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PRINTING HOUSE AND ENGRAVING SHOP

A Mysterious Collaboration

The bibliography of engraved book illustration is a subject largely neglected in manuals of bibliography, as well as by cataloguers of prints. It has implications for the study of all the graphic elements in books, all the marks on the paper which are not words and numbers printed from movable type. This is something new. Until now bibliographers have concentrated almost exclusively on the words on the page. We know, in reasonable detail, about typography and printing; about printer’s copy, composition, presswork and proof-reading. Rooted in textual criticism, classical bibliography concentrated on recovering the words that the author actually wrote. McKerrow’s *Introduction to Bibliography* (1928) was quite specifically subtitled *for literary students* and his stated purpose was to get at the relationship between the printed book and the author’s manuscript. Philip Gaskell’s *New Introduction to Bibliography* (1972) is no different in its intent: ‘The study of printed books as material objects and the right interpretation of the printed documents of the past will be based primarily on a knowledge of how authors’ manuscripts were transcribed in type, printed, distributed and sold.’

Words then, in manuscript and type, are the subject of what is still the standard manual of bibliography.

What is lacking is a bibliography of images. Printing historians have studied the technology of punch-cutting, type-founding, composition, imposition and printing, and this has underpinned analytical bibliography in accounting for the ways in which the words written by the author are set in type, made up into books, distributed and read (or used in some other way). Descriptive bibliography records details of the book’s manufacture, providing among other things, further data for analysis. Where processes of graphic reproduction have been studied, it has been largely independent of their integration into printed books. But even the woodcut, printed as it is together with the type on the same

1 Gaskell, p. 1.
press, raises questions of planning and production which are not fully accounted for in traditional analytical and descriptive bibliography.

More complex than the bibliography of the woodcut is the bibliography of graphic elements which are printed by separate processes, those of copperplate printing and lithography. Here it is necessary to address not only the quite different production processes, but also the combination of the results with the printed text – the mysterious collaboration which is the title of my article. I deal only with copperplate printing, but I believe that while the technology of the lithograph is quite different, the bibliographical implications of the separate production are similar. Bowers made the rather awkward distinction between leaves which 'in some manner go through the printing press', that is letterpress sheets including those overprinted with engravings, or engravings with printed captions, and leaves which 'never passed through the press' that is, in this context, leaves which only have engravings printed on them. This is not helpful, dividing up the accounts of both letterpress and engraved material between different parts of the bibliographical description. Thomas Tanselle has written about the need to apply the same standards of analysis and description to illustrations in books as to the text, which of course is correct, but his prescription for bibliographical recording is largely aimed at inserted plates. In what follows I have demonstrated the need for a more integrated analysis and description of words and images, rather than making a distinction between sheets which contain letterpress and those that do not, or between quired and inserted leaves.

The history of copperplate printing has been largely left in the hands of print historians. One or two, notably Anthony Dyson, have taken an interest in printing technology, but their attention has been on printing single-leaf prints, not on how impressions of engravings were made specifically for books. Book illustrations are often discussed in the print literature, but with little acknowledgement that their production may well be different from that of single leaf prints; and that their interpretation certainly must be.

What follows is the text of a lecture that describes the process of printing from copper plates, based mainly on a reading of the rolling press manuals. This is followed by an attempt at the analytical bibliography of engravings in books, from which I have tried to discover how

2 Bowers, pp. 198–201.
engravings are printed when they are made specifically for inclusion in books, something about which the early manuals are silent. Finally I make some suggestions about descriptive bibliography. Only when bibliography in all its branches fully embraces the visual will it be able to support the full interpretation of the book, not just by historians of illustration, not just by literary critics, but by all historians of the book.

In January 1675 Humphrey Prideaux wrote to his friend Henry Ellis telling him about the discovery by Bishop John Fell, the Dean of Christ Church and founder of the Oxford University Press, of the after hours activities of the copperplate printers at the Sheldonian Theatre:

The presse hath often furnished me with something to tell you. You little thinke it hath been imployed about printeing Aretins postures. I assure you we were like to have had an edition of them from thence were it not that last night the whole work was mard. The gentlemen of All Souls had got them engraved, and had imployed our presse to print them of [f]. The time that was chosen for the worke was the evening after 4, Mr. Dean after that time never using to come to the theator; but last night, being imployed the other part of the day, he went not thither till the work was begun. How he tooke to find his presse workeing at such an imployment I leave to you to imagin. The prints and plates he hath seased, and threatens the owners of them with expulsion; and I thinke they would deserve it were they of any other college than All Souls, but there I will allow them to be vertuous that are bawdy only in pictures.3

In the seventeenth century ‘Aretino’ was a byword for erotica, and the Postures, as this letter demonstrates, widely known, at least by reputation. They provided the plot for Robert Hellenga’s 1989 novel The Sixteen Pleasures. A young book-restorer from the Newberry Library in Chicago goes to Florence after the 1966 flood and while working in a convent library she discovers the only surviving copy of the 1525 edition of I Modi, bound up with a prayer book in a later embroidered binding. I Modi began life as a suite of engravings made in about 1524 after drawings by Raphael’s pupil, Giulio Romano. The engraver was Marcantonio Raimondi, the most influential Renaissance engraver, particularly as an interpreter of Raphael’s work. Soon after publication of the engravings Pope Clement VII ordered the prints to be burned, and Marcantonio was imprisoned. The plates were none-the-less re-issued in

3 Carter, pp. 130–1.
1525, now with a printed text, a series of sexually explicit sonnets written to accompany them by Pietro Aretino. There were undoubtedly many piracies, but despite their widespread circulation – as demonstrated by the story of the gentlemen of All Souls – no complete copies of the original survive, Hellenga’s Florentine copy being entirely fictional. Of the original impressions, only the first survives, and fragments of a few others.4

