CHAPTER 2

The Invention of Printing

The invention of printing was not the work of scholars. Scholars in the fifteenth century had all the books they needed: their attention was directed to the borrowing, copying and bargaining necessary to obtain more texts. It required hard, practical men, often men of little education, to see the potential of a new method of copying that would bring many hundreds of texts simultaneously to the marketplace. It was also men of this stamp who perceived how the techniques of medieval craft society could be applied to achieve this.

Experiments with new techniques of mechanical copying seem to have begun around 1430. In 1444 and 1446 a certain Procopius Waldvogel of Prague was recorded in Avignon, where he was promising to teach a method of artificial writing (*ars artificialiter scribendi*). But it would be another decade before Aeneas Sylvius Piccolomini, later Pope Pius II, could report having seen at the Frankfurt Fair the pages of a bible produced without a human scribe.[1]

These pages were the work of a German merchant speculator, Johannes Gutenberg. And Piccolomini was right to think that what Gutenberg had achieved was remarkable. Gutenberg had brought together several processes well known in medieval craft society to create sheets of text 'written' with individually cast metal letters. It was a process that would provide the crucial technological apparatus for an infinitely expanded production of books.

But Gutenberg could not make it pay. He died bankrupt and disappointed, defeated by the complexities of a market not yet adjusted to absorb many hundred copies of identical books. Making the new invention a commercial proposition was the crucial and most critical challenge facing the new book entrepreneurs. It would defeat many who plunged into the new art before the end of the fifteenth century.

Gutenberg

Johannes Gutenberg was born some time between 1397 and 1403, in Mainz, a small German trading city on the Rhine.[2] His father, a cloth-maker, was a member of the Mainz patriciate, and he ensured that Johannes received a sound education. As a young adult Johannes worked mostly away from the city, largely in Strasbourg, where in 1437 he was reported to have been teaching the cutting and polishing of precious stones: probably he trained as a goldsmith.

In Strasbourg Gutenberg involved himself in several imaginative ventures that revealed the entrepreneurial flair he would later bring to his experiments with print. They also established an unfortunate pattern that business associations he optimistically entered into would collapse in acrimony and litigation. The legal documents that resulted from these cases have proved vital in reconstructing what we know of how the first experiments in printing were conceived.[3] Around 1438 Gutenberg established an ambitious scheme to manufacture pilgrims' badges for the forthcoming pilgrimage to Aachen, a great medieval shrine. These badges were simple decorative metal brooches, about four inches in length, into which a small mirror could be inserted. The partners undertook to make the impressive quantity of 32,000 of these brooches, which they intended to sell for half a gulden each. Alas for their scheme, they had miscalculated the date of the pilgrimage by a year: it would not in fact take place until 1440. Gutenberg thus had an early painful experience of the difficulties that would arise when capital had been expended, but with an awkward interval before any return could be expected from sales. This would be a recurrent problem for all those who undertook large, complex projects in the new age of print.

Gutenberg's experiments with printing may have begun in these Strasbourg years. Surviving documents include enigmatic references to terms that would later be resonant in the context of print, such as 'presses' and 'formes'. These may be connected with the pilgrims' mirrors; nothing further is known of Gutenberg's whereabouts between 1444 and 1448. But by 1448 he was back in Mainz, accepting a loan from his cousin Arnold Gelthus. This was the first of many financial transactions that underwrote his experiments with printing, which now seem to have begun in earnest.

None of the work of the first press bears Gutenberg's name. The custom of identifying the responsible printer, usually in a statement at the end of the text (known as the colophon) developed only a decade later. Nor are we helped by the fact that the books printed in Gutenberg's earliest type, the so called DK

type, have survived only as fragments. These include at least twenty leaves taken from apparently different printings of the *Ars minor* of Aelius Donatus, the most popular school-book of the day, and several other small pamphlets and broadsheets. Gutenberg's partner, the financier Johann Fust, later reproached him for having diverted his presses from the business of the Bible for these more prosaic tasks, but in this, at least, Gutenberg's instincts were sound. For printing small, popular texts of this sort was a sensible way to ensure some income and keep an enterprise solvent while larger works passed through the press. Gutenberg may have produced several thousand copies of these school-books before he embarked on his Bible. If so these humble, now largely lost editions deserve to be honoured as Europe's first printed books; and it was in this initial project that Gutenberg resolved the complex technical challenges that lay behind the new art of printing.

The invention of printing

In conceptualising the printed book, Gutenberg had several models on which he could draw. There already existed a technique for reproducing short, simple texts cut into wood, from which copies could be reproduced by rubbing through on to a piece of paper or parchment. This technique, mixing text and woodcut illustrations, was used in particular for the production of devotional texts or images. These were usually sold as single sheets, but a number of woodcuts could also be gathered together to form a primitive book. One example was the series of woodcuts with inscribed text on biblical themes, known as the Bible of the Poor. A surviving example from the British Library consists of some 120 pictures from the Old and New Testaments with pertinent verses from Scripture.[4] The genius of print was to recognise that if the letters could be produced separately, then they could be arranged into an infinite number of new combinations, and constantly reused. Equally important was the recognition that an efficient mechanism would produce the image by pressing down the paper on to the inked type, rather than, as had been the case with the earliest block-books, by rubbing through (the technique practised in Asia for many centuries).[5] But first the type had to be created. The critical core of this process was the invention of the mould for hand-casting of individual pieces of type. This mould was a complex wooden frame into which a soft metal alloy could be poured and from which set type could then be released.

