PRINTING BOOKS

Fernand Braudel

Fernand Braudel (1902-1985) was a French historian and a leader of the Annales School, which focused on social, as opposed to political or diplomatic, histories. His writings include the three-volume Civilisation Matérielle, Économie et Capitalisme, XVe-XVIIIe *[Civilization and Capitalism, 15th-18th Century]. The selection below is drawn from the first volume of this trilogy (*Les structures du quotidian; The Structure of Everyday Life*). The many footnotes that cite the source material have been omitted. [*The Structures of Everyday Life. The Limits of the Possible*, transl. from the French by Siân Reynolds (Harper & Row, 1979), pp. 398-402]*

From paper to the printing press

Paper came from very far afield, again from China, passed on to the West via the Islamic countries. The first paper mills were turning in Spain in the twelfth century. However, the European paper industry was not established in Italy until the beginning of the fourteenth century, when there was near Fabriano a water-wheel operating ‘beaters’ – enormous wooden pounders or mallets – fitted with anvil-cutters and nails which tore the rags to shreds.

Water served both as motive power and ingredient. The production of paper required enormous quantities of clear water, so mills were sited on rapid rivers, upstream of towns that might pollute it. Venetian paper was produced around Lake Garda. The Vosges had paper factories very early on; so did Champagne, with a large centre at Troyes; and Dauphiné. Italian workers and capitalists played an important role in this expansion. Fortunately there was an abundance of old rags for raw material. Flax and hemp cultivation had increased in Europe from the thirteenth century. Linen cloth had replaced what woolen cloth there was. Old rope could also be used (as at Genoa). Nevertheless the new industry prospered so much that crises of supply arose. Law-suits broke out between paper-makers and itinerant rag-and-bone men – attracted by the large towns or the reputation of the rags in a specific region, Burgundy for example.

Paper had neither the strength nor the beauty of parchment. Its sole advantage was its price. A 150-page manuscript on parchment required the skins of a dozen sheep ‘which meant that the actual copying was the smallest expense of operation’. But the flexibility and uniform surface of the new material was bound to mark it out as the only solution to the problem of the printing press. As for the press itself, everything prepared the way for its success. The number [399] of readers in the universities of the West, and even outside them, had increased considerably since the twelfth century. An enthusiastic clientele had created an increase in the number of copyists’ workshops and multiplied the numbers of correct copies; people were looking for rapid reproduction processes – for example, by tracing at least the main lines of illuminations. Virtual ‘editions’ of books appeared as a result of such methods. Two hundred and fifty copies of the *Voyage of Mandeville*, completed in 1356, have been preserved (73 in German and Dutch, 37 in French, 40 in English, 50 in Latin).

The invention of moveable type

It does not really matter who invented moveable type in the West towards the middle of the fifteenth century. It could have been Gutenberg of Mainz and his collaborators – which still seems the most likely answer; or Procope Waldfogel, from Prague, who settled in Avignon; or Coster from Haarlem, if he existed; or perhaps someone completely unknown. The problem is rather to know whether the discovery was a revival, an imitation, or a rediscovery.

For China had been familiar with the printing press since the ninth century, and Japan was printing Buddhist texts by the eleventh. But this early printing, using blocks of engraved wood, each representing one page, was a very slow process. It was between 1040 and 1050 that Pi Cheng first devised the revolutionary idea of moveable characters. The first characters were made of pottery and fixed with wax into a metal form. They were not much imitated; nor were the tin characters which followed them, and which deteriorated too quickly. But by the beginning of the fourteenth century, the use of moveable wooden characters had become widespread and had even reached Turkestan. Finally, during the first half of the fifteenth century, metal characters were perfected, either in China or Korea, and became widely used during the half-century preceding Gutenberg’s ‘invention’. Were they brought to the West, as Loys Le Roy suggests – in 1576 it is true, that is some time after the event? The Portuguese ‘who have sailed all over the world,’ he writes, brought back from China ‘books printed in the script of the country, saying that these have long been in use over there. Which has moved some to think that this invention was brought from there by way of Tartary and Muscovy to Germany, then communicated to the rest of the Christian world’. This version of events is by no means

proved. But there were certainly enough travellers – and travellers of some education – who had been to China and back for us to have serious doubts about the European origin of the invention.

Whether copy or re-invention, the European printing press became established after a good deal of experiment and difficulty in about 1440-50. The moveable type had to be cast from a mixture of precisely determined quantities of lead, tin and antimony (and antimony mines only seem to have been discovered in the sixteenth century) which would be sufficiently resistant without being too [400] hard. There were three essential operations: a very hard steel punch was cut bearing the character in relief; the character was then stamped into a copper (occasionally lead) die or matrix; finally, the moveable character itself was obtained by casting the alloy into the matrix. Then one could embark upon ‘composing’ lines of type which would be locked in a form, inked and pressed on a sheet of paper. The bar press made its appearance toward the middle of the sixteenth century and was hardly altered until the eighteenth. The principal difficulty was that the letters wore out quickly. They had to be replaced by using the punches again and these in their turn wore out. In other word, the whole process had to start all over again. It really called for the craftsmanship of a goldsmith. So it is not altogether surprising that the new invention emerged from this milieu, and not as some have maintained from the xylographers, or manufacturers of woodcuts – pages printed from blocks of carved and inked wood. On the contrary, these peddlers of popular pictures at first fought against the new invention. But in about 1461, Albrecht Pfister, a Bamberg printer, incorporated a woodcut in a printed book for the first time. From then on, wood was not a serious competitor.

