PART I

Printing and book production

CHAPTER I

The arrival of printing and its techniques

I THE SPREAD OF PRINTING IN ITALY

In about 1466 Leon Battista Alberti described how he and a friend in Rome had talked of a wonderful technique of reproducing texts which had recently been introduced to the area. 'It happened', he wrote, 'that we greatly approved of the German inventor who in these times has made it possible, by certain pressings down of characters, to have more than two hundred volumes written out in a hundred days from an original, with the labour of no more than three men; for with only one downwards pressure a large sheet is written out.'[1] In order to appreciate how great would have been Alberti's sense of enthusiasm and awe at the power of the new process of printing books, we can recall that just ten years earlier the Florentine bookseller Vespasiano da Bisticci had needed the work of forty-five scribes and a period of twenty-two months in order to copy out two hundred manuscripts commissioned by Cosimo de' Medici for the library of the Badia di Fiesole.[2] Strange and foreign though the technique of printing was, Alberti and his Italian contemporaries were quick to realize that it provided a means of production so much more rapid and economical than the pen that, for better or for worse, it would revolutionize their written communication.

The 'German inventor' of printing is traditionally identified as Johann Gutenberg of Mainz, a goldsmith by profession. His interest in such procedures went back as early as 1436, when he was residing in Strasburg. He was not alone in experimenting with the mechanical production of books: another goldsmith was teaching an 'art of writing artificially' ('ars scribendi artificialiter') in Avignon in the mid 1440s. But the weight of evidence strongly suggests that it was Gutenberg who, after returning to Mainz by 1448, began to produce books by using the key invention of printing with movable metal types, as opposed to making an impression from a fixed block of wood or metal. By 1452 he

must have been working on his great forty-two-line Bible. During the 1450s several other printing houses probably began to operate in Mainz, and the first dated volume appeared in 1457.[3] But the spread of the industry beyond Mainz did not occur until towards 1465, when presses were set up in two other German cities and when two German printers, Conrad Sweynheym and Arnold Pannartz, began to work in Italy.

This first printing venture outside Germany was most probably promoted by a German cardinal, Nicholas of Cusa, and it took place in a Benedictine monastery in which the majority of monks were German, at Subiaco, about fifty miles east of Rome. The press here produced four books between 1465 and 1467. One was an elementary Latin grammar, for which there would be a certain demand from schools, but the others were aimed at a cultured elite of humanists and clerics: Cicero's *De oratore* and works by the early Christian writers Lactantius and Saint Augustine. Printing very soon moved from such a peripheral setting to Rome itself, where editing and marketing would have been much easier. There is evidence that a 'company to print books' combining German technical skill and Italian finance had been set up in the city by the autumn of 1466, and Sweynheym and Pannartz moved there in 1467, printing at least forty-eight more books together before their partnership broke up in 1473. Other Germans introduced printing to Venice in 1469 and to Foligno and nearby Trevi in 1470. Then came a sudden expansion of print: presses began to operate in 1471 in cities such as Ferrara, Florence, Milan, Bologna, Naples, Perugia and Treviso, in 1472 in Padua, Mantua, Parma, Verona and Perugia, and in the following year in Brescia and Pavia. By the end of the century, printing had taken place in nearly eighty towns or cities in Italy, many more than in Germany or France.[4]

Printing took root so fast and so widely in Italy because, once ecclesiastical patrons had given it a crucial initial impetus in Subiaco and then in Rome, the peninsula provided the fertile terrain which was essential to nourish and support it, in spite of the disunity of its states and the political instability of the period. On the one hand, printing needed a context of literacy and culture. Italy had in plenty the writers and scholars who would provide the industry with its raw material, the texts to be set in type, and it had urban populations sufficiently large, literate and well-to-do to provide the demand for the products of the industry: books for use in schools, books for personal study, entertainment or devotion, and books connected with professions or vocations, as in the cases of lawyers, doctors, clerics, teachers and university students. On

the other hand, printing also required suitable economic conditions: the support of individuals or groups willing to take the initiative of promoting printing (for reasons of idealism, profit or both), and a good trade network which would provide access to supplies of paper and which would then distribute and sell the finished books efficiently. Many Italian cities were well placed to provide these contexts, especially those from Rome northwards; of the southern printing centres, only Naples was of any importance.