The process began with the tracing of the image of a letter on to the head of a rectangular piece of hardened steel. The background, non-printing areas would then be filed away to leave the character exposed: this was the letter

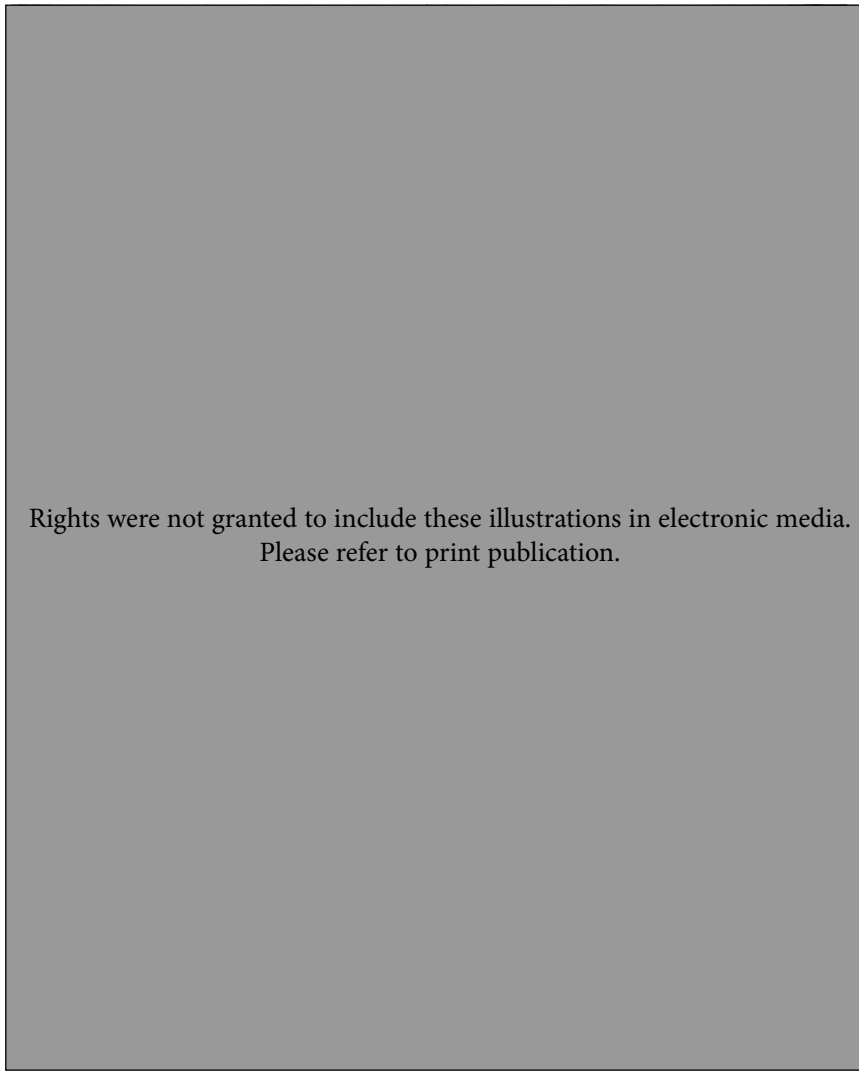

Fig. 4 Block book Bible. Here the text was cut into the wood block along with the illustration. The technique allowed the production of books of great beauty and utility; but it lacked the flexibility of print. This example was manufactured in the Netherlands, *c.*1430.

punch. It could then be driven with a single hammer blow into a bar of copper, yielding a sunken impression: the matrix. The matrix was then placed in the base of the hand mould; pouring in soft alloy, a compound of lead, tin and antimony, produced a column, ideally about an inch tall, with the letter standing proud and clear. Once the technique had been routinised, such

characters could be produced at the rate of about four a minute. The emerging body of type would have to be filed to ensure that the types were of identical depth: this was essential for ensuring an even impression on the paper.

The second major technical component, the press, seems to have required the application of rather less in the way of ingenuity. Just as the creation of the type punch and matrix drew on the established arts of metal work and coin-making, so the press was based on familiar structures: the winepress, or a press for printing textiles from wooden patterns. The printing press consisted of two moving parts: the carriage on which the forme of type was placed and the screw, which caused a metal plate to press the paper down on the type as the pressman articulated a lever through ninety degrees. In presses that have come down to us this screw is made of metal: in the Gutenberg era it might conceivably have been made of wood. The pressure required was considerable: the whole frame of the press was therefore often secured to the superstructure of the print room by vertical struts.

With the press built and the type cast the task of creating a printed sheet could begin. First the individual pieces of type had to be set in a wooden frame or 'forme'. This was the job of the compositor, who sat with cases of type, setting up a line at a time from a manuscript copy text, placing the type first in a

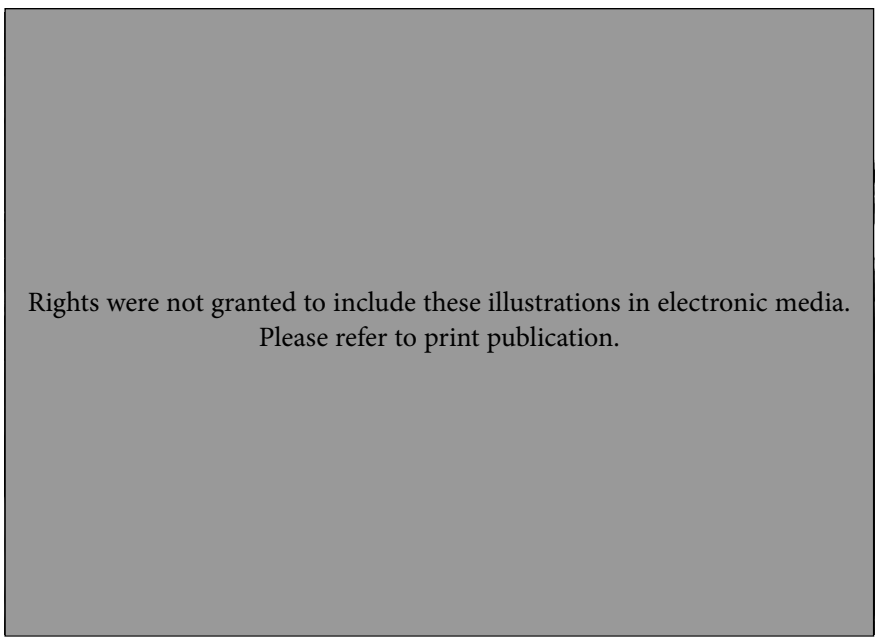

Fig. 5 The type-caster's workshop, showing the moulds, chisels and vessels for the liquid metal that would be poured into the matrices to make the individual characters.

handheld compositor's stick before transferring it into the forme. The larger-format books would be from this point of view the simplest task, for here a forme consisted of just two pages of type for each side of paper. When one sheet was complete the forme was affixed to the carriage of the press. The mechanical task of printing off the desired number of copies normally required two pressmen. One would fix the paper into its frame to be lowered on to the type, which the second man meanwhile covered in an even coating of ink. The carriage would then be slid under the press and the screw rotated to press the paper down on the inked type: two impressions were required, one for each leaf of the folio sheet.

