corn for a few weeks, others began to breed more systematically to meet the growing scale of production. In 1816 the Ohio Valley Shaker Society mixed local Russia and Byfield varieties—traditional European types—with the new “Big China” crosses ordered from a firm in Philadelphia. The resulting prototype of the “Poland China” (whose name is at least half correct) paved the way for the first major improved breed in America, and the one that would dominate the industrialization of the American pork production process in the later nineteenth century. As Cincinnati became “Porkopolis” to America, and later as industrial packing and refrigerated shipping turned Chicago into the “hog butcher for the world,” the new scale of meat production relied in no small part on improved breeds composed of Asian genetic material.

It would be a great exaggeration to suggest that new markets and breeding transformed pigs and pig keeping overnight. The mechanization, concentration, and efficiency gains of the new industrial meatpacking proceeded faster than changes in animal husbandry. Revolutions in transportation—the steamship, railway, and refrigerated packing—moved decades ahead of comparable revolutions in the science of industrial livestock production. As the frontier was cleared for farms, however, the ranging of the old half-wild types gradually gave way to pigs penned and fed in sties, in which circumstances the new Asian crosses proved their superior efficiency. Moreover, well into the twentieth century the rural family pig enjoyed a renaissance in America even as its day was passing in parts of Northern Europe. As late as the 1960s over half of Iowa farms still kept pigs, compared to less than a fifth by 1990, as production intensified. To take another example, when E. B. White wrote Charlotte’s Web in 1952, he was not merely being sentimental but reflecting on his own life on a small farm in Maine, with which many of his readers could still easily relate. While the protagonist’s appearance is far more reminiscent of a modern Yorkshire than of his feral forebears of a few generations before, his open-air lifestyle still has about as much in common with a wild boar’s as with that of the mass-produced animal of today.

Only in the past fifty years has concentrated factory farming fully realized the disturbing potential of the animal’s best genetic material for
efficient feed conversion and weight gain. Given their natural capacity for rapid growth and prolific breeding, enhanced by millennia of domestication, swine have proven particularly amenable to scientific livestock production, pioneered in the early twentieth century and applied at large since the 1960s.\textsuperscript{95} The combination of antibiotics, electric lights, and climate control has moved production into a series of crowded indoor facilities, while carefully controlled feeding and restrictions on movement have brought the ratio of caloric conversion below 3:1—second only to that of broiler chickens. Genetic engineering has thus far played little role in the process,\textsuperscript{96} which has been enabled instead by the almost universal spread of similar Yorkshire (or “large white”), Duroc, and Hampshire hogs of Chinese stock, which have gradually edged out the regional and genetic diversity that prevailed until the past fifty years.\textsuperscript{97} Changes in breeding have continued, but more to alter appearance and fat content according to changing dictates of nutrition and diet, such as the “other white meat” campaign launched in the 1980s substituting lean protein for marbled chops.

As the vast majority of small operations have given way to giant indoor facilities of ten thousand hogs or more, pigs have also shifted their role in Western, especially American, culture one last time. On the practical, everyday level, the animal itself has all but disappeared to be replaced by standardized pork products. Even the U.S. Pork Board’s own website—named for the meat, not the animal—neglects to show a single picture of an actual pig, save for abstract diagrams indicating the source of various cuts.\textsuperscript{98} This physical absence has in turn paved the way for anthropomorphized pigs of the imagination to supplant the original, as far more modern Americans and Europeans have experience with the cartoon version than the living creature.

Returning to our Chinese comparison then, it is interesting to reflect on why the celebration of a “golden pig year” excites our amusement the way that the other animals of the Chinese zodiac do not. While Europe and America imported the genetic material of the Asian variety, they could not import its historical and social significance as well. The pig’s place as a true farm animal has passed far too quickly in the West to leave a lasting cultural impression beyond images like those of \textit{Charlotte’s Web}, easily dismissed as idyllic children’s fantasy. Meanwhile, the animal’s long past as a strange free-ranging beast may be simply too bizarre, and its present condition in giant concentrated animal feeding operations and slaughterhouses simply too distasteful and inhumane to dwell much in the popular imagination.

WORLD HISTORY FROM A PIG’S PERSPECTIVE

In an article two decades ago, William Cronon asked the question whether “capitalist pigs” were intrinsically more destructive than noncapitalist pigs.\textsuperscript{99} While intended to be humorous, Cronon’s question also raised an important point for
environmental historians: namely that elements of the natural world, like livestock, have formed an intrinsic part of broad social and economic transformations including capitalism, industrialization, and globalization. Animals prove to be both actors in and reflections of the serious ecological and biological changes that have often accompanied and sometimes driven major developments in human history. While this article does not definitively answer Cronon’s question, it does conclude that the “capitalist pig” is something biologically and ecologically distinct, and to understand how and why, we need to study the history of pigs themselves as well as the history of capitalism.

Taking the long and wide view of porcine history, this study also raises three broader issues in the emerging field of human–animal studies. First, this article has tried to demonstrate the potential of an interdisciplinary approach, bridging scientific and literary evidence and cultural and environmental perspectives. As the study of animals in human history coalesces into a serious subject of research, it is more important than ever to explore the full range of methods and paradigms available to scholars in this inherently crossdisciplinary field. Above all, this study illustrates the interplay among social and environmental contexts in the history of domesticated animals.