The city which offered the best conditions of all was Venice. Intellectual life flourished in the city and in its subject towns of Padua, with its important university, Verona and Vicenza; its government and territory were relatively stable, apart from the temporary setback of the battle of Agnadello in 1509; and it had a thriving mercantile system whose links reached throughout the Mediterranean and north of the Alps. Venice thus soon came to dominate the Italian printing industry, indeed for a while the European printing industry. The extent of this dominance is reflected in the results of two estimates of the percentages of books printed in the major Italian centres. One, by Ennio Sandal, focuses on books printed before 1501, known as incunables or incunabula.[5] In this period Italy may have produced, in at least seventy-six places of printing, some twelve thousand editions, a total which would represent some 45 per cent of the European output. The estimated production of the centres, in round figures, is shown in table 1. Another analysis, carried out by Amedeo Quondam, covers the period up to 1600 and is based on the holdings of the British Library (which, extensive though they are, represent of course only a sample of all the editions printed). The percentage figures shown in table 2 for the output of the eight major centres of the whole period (Pavia has now yielded its place to Ferrara), as proportions of the production of all Italy, suggest that Venice produced over half of all the editions overall and at one point, between 1526 and 1550, produced nearly three-quarters of the editions printed in Italy.[6]

2 THE CONTINUITY BETWEEN MANUSCRIPT AND PRINT

Just how revolutionary was this new means of communication which spread so rapidly through Italy? The initial development of the various media of mass communication – most notably the printed book, the newspaper, recorded sound, telecommunications, film – has characteristically involved a two-part scenario. In the first place, a set of

Table 1. *Sandal's estimates of editions printed before 1501*

	No. of editions	% of total
Venice	5,000	41.32
Rome	2,000	16.53
Milan	1,200	9.92
Florence	800	6.61
Bologna	650	5.37
Naples	300	2.48
Pavia	280	2.31
Brescia	260	2.15
Others	1,610	13.31
Total	12,100	100.00

Table 2. *Quondam's estimates of editions printed 1465–1600*
(percentages of total output)

	1465–1600	1465–1500	1501–25	1526–50	1551–75	1576–1600
Venice	52.4	42.7	48.9	73.7	61.6	40.7
Rome	11.4	15.0	16.8	7.8	4.3	13.8
Florence	8.7	7.7	8.0	5.2	8.8	12.3
Milan	5.1	9.0	8.8	1.9	2.6	3.1
Bologna	3.6	4.6	5.8	3.3	3.1	1.7
Brescia	2.0	3.0	0.7	0.7	3.3	1.6
Naples	1.7	1.8	1.2	1.3	1.6	2.5
Ferrara	1.7	1.2	0.9	0.7	1.6	3.3

favourable social, economic and cultural circumstances provides a context in which a new medium can flourish. Secondly, this new medium is developed as a result of a perfection and synthesis of existing technical and commercial know-how, in other words a combination of continuity and innovation. In the case of the birth of printing in western Europe in the fifteenth century, long-term factors, such as urbanization, the rise of the cost of labour, and the development of universities and hence of lay culture, came together to foster a demand for cheaper and more plentiful reading matter. This demand was met by Gutenberg's invention; but we must bear in mind that the transcription of texts in type and their distribution to the public built in several respects on foundations laid during the age of manuscripts.[7]

From the thirteenth century, techniques had been evolved to promote the manufacture and circulation of books in order to satisfy the

needs of the teachers and students of the new universities, a development described by Petrucci as an 'embryonic process of industrialization of book production'.[8] Entrepreneurial booksellers co-ordinated the work of those who prepared the animal skin on which the texts would be written, of the scribes who copied the texts, and of the various people who gave the product its finished appearance: illuminators (who embellished the text with decorative letters at its main divisions or with elaborate vine-stem motifs in the margins of the first page), rubricators (who painted simple initial letters, book and chapter headings, and paragraph marks), flourishers (who added red or blue flourishes to capital letters), and binders (who sewed together the separate gatherings or quires of leaves and added a covering to the resulting book). Manuscripts of a text in heavy demand could be turned out in a process resembling mass production: a group of manuscripts of Dante's *Commedia* copied by professional scribes in the mid fourteenth century is known as the 'gruppo del Cento' after the story of one such scribe who married off his daughters thanks to his earnings from writing a hundred Dantes.[9] In the thirteenth and fourteenth centuries some large universities, such as Bologna and Padua, had a system to regulate and expedite the rapid diffusion of correct copies of set texts. A *stationarius*, or stall-keeper who had sworn to obey university statutes, hired out an authorized *exemplar* (master copy) of each work, provided not as a complete unit but by the separate *pecia* (piece or gathering, consisting of four or more written sheets), to be copied by professional scribes or by teachers and students themselves. The tariff was fixed by the university, and the bookseller could be fined if his master copy contained errors.[10] Multiple copying itself, then, was by no means a new concept; printing simply increased the scale on which it could take place, and to a large extent ensured that copies would be uniform.