This was the ideal process, but it would be many years before it became the unvarying routine of the print shop, and there were many technical problems to be solved along the way. To take the ink the paper had first to be damped; after impression the printed sheets had to be allowed to dry, but in such a way that the reverse side could be printed without the ink smudging or showing through. The reverse also had to be printed before the paper had dried out completely. Although early illustrations seldom show this, presumably early print shops must have been cluttered with half-dry sheets, suspended like

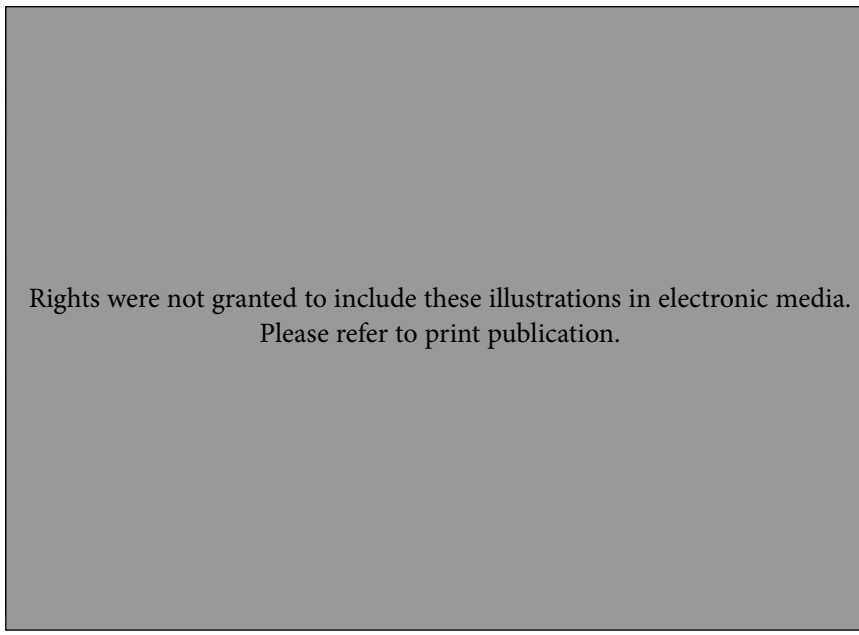

Fig. 6 This outstanding surviving example of an early press shows the carriage open, exposing the type laid out on the forme below. Hanging from the side of the press is the soft sponge used to ink the type. Beams anchor the press to the ceiling of the workshop.

clothes on a clothesline until they were dry enough to be stacked between felt. Then there was the problem of the ink itself. The early typographers had to develop a very specific sort of ink: rich and sticky; sufficiently viscous to be easily spread, but giving an even impression and drying quickly before the paper had dried through. This was one of the great triumphs of the early Mainz typographers, who contrived (from soot, varnish and egg white) a superb black ink, rich and pure, and free of any tendency to stain. Subsequent attempts to cut cost led to a considerable reduction in the quality of printer's ink.

One can only imagine the sense of triumph as the first examples of the new printed sheets were stacked up and arranged into finished books. If the first book was indeed a now lost copy of the popular school grammar known as the Donatus the finished product would have emerged relatively quickly as this text was only 14 leaves or 28 pages long. The first books then vanished from sight, probably sold to local customers to whom they may have been virtually indistinguishable from the thousands of manuscript school-books already in circulation. The crudeness of the type, cut explicitly to resemble a manuscript hand, and the unadorned simplicity of the text on the page, must have assisted this process. Certainly if Gutenberg's first customers were aware of the momentousness of his achievement, they left no comment: until, that is, the publication of the Gutenberg Bible.

The Gutenberg Bible

One can well understand why Gutenberg, conscious of what had been accomplished, should now have hankered after a master-work to announce his great invention. That said, the choice of the Bible for this purpose is far less obvious than it may now seem. The first half of the fifteenth century had seen a large increase in book production in many parts of Europe. But the high point of manuscript production of bibles had been reached and passed in the thirteenth century. If gentry or noble households acquired any religious texts in the first half of the fifteenth century then these were far more likely to be Books of Hours. Institutional customers like monasteries had most need for liturgical texts, missals and lectionaries.[6]

The liturgical book most obviously in demand was the missal, used by all priests in celebrating the Mass. Church reformers such as Nicolas of Cusa had already spoken out for the creation of a correct and reliable text, to ensure that the Mass was performed in a proper manner throughout the Western Church. In 1451 Nicolas of Cusa was in Mainz, as the papal delegate to the fourteenth general chapter of the Benedictine Order, which had been summoned to pursue

an agenda of monastic reform. The design of the DK type may indeed suggest that a missal or psalter was the original goal of Gutenberg's enterprise, and liturgical publishing of this sort would be the mainstay of the first generation of German printing. But Gutenberg resolved on a bible, and around 1452 he set about raising the additional funds necessary for such a giant undertaking.

A task of such complexity required a business of far more sophistication than the small workshop employed for the rudimentary school-books. In many respects the co-ordination of this venture is Gutenberg's greatest achievement. For the new project Gutenberg moved to a larger a workshop with four, and later six, presses. The Bible required new fonts of type to be cut, and to imitate the appearance of a manuscript bible Gutenberg proposed to use a far greater range of characters than would later be standard. Examination of the physical copy has established that four (and later six) compositors were simultaneously at work setting up type.

Printing could now begin – once a stock of paper, or vellum for the luxury copies, had first been acquired. This again meant a very substantial financial outlay, which Gutenberg could not have contemplated without taking a partner: this was Johann Fust, with whom he subsequently fell out. The surviving copies of the 42-line Bible reveal evidence that the ideal manufacturing process was only gradually discovered, through a process of trial and error. The first leaves have pages of 40 or 41 lines of type, and only from page eleven onwards does 42 lines become standard (an economy of around 5 per cent in paper and vellum). Gutenberg at first clearly had in mind that the required red page headings should also be inserted mechanically: this called for each sheet to be placed in the press again, this time with the appropriate parts of the forme inked in red. This proved too intricate and was soon abandoned: the headings were instead left for hand rubrication once the printed book was complete.