The copperplate printers at the Oxford press attempting to print pornography on the side were almost certainly different workmen from those employed in letterpress printing, a totally different craft requiring different skills. Fell’s press was in fact highly unusual in having copper-plate printers on the same (or possibly adjacent) premises, and this is an essential point which I want to emphasise. Printing the text and printing the pictures, if they were engraved, were separate operations, for the most part carried out in different shops. Even at the great Plantin press in Antwerp, where punch-cutting and type-founding were carried out under the same roof as letterpress printing, copperplate printing was contracted out during the whole of the seventeenth century. Only at the beginning of the eighteenth century, when for some reason there was a serious decline in the standards of the copperplate printers of Antwerp, did Balthasar Moretus order a copperplate press and hire workmen to use it. The Cambridge University Press did own a copperplate press in the late seventeenth century, but significantly it did not directly employ copperplate printers, but hired itinerant workmen. These are the exceptions that prove the rule: copperplate printing for book work was carried on in separate workshops, by firms independent of the printing houses, and this was the rule for the whole of the hand-press period.

Just as the gentlemen of All Souls must have commissioned engravers to make their plates and took them to Bishop Fell’s printers to run off copies, a publisher could commission the engravings for a book and contract out the printing. Notice that the gentlemen of All Souls are quite specifically described as the owners of the Aretino plates. Plantin was responsible for commissioning Rubens and others to make drawings for frontispieces and plates, and then dealt with the engravers and retained ownership of the plates. The Oxford University Press still owns plates used in the seventeenth and eighteenth centuries.

4 Bette Talvacchia, Taking Positions. On the erotic in Renaissance Culture (Princeton, 1999), Ch. 2, pp. 49–69.
However there are also a number of documented cases where it was the author, not the publisher, who commissioned the engraving. From his remarks in the preface, it seems clear that Robert Hooke commissioned the plates for his *Micrographia* (1665); and from his correspondence with Robert Boyle, we know that Hooke drew the illustrations for Boyle’s *New experiments and observations touching cold* (also 1665) and dealt with the engravers. For the second edition of the *Principia*, Newton himself commissioned the single engraved plate and had it printed off in London. He sent the finished impressions to Cambridge, where the book was being printed, for insertion in the book before it was distributed. In these cases presumably the authors owned the plates, as must often have been the case with portrait plates for frontispieces which were regularly used to print separate copies for distribution to friends and patrons. The author’s ownership of the printing plate may be behind the curious case of the portrait of James Howell by Claude Melan and Abraham Bosse which first made its appearance in a French edition of Howell’s *Dodona’s grove* printed in Paris, and turns up again, re-worked, in Howell’s *Londinopolis*, printed in London in 1657 (it is not clear if the printing plate or the impressions from it crossed the Channel). Clearly then, either the author or the publisher could commission engraved plates and retain ownership of the printing surface. In any discussion of illustrations, it is important to bear this in mind, and if possible to discover who directed the engraver, and who retained control of the plate.

Engravers themselves must have owned or had access to rolling presses for proofing their work, and it is interesting that it was the engraver David Loggan who supplied one of the rolling presses to Bishop Fell’s press in Oxford in 1669. Samuel Pepys recorded a visit to the house of the engraver and print-seller William Faithorne on 1 December 1666, when he bought three copies of Faithorne’s portrait of Lady Castlemaine ‘printed this day’, suggesting that it was printed on the premises. I assume that engravers could and so probably did undertake edition work for booksellers in the seventeenth century, but there were also specialist copperplate printing firms. Bosse himself says, in his 1645 manual, that printing was not his trade, that is, he was an engraver, not a printer. In England copperplate printers were not controlled by any guild, they did

6 McKenzie, i, p. 336.
not have to be members of the Stationer's company, and very little is known of their organisation. In the Pepys Library there is an invitation card for a dinner organised by the 'Loving Society of Roling-Press-Printers' in about 1685. If Pepys, who took a keen interest in engraving, had not pasted this invitation into one of his scrap books we would know nothing of this society, and there is no other records of associations of copperplate printers in London. In Paris, the organisation of the picture printers is better known because of an edict of 1600 forbidding them from printing books, and the subsequent lawsuit brought by the corporation of booksellers, book-printers and binders against Melchior Tavernier in 1620.7

The Pepys invitation is to a William Hawkins who is unknown, and of the two stewards who signed the card, one, Joseph Nutting, is recorded as an architectural engraver, but the other, John Brodstock, is unknown. We know the names of one or two other copperplate printers of the seventeenth and eighteenth centuries from a few trade cards and records of printers and publishers, but there is no surviving archive of a copperplate printer before the Bewick archive from the early nineteenth century. There must have been dozens or even hundreds of firms of whom we know nothing. This is in very marked contrast with the letterpress printers whose names and addresses appear on title-pages and whose professional and private lives have been documented in great detail.

A huge range of crafts is involved in book production, far greater than for any other manufactured product of the pre-industrial age. The basic ones of punch-cutting, type-founding, paper-making, type-setting, printing and binding each depend on a range of ancillary crafts producing equipment and supplies. So perhaps we should not be surprised that even putting ink to paper might have to be done in two different workshops. The reason is that taking an impression from the raised surfaces of type and woodcut requires a different press from the one needed to pick up the ink from the lines engraved in a flat plate. Mechanically this is not self-evident, so it is worth quickly explaining the reason why the two kinds of press have to be different before describing their working.

In letterpress or relief printing, the printing surface is level and the non-printing areas are cut away so they do not touch the paper. In copperplate or intaglio printing, the lines which are to be printed are

7 Duportal, pp. 3–19.
cut into the surface of the plate to varying depths, and the white areas correspond to the polished surface of the plate. In printing from an intaglio plate, the paper is forced into the lines to pick up the ink, and the surface of the plate is in full contact with the paper. With this in mind, we can appreciate that very much more pressure will be needed to print from an engraved copper plate than from a raised surface. With the copper plate the load is spread over the whole area of the plate and enormous pressure is needed to mould the dampened paper into the engraved lines; but in printing from a raised surface only the inked surface, a fraction of the area of a page of type, takes the load of the press. The big difference between printing from raised type and from flat copper plates is the much greater pressure needed to print from copper plates. With the technology available, this could only be achieved by the use of rollers where the pressure generated by the press is concentrated in a line that moves across the plate.

