
Printing and publishing of music

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Printing is a technique for producing many single sets of copies taken from raised, incised or plane surfaces: that is, from type or from wood or metal blocks cut in relief; from copper, pewter or other metals engraved and punched; from stone or metal plates bearing an image imperceptibly raised. These, generally called letterpress, intaglio and lithographic printing, have each been used for printing music, and each has enjoyed a period of pre-eminence.

I. Printing

The waxing and waning of different printing processes was not in the lineal order of a successor taking the place of its antecedent: over long periods the processes were in use side by side, the unique qualities of each of which was employed for some particular purpose. At the beginning of the 19th century, for example, Breitkopf & Härtel were printing music from type, from engraved plates and from lithographic stones concurrently. It is only since the late 1960s that music type has all but disappeared from the case rooms of printing offices and hand engraving has been supplanted by computerized production of visual text from which photographic plates are prepared.

Before the technique of printing was established and exploited widely, music was preserved and circulated in manuscript, or survived as a repertory carried in oral tradition among priests and professional lay musicians. During the latter part of the 15th century printing became the accepted means by which works of literature, history, philosophy and scientific speculation were multiplied and disseminated in hundreds of copies – school primers by the thousand; but almost all music was still circulated in handwritten form. Manuscripts were prepared for sale in this way at least until the beginning of the 19th century: the names of Foucault in Paris, Traeg in Vienna, Breitkopf in Leipzig and Ricordi in Milan recall the continuity and significance of this tradition. The dichotomy between the means chosen to perpetuate the ‘word’ on the one hand and the ‘note’ on the other arises more from social and economic factors than from technological ones: and it raises questions about the spread of musical literacy, about the regulation of printing by state institutions, about the size and nature of the musical public and the scale of the market – national and international – at any given time. These issues have to be borne in mind, for each was one of the forces influencing, and reacting with, changes in technology. The following article outlines a history and a series of techniques which are discussed in much more detail elsewhere (Krummel and Sadie, B1990).

1. Early stages.

Stanley Boorman

The early stages of music printing show a diversity of technical solutions, for it cannot be claimed that music adapted itself immediately to the printed page. It first appeared, albeit in manuscript, in the Mainz psalter issued by Fust and Schoeffer in 1457. Sir Irvine Masson in his study of the surviving

copies of this superb book found evidence that 'although no music was printed the composers made the most careful provision for its being added by hand', and after citing examples suggested that 'no doubt the composers of the psalter worked from manuscript which was musically complete'. If that is so, then those who subsequently wrote the music - using different styles of notation - were very careless. For example in the exceptionally fine copy in the library of Queen Elizabeth II at Windsor a splendid red printed initial on folio 29b driven well into the vellum has been unskilfully erased to accommodate a melody notated in Gothic style: in the British Library copy the corresponding initial has been written over.

This pattern with its resulting infelicities was characteristic of many liturgical books printed during the 15th century and even into the 16th. Sometimes space for music was left blank on the page, sometimes the staff lines were printed (in red, only exceptionally in black). Presumably the music necessary to complete the text was added by professional scribes attached to the court, cathedral or monastery where the books were to be used, but the result favours the words over the music, which, while often beautifully written, elsewhere uses dull ink or is modestly drawn or omitted entirely. The space allotted to music, while usually adequate, was still determined by composers whose standards and ideals were those of the literary text, and whose achievements in this speciality are typically very impressive, on occasion spectacular and noble.

The principal reason for the survival of this makeshift technique has often been assumed to be that liturgical usage in music, even in the words of the Office, was not uniform throughout the Western Church in the 15th century. Dioceses and monastic establishments introduced variants of the accepted text of Rome and the musical expression of the different uses diverged even more. It was common sense for the printer, therefore, to omit from his books - expensive as they were to produce - those elements that would restrict his sale to one market. Even though many titles exist which suggest that only one diocese could use them, they were in fact often suitable for sale elsewhere, if the music were not printed. For example, in 1840 a Veronese printer (probably Pierre Maufer) printed a *Missale ultramontanorum*, for the Hermits of St Paul. Some time later, he took the unsold copies and changed their title, so that they could be sold as if for the Archdiocese of Esztergom.