Second, the story presented should draw attention to some of the unusual connections and contingencies in the domestication and breeding of livestock and, by extension, the broader complexity of interactions between human society and domesticated animals. Studied over short periods or in individual countries, it can be all too easy to assume a static relationship or teleological direction in the role of domesticated animals. The diverging paths of pigs in Asia and Europe, the latter’s unusual cycles of intensification and extensification, and the fortuitous reunion of the two suid lines may all serve to illustrate the peculiar ways that particular ecological and economic circumstances—and even sheer chance—may come to play a critical role in animal history.

Finally, the same processes shaping the history of the pig also emphasize the more steady guiding hand of ongoing environmental change and corresponding evolutionary response. Since Neolithic times, pig raising and pigs themselves have of necessity adapted to broad shifts in ecological pressures. Domestication was and still is an evolutionary process, involving continuous selection for particular hereditary traits. As Edmund Russell has recently advocated, historians need to come to grips with this sort of evolutionary agency as an ongoing phenomenon with significant historical consequences. Furthermore, as the same author has argued elsewhere, historians ought to keep in mind these underlying processes of biological change even in apparently anthropogenic, technological developments. In an important sense, this story of how Chinese pigs went West represents less a feat of human luck or ingenuity, or even a triumph of porcine adaptability, than the remarkable success of a peculiar range of S. scrofa genetic material, which used unwitting human agents to find its way across the globe, working its way into now billions of swine bodies.
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NOTES

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17. Parsons, “Acorn-Hog Economy.”


24. Ibid.


27. See especially ten Cate, *Wan God Mast gift*, and A. Ervynck et al., “An Investigation into the Transition from Forest Dwelling Pigs to Farm Animals in Medieval Flanders, Belgium,” in *Pigs and Humans: 10,000 Years of Interaction*, ed. U. Albarella et al. (Oxford: Oxford University Press, 2007). Robert Trow-Smith, *A History of British Livestock Husbandry to 1700* (London: Routledge, 1957), 53, likewise notes that “Again in ninety-nine cases out of every hundred, the literary reference to pig husbandry associates the swine with the wood, although some pigs were certainly housed or yarded from early Saxon times.”


47. Peter Boomgaard, “Horse Breeding, Long-Distance Horse Trading and Royal Courts in Indonesian History, 1500-1900” in *Breeds of Empire: The ‘Invention’ of the Horse in Southeast Asia and Southern Africa*, eds. Greg Bankoff and Sandra Swart (Copenhagen: NIAS, 2007).


52. Wiseman, *Pig*, 12 quotes a 1683 edition of *Cheap and Good Husbandry* (originally by Gervase Markham) admiring Leicestershire hogs. John Mortimer, *The Whole Art of Husbandry, or, the Way of Managing and Improving of Land* (London, 1707), 184, mentions specifically that “The largest Swine, and the greatest numbers for any particular places, are bred in Leicestershire and some parts of Northamptonshire, and in the Clay Countries therabouts, which I suppose proceeds from the great quantities of Beans and Pease sowed in those Parts.”


58. E.g., Lawrence, *New System of Agriculture*, 100.

59. Pehr Osbeck, *A Voyage to China and the East Indies* [1757] (London, 1771), 301: “The Chinese Swine are already so well described that I can add nothing. They are generally either black or white. They propagate more than ours, and are cleanly; for which reason they are kept in houses like dogs. They also sometimes go into the streets, but never wallow in dirty places; however, I have been told by one of our husbandmen, that when they come to Sweden and see the uncleanness of our swine, they sometimes take to the same manner of living.”

60. Pomeranz, *Great Divergence*.

61. For an overview, see Overton, *Agricultural Revolution in England*.

63. Margaret Derry, Bred for Perfection: Shorthorn Cattle, Collies, and Arabian Horses since 1800 (Baltimore: Johns Hopkins University Press, 2003), chapter 1. See also Russell, Like Engend’ring Like, chapter 3.


66. Pomeranz, Great Divergence, chapter 6. It should be noted Pomeranz himself disputes the notion of “involution” per se, emphasizing instead China’s lack of coal and colonies.


68. Trow-Smith, History of British Livestock Husbandry to 1700, 216, describes pig husbandry in the early 1700s as “backward in the extreme.” Interestingly, Robert Bakewell (1725–95), known for his improved sheep, also experimented with hogs, although evidently without the same degree of success—see Wiseman, Pig, chapter 4.


70. Overton, Agricultural Revolution in England, 115–16. Overton attributes the rise in pig prices in part to larger size, but because it appears the price of pork by weight was also rising, this conclusion is probably incorrect.


73. Lawrence, New System of Agriculture, 100.

74. The Farmer’s Compleat Guide, through All the Articles of his Profession; the Laying Out, Proportioning, and Cropping his Ground [etc.] (London, 1760), 414–15.


81. Youatt, Pig, 73.

82. See Malcolmson and Mastoris, English Pig, chapter 1.
83. See, e.g., the example from Majapahit on page 55 of Mary Heidhues, *Southeast Asia: A Concise History* (London: Thames and Hudson: 2001).


87. According to Youatt, *Pig*, 47: “The common breed may for the most part be described as rough, long-nosed, big-boned, thin-backed, slab-sided, ravenous, ugly.” For various folksy descriptions and early American pig lore, see, e.g., Charles Towne and Edward Wentworth, *Pigs, from Cave to Corn Belt* (Norman: University of Oklahoma Press, 1950).


96. Early experiments with gene transplants to increase weight gain tended to create serious health problems (see, e.g., V. Pursel et al., “Genetic Engineering of Livestock,” *Science* 244 (1989): 1281–88) and have not produced many notable breakthroughs since. However, experiments to genetically engineer pigs for xenotransplantation have continued.