The actual process of taking an impression from a copperplate was described for the first time by Abraham Bosse in the caption to his large plate of 1642, and in more detail in his manual of 1645. The copper plate, a few millimetres thick, is first warmed over a brazier, making it easier to work the rather stiff ink into the lines engraved on the plate. This is done with a rubber, a tight roll of old linen cloth, stippling and rubbing the ink into the lines, using the fingers as well if necessary. After this all the ink has to be wiped from the surface of the plate. Two stages of wiping with rags, the second stage rags replacing the first as they become soiled, are followed by wiping with the heel of the hand, the fleshy part below the little finger of the right hand. The plate is now briefly returned to the brazier before being carried to the press, the edges given a final wipe and the last traces of ink polished off the surface with some French chalk on the hand. (I'm told that traditionally copperplate printers, because of their inky alms, would greet visitors with a sort of Masonic hand-shake using only their thumb and first two fingers.) Since the surface of the plate produces the white areas of the image, the slightest smudge, or a fine scratch that holds ink, will show up.

The mechanism of the rolling press is simple. The star wheel is attached to the top roller, the bottom roller is free-running, so that turning the spokes draws the table or plank through the press, sliding over the supports at either end but supported on the bottom roller which rotates in the opposite direction. The press is entirely constructed of wood, except for bearings for the rollers which are lined with iron
plates. The pressure is adjusted with a packing of card, interleaved with felts, to give the press some elasticity, above and below the bearings. The plate is placed face up on the plank, the printing paper laid over it, and the whole covered with two or three soft woollen blankets. Even with the leverage provided by the long spokes of the wheel, considerable force is required to work the press, and gearing was later added to make the task easier and produce a smoother passage of the plank through the press.

On the rolling press, in contrast to the typographic press, neither the plate nor the paper is fixed to the press in any way, their positions depending on the pressman's care in placing both for each impression. The procedure which Bosse describes in 1645 is as follows. With the blankets firmly nipped by the roller and thrown back over it, a sheet of dry paper of the same size as the printing paper is placed on the plank of the press; the inked plate is then positioned on this sheet to give the desired margins. The dampened printing paper is then laid over the plate, lining it up with the undersheet, followed by another sheet of dampened paper, the maculature, and the blankets. The whole assembly is then drawn through the rollers with a firm even pressure on wheel. The pressman then has to move to the other end of the press. The blankets are lifted and placed over the roller again, the maculature removed and the print carefully peeled off the plate with both hands. For the next impression, the press is worked in the opposite direction. The dampened printing paper is placed on a board on top of the press and the pressman is provided with a table at each end of the press to receive the printed sheets as impressions are taken first in one direction and then the other. At the end of the day, or the next day, they can be hung up to dry.

In the printing house, printing from raised type, the press was normally operated by a team of two men, taking turns at inking – the beater – and laying on the paper and taking the impression – the puller. On wooden or common presses, speeds of up to 250 impressions an hour were quite normal. Working a ten hour day or more, output figures at the Cambridge University Press at the end of the seventeenth century were regularly between about 1500 and 3000 impressions a day, or between 750 and 1500 perfected sheets (printed on both sides).

Copperplate printing is much slower, mostly because the inking of the plate, and particularly the wiping, are very time-consuming and skilled operations. A few hundred impressions a day at the most could be printed, and then probably only of single illustrations, rather than the 4, 8, or 16 pages printed on a sheet for a folio, quarto or octavo book.
Output would vary enormously depending on the size and quality of the engraving, Tempesti for example mentions 180 impressions a day for an ordinary print, but only 50 a day for a large portrait. But curiously the only early output figure I have found specifically for book work is 750 sheets a day at the Cambridge University Press at the end of the seventeenth century. McKenzie calculated this from the fact that the printer, John Ebrall, who charged 8d. per 100 impressions, put in a bill for 15s. for three days work. If this is correct, it is a very high output compared with figures I have found for the print-trade, but it is in line with figures given much later in Berthiau and Boitard’s 1837 manual, where it is stated that 400 impressions a day might be achieved with a three man crew, raised to 700 impressions with a four man crew. Thus the Cambridge University Press figures possibly suggest that a press crew or four men was being employed, in which the inking and wiping would have been shared between two or three men. McKenzie assumed that the payment of 5s. a day was for a single workman, so he was led to the conclusion that copperplate printing at 5s. a day was better paid than letterpress printing at from 1s. 6d. to 3s. per day. But if my suggestion is right, then the 5s. had to be divided among four workmen, making them worse paid than the letterpress printers.

Having said this, I must admit that Berthiau and Boitard do not suggest that the three- or four-man crew was normal practice, it is only proposed as a possible means of achieving greater efficiency. Furthermore the other manuals make it clear that they are describing the operation of the press by a single workman, since there are injunctions to clean inky fingers before handling the paper. None the less I think that it is important to consider the possibility of more than a single workman being employed, an idea which seems to be supported by the early illustrations of copperplate printers at work. In Theodore Galle’s engraving after Jan van der Straet (Stadanus) in Philippe Galle’s, *Nova reperta* (Antwerp, around 1600), one man is warming a plate, another wiping, a third holding a plate ready to go on the press, in addition to a pressman taking an impression, and yet another examining a finished print. In the engraving by Pietro Bertelli in Vittorio Zonca, *Novo Teatro di Machine et Edificii per varie et sicure operationi* (Padua, 1607) a boy is warming the plate, the pressman is taking an impression, and another workman is hanging prints up to dry. In Abraham Bosse’s large print of 1642, three...
men are at work, inking, wiping and working the press; there are two men in Johan Wilhelm Meil’s etching in an anonymous book of trades for children, *Spectaculum naturae et artium* (Berlin, 1761–5); and in Rowlandson’s caricature illustrated by Hind there are five figures. Obviously this can be dismissed as an artistic convention, representing the separate operations carried out in sequence by a single man. On the other hand the separate workmen always wear different clothes and we seem to be invited to read these images as naturalistic views of bustling workshops, not as superimposed time-lapse images of solitary workmen. The possibility that the rolling press was operated by a team has not, I think, been previously discussed, yet it is obviously relevant to the economics of copperplate printing and also has important bibliographical implications which I will discuss later.