However, at least as important a reason for the continued dominance of manuscript copying of music lies in a technical feature of notation, the manner in which one element - the notes - occupies the same space as another - the staff lines. The basic procedure of superimposing one on the other using wholly typographic means was solved in the 1470s, most notably and probably first in a south German gradual often associated with the Konstanz diocese and extant in a single copy (**GB-Lbl**), in which staves, clefs (F and C), two vertical lines that abut on to the staves at each end, and text were all printed in black at two impressions. Large initials for which the printer left space have been rubricated by hand and an additional red line has been drawn on the staves to indicate the position of F. Unfortunately the book does not bear a date, nor is the printer or the place of printing known, but the pages themselves are eloquent: they have been planned and achieved by a rational mind thinking in typographic terms. The relationship between the depth of the type area and the measure between the vertical lines that extend above and below the seven five-line systems is nicely judged; so is the interval between the individual staff lines in relation to the size of the Gothic notes and the size and the visual 'weight' of the text type, although it appears from the irregularity of the fount that the matrices were not well struck and justified.

A passage on leaf vii *a* of Jean Charlier de Gerson's *Collectorium super Magnificat* (Esslingen: Conrad Fyner, 1473) shows five identical black squares – often but incorrectly thought to have been printed from inverted type sorts – descending in regular steps above the names of the principal notes of a scale: this qualifies only in a minimal way as music printing. Probably about contemporaneous with the south German gradual is a missal printed in Rome by Ulrich Han; in its colophon, dated 12 October 1476, he claimed to be the first to copy music 'non calamo ereove stilo: sed novo artis ac solerti industrie genere Rome conflatum impressumque unacum cantu: quod numquam factum extitit' (not by the pen or copper stylus but by a new method ingeniously and carefully devised and printed in Rome, together with music, such as has never before been done). Han's work is outstanding in quality. The text of the Office is printed with a superb type in two columns in red and black. The notes in Roman notation are printed in black on red staff lines made up from pieces of rule the length of the column measure. Initials in red or blue, with touches of yellow in some capitals, are added by hand. As in the south German gradual, but here in a masterly way, the relationship of the parts is calculated to achieve a unity that satisfies, and one which is wholly efficient.

The missal was Han's only book containing music, but his methods were copied throughout Europe. Damiano da Moilli printed a *Graduale* in Parma in 1477; Bernhard Richel printed a *Missale constantiensis* in Basle before 1481; Reyser printed a *Missale herbipolense* at Würzburg in 1481; Scotus printed two missals in Venice in 1482, and in the same year Valdarfer printed a *Missale ambrosianum* at Milan. In 1489 in Paris Jean Higman and Wolfgang Hopyl printed a *Missale andegavense*; two years later the Compañeros Alemanes produced an *Antiphonarium Ord. S. Hieronymi* in Seville. It was not until 1500 that Han's technique reached England, but the *Missale Sarum* printed by Pynson in London in that year was a splendid book worthy to be set alongside the finest of its precursors.

Altogether, liturgical books with music – notes and staves – printed at two impressions were produced in at least 25 towns by 66 printers between 1476 and 1500. Most of the printers are represented by only one or two books, but others clearly were specialists: Ratdolt, the splendid printer of Venice and Augsburg, was responsible for 13; Emerich in Venice printed no fewer than 13 in seven years; Higman, a most refined craftsman, produced 12 in Paris; Hamman printed at least 11 in Venice; Planck, Han's successor, printed eight; Sensenschmidt of Bamberg produced seven; and Wenssler of Basle produced five.

