

**Why Europe and the West? Why Not China?**  
*Journal of Economic Perspectives – Volume 20, Number 2 – Spring 2006*  
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The world history of technology is the story of a long, protracted inversion. As late as the end of the first millennium of our era, the civilizations of Asia were well ahead of Europe in wealth and knowledge. The Europe of what we call the Middle Ages (say, tenth century) had regressed from the power and pomp of Greece and Rome, had lost much of the science it had once possessed, had seen its economy retreat into generalized autarky. It traded little with other societies, for it had little surplus to sell, and insofar as it wanted goods from outside, it paid for them largely with human beings. Nothing testifies better to deep poverty than the export of slaves or the persistent exodus of job-hungry migrants.

Five hundred years later, the tables had turned. I like to summarize the change in one tell-tale event: the Portuguese penetration into the Indian Ocean led by Vasco da Gama in 1498. This was an extraordinary achievement. Some scholars will tell you that it was some kind of accident; that it could just as easily have been Muslim sailors, or Indian, or Chinese to make the connection from the other direction. Did not the Chinese send a series of large fleets sailing west as far as the east African coast in the early fifteenth century – bigger, better and earlier than anything the Portuguese had to show?

Don't you believe it. These affirmations of Asian priority are especially prominent and urgent nowadays because a new inversion is bringing Asia to the fore. A "multicultural" world history finds it hard to live with a eurocentric story of achievement and transformation. So a new would-be (politically correct) orthodoxy would have us believe that a sequence of contingent events (gains by Portugal and then others in the Indian Ocean, followed by conquests by Spain and then others in the New World) gave Europe what began as a small edge and was then worked up into centuries of dominion and exploitation. A gloss on this myth contends that a number of non-European societies were themselves on the edge of a technological and scientific breakthrough; that in effect, European tyranny (to paraphrase Thomas Gray's "Elegy Written in a Country Churchyard"), "froze the genial current of the [Asian] soul."

...I shall return later to this revisionist debate. Here, suffice to say: 1) The Portuguese success was the result of decades of rational exploration and extension of navigational possibilities in an ocean (the south Atlantic) that was hostile to traditional techniques of navigation, which essentially involved following the coastline. This technological enhancement rested in turn on a systematic utilization of astronomical observations and calculations, taken from the Muslims and transmitted largely by Jewish intermediaries, which allowed the Portuguese to follow winds and currents across the south Atlantic, and then use a knowledge of latitude to swing back around the tip of Africa and into the Indian Ocean. 2) The Chinese abandonment of westward exploration was partly the result of contingent political events; but at bottom it reflected the values and structures of Chinese society and civilization. 3) European exploitation of the breakthrough rested on a disparity of power technology (better powder and better guns) as well as on navigational superiority. The extension of European power into other parts of the world was the expression of these and other disparities. Why other regions did not keep up with Europe is an important historical question, for one learns almost as much from failure as from success.

### **The First Chance: Science without Development**

The one civilization that was in a position to match and even anticipate the European achievement was China. China had two chances: first, to generate a continuing, self-sustaining process of scientific and technological advance on the basis of its indigenous traditions and achievements; and second, to learn from European science and technology once the foreign “barbarians” entered the Chinese domain in the sixteenth century. China failed both times.

The first failure has elicited much scholarly inquiry and analysis. And yet it remains an abiding mystery. The China specialists tell us, for example, that in a number of areas of industrial technique, China long anticipated Europe: in textiles, where the Chinese had a power-driven spinning machine in the thirteenth century, some 500 years before the England of the Industrial Revolution knew water frames and mules; or in iron manufacture, where the Chinese early learned to use coal and probably coke (as against charcoal) in blast furnaces for smelting iron and were turning out perhaps as many as 125,000 tons of pig iron by the later eleventh century – a figure not achieved by Britain until 700 years later (Elvin, 1973, p. 85). In general, one can establish a long list of instances of Chinese priority: the wheelbarrow, the stirrup, the rigid horse collar (to prevent choking), the compass, paper, printing, gunpowder, porcelain. (But not the horse-shoe, which implies that the Chinese did not make use of the horse for transport.)

The mystery lies in the failure of China to realize the potential of some of the most important of these inventions. One generally assumes that knowledge and know-how are cumulative and that a superior technique, once known, will dominate older methods and remain in use. But Chinese industrial history offers a number of examples of technological regression and oblivion. The machine to spin hemp was never adapted to the manufacture of cotton; cotton spinning was never mechanized; and coal/coke smelting was allowed to fall into disuse, along with the iron industry. Why, asks Elvin (1973, pp. 297–298)?

It would seem that none of the conventional explanations tells us in convincing fashion why technical progress was absent in the Chinese economy during a period that was, on the whole, one of prosperity and expansion. Almost every element usually regarded by historians as a major contributory cause to the Industrial Revolution in north-western Europe was also present in China. There had even been a revolution in the relations between social classes, at least in the countryside; but this had had no important effect on the techniques of production. Only Galilean-Newtonian science was missing; but in the short run this was not important. Had the Chinese possessed, or developed, the seventeenth-century European mania for tinkering and improving, they could easily have made an efficient spinning machine out of the primitive model described by Wang Chen. A steam engine would have been more difficult; but it should not have posed insuperable difficulties to a people who had been building double-acting piston flame-throwers in the Sung dynasty. The crucial point is that nobody tried. In most fields, agriculture being the chief exception, Chinese technology stopped progressing well before the point at which a lack of scientific knowledge had become a serious obstacle.