With the technique in its infancy, work progressed slowly. If each press were able to make between eight and sixteen impressions an hour, then the printing of the 1,282 pages of an edition of 180 copies would have taken roughly two years – a very considerable time for capital to be tied up before sales allowed the partners to recoup their investment. The work required constant injection of new funds. The logistical requirements were beyond anything previously experienced in a book world accustomed to manuscript books emerging from the copyist one at a time.

Gutenberg's nemesis

The Gutenberg Bible was an immediate sensation. When Piccolomini visited the Frankfurt Fair in 1454 he was able to view trial sheets but not a complete

copy because the whole edition was already sold out. The astonishingly high rate of survival – of an estimated print run of 180 copies a full fifty can be identified today – suggests that from the very beginning this was a book that was cherished and treated with awe. Most of the initial buyers were monasteries and ecclesiastical customers in the immediate vicinity of Mainz, though Piccolomini dispatched samples to the Emperor for his inspection. Institutional customers would have had access to the calligraphical expertise which added the rich decorative illumination that adorns most of the surviving copies. They would also have been able to afford the very high cost. Customers paid around 20 gulden for a paper copy of the Gutenberg Bible and 50 for a copy on vellum. By way of comparison, a stone-built house in Mainz would have cost between 80 and 100 gulden; a master craftsman would have earned between 20 and 30 gulden a year.[7]

These costs would not have seemed outlandish for ecclesiastical institutions used to paying high prices for richly decorated manuscripts. But recouping the purchase price from a mass of individual customers or intermediary agents was inevitably a slow process; too slow to save Gutenberg's partnership with Fust. As soon as the Bible was published, Fust sued for return of his loans. Gutenberg could not pay. The case went to court, and Gutenberg lost. To meet his obligations he was forced to surrender his only substantial asset, his printing shop. For the next seven years, until his own death, Fust continued to run the press, now in partnership with Peter Schoeffer, his future son-in-law and eventual successor. Gutenberg faded from the scene. He would not be the last printer to learn that large complex projects carry the greatest risk, as well as the greatest renown. Although the Bible was a technical triumph, it effectively ended Gutenberg's active career as a printer. The future of print lay with Fust and Schoeffer.

Although Gutenberg is rightly honoured as the visionary force behind the new typographical invention, the partnership of Fust and Schoeffer also played a crucial role in ensuring the eventual triumph of print. For it was Fust and Schoeffer who would first place the business of print on a sound commercial footing. For this the partners were well matched. Fust provided the capital resources, and had a practical financial sense, as his ruthless dispatch of Gutenberg had demonstrated. Schoeffer, meanwhile, was the technical genius, who developed the design and manufacture of type beyond the clumsy and somewhat crude typefaces of the first experimental books.[8]

Originally a calligrapher in Paris, Peter Schoeffer had been recruited to work with Gutenberg and Fust as foreman in the print shop, and almost certainly to assist Gutenberg in solving the technical problems of designing

and casting type. But whatever his loyalties to Gutenberg, when the partners fell out he stood as witness for Fust; his evidence may indeed have played a decisive role in deciding the case.

The new partners announced their enterprise with a publication as eye-catching and impressive as the Gutenberg Bible: the famous Mainz Psalter of 1457. Printed in a range of new typefaces designed and cut by Schoeffer, the Psalter was a technical masterpiece, printed in no fewer than three colours: black, red and blue. It was an unabashedly luxury item: all of the surviving copies are printed on parchment. At this stage the partners seem determined to test the technical limits of the new invention. Three-colour printing, which required the paper or parchment to be placed on the press for three separate inkings, all carefully aligned, was never a truly commercial proposition. But over the next years the new firm published a range of titles that revealed a shrewd sense of the potential of the new market for printed books. At first, their books were directed to an exclusively clerical audience. The Mainz Psalter was followed in short order by a further Psalter for the Benedictines of Bursfeld, and a series of liturgical texts. From 1460 there followed editions of Canon Law and staple texts of Roman law, such as the *Institutions* of Justinian. Other early editions included theological works by Thomas Aquinas and early Christian authors: two works by Augustine were published in 1460.

In 1462 another lavish Bible was printed, the two-volume 48-line Bible. Although not a slavish copy in typographical terms, this edition was clearly set up from a copy of the printed Gutenberg Bible. In this very important respect, therefore, the influence of Gutenberg's prototype proved to be remarkably enduring. Gutenberg seems to have given little thought to his choice of a copy text: he used one of many manuscripts of the Latin Vulgate (the fifth-century translation attributed to Jerome).[9] Yet this unconsidered aspect of the printed book proved extremely influential. Virtually all of the Latin Bibles subsequently published in the fifteenth century (a total of some 94 editions, 81 in plain text and 13 with an accompanying commentary) took a printed bible as their model. The earliest editions used a copy of Gutenberg's Bible as their copy text: later fifteenth-century editions used either Gutenberg or one of these early imitators. Unwittingly, therefore, Gutenberg played a major role in fixing the text of the Vulgate as the standard authorised text of Scripture. This would cast a long shadow over sixteenth-century efforts at revision.

These books were expensive, luxury items. Almost all were still in a large-folio format. The three Mainz Bibles were printed in an especially lavish manner, on a large sheet of 40 centimetres which became known as Royal folio, later largely superseded by the more economical Chancery folio

(30 centimetres) for all but the most expensive projects. Often a significant proportion of their print run was on parchment. All of this required heavy investment, and Schoeffer was sensible enough to take on simpler jobbing work to assist with cash flow. In addition to the theological and liturgical works that were their mainstay, the press published large quantities of single-sheet broadsheets and certificates. These included a large number of letters of indulgence, certificates granting the purchaser a remission of punishment in the afterlife in return for pious donations. Indulgences were proclaimed by the Pope to assist with specific fundraising projects: the building of a church, financing wars against the Infidel. Later they would achieve fame when Martin Luther spoke against them, but in the fifteenth century Christians had no such misgivings. Demand seemed to be inexhaustible and many early printers earned valuable fees by printing them.[10]

Fust and Schoeffer also published a number of other official notices, including broadsheet manifestos for both Adolf von Nassau and Dieter von Isenburg, rivals in the increasingly bitter contest to be named Archbishop of Mainz. The harrowing denouement of this conflict, when troops of the victorious Adolf sacked and burned large parts of Mainz, brought a temporary cessation of the press; but by 1465 the partners were back in business, turning out new editions of their expanding range of titles.