2. Woodblock printing.

Stanley Boorman

Those who needed printed books for the celebration of religious Offices were well served, as were the authors of works on the theory of music, though by different technical methods. For historical reasons, discussions of music theory during the Middle Ages and early Renaissance were built on an arithmetical basis: thus manuscripts contain diagrams of ratios and relationships as well as notes. When these treatises and polemical discourses were printed, the diagrams and sometimes simple arithmetic were reproduced by woodcuts. The process involved cutting away unwanted material, so that the design was left raised above the level of the rest of the block: this was widely practised throughout Europe by the end of the 15th century, having been used for bulk production of books even before Gutenberg's time. Many early printed books had been decorated with splendid woodcut initials

and borders, and with representations of buildings, animals and people. It was therefore easy to extend the practice to music, though in some texts spaces were left in the printed page for the notes and staves to be written in. The technique offered great advantages. The musical material was not complicated and the examples were often short; many models of the required notation were available. Since the printers of these treatises were usually not involved with liturgical books, they would have had little access to the skills or musical type involved; therefore, it was natural that the printer should turn to a wood cutter.

It is nevertheless difficult to account for the poor quality of much early woodcut music. While the technique was essentially simple, it demanded judgment and manual dexterity and control from the operator to produce a block with the text and music reading from right to left, precise in every detail on a flat surface with everything else cut away. The graphic nature of music – a system of horizontal and vertical lines crossing at right angles with associated elements, notes, clefs and other signs, imposing shapes and angles of their own – presented difficulties. Unless the point of intersection of staff and note stem were cut very cleanly, and subsequently inked and printed with care, the ink tended to blob or spread at the junction. To avoid this some cutters left a small nick breaking the surface at the intersection, to reduce the density of the film of ink at this point. For the same reason it was not easy to cut open (white) notes with a staff line at its proper thickness running through.

Woodcut music from the 15th and 16th centuries varies enormously in extent and quality; this is to be expected, taking into consideration the large amount that was produced. By 1500, 12 works with woodcut music had been issued in Italy: nine theory books, two missals (one with 46 pages of music) and a four-part song. From 1500 to 1600, well over 300 separate works on the theory of music were issued in more than 600 editions by 225 printers in 75 towns throughout Europe (see Davidsson, B1947–8, 3/1965). A few of the texts were remarkably popular, running through 30 editions in 49 years, or 40 editions in 63 years, repeated sometimes in the same form by the first printer, sometimes with new blocks for the music, sometimes with the originals, and sometimes by a different printer in the same town or elsewhere. Relatively few books of music (other than treatises) were produced from woodblocks after 1500, although one distinguished example is mentioned below, and the collections of chant, such as Coferati's *Il cantore addottrinato*, continued to use woodblocks well into the 17th century, sometimes alongside typeset music. The first music to be printed in the British colonies of North America, in the ninth edition of the Bay Psalm Book (Boston: Green and Allen, 1698), was taken from woodblocks. They were also used, even into the 19th century, for the small amounts of music included in librettos and similar pocket books.

The earliest example of music printed from blocks may be the second edition (Basle, c1485) of the *Brevis grammatica* of Franciscus Niger, which has a few pages with four lines of notes without staves (but with a clef) to illustrate the rhythms of five different poetic metres, using verses from Virgil, Lucan, Ovid and Horace. This was followed by the *Musices opusculum* of Nicolò Burzio, printed in Bologna by Ugo de Rugeriis for Benedictus Hectoris in 1487 (fig.1a). Woodcuts were used to show the hymn *Ut quaeant laxis*, specimens of note forms and ligatures and, in the section on counterpoint, a short complete composition for three voices, all with staves. The cutting is thick and unskilful. The hesitant performance continues well into the 16th century in some treatises published in northern Europe, and even as late as J.A. Gorczyn's *Tablatura muzyki*, published in Kraków in 1647. By contrast the treatment of the music in *Flores musice omnis cantus Gregoriani* by Hugo Spechtshart of Reutlingen, printed in Strasbourg by Johann Prüss in 1488, is accomplished. As its title suggests, the practice of plainchant is treated in detail: the music, in Gothic notation on five lines with clef and

directs, appears on 67 pages mostly occupying the whole panel. The second edition (c1490) is usually overlooked, but the cutting and printing of new blocks for the music in quite different notation is equally accomplished.