Furthermore, for all the justified admiration aroused by Gutenberg's invention, he was essentially adapting technology and materials which had been in use previously, though not necessarily in the context of book production. The printing press itself, which will be described in section 4 of this chapter, shared the mechanical principles of the wine press. Ink had of course been used for centuries, though printer's ink had to be thicker than that made for use with a quill and was oil-based rather than water-based.[11] The two materials on which the printed impression was normally made, paper and vellum (treated animal skin, also known as parchment), were likewise inherited from the manuscript age, though vellum was far less commonly used in printing. Paper was much the

younger material, in European terms, since it had arrived in Italy from China, via the Arabs, early in the twelfth century and had been used widely in place of vellum only since the late fourteenth century. There was a flourishing industry of paper mills in many parts of Italy, notably at Fabriano in the Marche and around Salò on Lake Garda. Without an adequate supply of paper, the spread of print would not have been possible. Paper is more fragile than vellum, but it was also several times cheaper (being made at that time from linen or hempen rags, which were allowed to rot, then pulped, diluted with water, and drained in rectangular wire moulds); it was much lighter and therefore less expensive to transport; and unlike vellum it offered a perfectly flat surface.[12] The movable metal types, consisting of printing, alphabetical and other signs cast in relief at the end of metal stalks, were of course new; but even these were, as will be shown in section 3, produced with tools – the punch and the matrix – which were in everyday use in making coins, medals and seals and in hallmarking metal. Gutenberg, we have noted, was a goldsmith, as were several early Italian printers.[13]

The appearance of the printed book was, naturally and necessarily, intended at first to be as similar as possible to that of the only existing model, the handwritten book. We shall see below that printed books could be individually hand-finished in the same way as manuscripts. We shall see in more detail in chapter 6, too, that typefaces imitated the main current forms of script; that, like manuscripts, early printed books did not have title pages; and that printers and publishers continued for many years to provide information about their identity and the place and date of printing by adapting the device of the concluding 'colophon', which scribes might use to give equivalent information about themselves. Many of the Italians involved with printing in its early years had been connected in one way or another with manuscript publication. The *cartolai*, who dealt chiefly in book materials and made bindings but who sometimes dealt in handwritten books, also supplied printed books, and they were among those who financed and organized printing enterprises.[14] Some scribes, too, learned to use the new technology. Clement of Padua, probably the first native Italian printer, taught handwriting, binding and illumination in Lucca before 1470 and, after working in the printing industry in Venice, was invited to return to Lucca in 1472 in order to exercise 'his art of printing letters, binding, and illuminating', the last two activities now to be carried out also in the context of printed books.[15] Others who were concerned with the production of both manuscript and printed books include, in the fif-

teenth century, André Belfort in Ferrara and Francesco del Tuppo in Naples, and, in the first half of the sixteenth century, Bartolomeo Zanetti and Ludovico degli Arrighi.[16] The circulation of books in manuscript certainly declined once printing had become established in the 1470s but by no means came to an end: there was still a demand for manuscripts of texts not yet in print or of choir books, or for de luxe manuscripts for presentation or collection.[17] Both the court of the Este in Ferrara and the Aragonese court in Naples continued to pay scribes to copy manuscripts up to the turn of the century.[18] Some authors, we shall see in chapter 4, were reluctant to commit their works to print. The copying of manuscripts from printed editions was quite common, and it shows that some readers still preferred the traditional medium, or perhaps found it impossible to obtain copies of some printed texts.[19] Even a student might need to commission a manuscript, as one sees from an order for a work by Albertus Magnus placed in Naples in 1475.[20]

The transition from manuscript to printed book was in some respects, then, a process of evolution. But the production of a printed book also required technical innovation, and we must now turn to examining its various stages. We can then go on in chapter 2 to examine the financial and institutional frameworks within which the printing industry operated.

3 COMPOSITION, IMPOSITION AND PROOFREADING

The crucial innovation in the printing process was, as has been mentioned, the use of a fount (that is, a set) of type.[21] Three devices were needed in order to cast this. First and most important was the punch (*punzone* in Italian), made originally of bronze or brass and then of steel, on the end of which was cut by hand a relief pattern, in mirror image, of an alphabetical or other symbol. The elegance of the type depended on the skill with which this cutting was done, and the contribution to type design made by punch-cutters such as Francesco Griffo, who worked for Aldo Manuzio, was thus fundamental.[22] The punch was hammered into a small block of softer metal (at first lead, then copper) in order to create a hollow image of the symbol; this was the matrix (*matrice*). In order to cast a type, the matrix was clamped in a mould (*forma*) of two parts, made of steel and clad in wood so that it could be held comfortably in the hand during the moulding process. The type-caster then poured into the mouth of the mould a molten alloy which solidified very rapidly. The principal metals used appear to have been lead, tin and antimony,

but the proportions are uncertain.[23] In the early decades, some printers would possess their own punches and matrixes and would employ a specialist to cast founts of type for them, and it is thus often possible to use the typeface in order to identify the press at which a book was printed. During the sixteenth century, individuality in type design from press to press gave way to the purchase of punches, matrixes and types, first within states, then internationally, and some specialized type-founding companies developed.[24] But type remained expensive, and printers could therefore afford to keep only a limited number of characters in stock.