In 1466 Fust departed for Paris, taking with him a large stock of books, which he hoped would find a new market there. Once again the partners had been shrewd. News of the invention was spreading rapidly through Europe, and scholars in the largest centres of learning were indeed eager to own copies of books produced by the new technique. When Fust died of the plague in Paris, Schoeffer hurried after him to ensure the future of the business in the French capital. His new representative in Paris was another German, Hermann von Stadlohn, and although Stadlohn succeeded in reviving the trade, his death shortly after this caused Schoeffer great difficulties. The property of a foreigner dying in France was by custom forfeit to the crown, and this fate now befell Schoeffer's Paris stock. It was only after representations from the Archbishop of Mainz and the Emperor that the French king, Louis XI, agreed to compensate Schoeffer for the loss. The legal documents drawn up in connection with this case offer an awesome demonstration of the huge sums now bound up in the business of books. The French king promised restitution of a sum of 2,245 gold talers, or 11,000 livres. This was the equivalent of the annual income of one of the leading noblemen of France.

In the two decades that followed this case Schoeffer continued to turn out a steady stream of new publications, mostly in the genres that had proved so

successful for his partnership with Fust: missals, Canon Law and theology. In all, he published over 250 editions, as well as at least a hundred single-leaf broadsheets: and these surviving ephemeral items were probably only a small fraction of a much larger business. But if Schoeffer had demonstrated that the business of print could be a richly rewarding one, the potential of the new market was not lost on others eager to win a share in the profits. Even before Fust's death in 1466 Schoeffer faced competition from other German workmen keen to try their hand at printing.

The spread of print

The first press established outside Mainz was probably that operated by Albrecht Pfister at Bamberg around 1460. Pfister had obtained Gutenberg's original DK types, presumably because they were regarded as outmoded and redundant by the new owners of Gutenberg's shop. Pfister published his own edition of the Latin Bible, as well as a number of small, more popular works in the German language. These included Johann von Tepl's *Der Ackermann aus Böhmen* (The Ploughman from Bohemia), a long narrative poem now regarded as the most significant printed text of early German humanism. These promising beginnings would not be maintained in Bamberg, which by the later decades of the fifteenth century was almost exclusively concerned with the publication of liturgical works. Of greater significance in the long term was the establishment of presses in the two great regional trading centres of the Rhineland, Strasbourg and Cologne.

The sack of Mainz in 1462, which induced workmen from the temporarily suspended Fust/Schoeffer enterprise to seek employment elsewhere, is sometimes seen as a major turning-point. But in truth it could hardly be expected that the techniques of the new art could be confined to Mainz, once purchasers of books began to recognise the potential of the new invention. Print had reached Strasbourg some years before the Mainz calamity. A printed Bible published by Johann Mentelin in Strasbourg is known to have appeared by 1460, the date given by an illuminator for his work rubricating the text. Mentelin published mostly editions of the Church Fathers, but he was also responsible for a milestone work, the first printed edition of the Bible in German (1466).

Printing certainly reached Cologne thanks to a man who had learned his trade from Fust and Schoeffer, Ulrich Zell. Having established his own press in 1464, Zell swiftly achieved a substantial output, mostly of theological texts, and also some editions of the classics. As befitted Cologne's status as home to a distinguished university, almost all of his works were in Latin. Cologne

developed a special reputation for its theological literature, but the key to its emergence as a major centre of production lay in its role as a leading place of trade on the Lower Rhine.

It was swiftly becoming clear that it was the centres of trade, rather than of learning, that would provide the best locations for production of printed books in the fifteenth century. Rather against expectations print did not flourish in many places that boasted a distinguished medieval university. There was virtually no printing in Tübingen or Heidelberg; in England it would be London, rather than Oxford or Cambridge, that monopolised print. Large commercial cities proved more fertile territory. Print shops were established in Basel and Augsburg in 1468 and in Nuremberg in 1470. In the next thirty years these three southern hubs of German commerce, along with Strasbourg, Cologne and Leipzig, would come to dominate the production of German books.

Established trading cities enjoyed important advantages in the new commerce of books. They were natural distribution points for a business that would rely on moving books into markets a long way from the point of production. Importantly too, many of those who entered the new trade in these places were able to bring to the business of books considerable commercial expertise and substantial capital resources.

The physical appearance of books evolved rapidly in these years. In the first experimental years, the Mainz typographers had modelled their books very closely on their manuscript exemplars. This had led to a relatively easy acceptance of print in the existing established markets, where the appearance of the first printed books was simultaneously both thrillingly new and reassuringly familiar. But it also led to significant missteps in terms of the technology. The attempt to replicate all aspects of the finished manuscript through mechanical process had encouraged experiments in two-colour or even, as we have seen, three-colour printing. This was painfully slow: it required each printed sheet to be returned to the press for the decorative features to be imposed in a different ink. It was intricate and expensive work, and it was hard to ensure that the second impression was exactly aligned. It soon became clear that it was far better to leave these tasks to the established experts, the calligraphers, who would then hand back the unbound sheets to be made up as a finished book.

Such a compromise characterises most of the production of the first twenty years of print, until printers found other ways to adorn the appearance of their books. The illuminated headings and decoration familiar from the manuscript age played an important role in leading the reader through the text and in breaking up the text. To achieve a similar effect printers began to experiment

with new arrangements of type, using large fonts for headings and substituting decorative woodcuts in the blank spaces previously left for hand-executed decorative initial letters. Books of the Fust/Schoeffer press frequently used several of the fonts at their disposal. This was only part of the necessary adjustment from manuscript to print. Ultimately printers had to train readers to accept a book printed in just one colour.