Two examples of music printed from woodblocks: (a) page showing note forms and ligatures from the 'Musices opusculum' of Nicolò Burzio, printed by Ugo de Rugeriis for Benedictus Hectoris (Bologna, 1487); (b) beginning of the Kyrie from Pipelare's 'Missa "L'homme armé"', part of a page from the 'Liber quindecim missarum' (Rome: Andrea Antico, 1516), exemplifying woodcutting of the highest technical and artistic achievement [(a) 47%, (b) 27% of actual size]

The last two pages of *Historica beatica* (a play by Carolus Verardus) printed by Euchario Silber (Rome, 1493) are followed by a four-part song, which is the first printing of dramatic music, although the cutting of the block is not good. As King wrote, 'what is probably the earliest German secular song, found in *Von sant Ursulen schifflin* (Strasbourg, 1497) is also reproduced by an unusual use of this process - the notes (in Gothic form), the staves, and the text all being cut on wood' (KingMP). Perhaps Andrea Antico was unaware of these examples when in *Liber quindecim missarum* (RISM 1516¹) he said that he cut the notes in wood which nobody before him had done. This splendid folio of 161 pages is set off with fine initial letters, and the work is a remarkable technical achievement, though the impression is rather flat and heavy (fig.1b). Antico cut the blocks for a number of smaller volumes of music, but he had no imitators in printing large-scale collections of music from woodblocks. Woodcutting of the highest artistry may be seen in Luther's *Geistliche Lieder* printed by Valentin Bapst (Leipzig, 1545), and there is much to admire in the decorative touches that enliven many more workaday theoretical treatises.

It is normally stated of such works that the blocks were cut in wood. It might be more precise to say 'wood or perhaps metal', for it is very difficult to resolve which is used by inspecting a well-printed page. In theory, an ill-prepared woodblock, inadequately inked, might show grain, though no examples

are known. Nor is evidence for the use of metal easier to come by. Comparison of numerous copies of a book in a single edition, or of copies in different editions, sometimes yields results. In the first edition of *Practica musice* by Gaffurius, printed by Guillermus Le Signerre for Johannes Petrus de Lomatio (Milan, 1496), the examples of plainchant and mensural notation are well cut and printed without blemish. The editions of 1497 and 1508 (Brescia: Angelo Britannico) were printed using the same blocks, but small circles appear in association with music on two folios. This suggests that the music was cut on a plate nailed to a wooden mount, and that a careless beater inked the heads of the nails, which printed. In the edition of 1512 (Venice: Agostino Zani) some music examples are slanting, which again suggests that the printing surface was mounted – and carelessly – because the forme could not have been locked up unless all the type, furniture and associated material were properly squared: this suggests a metal plate rather than a woodblock. Such plates for illustrations in 16th-century books have survived with flanges pierced to take mounting nails, and evidence of the nail-heads has survived occasionally on the impressions of the decorative initials which regularly ornament the openings of polyphonic compositions.

The use of wood or metal blocks to print music was more extensive than the complexities of musical notation might be thought to allow. The early 1470s saw not only the first European printed music, but also the earliest music printing in Japan. A recently discovered book of *shōmyō* (Buddhist hymns chanted in the services of the Shingon sect), printed by the priest Kaizen at Kōyasan on 21 June 1472 and now at the Research Archives for Japanese Music at Ueno Gakuen College in Tokyo, employed blocks that were re-used in an edition of 1478, and again in 1541 and 1561. Block printing was temporarily supplanted in the late 16th century by the Korean method known as ‘old typography’ and by the European-style typography used by Jesuit missionaries, but as early as 1601 secular music was again being printed from blocks; the process was used widely thereafter in the extensive production of *utaibon* (*nō* texts with music). In the West, librettos and other small books continued into the 19th century to include music printed from blocks.