The Cambridge University Press figures suggest that it cost about the same to machine one plate as three letterpress sheets for an edition of 500 copies. That is one plate per 24 pages of a quarto, 48 pages of an octavo. A standard assumption is that paper accounted for half the production costs of a book at this time, so that leaving aside composition and engraving, we can see that adding a plate to a quarto of 30 sheets (240 pages) in an edition of 500 copies is like adding three sheets, it adds 10 per cent to the machining costs or 5 per cent to overall production costs. The cost of cutting the woodblock compared with engraving a plate would in some cases be more, in some less, depending on the subject. The above figures are probably not generally applicable, but this analysis suggests the kind of approach that should be used in trying to get a sense of the cost implications of including copperplate illustrations in a book.

The copperplate printing manual published by Abraham Bosse in 1645 was the first published manual for the construction and use of the rolling press, and the only significantly original one for nearly 200 years. Entitled ‘La Manière d’Imprimer les Planches en Taille Douce. Ensemble du Moyen d’en Construire la Presse’, it appeared as an appendix to his treatise on etching and engraving, *Traité des Manières de Graver en Taille Douce sur l’Airin* (Paris, 1645). Abraham Bosse (1602–1676), the pupil of Callot, was one of the best etcher-engravers of his time, and though as I mentioned earlier he modestly states that the printing of copperplates is not his own craft, he must have had considerable first-hand experience of the rolling press, and must certainly have had access to the workmen

9 Hind, p. 236.
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who built and operated such presses. Most of his book is taken up with the techniques of etching and engraving, the part on the construction and operation of the rolling press occupying less than twenty pages, illustrated with six plates. The first four plates are measured drawings of the rolling press and its parts, the fifth a view from one end of the press showing a plate laid on the plank, and the sixth an illustration of the pressman at work, clearly derived from the large separate print published in 1642.

John Evelyn translated the printing part of Bosse’s manual into English, intending to publish it as an appendix to his *Sculptura* of 1662, which like the main part of Bosse’s treatise is about engraving, rather than printing. He then learnt that the engraver William Faithorne was bringing out a translation of Bosse, so after reading his translation of the printing part at the Royal Society, he put it aside.10 For some reason Faithorne only published his translation of the first part of Bosse’s manual in the first edition of his *Art of Graveing and Etching*, published in the same year as Evelyn’s work; however the section on the rolling press was added to a re-issue in 1702. Bibliographies refer to *An essay on engraving and copper-plate printing* (1732) by J. Hauckwitz, a copperplate printer, but frustratingly no copies are known, and the book could not be found by Levis in 1912. There were numerous continental translations and adaptations of Bosse, first in Dutch (1662), but also several in German (the first in 1669) and one in Portuguese (1801) but the first Italian translation did not appear until 1937. The second French edition was edited by Sébastien Le Clerc and published in 1701, but the most important edition was the revised and greatly enlarged edition by Cochin published in 1745, with several new illustrations, and it was further augmented in the edition dated 1758. These editions were the basis for the text and illustrations in the *Encyclopédie* and *Encyclopédie méthodique*. The 1745 Cochin edition also provided the main source for Robert Dossie in his *Handmaid to the arts* (1758, 1764), though he added material of his own. Apart from a paragraph in C. F. Partington’s *The engraver’s complete guide* (1825?), no other original copperplate printer’s manual appeared in print before the *Nouveau manuel complet de l’imprimerie en taille douce* (1836) in the series ‘Manuels-Roret’. This very detailed treatise was edited by Pierre Boitard from information supplied by Berthiau, an experienced copperplate printer. Berthiau travelled to England to investigate copperplate printing in London, where plates for books were

10 Birch, ii, p. 33.
much better printed than in Paris. Boitard attributed this to the higher price the English were prepared to pay for their books, the French printers being among the best in Europe for large separate prints. Berthiau and Boitard’s manual was the first to discuss the printing of engravings for books.

Evelyn’s translation of Bosse was finally published from the manuscript at the Royal Society as an appendix to C. F. Bell’s edition of Evelyn’s *Sculptura* (Oxford, 1906), illustrated with the original French plates, not the four new ones that Evelyn told John Wilkins in a letter of 1661 that he had already had engraved. Evelyn’s translation is interesting because he evidently discussed the construction of the press with English workmen and claimed to have improved Bosse’s methods and made his text more intelligible. More recently, a manuscript engraver’s manual by Domenico Tempesti written in 1717 has been published (Florence, 1994) containing some brief paragraphs on printing copperplates. A more significant manual, which is still unpublished, was prepared at the end of the seventeenth century as part of the series of monographs on arts and trades projected by the Académie Royale des Sciences. Many of these were finally published in the 1760s in the series of *Descriptions des Arts et Métiers*, but not the manuals on letterpress and copperplate printing.