Types were kept in a case (*cassa*), a wooden tray divided into separate compartments (sing. *cassettino*) for each symbol, with capital letters at the top (hence the terms 'upper case' and 'lower case'). The process of assembling type for printing is known as composition (*composizione*), and was carried out by a compositor (*compositore*). His (or occasionally her) working day probably lasted from twelve to fourteen hours.[25] He set up his 'copy', the source text or exemplar, over the case on a clip known in Latin as a *visorium*. The text might have been previously corrected by an editor and might have been marked with instructions concerning layout.[26] Sitting before the case, which was propped up at an angle, the compositor picked out types one by one and assembled them in a composing stick (*compositoio*), a small hand-held tray with a slide adjustable according to the length of line desired (see fig. 2). As each line of type was completed, he ensured that the right-hand margin was even (or 'justified') by altering the space between words or by introducing or expanding abbreviations, using hyphenation or (most significantly from the point of view of the nature of the text) alternative spellings where these existed. When the composing stick was full, the few lines of type in it were transferred to a tray called a galley (*vantaggio*) which eventually came to hold a mirror image of a whole page of text. At this point the compositor tied the page of type with string and would probably mark in his copy-text the place at which the printed page ended (this mark would also be useful later when carrying out corrections). Composition was thus an intricate job which demanded both dexterity and enormous concentration; yet it was carried out in distracting conditions, in the same room as the creaking press, and at times by candlelight.

Books were printed on sheets which were large enough to contain at least two printed pages on each side. In the early years of printing, vellum was used not uncommonly for works of devotion, such as breviaries and missals, perhaps partly because the exclusiveness of the

material appealed to customers who were as wealthy as they were pious, partly because its durability made it a sensible investment in the case of works which would receive frequent handling.[27] Thereafter vellum was used only occasionally for a few de luxe copies of an edition, destined to be presented as gifts or collected by bibliophiles (see chapter 3, section 1), and, as has been mentioned, the normal support was paper. The four sizes of the paper sheet (*foglio*) on which the great majority of early books were printed were, in decreasing order of surface area but in increasing order of frequency of use, imperial (*imperiale*, about 74 × 50 cm), royal (*reale*, about 61.5 × 44.5 cm), median (*mezzana*, about 51.5 × 34.5 cm) and chancery (about 45 × 31.5 cm). This last, presumably because it was the size normally used, was generally known as *comune* in Italian, but the term *rezuta* was used in the Bolognese paper-manufacturing regulations of 1389 (*rezuta* apparently means 'cut in half', the surface area being just over half that of royal).[28]

Once the number of pages of type sufficient to cover one side of a sheet had been composed, they were put together in a process known as imposition (*imposizione*). (Some manuscripts, too, appear to have been written page by page on a large sheet, and this technique was used in the fifteenth century for their mass production.)[29] The compositor arranged the pages so that they would follow in the correct sequence once the paper was folded and cut. He fixed them in a rectangular wooden or iron frame called a chase (*telaio*), locking them firmly with screws or wedges. Each set of pages thus imposed for printing on one side of a sheet of paper is called a forme (*forma*, to be distinguished from its other sense of 'mould'). Of the two formes required to print a sheet on both sides, that containing the first and last pages of the sequence of pages was the 'outer' forme, the other the 'inner' forme (for an example, see fig. 3). If it was felt that page divisions could be predicted, for instance in the case of poetry, the compositor might set the text 'by formes' (*per forme*), in other words setting all the pages of one side of the sheet rather than in their natural text sequence. This meant that the types could be reused without waiting for the second forme to be composed, and that more than one compositor could work simultaneously on the same forme. Setting by formes can be detected when faulty type was reused or when the 'casting off', or calculation of the number of pages, was inaccurate and consequently the second forme to be composed had pages of an irregular length in order to fit in with what had already been set. Another means of reducing (approximately by half) the quantity of type required was half-sheet imposition (*imposizione a mezzo foglio*) or