3. Printing from type.

Stanley Boorman

(i) Basic techniques.

In 1450 Johann Gutenberg established a system of taking copies from single types, ordered according to the text to be printed, grouped into pages and printed on paper or vellum with a press using a varnish-based ink; the same process was adopted several decades later to make the first music types. The process involves two essential stages, each with its own particular materials. The type itself has to be arranged in an orderly manner, by a typesetter or ‘compositor’, who needs to have available a large number of copies of each letter or musical symbol, each of which will fit exactly with its neighbours. Then the sets of arranged type, or ‘formes’, have to be printed accurately by a press designed to align them with the paper to be printed, and also to ink the type consistently each time. These processes have been increasingly mechanized with the passing centuries, but the early stages involved much manual labour.

While there are manuals for the type founder and printer, from the 16th century onwards, none discusses the making of type specifically for music or the manner in which it was used. Fortunately some type and type-making materials survive, notably in the Plantin-Moretus Museum in Antwerp, but otherwise we believe that the procedures were essentially the same as those followed for verbal texts.

There were three stages to the making of type. Firstly, the type-cutter cuts the required design – a letter, a note, a section of staff – on to the end of a piece of mild steel, cutting away the unwanted metal. The finished tool is then tempered hard and becomes a ‘punch’ which becomes the master copy of the symbol. The punch is then driven into a piece of copper to make a ‘strike’. The strike has to be cleaned, smoothed and squared up, when it becomes a ‘matrix’, a copy of the design, but recessed into the metal. This matrix is used to make each piece of type; placed in the bottom of a mould, into which molten type-metal is then poured, the matrix will produce a raised version of the symbol on the end of the solidifying metal. This metal, when cold, turned out of the mould and cleaned of waste metal or rough edges, forms a single piece of type. The matrix and mould can then be re-used to make more copies of the symbol, or a new matrix can be inserted in the mould, to start making type sorts for a new symbol.

A complete set of type, a ‘fount’, is stored in a ‘case’. This shallow tray has compartments arranged so that the most frequently used sorts are grouped in the centre, and the rarer to the edges. The sizes of the compartments vary, because they contain different numbers of pieces of type: in music, for example, more minims were used than breves generally speaking, and more flats than sharps. Pieces of black staff were also required to allow for a variable spacing of the notes across the page.

In practice, fewer matrices were needed than the total number of symbols to be cast: the same matrix could be used for notes at different positions on the staff. Some founts seem to have been cast from matrices with six or seven staff lines. According to the placing of the matrix in the mould, the same matrix could produce notes at two or three different places on the staff.

All the sorts – characters – and spaces in a fount will vary in width, according to the size of the symbol on them (‘w’ taking more space than ‘i’, and a breve more than a minim rest), but both the other dimensions had to be absolutely consistent from sort to sort, or they would not fit well together or stay in place under the pressure of the press. Type sizes – defined by such terms as ‘pica’ and ‘petit canon’ – were in fact not standardized before the 18th century, and music types have never been widely regulated in that manner.

The first task of the compositor was to plan the layout of the music as it would appear on the printed page. He marked the exemplar to show where page-breaks and line-ends would occur. This process of ‘casting off’ was essential: it ensured that the music was well spaced, that it could be printed economically without wasting paper, and (particularly for instrumental parts) that page-turns fell at convenient places in the music. Once the compositor had decided the layout, he was ready to begin setting the type. This involved three pieces of equipment: the case of type, with the text to be set placed next to it; the galley, into which the type would be placed, as a whole page ready for printing; and the composing stick, into which the compositor arranged the type. This stick was a narrow, open-fronted box, with one end adjustable to the length of the line of music to be set and held in the left hand so that it was not completely horizontal. The compositor placed the type in the stick, line by line,

until it was full with a few rows of type. These were then slid carefully into the galley, and the process begun again. Once the galley was full, the type of the page was tied round with cord, and could be removed and stored until ready for the press. The compositor would then start on the next page.