Although all the major published manuals before Berthiau and Boitard are based on Bosse, they each add significant details and require careful collation and analysis. Another line of enquiry is obviously to look at the presses themselves, but frustratingly few survive. Anthony Dyson illustrated just two seventeenth-century wooden presses and one from the eighteenth century in his article on the history of the rolling press. Wooden presses were still being built and used in 1836 and are described in detail by Berthiau and Boitard, their replacement starting later and taking longer than the equivalent change from wooden to iron presses for printing from raised type. One of the few significant changes to the construction of the rolling press was the addition of gearing. This was sometimes applied retrospectively to wooden presses, like the one the science museum in London, and gearing was a standard feature of iron presses. Another innovation was the D-shaped roller, making it possible to run the plank quickly back through the press so that the pressman did not have to keep changing ends.

The principle of the rolling press is simple and it did not change from wooden to iron presses, but there can be little doubt that printing on the wooden press would have been different from printing on an iron press. A number of replica wooden typographic presses have been built and operated for bibliographical research and teaching, but, so far as I know, this has not been done for the rolling press. There is now the potential to do this with the replica press at the Rembrandt House in Amsterdam, regularly used to print copies of Rembrandt’s etched plates.

I want now to turn from what can be learnt from illustrations, manuals and surviving presses and replica presses, to the books themselves, to see what they can tell us about their own production. My research was carried out on English imprints of the second half of the seventeenth century. I have looked at five aspects of engravings in books. First, the paper on which the engravings are printed; second, how engravings are positioned on the sheet for inserted plates; third, where plate leaves are inserted in the book; fourth, whether plates for inserted leaves are printed several at a time on a single sheet, or printed individually on cut leaves; and last, how engravings are combined with text on the same sheet.

The paper on which inserted plates are printed is almost invariably different from the paper stock used to print the text of a book and is generally of a better quality. Lightly sized or unsized paper is best for printing engravings, but it is clear from the manuals that sized paper was being used, more heavily sized paper requiring a longer soaking (or rotting as Dossie calls it) before printing, and the blankets needing regular washing or they became hardened with the size transferred from the paper. Although high quality, lightly sized paper might be preferable, ordinary book paper could well be used to print engravings, as can be seen in the many books in which engravings are printed in the text, and these books are printed on paper no different from any other book. The real reason that plates are printed on different paper is not that better paper is strictly necessary for everyday bookwork, but has to do with the fact that the copperplate printers were independent of the letterpress printers, and their paper was bought in a different way. In book printing, the paper was ordered and paid for by the publisher, or the printer who financed the publication. He paid the printer to print on the paper he supplied, and the printer did not hold his own stock of paper. By contrast I am convinced that the copperplate printer supplied his own paper. Even at Oxford, Walter Charleton’s *Exercitationes de
differentiis & nominibus animalium (1677) is printed on two different paper stocks, one for the text and one for the inserted engraved plates, although other engravings in the book are printed on the letterpress sheets. This again emphasises the independence of the rolling press printers. According to Berthiau and Boitard, it was the copperplate printers' responsibility to advise the publisher on the most suitable paper for the job. They also point out that the paper for the engravings needs to be of a larger size than the text paper to allow for the stub needed to sew the plate in with the printed sections.

The second consideration is how engravings are positioned on the sheet. That is which side of the paper is used; the orientation of the plate relative to chain lines in the sheet; and its position relative to the edges of the paper. The first two of these parameters I have only tested in a small sample, but it does look as if there is a preference for printing on the mould side of the paper – this is not surprising as the mould side is smoother than the felt side – and for placing the plate with the chain-lines parallel to the short side of the image, so that an upright plate has horizontal chain-lines. In other words the oblong shape of the plate is in the same orientation as the oblong shape of the full sheet of paper.

The position of the plate relative to the edge of the sheet is significant because it tells us something about the planning of a book. When engraved plates are to be inserted in books, a sufficient margin is usually left on one side to provide a stub to be folded round a gathered section. The sewing thread then goes through the section, including the fold between the plate leaf and its stub, holding the plate firmly in place. The stub will almost invariably be seen coming out a few pages back, or further on in the book, looking as if a leaf has been cut out ( alarming for the novice book collector).

The familiar problem of reading the text of a book while referring to an illustration was commonly solved in the seventeenth and eighteenth centuries by binding the plates as throwouts. Throwout plates are attached to the book in such a way that they can be opened out with the image thrown clear of the text block, so that any page can be read while looking at the illustration. The image itself may be no larger than the page of text, or it can be larger and folded several times. Furthermore, and this is important, it can be constructed by the book-binder or planned in advance by the publisher or master-printer. If it is to be constructed by the binder, he binds in a blank leaf, called a full apron, and hinges the plate to the outer edge. A variant is to hinge the plate to the fore-edge of
a text leaf, which is rarer, but still a standard solution. In looking at English natural philosophy books I have been struck by how often throwouts must have been planned by the printer. The copperplate is printed to one side of the piece of paper, leaving a large blank space on one side. In this way it can be bound as a throwout without the binder having to supply an extra leaf to attach it to. Furthermore the same arrangement can be found in multiple copies of the same book, which must indicate that the book was designed this way. This in turn means that an instruction was given to the copperplate printer to use a larger piece of paper than would otherwise be necessary (incurring extra cost) and to position the impression on the piece with a large white margin, more often than not on the left-hand side so that the plate opens on the right.

