Printing Technique, Renaissance

Abstract*

The advent of print is widely acknowledged as one of the defining factors of the Renaissance. The printing process developed upon pre-existing techniques, such as the hand press already in use for block printing. Its fortune was largely supported by the dissemination of paper throughout Europe in lieu of parchment and other animal support. Indeed, print usually developed in the proximity of papermaking centres. Moveable types were made of an alloy formed by lead, tin and antimony, that made them suitable for the mechanical process of printing. A printing shop included various roles within its walls: the pressmen, the compositor and the master printer (though these may vary depending on the size of the workshop). The production of a book as a finished commodity relied on a number of different trades, depending on the presence and typology of illustrations, or the customisation required by the reader.

Heritage and rupture with the tradition

The advent of the hand press book in early modern Europe around 1450 was a media moment of exceptional importance. The production of books was thus made much faster than it ever had been. Medieval Europe had been full of books; the production of manuscripts was a very efficacious commercial enterprise before the printing press and continued to be so well after (Pettegree 2010). Since the twelfth century, the trade in manuscripts had included procedures for the serial reproduction of text. The *pecia* system allowed to quickly replicate a text – traditionally, student handbooks – by splitting a manuscript into quires and assigning each to a scribe. Rather than an exercise in contemplation, the production of manuscripts evolved into book trade alongside the growth of the major European universities and soon turned to devising the most suitable strategies to increase sales. As Elizabeth Eisenstein put it, 'book production … had thus moved out of scriptoria three centuries *before* the advent of print' (Eisenstein 1979). The printing industry revolutionised the manufacturing of books by increasing the speed of serial reproduction of text dramatically. Originally this was the main objective of the book merchants who invested in a printing press: printed books were essentially the surrogate of manuscripts, designed to replicate the traditional features of their predecessors. The following decades in the history of printing were marked by the gradual detachment from the manuscript world.

Printing built on two pre-established techniques: the hand press, already used for block printing in the fourteenth and fifteenth century, and itself based upon the much older wine press; and rag paper, imported into Europe via the Arab world in the twelfth century, and perfected thanks to the spreading of linen textiles (Febvre and Martin 1976; Harris 2017). Whilst representing the single most expensive element in the production of books – amounting to some 40% of the entire production cost – paper was significantly cheaper than the traditional skin, and lent itself much better to the printing process, if treated properly. The paper industry required a regular supply of rags or rope, as well as clear running water, both to operate the paper mill, and for the rag paste that would become paper (Febvre and Martin 1976). The ideal location for paper making therefore was near cities, where used rags would be easier to purchase; and uphill, so that water may run clean and fast. The flourishing of Fabriano, Italy in this industry is thus easily explained, given its location in the mountainous Marche region, not far from densely populated areas. The consolidation of the great printing centres naturally took place in areas that had quick access to paper; the area

around Lake Garda in Italy served the rapid expansion of the Venetian printing press, while paper mills in the Troyes area were the key paper suppliers in Paris. Indeed, the prominence of Troyes paper in Paris pre-dated the printing press and was well established before printing ever commenced (Febvre and Martin 1976).

Printing in itself already existed in late-medieval Europe in the form of block printing. Hundreds of thousand impressions – mostly of saints and other devotional subjects – had already been circulating in the late fourteenth and the early fifteenth century. The earliest dated example is a woodcut of St Christopher (1423), held in the John Rylands University Library, Manchester. Block printing was even used for short books, such as the *Biblia pauperum* or the *Ars moriendi* (Febvre and Martin 1976). Images were well suited to be carved in wood; however, the same material was not appropriate for the carving of small letters, which required a higher degree of precision. As a rule, only limited text was included with these iconographic blocks, and was usually quite rudimentary. Text carved into a wood block of course would also create a certain fixity in the use of the block itself – therefore, while it might be suited for standard images intended for wide dissemination, it was not very useful in the case of books. Individual letters that could be composed into any text were much better value for money, as they could be used ad libitum, until they were worn.