The printer’s craft was slow to improve and was still virtually the same in the eighteenth century as when it began. ‘Until 1787 (when François Ambroise Didot conceived the press which enabled a folio to be printed by one turn of the screw) methods of printing were such that if Gutenberg had come back to life and walked into a printing shop during the early years of Louis XVI’s reign in France, he would immediately have felt at home in it, save for a few minor details.’

The invention travelled round the world. Like gunners looking for hire, printing workers with makeshift equipment wandered at random, settled down when the opportunity offered and moved on again to accept the welcome of a new patron. Paris saw its first printed book in 1470, Lyon in 1473, Poitiers in 1479, Venice in 1470, Naples in 1471, Louvain in 1473 and Cracow in 1474. More than 110 European towns were known by their printing presses in 1480. Between 1480 and 1500, the process had reached Spain, spread throughout Germany and Italy, and touched the Scandinavian countries. By 1500, 236 towns in Europe had their own print shops.

One calculation puts the total of *incunabula* (books printed before 1500) at 20 million. Europe had perhaps 70 million inhabitants at the time. The movement gathered speed in the sixteenth century: 25,000 titles were published in Paris, 13,000 in Lyon, 45,000 in Germany, 15,000 in Venice, 10,000 in England, perhaps 8000 in the Netherlands. An average of 1000 copies printed should be reckoned for every title, i.e. 140 to 200 million books, representing 140,000 to 200,000 titles or editions. And this when the population of Europe, including Muscovy, was even by the end of the century, little more than 100 million.

Books and presses from Europe were exported to Africa, America, the Balkans (reached via Venice by itinerant printers from Montenegro) and [401] Constantinople, where Western presses were taken by Jewish refugees. Presses and moveable type were taken on Portuguese ships to India, and naturally to the capital, Goa (1557); then to Macao (1589) on the doorstep of Canton, and Nagasaki (1590). If the invention had indeed originated in China, the process had gone full circle.

Printing and history

Books were a luxury; as such they had from the start been subject to the strict laws of profit, supply and demand. A primer’s materials had frequently to be renewed, the cost of labour was high, paper represented over double the other costs, and returns from outlay were slow. All this made the printing-house dependent upon money-lenders who soon controlled the distribution network. The publishing world had its Fuggers on a small scale, as far back as the fifteenth century: Barthélemy Buyer (died 1483) in Lyons; Antoine Vérard, master of a Paris workshop originally devoted to calligraphy and the illumination of manuscripts, who then adopted the new processes and specialized in illustrated books for France and England; the Giunta family from Florence; Anton Koberger, perhaps the largest publisher of his time, who brought out at least 236 works in Nuremberg between 1473 and 1513; Jean Petit, who controlled the Parisian book market in the early sixteenth century; the Venetian Aldo Manutio (died 1515); and one final famous example, the Frenchman Plantin, who was born in Touraine in 1514, but settled in 1549 in Antwerp where he made his fortune.

As a commodity, books depended on routes, trade, and fairs; book fairs were held in Lyon and Frankfurt in the sixteenth century and in Leipzig in the seventeenth. The book trade as a whole was a source of power at the service of the

West. All thought draws life from contacts and exchanges. Printed books accelerated and swelled the currents which the old manuscript books had kept within narrow channels. So printing hastened some developments, although there were times when advance was held back. In the fifteenth century, age of the *incunabula*, Latin predominated and with it a religious and devout literature. Not until the Latin and Greek editions of classical writings, appearing in the early sixteenth century, did printing serve the thrust of the humanist cause. Later still, the Reformation, then the Counter-Reformation, made use of books to further their ideas.

So it is hard to say whom the printing press really served. It expanded and invigorated everything. One particular consequence can perhaps be discerned. The great discovery which was to lead to the mathematical revolution of the seventeenth century was, to quote Spengler, the discovery of the number function: y= f(x) in present-day terms. The notion of function implies the concepts of the *infinitesimal* and of the *limit*: both concepts already found in the thought of Archimedes. But how many people knew anything about Archimedes in the [402] sixteenth century? A few privileged individuals. (Once or twice, Leonardo da Vinci went in search of an Archimedes manuscript after someone had talked to him about it.) Slow at first to engage in producing scientific works, printers gradually began to take them on, and little by little reinstated Greek mathematics. Alongside the works of Euclid. and of Apollonius of Perga (on conics) the seminal thought of Archimedes was for the first time made available to all.

It may be that the comparatively late date of such publications was responsible for the slow progress of modern mathematics between the end of the sixteenth century and the beginning of the seventeenth. Without them, however, progress might have been delayed even longer.