The third feature I have examined is the position of plate leaves inserted in books. In the hand-press period the position and folding pattern of plates can vary from copy to copy because these features of the book's construction are to some extent determined by the wishes of the owner, or the traditions of the binder. However this does not mean that these details were not planned by the publisher or master-printer. Just as with throwout construction, it is noticeable that there are standard folding patterns and positions for plates, even where there is no indication on the plate nor any printed instruction. Although bookbinders' manuals suggest that it was the binder's responsibility to put the plates in their correct positions, and I have seen books which survive in sheets with the plates lose, it is, I believe, also possible that in some cases plates were inserted in gathered and folded sheets by the master-printer before they were delivered to the bookseller or binder. In support of this, seventeenth-century books are occasionally seen uncut in boards, with the plates in place—and in unopened copies with the bolts cut only where necessary to insert a plate within a gathering. If this was done in the printing house, the master-printer would have had control over the position of the plates as the books left his warehouse, and the binder's easiest course would be to leave the plates where he found them. John Hannett in the Bibliopegia (1865 edition) says that it is 'usual with some binders, at this period' to insert plates before beating, but advises against it to prevent offsetting, the copperplate ink drying more slowly than letterpress printer's ink.12 However, Bernard Middleton reports that

in first-class work, plates were usually removed before the book was beaten.\footnote{Bernard Middleton, \textit{A History of English Craft Bookbinding Technique} (4th edn, New Castle, Delaware, 1996), p. 7.} This suggests that at least in some cases the book came to the binder with the plates in place, and that in everyday work they were left in place during beating (which was done before sewing). If this is so, then in fine work, where the binder removed the plates before beating, the most natural course would be to put them back where they came from, but with the possibility that they would go back in the wrong place. This seems to be borne out by the observation that multiple copies of seventeenth-century books in contemporary trade bindings tend to have the plates in the same places and similarly folded, but position and folding are more variable in higher class bindings.

Plates often have an engraved page number to show where they are to be bound, or they are referred to in the text as ‘see plate facing page . . .’, and there are sometimes printed directions to the binder at the beginning or end of the book, or on the plate itself, sometimes intended to be trimmed off. Occasionally, especially in the eighteenth century, these include detailed folding instructions. But whether there are printed page numbers or instructions or not, I think that the position and folding of plates was generally a matter of conscious design on the part of the publisher, conveyed somehow to the copperplate printer and the bookbinder, though the latter might very well still sometimes exercise his own judgement. In any case, whether by design or craft practice, the position and folding of inserted engravings affects the reading of the images, as well as their rhetorical impact, and should not be ignored by bibliographers and historians, as has almost invariably been the case.

The fourth item of evidence for reconstructing the production history of engraved plates, and the most elusive, is what might be called imposition. That is whether copperplates were printed several at a time on a whole sheet of paper, or printed individually on cut pieces. Having looked at the paper, comparing watermarks and deckle edges in different copies of a number of books with inserted engraved plates, I have come to the tentative conclusion that in Britain at least it was common to print plates singly on cut leaves, that is on pieces of paper not much bigger than the eventual size of the plate-leaf in the finished book. There is also clear evidence of printing several plates at once on larger sheets which were then cut up at some point before the book was bound. It was also quite
common to engrave two or more illustrations on a single plate with engraved lines showing where the impression had to be dissected before binding. There seem to be regional differences, printing several engravings on a single sheet, as well as having several images engraved on a single copper, being apparently more common on the continent than in Britain.

Could the difference between printing on cut leaves as opposed to several at once on a single sheet have had something to do with the size of the press crew? With three or four men inking and wiping plates, a pressman might be kept busy pulling impressions as the plates were presented to him one at a time. On the other hand one man working alone would perhaps find it more economical to ink and wipe several plates, then lay out and print them on a single sheet of paper all at once with only one pass through the press. But this is pure speculation. There is something else very intriguing about the possibility of a three- or four-man press crew. With three men, four plates would be being printed concurrently, since one plate is warming on the brazier while the other three are being inked, wiped and printed. With a four-man team five plates would be in concurrent production. So if a book had only one or two plates, this could mean they would have been printed concurrently with the plates for another book. If we could identify the paper stock, perhaps it would be possible to identify a particular copper-plate printer working on the plates for two or more books, perhaps even doing work for two different publishers at the same time.

At the moment paper identification is probably impractical. David vander Meulen in his work on Pope's Dunciad has shown how to identify whole sheets of unwatermarked paper, but it is much more difficult with cut sheets. Furthermore a mixture of paper stocks is often used in one book. This happens in the letterpress parts of books too, where printers are using up remnants of paper stock left over from other jobs, but the use of mixed paper stocks is more pronounced in plate leaves.

Finally in the analysis of the physical book, I want to discuss how engravings are combined with letterpress text on the same sheet. In printing a sheet combining letterpress and engraving, the type-pages have to be made up leaving blank spaces for the illustrations. The letterpress is run off and the sheets with blank spaces delivered to the copper-plate printer for him to add the engraved illustrations and decorations – initial letters, headpieces and vignettes. There is documentary evidence that the letterpress was normally printed first in this way, and there are
good practical reasons for it. The most compelling is that if it were the other way round it would be very difficult for the printer to tell the copperplate printer exactly where to place the impressions unless he had already set the type; and if he had done that he would not keep the type standing while the copperplate printer put the prints on otherwise blank sheets. Printing several copperplates on one sheet at one pass through the press, which as I have said was one way of printing a sheet of illustrations which could then be divided and bound in separately, was almost certainly the way engravings were printed in letterpress sheets, if more than one engraving appears on one side of the sheet.

It is noticeable that when copperplates are printed in the text of a book they are not always perfectly aligned with the type. Sometimes they are crooked, sometimes overlapping the text. One problem for the printers was that dampened paper expands unevenly, and depending on how wet it is; and the sheets would be further deformed in printing the letterpress and the engraving. A further difficulty would have been that the deckle edges of the sheet are uneven. This problem is overcome on the typographic press by the use of press points which fix the sheet in position on the tympan. This means that the printed type page is in a constant position relative to the point holes, but not to the edge of the sheet. The edges of the sheet would therefore provide only a very inaccurate guide for placing the coppers. The rolling press manuals say nothing about registering engravings in text, and an awareness of the problem is shown by Fertel in his 1723 printer's manual where he cautions the letterpress printer to leave enough space for vignettes and headpieces to make things easy for the copperplate printer.14 Bosse only describes and illustrates the system for positioning single sheet prints. As noted above, a sheet of the printing paper is laid on the plank of the press, and the plate positioned on it 'to give the desired margins'. The sheet to be printed is then lined up on this undersheet so that the impression appears on the finished sheet in the same position that the copper occupied on the undersheet. By extension one can imagine the positions of one or more coppers being marked out on the undersheet, but there is no suggestion of this.