Print was not the invention of one individual, but it was in many ways a natural development for the book world; around mid-fifteenth century, others were at work trying to come up with the method that Johann Gutenberg is largely credited with today. In the words of Daniel Berkeley Updike, 'Gutenberg's invention consisted … in making brass moulds and matrices by which type could be *accurately cast in large quantities*' (Updike 1922). Many of the proto-typographers were goldsmiths by training; the skill in metalwork was essential in identifying the most suitable alloy for metallic characters, neither too hard (as it would break) nor too soft (as it would bend). Metal types were made of lead, tin and antimony, though the compound varied in its proportions well into the eighteenth century (Febvre and Martin 1976). The alloy composition made it easy to work with, giving it a low melting point and a stable volume once the metal had cooled down (Gaskell 1995).

Like other feature of the early printed book, types were designed to mimic script. Different declinations of the gothic script inspired many early types, especially in the Germanic territories. The revival of classical learning in Italy led to the development of humanist scripts – thought to be based on classical models, but in truth mimicking the Carolingian minuscule from medieval manuscripts. Roman types, common in Italy and soon imitated throughout Europe, were a mixture of humanist script for lowercase letters, and Roman epigraphic letters for the uppercase. The expressions themselves: "lowercase" and "uppercase" derive from the distribution of the individual characters in the typographical case, from which the compositor would select them to set a text in metal type.

Non-Latin scripts took longer to develop due to technical difficulties. Among these scripts, Greek was the most important to the printing presses in Renaissance Europe. Greek printing in the fifteenth century was largely experimental (Gaskell 1995). The Aldine Press, founded by Aldus Manutius the Elder in the late fifteenth century, was the first to employ a cursive Greek script that was soon imitated throughout Europe (Barker 1992; Gaskell 1995). The Aldine Greek remained a widely sought-after model and was hugely influential in the printing and reading of Greek texts for some 300 years (Gaskell 1995). Wise to the importance of his investment, when he was finally satisfied with the result of the commissioned Greek type Aldus requested a privilege from the Venetian government to prevent others from imitation (Barker 1992).

Soon after, the Aldine Press released yet another font of type, inspired by the Latin cursive script (McLeod 2015). The Aldine italic was immediately a great success, and it was imitated throughout

Europe, despite Aldus's efforts in securing another privilege. The new italic type was more compact than Roman types, despite allowing for a lighter-looking page; therefore, it was particularly well suited to small-format books, and indeed it came to fame through its use in the famous Aldine enchiridia or pocketsize books.

In the early years of printing, the printing shop usually also owned the matrices to produce their types, therefore much of the identification of early books can be done by looking at the type. The online portal, *TW - Typenrepertorium der Wiegendrucke*, developed alongside the *GW – Gesamtkatalog der Wiegendrucke*, offers many such examples. From mid-sixteenth century onwards, it became customary that printers and publishers could acquire the type but did not own the matrices. These remained the property of the type designer, who could then sell the type to multiple customers (the examples of Claude Garamond or Robert Granjon are prominent). By this stage, printing types can no longer be used as means for the identification of editions.

Innovative and original aspects

The best analytical description of the typographical materials, the printing process and the individual roles in a printing shop is given by Philip Gaskell (Gaskell 1995). Much of the process remained unchanged for some three centuries, so that the illustrations of Diderot and D'Alembert's *Encyclopédie* remain for the most part on point for the Renaissance printing technique. English-speaking readers may use the version with an introduction by Giles Barber (Barber 1973), as well as consulting the original *Encyclopédie*, available in open access on Gallica.fr.

The common press was formed of a wooden frame, fixed to the floor and the ceiling so to avoid movement. To this frame, two core moveable parts were attached: the carriage assembly, that held the paper and the type, and could slide in and out; and the impression assembly that performed the actual printing, pushed down onto the sheet and type by use of a lever (the bar). The carriage assembly was formed of a series of frames that folded onto one another: the sheet of paper was placed upon the tympan and fixed with pins; the frisket was then folded onto the sheet of paper, covering any parts of the sheet that should not be inked, similarly to a stencil; the tympan was then folded over onto the press stone, and the coffin was rolled under the press. The rear of the tympan was padded with parchment and other recycled material, so that the impression would not tear the paper. The impression assembly was actioned by pulling the bar, that would in turn move a wooden or metal nut which would cause the hardwood (or metal) platen to hit the tympan and the sheet of paper through it. The wooden press was operated by two pressmen: one pulled the bar and changed the sheet, the other inked the type. Pulling of the bar was a significantly heavier job, therefore the pressmen took shifts.