Illustration

In the first generation of print many printers cut their own types: Schoeffer, a precocious master in this field, cut a number of new fonts that enabled the Mainz books to experiment with a pleasing variety of arrangements of text. Fust and Schoeffer were also the first to experiment with the use of initial letters printed from wood blocks. It helped that the introduction of print coincided with a golden age of German woodcut art. The development of the woodcut precedes the invention of print by several decades: perhaps by as much as a century.[11] In this earliest period woodcuts were used largely for the manufacture of playing cards, and for the making of pictures of saints and other religious subjects. Ulm, near Augsburg, was renowned in the early fifteenth century as the chief centre for the making and distribution of playing cards throughout Europe.[12]

The first sustained experiment with woodcut illustrations was pursued by Pfister at Bamberg, who embarked on a type of book production radically different from that of the Mainz presses, directed to a largely popular market and mostly in the German language. To attract these buyers eye-catching illustrations were an obvious advantage, and Pfister invested heavily to produce this new effect. *Der Ackermann aus Böhmen* (The Ploughman from Bohemia) had five full-page woodcuts, and *Der Edelstein* (The Precious Stone), a series of fables in German, no fewer than 103. Three editions followed of the Bible of the Poor, two in German and one in Latin. This text was the traditional favourite of woodcut artists, but now the texts previously painstakingly cut into the wood blocks were replaced with movable type. A further biblical subject, the *Four Histories* (of Joseph, Daniel, Esther and Judith) was decorated with fifty-two oblong woodcuts. The cuts designed for Pfister's books were purely in outline, with little background shading. The style suggests they were intended for hand colouring, and may indeed have been coloured in the shop before sale.

After Pfister ceased production in Bamberg the main focus of book illustration moved south, to Augsburg and Ulm, the established centres of woodcut production. In 1471 Günther Zainer, one of the earliest to establish a print shop in Augsburg, began a remarkable series of illustrated books, including two

magnificent editions of Jacobus de Voragine's compendium of saints' lives, the *Golden Legend*. In 1475 he published a magnificently illustrated German Bible, initiating a tradition that would continue until the Reformation. Almost every vernacular Bible published in Germany from this date until Luther's Reformation translation was copiously illustrated.

Zainer's illustrated books stirred up a great deal of discontent among the local artistic community. Those involved in the local production of block-books sensed the danger posed to their craft by books that integrated text and pictures, and they were initially successful in preventing his attempts to print. Zainer was ultimately given permission to print only on the understanding that he employed as illustrators the woodcutters of the guild.

In Ulm, meanwhile, his kinsman Johann Zainer was able to exploit the tradition of playing-card manufacture to create some exquisite illustrations for early Latin editions of Boccaccio and Petrarch. His example was followed by Heinrich Knoblochtzer of Strasbourg, who published lavishly illustrated copies of a number of popular literary works, including the *Belial* of Jacob de Theramo, the *Mélusine* of Jean d'Arras, and the *Fables* of Aesop.

So far illustration was largely confined to books of this type, a relatively small proportion of overall production at this stage. But more generic decorative features such as woodcuts, initials and border panels could find their way into the mainstream scholarly and religious texts, and did so more often in the last three decades of the fifteenth century. Through these features and the increasingly deft handling of different arrangements of type, capitals and headings, buyers of books were gradually weaned away from the expectation that a finished book required hand decoration.

Publishers of printed books began to deviate even more boldly from the manuscript prototype. Symbolic of this change was the introduction of a design feature, specific and original to the printed book: the title-page.[13] In the manuscript era books had characteristically announced their subject in the first lines of the text, often with the formula, *incipit* (literally, 'here begins'). The first printed books followed this practice. But as books were manufactured in ever-larger numbers this came to seem unsatisfactory. The precious printed sheets were now being transported, unbound, over large distances, with consequent danger of damage to the top or outer sheet. A far larger selection of texts was also available for purchase. For both of these reasons it was sensible to provide printed books with a top sheet that provided protection for the text, and a swift means of identifying the work inside. This was the title-page. In the very first printed books it was usually a blank wrapper, before printers began to use the space to provide a short description of contents. It was only towards the end of

the fifteenth century that the title-page started to take on its mature form, offering a full view of what the reader might expect of a book and advertising its particular virtues. This longer description often stressed that the text was complete and accurate, or that a new edition had been freshly and wholly revised. The eloquence of the title-page announcement did not necessarily correspond to the accuracy of these claims.

The merchant publisher

In the last quarter of the fifteenth century, print spread far and wide through the German Empire, and beyond. Print reached Lübeck in 1475, and Vienna in 1481. A press was established in Hamburg in 1491 and Danzig in 1499; eastwards print reached Buda in 1473, Cracow in 1474 and Breslau (Wrocław) in 1475. In all, presses were established in some sixty-four places in Germany and central Europe before the end of the fifteenth century. But the crucial development of these years was less the mosaic of print towns, impressive though this was, than the establishment of major centres of production in the three great trading cities of the German south: Augsburg, Nuremberg and Basel.

Although those involved in the book trade in the three cities often co-operated closely, their publishing profile was quite distinctive. Basel, home to a distinguished university and a renowned group of humanist scholars, published mostly for these academic and ecclesiastical markets. Nuremberg publishers, too, could afford to publish rich, expensive editions. In the last decade of the fifteenth century Nuremberg was a town of around 50,000 inhabitants, and after Cologne the largest in the Empire. It was renowned for its role in the international book trade. Augsburg, in contrast, catered for a more local, regional trade, and for a more commercial burgher readership.[14] Very unusually, more than 60 per cent of the 1,252 editions published in Augsburg in the fifteenth century were in German. This is in contrast to the overwhelming domination of Latin in the production of early printed books overall.