There is however a clue in Cochin's 1745 edition of Bosse which may provide the answer to the problem of printing engravings on letterpress

14 Martin Dominique Fertel, La science pratique de l'imprimerie (St Omer, 1723), pp. 54-5.
sheets. Cochin notes that in printing on satin, the fabric is laid on blankets on the plank of the press and then the inked plate face down on the fabric. He goes on to say that in printing several plates on a single sheet of paper the same procedure is followed, the coppers are placed face down. If this method was used for printing onto letterpress, the printed sheet with blank spaces could be placed on the press, face up, and the coppers positioned, face down, in the proper places. This would readily explain why it is a common mistake for a copperplate to be printed upside down in letterpress. In the standard method of working the rolling press the plate is face up, so it is unlikely to be placed upside down, but if it is placed face down it would be all too easy to put it down the wrong way. Confirmation that plates were printed face down comes from Plantin’s order for blankets to go both above and beneath the plates.¹⁵

Whatever method was used to register the engravings in the text, the key bibliographical point is that the letterpress was printed first, and printed sheets with blank spaces would be delivered to the rolling press printer. With separately inserted plates on the other hand, the engravings may have been printed before or after the letterpress; furthermore, and significantly, they may not have been printed at one time for the entire edition. This is in contrast to the letterpress. The whole edition of the letterpress for a book of the hand-press period was, with very few exceptions, printed sheet by sheet in one press run. Type was set, printed and distributed as printing progressed; the entire print run of, say 500, 1000 or 2000 impressions had to be run off in one go because not enough type was owned by the printing house to keep an entire book in standing type. After each sheet was printed the type had to be distributed and used to set subsequent sheets. Copperplates, in contrast, can be printed in any order, and in large or small batches. It is quite possible for the engravings printed in the text or on inserted leaves to be printed after the original date of publication, with the further possibility that the original plates are replaced with others. Therefore copies of a book with the same title-page and text can have later impressions and states of the plates, or even different plates, and this can indeed be observed. It is particularly likely for lavishly illustrated books to have had their plates printed as demand arose, as in the case of Francis Willughby and John Ray’s *De historia piscium*, 1686. The text for this book was printed in Oxford but the plates printed on demand in London, the cost of the

¹⁵ Voet, p. 222.
book including the engraving of the plates amounting to £1.5s. per copy, with an additional 5s. 8d. or 8s. for running off a set of prints from the plates, depending on the quality of the paper selected.16

We should also think about workshop practices when considering the motivation for using engravings at all. Despite the increasing dominance of engraving from about 1600, woodcuts continued to be used for certain types of illustration, particularly diagrams, even in high quality printing, and for most decorative elements; at the same time engravings of all kinds very often appear in the cheapest productions. The cost of engraving varied enormously depending on the amount of work involved, roughly the number of lines to be engraved, obviously far more in a landscape than a line diagram on a white background. Some subjects would be cheaper to cut in wood than to engrave, other subjects cheaper to engrave. In other words it is certainly not the case, as is often stated, that engravings are simply better and more expensive. Semantic, rhetorical, aesthetic, technical, organisational and commercial considerations had to be balanced in every case. Some of these I have touched on, others not. And on the woodcut side, it is also important to note that the technology of printing images from woodcuts combined with text is by no means simple, and was not therefore necessarily the easiest option. For a start each woodblock had to be ready in sequence as the sheets are being printed or the whole production would have been held up, whereas if an engraver delivered finished plates out of order or late, it was of much less consequence. Then the actual integration of the woodblock in the page of type was no easy matter, as is shown by Bentley’s letters to Newton concerning the printing of the second edition of the Principia (1713). It was originally suggested that the block-cutter, Livebody, should come down from London to work on the page make-up, something he was especially skilled in. But when the master-printer at Cambridge found out his reputation for drunkenness he feared he would ‘debauch all his Men’ and the page make-up was done in house after all. A final complication, and an added cost, was that one sheet had to be ‘Printed thrice for a Cut repeated’, that is one side had to be put through the press twice so that the same woodcut could appear twice on the same side of the sheet.17 Evidently it was sufficiently

17 McKenzie, i, pp. 334 and 331.
important that the reader should be able to refer to the diagram several times, without flipping back, to justify the extra expense of a second press-run for this sheet. In other books I have seen duplicate blocks for the same diagram used to avoid this double impression. These bibliographical details teach us a good deal about the planning and expected reception of these books, an awareness of which should inform our interpretation of them.

Having considered some of the technical aspects of printing engravings in books and suggesting some of the bibliographical implications, I will end with some remarks about the extension of descriptive bibliography to include a proper treatment of graphic elements in books. Different kinds of illustration have different relationships with the text and this relationship may be revealed by the internal reference system used, or the lack of one. There are three principal ways in which text can refer to images: first the illustration is placed adjacent to the text which refers to it; second a reference system is used in the text, such as plate and figure number; third an explanatory caption, not part of the narrative of the text is attached to the plate or printed on a facing page. If the image is not keyed to the text, this tells us that it is probably not necessary for a linear reading of the text, but has some other function. Thus portraits and allegorical frontispieces may not be referred to as part of the intellectual argument, but are full of meanings at different, not always fully conscious levels. Frontispieces may also function as advertisements, along with pictorial title-pages, giving a quick visual summary of the contents of the book. Other un-keyed illustrations, including headpieces, tailpieces and historiated initials as well as inserted plates, may also function allegorically, or as commentary, or to indicate the content of a chapter visually, as visual place markers, or as embellishments to enhance the sale of the book. Not that we should see decoration as purely a matter of prettyfying: typography and decoration alert the reader to the type of content to be expected, whether academic or popular, serious or lightweight; they may evoke a mood; and in many other ways mediate the text, both visual and verbal.