Hand press books were produced one sheet at the time, or indeed, one side of a sheet. The volume of work undertaken by the pressmen would vary considerably, though the highest figure for a day's work would have been in the region of 3,000 impressions (not sheets). Detailed account books such as those by Christopher Plantin offer real-life examples based on well documented work undertaken at the Officina Plantiniana (Gaskell 1995). In setting up the printing, a number of preliminary operations had to be performed. The compositor or the master printer had to calculate the number of words in the text, so to estimate the overall length of the edition and to allocate work – a process known as 'casting off' (Gaskell 1995). Thanks to such calculation, the composition of the text could be done by formes, i.e. the inner side of an entire sheet first, followed by the outer forme. While these calculations were usually fairly accurate, the signs of a slightly erroneous casting off can be

detected in the increased presence of abbreviations (when there was more text than anticipated) or added spaces between words or letters (when there was less text than anticipated), especially in the first page of a gathering.

The compositor worked with the type cases, choosing the characters one by one, and composing the text (usually two lines at the time, but Gaskell 1995 suggests a different number of lines depending on the region) using a composing stick. The lines of text were then transferred onto larger trays known as 'galleys'. Once the text set in metal reached the length of one page, it was completed with running title, page or leaf number, catchword and signature; these elements were not always present, though they became increasingly more common throughout the sixteenth century and beyond (Sayce 1966). The type-set page was then tied with string, to ensure that all the lines were kept together (dropping type was one of the most common accidents in the printing workshop; Bowers 1949). Once the pages for a whole side of the sheet were set in type – the number of individual pages depended on the format – the process of imposition took place. The pages were distributed in the correct order, that is, the order in which they should be once the printed sheet was folded; they were then locked within a frame (the 'chase'), using wedges and pieces of wood to fill in all the empty spaces, so that the type could not move. The chase was then transferred to the press, and the forme was ready for printing. A proof was usually printed, so that any mistakes could be removed from the text; though stop-press corrections were also extremely common, meaning that during the printing of a full run, the printing was halted, a correction was made and the printing recommenced with the altered text. The two versions thus printed are what is called 'state' variants (Bowers 1949). In most cases, the sheets printed before the identification of a mistake were still commercialised, as the cost of the paper made it uneconomical to discard them as waste. Often errors were only noticed much later into the process; printing shops such as the early Aldine Press would often make interventions in manuscript to correct the erroneous instances. More commonly, an 'Errata corrige' ('mistakes to be corrected') was printed at the end of the text, so that readers could make the corrections themselves if they so wished. Most of the time, however, mistakes went unnoticed and uncorrected. The type was usually distributed back into the cases immediately or soon after printing (Gaskell 1995).

The pile of sheets to be printed was wetted the day before and left under a weight overnight. This was essential, as dry paper would have torn under the press, despite the padding provided by the tympan. Damp paper was also better suited to receive the ink, and this preliminary operation ensured a much better and even inking. Printing ink was made of varnish and colour, resulting in a fatty liquid; consistency was important so that the inking balls run smoothly over the type, the ink should dry quickly (but not too quickly, or it would not transfer onto the paper), but without staining (Febvre and Martin 1976; Gaskell 1995).

Inking in more than one colour was achieved by printing each sheet in the first and then in the second (and subsequent) colour. The frisket was cut accordingly, so to cover the sections of the sheet that ought not to be printed. The most common combination was red and black, the traditional colouring of books of liturgy. Elizabeth Upper Savage has been investigating the evidence provided by remnants of red frisket sheets in detail, with an ongoing census as part of her study (Upper 2014). The early printers attempted to print in two colours in one go, which resulted in contamination between the inks (Gaskell 1995). The process was, in any case, time consuming, which accounts for the higher cost of such books. Occasionally other colours were used under the press in early printed books (for example yellow) though these experiments are in the minority. A recent collection of essays (Stijnman and Savage 2015) explores the use of colour in pre-1700 printmaking, offering the first systematic treatment of the topic in a pan-European context.

While woodcut illustrations were printed through the same process as moveable type, and could therefore be embedded in the same composition, copperplate engravings were produced on a different press altogether. Copper allowed for a much finer detail but required constant retouching due to the softness of the metal; such illustrations usually exist in a set of states, following the necessary touching up. Engravings were printed with a special rolling press, and indeed, often the illustrations to accompany a text were printed in a separate workshop than the rest of the book. Engraved illustrations were significantly more expensive than woodcut ones, and they might amount to more than all the other production costs put together (Gaskell 1995).