These merchant communities, with their extensive resources and experience of major capital investment, would play a decisive role in the development of the German book industry. Their business experience allowed the emergence of a new phenomenon in the book world: the merchant publisher. Merchant publishers were men who commanded the capital necessary to underwrite large, ambitious projects that required careful preparation and a sophisticated network to ensure sales. In Basel, the dominant figure in the industry was Johann Amerbach, the son of a wealthy Franconian merchant. He quickly joined the merchant elite, founding a printing house that played a large role in

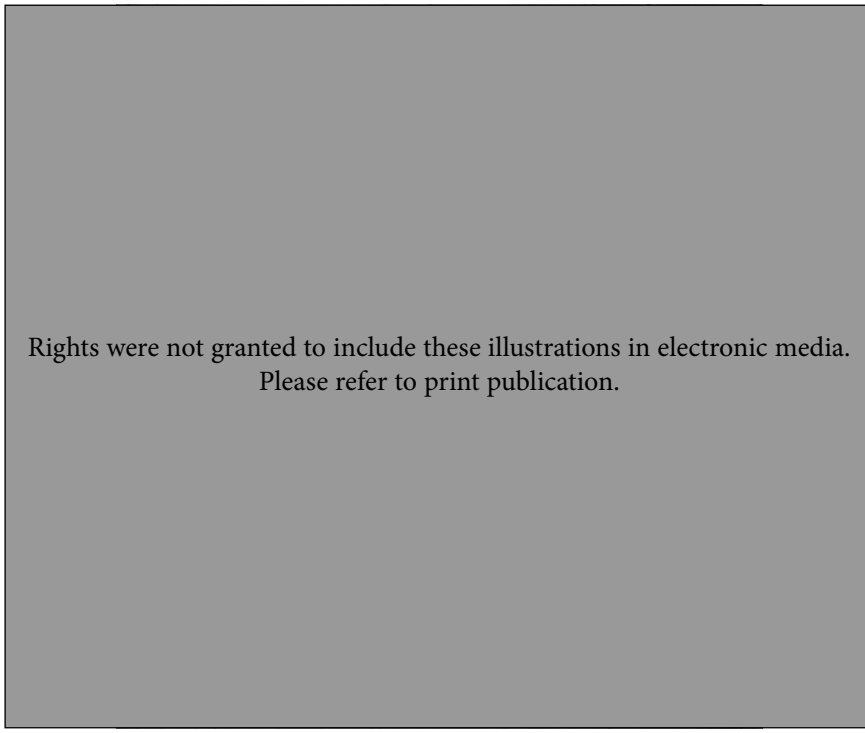

Fig. 7 Augustine, *De trinitate*, Basel, 1489. The median state of the title-page. The blank wrapper has been replaced by a terse identification of the text with no attempt at decoration.

establishing Basel in the first rank of learned publishing. His enterprise prospered greatly from his close association with Anton Koberger, the quintessential merchant publisher and leading figure in the Nuremberg book industry.[15] Koberger published over 200 works between 1480 and 1500, but he also underwrote ambitious schemes for the publication of large learned works commissioned from printers in other cities. By 1480 the productivity of his shop had dwarfed that of Schoeffer in Mainz; his operations were so extensive that in 1493 he received permission to lay in his own water supply for the row of houses he had purchased in one of Nuremberg's most prestigious quarters.[16] The pipes traversed the town at shoulder height, and were only taken out of service at the end of the nineteenth century.

The claim that Koberger's shop operated two dozen presses probably reflects the characteristic imprecision of the age with regard to numbers, but this was certainly a venture on an industrial scale. His investment was enormous: books published by Koberger used more than thirty different typefaces during the

lifetime of the firm. Augsburg had no similarly dominant figure in the printing industry, but it was still of sufficient size to turn out large numbers of books in sizeable editions, such as the 12,000 broadsheets supplied by Johannes Bämler to a single customer in 1480.[17] Augsburg led the way in the output of small, relatively ephemeral books, such as almanacs and news pamphlets, and quickly established the leading role in the book trade of the region. Despite promising beginnings, printing in Ulm soon withered in the face of competition from its larger neighbour, and the same is true of fitful printing houses in other cities round about: Nördlingen, Reutlingen, Tübingen and Memmlingen. None could sustain a profitable business fit to compete with the regional giants.

Peter Drach

The growth of the German book market encouraged an increasing degree of specialisation, as printers avoided books that they knew were adequately catered for by other publishers. The robust trade in books also encouraged the rise of a new class of trader: the specialist book merchant.

We can learn much about the functioning of the book trade from many fragmentary sources. Scholars, publishers and book collectors maintained a lively correspondence about books, sharing information on recent publications, arranging consignments of books, and asking after titles they wished to obtain. However, the world of the book dealer would have remained largely in the shadows but for the relatively recent discovery of a remarkable source: the account book of the Speyer book dealer Peter Drach.[18]

This account book was discovered in the binding of three sixteenth-century books, where the manuscript sheets had been used as 'printer's waste' to bulk out and stiffen the boards behind the leather or pigskin that made up the book's binding. In itself, this was not unusual. Paper was too precious a commodity simply to be thrown away, so printers routinely sold bookbinders spoiled sheets or unwanted surplus from a print run for use in this way. The examination of original fifteenth- and sixteenth-century bindings during restoration and repair has revealed parts of many otherwise lost printed items, often fragments of school-books, or broadsheet edicts and announcements regarded at the time as too ephemeral to be worth collecting. So it was with Drach's account book, which disappeared into the binding of books imported from Lyon to Speyer some time after 1562. The sheets that have been rescued, though extensive, were not the whole book. What survives is probably only a third of the original. But this is enough to give a vivid picture of a fascinating business.

Peter Drach was a member of an established merchant family in the prosperous Rhineland town of Speyer, where his father, Peter Drach the Elder, had established one of the first printing presses. His son inherited the business in 1480, and ran it until his death in 1503. But increasingly Drach's business was focused on selling books. Speyer was well placed geographically, between the major print centres of southern Germany and the Rhine, but Drach built a business that ranged far beyond this regional trade.

Drach's bookselling business was extremely profitable. The surviving portions of his account book record the delivery of 17,155 books, an average of 1,200 a year. Drach had good regular business with the university towns of Heidelberg and Tübingen, though he sold more in Tübingen, where there was no local competition, than in Heidelberg, which had its own printers. He dispatched books to booksellers in Lübeck and Cologne, to Breslau and Halberstadt in the east, and south to Landshut and Ulm. Drach conducted much of his business, and met potential customers, through the two major trade fairs at Frankfurt and Leipzig. Almost two-thirds of all his books were delivered to Leipzig, which functioned as an entrepôt for Drach's important markets in Bohemia and Moravia.

Drach operated at the top end of the market. Most of the books he sold were intended for the use of the clergy, and he sold many theological works and books of Canon Law and liturgies for use in church to institutional customers. Individual purchasers bought collections of sermons and dictionaries. Among the sermons that sold well were the works of Bernard of Clairvaux, and the near contemporary German Dominican author, Johann Herold. Interestingly, despite the importance of the clergy in Drach's extended customer base, the texts of the Bible do not feature particularly strongly in his accounts.