Even when bibliographers do record the graphic elements a book, they very rarely record the spatial relationship of graphics and verbal text, the internal reference systems in use, or the placing and folding of the plates. Bibliographical descriptions should, I suggest, record all these things.

The technology and workshop practices I have described must form
the foundation of any formal description of illustration and decoration. Since this technical history remains to be written such a descriptive method has yet to be developed. In addition to considerations of production, a full bibliographical method for graphics in books should address the relationship of text and image, and, for less valid reasons, this has not been attempted either. Analysing the techniques needed to produce books will help us to understand the author’s intentions for the illustrations; how his ideas were interpreted by the draughtsman and the engraver; and how their contributions were mediated by the publisher. Understanding why the layout of the page or the make up of the book are as they are will integrate our reading of the text and graphics.

In the rapidly growing literature on scientific illustration there is almost never any account of the origin and production of images, so they cannot be fully interpreted. Nor can literary critics, with the current academic interest in visual and material culture, any longer dismiss illustrations out of hand, as McKerrow did, as ‘of aesthetic rather than bibliographical interest’. In order to understand the impact and reception of a book and to form a view of its intended audience, it is important to understand its appearance. Descriptive methods need to be developed based on the technology of production. Not only will these methods clarify the meaning of the images in books, these methods will allow for the collection of more data and in turn increase our knowledge of production processes to provide further insights for critics and historians. The new descriptive methods are to include an account of the relationship between text and graphics, both intellectual and material. These investigations and methods are not just important for the interpretation of pictures in books, they are vital for the right interpretation of the verbal text, indeed the right interpretation of the whole book.

Acknowledgements and Sources

This article is based on work done on a short term bibliographical fellowship at the Clark Library in 1999. I thank Roger Stoddard for inviting me to deliver the first version as the Winship Lecture on 25 October 2000, at the Houghton Library; and for suggesting the title. The lecture was given again in revised form

18 McKerrow, p. 113.
to the Cambridge Bibliographical Society on 28 November 2000 and it is printed here with further revisions. I would like to thank Michael Hunter and Patricia Fara for encouragement and advice. It gives me especial pleasure to acknowledge my great debt to Iain Bain for many enjoyable and informative discussions and for showing me how copperplates are printed. I have had enjoyable and informative discussions with Mirjam Foot and with André Jammes. Tim Verberk at the Rembrandt House Museum in Amsterdam demonstrated the use of the newly constructed wooden press there and conducted some preliminary experiments on printing with the plates face down for me. I am indebted to James Mosley for drawing my attention to the des Billettes manuscripts on which he is currently working, and for allowing me to use his transcripts.

The Rolling Press Manuals


William Faithorne, The Art of Graving and Etching. Wherein is express’d the true wy of Graving on Copper. Also the Manner and Method of the Famous Callot, and Mr. Bosse, in their several ways of Etching. Published by William Faithorne. The Second Edition. To which is added, the way of Printing Copper-Plates, and how to make the Press (London, 1702).


J. H. Hauckwitz, An essay on engraving and copper-plate printing. To which is added, Albumazar, or the Professors of the black art, a vision (a poem) by J. H. copper-plate printer (London, 1732). No copies known, title from Levis, who had not seen a
copy but notes that it is mentioned in the Universal Catalogue of Books on Art and in other Bibliographies.


C. F. Partington (d. 1857?), *The engraver's complete guide: comprising the theory and practice of engraving, with its modern improvements, in steel plates, lithography, &c. &c.: forming part of the Mechanics' library, or, Book of trades* (London: Sherwood, Gilbert, and Piper, [1825]).

Berthiau and Pierre Boitard (1789?-1859), *Nouveau manuel complet de l'imprimeur en taille-douce . . . enrichi de notes et d'un appendice renfermant tous les nouveaux procédés, les découvertes, méthodes et inventions nouvelles appliquées ou applicables a cet art, par plusieurs imprimeurs de la capital.* (Paris, à la Librairie Encyclopédique de Roret, undated, probably 1836).


**Selected Secondary Sources**


PLATE I  Anonymous, invitation card for a dinner organised by the 'Loving Society of Roling-Press-Printers', about 1685. The printer is inking the plate held over a brazier. (Pepys Library, Magdalene College, Cambridge)
PLATE 2  Abraham Bosse (1602–1676), ‘Cette figure vous montre Comme on Imprime les planches de taille douce’, 1642, etching and engraving. The workman at the back is inking the plate; in front of him the man wearing a hat is wiping the plate with his hand. Dampened paper is placed ready for use on top of the press so that it can be taken from either side, and the table to the right receives the newly made prints. Another table, not shown, would have been placed on the left for prints made working the press in the opposite direction.
La Presse vue de front avec ses mesures

PLATE 5

(Roger Gaskell Rare Books)
PLATE 9 Theodore Galle (1571–1633) after Jan van der Straet (1523–1605) ‘Sculptura in aes’, engraving, plate 19 from Johannes Galle, *Nova reperta* (Antwerp, c1600). This is an earlier design of press than the one shown by Bosse. The central figure is warming a plate on the brazier, the bare headed man at the end of the table is wiping a plate, and the man behind the press is holding a plate by the edges, ready to go on the press. The figure to the left of the scene is examining a finished print. (*New York Public Library*)
PLATE II Gujet (nineteenth century), wooden rolling press and equipment, engraving, plate 1 from Berthiau and Pierre Boitard (1789?–1859), Nouveau manuel complet de l'imprimeur en taille-douce (Paris, 1836). The press on the right is geared, that on the left still very like those in use in the seventeenth and eighteenth centuries. (Roger Gaskell Rare Books)
PLATE 12  Throwout plate, in Robert Boyle, *Hydrostatical Paradoxes* (London, 1665). (Roger Gaskell Rare Books)
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