Few early modern accounts of the printing process are preserved, as such handbooks tended to be for the internal use of a workshop and were thus used to destruction. Neil Harris has made a comprehensive list of known contemporary sources (Harris 2004). Most printing shops relied on different trades, such as paper as discussed above, punchcutters for the provision of type, engravers and chalcographic presses for copper-engraved illustrations. Books were very rarely bound in the same place where they were printed, as binderies were separate businesses altogether (and indeed, the decoration of the bookbinding may be performed by a gilder). Customisation processes added after printing continued to exist alongside the circulation of standard copies, usually by commission of the customer / reader – such as the bookbinding, or the hand-colouring or illumination of the book. The production of the book as a finished commodity, therefore, relied on several different crafts.

Impact and legacy

The impact and legacy of print can hardly be emphasised enough. It has been defined as a revolution (Eisenstein 2012), transformative of the cognitive and epistemological processes (McLuhan 1962). While scholars continue to discuss the extent of this impact on society, it certainly influenced and catalysed the growth of literacy and the standardisation of European vernacular languages through the circulation of compositorial practices.

Cross-References (if there are any; please include a list of other entries in this encyclopedia that may be of further interest to your readers.)

Printing and Publishing in the Renaissance; Manuzio, Aldo; Aldine Press

References*

<u>Primary literature</u>

Barber, Giles. 1973. *Book making in Diderot's* Encyclopédie*: a facsimile reproduction of articles and plates*. Farnborough: Gregg.

TW - Typenrepertorium der Wiegendrucke: https://tw.staatsbibliothek-berlin.de/

<u>Secondary literature</u>

Barker, Nicolas. 1992. *Aldus Manutius and the Development of Greek Script & Type in the Fifteenth Century*. New York: Fordham University Press.

Bowers, Fredson. 1949. *Principles of Bibliographical Description*. Princeton: Princeton University Press.

Eisenstein, Elizabeth. 1979. *The printing press as an agent of change: communications and cultural transformations in early modern Europe*. Cambridge [Eng.]; New York: Cambridge University Press. 2 vols.

Eisenstein, Elizabeth. 2012. *The printing revolution in early modern Europe*. Cambridge: Cambridge University Press. E-Book.

Febvre, Lucien and Henri-Jean Martin. 1958. *L'apparition du livre*. English edition: Febvre, Lucien and Henri-Jean Martin. 1976. *The Coming of the Book. The Impact of Printing, 1450-1800*. (trans. David Gerard). London: Verso.

Gaskell, Philip. 1995. *A New Introduction to Bibliography*. Winchester: St Paul's Bibliographies; New Castle, DE: Oak Knoll Press.

Harris, Neil. 2004. *Analytical bibliography. An alternative prospectus*. Lyon: Institute d'Histoire du Livre. Published online: http://ihl.enssib.fr/en/analytical-bibliography-an-alternative-prospectus

Harris, Neil. 2017. *Paper and Watermarks as Bibliographical Evidence*. Lyon: Institute d'Histoire du Livre. Published online: http://ihl.enssib.fr/en/paper-and-watermarks-as-bibliographical-evidence

McLeod, Randall. 2015. *The Birth of Italics*. https://www.youtube.com/watch?v=nH0ACso70VM. Accessed 4 July 2019.

McLuhan, Marshall. 1962. *The Gutenberg Galaxy: The Making of Typographic Man*. Toronto: University of Toronto Press.

Pettegree, Andrew. 2010. *The Book in the Renaissance*. New Haven and London: Yale University Press.

Sayce, Richard A. 1966. Compositorial practices and the localization of printed books. *The Library*, 5th s., 21: 1–45.

Stijnman, Ad and Elizabeth Savage. Eds. 2015. *Printing colour 1400-1700: history, techniques, functions and receptions*. Leiden: Brill.

Updike, Daniel Berkeley. 1922. *Printing types: their history, forms, and use: a study in survivals*. Cambridge, Mass: Harvard University Press; London: Humphrey Milford; [Oxford:] Oxford University Press.

Upper, Elizabeth. 2014. Red Frisket Sheets, ca. 1490–1700: The Earliest Artifacts of Color Printing in the West. *The Papers of the Bibliographical Society of America*. 108.4: 477-522