Drach's accounts offer a revealing snapshot of the German book market as it had developed in the last twenty years of the fifteenth century. Of course Drach was only one dealer, and his stock is not representative of the whole corpus of available titles. Works by classical authors and recent humanist literature are scarcely represented; other booksellers developed the market in vernacular books that Drach largely ignored. But Drach's inventory does give us an illuminating insight into several aspects of overall production of books in Germany in this era. Three features, in particular, stand out. The first books published in Germany overwhelmingly concentrated on religious themes; they were mainly the works of authors of the preceding centuries rather than their own day; and most of these earlier works were also by non-German authors.

German presses turned out multiple editions of the Church Fathers, Augustine, Jerome, Chrysostom and Gregory. There were many editions too of

the theological authors of the medieval period, pre-eminent among them Thomas Aquinas, Jacobus de Voragine, Bonaventure, Gratian and Peter Lombard. Most of these were Italian. Only when we consider authors writing in the century immediately before the invention of print do German authors make more of an impact. Many were Dominican or Franciscan authors active in the composition of sermons and confessional literature, such as Johannes Nider or Johann Herold.

German printers of the fifteenth century also published extensively in other genres such as history, law and philosophy. But even here, the prestige of older authors severely handicapped attempts by newer writers to obtain a hearing. The encyclopaedias, medical books and histories of the thirteenth and fourteenth centuries continued in vogue, and were frequently reprinted, at least until the last decade of the century. For contemporaries seeking to make their name through the new genre of print, the fifteenth-century German presses offered relatively slim pickings. This would be an enduring problem that blighted the careers of many contemporary poets and scholars hoping to make a living in the rising tide of book production. The innovative spirit demonstrated by German publishers in developing the form of the printed book and in constructing an advanced business network contrasts with pronounced conservatism in their choice of titles. This was indeed the secret of their success. But it is a warning against too automatic an association of print with the triumph of the new.

The Nuremberg Chronicle

By the end of the fifteenth century the book had come a long way since Gutenberg's first experiments with print. Printers had mastered a complex arrangement of type and decorative material to render hand illumination and decoration redundant in all but the most valued copies. They had developed a range of typographical material and publication formats for a market developing cautiously beyond the traditional purchasers of books. They had exploited the potential of the new genre for new design features, such as the title-page, which differentiated the printed book decisively from its manuscript forebear. Most of all they had developed complex mechanisms of finance and marketing that allowed both the raising of capital for large, complex projects, and for these projects to be delivered to a marketplace spread across Germany and eastern Europe.

All of these features of the development of the book are evident in a project that epitomises the energy, ambition and pride of achievement of the German book world at the end of the fifteenth century: Hartmann Schedel's *World*

Chronicle, the Nuremberg Chronicle.[19] This was not an especially original work; in large part it is an essentially unaltered reworking of earlier histories. But the ambition to place Nuremberg at the centre of an encyclopaedic rendering of world history from the Creation made it an especially important project for the city's merchant elite. Intellectual ambition was matched by the opulence and complexity of the planned volumes. The whole venture was financed by two wealthy Nuremberg merchants: the text was the work of the learned physician, Hartmann Schedel, while Anton Koberger was to be the printer, responsible for both the publication and distribution.

Most unusually, the contracts laying out these detailed arrangements have survived and we are able to reconstruct every aspect of the production of this prodigious book. A crucial role was played by the woodcut artists, Michael Wolgemut and Wilhelm Pleydenwurff. In addition to providing the woodcut blocks, which included intricately executed (if freely imagined) typographical views of Europe's major cities, the artists had to provide sketches showing how the text, woodcuts and decorative features would all appear on the printed page. To ensure that the printers followed them accurately, one or other of the artists was required to be in Koberger's workshop throughout the production process. This took two years, for although Koberger allocated most of his available presses (up to fifteen) to the project, this was a massive work: a large folio with 645 different woodcut blocks (since they were frequently reused, this amounted to over 1,800 separate woodcuts through the text).

Koberger printed at least 2,500 copies – 1,500 of the Latin and 1,000 of the German edition. This represented a staggering investment in paper alone. In addition the artists were guaranteed 1,000 gulden, as well as a share in any possible profit. It is no wonder that when Koberger finally finished this monumental task in 1493, he should have indulged himself by publishing a separate broadsheet advertisement. This also survives, bound in with the author's own copy of the Latin edition. Koberger did not underplay his hand:

> Nothing like this has hitherto appeared to increase and heighten the delight of men of learning and of everyone who has any education at all: the new book of chronicles with its pictures of famous men and cities which has just been printed at the expense of rich citizens of Nuremberg.

The broadsheet concluded with an exultant verse encomium:

> Speed now, Book, and make yourself known wherever the winds blow free.
> Never before has your like been printed.

A thousand hands will grasp you with warm desire
And read you with great attention.[20]

The hubris is perhaps excusable, for the Chronicle was a formidable statement of German self-belief. It epitomised the commercial sophistication, economic power and technical virtuosity that had brought the art of print to this extraordinary climax. In these terms the book was an undoubted success, and spread far and wide through the book-owning world. Even today it is one of the most widely owned books of the fifteenth century, with over 1,200 surviving copies registered, 800 of the Latin and 400 of the German edition. But the story of the Nuremberg Chronicle has an extra twist, a sobering and revealing codicil. The early success of the Chronicle inspired a rapid reprint. In 1496 the Augsburg printer Johann Schönsperger produced his own edition, now with 2,165 illustrations copied from the Nuremberg blocks, but completely re-cut. He followed this with a Latin edition in 1497 and a second German edition in 1500. These pirate editions completely spoiled the market for the Nuremberg original. When the contract between the printers was wound up in 1509, a considerable portion remained unsold.

The eventual failure of the consortium behind this publication was a reminder that a market dependent on frequent reprints of a limited number of tried bestsellers easily descended into ruthless and mutually ruinous competition. For those easily entranced by the technical virtuosity of the new invention, the world of books could be cruel. Even in the first generation many more fortunes would be lost than won.