In practice, early sections of a book would be printed before the compositor had finished setting the rest. This is because there was necessarily only a limited amount of type: the number of minims or crotchets required to set a whole volume would have been prohibitively expensive to acquire. Indeed, the compositor might well not set pages consecutively. Books were printed on sheets that were then folded, so that more than two pages appear on each sheet. Thus, for a book in quarto, the format often used for music, one side of the sheet of paper contained pages 1, 4, 5 and 8, and the other pages 2, 3, 6 and 7. In order to use type as economically as possible, the compositor could set the music for one side of the sheet, and that could be printed while he was setting the other side. In effect, he would then need about half as many sorts as would be needed if he set consecutively. Of course, such a procedure required very precise 'casting off' of the text beforehand.

After all the pages for one side of a sheet of paper were set in type, they would be laid out in the correct arrangement, inside a rectangular iron frame called a 'chase'. The type was fixed in place, with pieces of wood - 'furniture' - and wedges - 'quoins' - to prevent the pages moving about, or the type falling out. The filled chase, with all the text for one side of the sheet of paper and with furniture and quoins, was called a 'forme' and was ready for the press. At this stage, a proof would normally be taken - 'pulled' - and any necessary corrections made to the type.

The printing press has to allow for three distinct processes: it has to hold the material to be printed (the forme) exactly in place, so that each copy will be printed evenly and correctly placed on the paper; it has to ensure that the forme is freshly inked before each impression; and it has to place precisely the sheet of paper to be imprinted, and then press it against the forme of type. In modern presses, each of these processes is automatically controlled, and done in a smooth mechanical sequence at high speed. In the early hand-press, each was done by hand and relied on details of the construction of the press. First the complete forme was placed and secured in the body of a sliding carriage, called the 'coffin'. In the left press in fig.4 this has already been done, and one of the two pressmen is applying ink evenly to the surface of the type using two padded balls of leather. (The same man can be seen behind the right press re-inking the two balls for the next impression.) At the same time, the man to his left is aligning a clean sheet of paper on a 'tympan' so that it will receive the inked impression precisely where it should. Above the tympan is another frame holding a sheet of parchment with holes cut in it for the type. This 'frisket', when folded over the tympan and its clean sheet of paper, ensured that no ink from the untexted parts of the forme onto the paper and marred the cleanness of the impression. The tympan and frisket were then folded together over onto the coffin holding the forme of type, and slid under the press proper. At this point the pressman pulled on a lever mounted on a large wooden screw-cut spindle; this forced down onto the tympan a large platen, a heavy wooden block cut to the size of the coffin and tympan. The tympan itself was forced against the type, and the enclosed sheet of paper was thereby printed with ink. Releasing the lever raised the platen and allowed the coffin, tympan, paper and frisket to be moved back; the paper could be removed and a new sheet inserted at the same time as the type was freshly inked. When the required number of copies were printed, the forme was removed, and the type cleaned and returned to its case ready for re-use on a different page. Meanwhile, the forme for the other side of the sheet of paper was put in place, and the whole process repeated. The exact alignment - 'register' - of the two sides was facilitated by the presence of two short pointed spikes in the long sides of the tympan: these perforated the outer margins of the paper

when printed. When printing the second side, 'perfecting the sheet', the pressman merely had to align the holes with the two spikes to know that the paper was correctly aligned. Whenever possible, the two sides of a sheet were printed in close succession. Paper had to be moistened to take good impressions since if it was allowed to dry out, it would shrink and warp slightly so that the second side would not be aligned correctly. This must also have been true for multiple-impression music printing where, if anything, the need for precise register was even greater.

This highly simplified account of the main procedures of typographic printing applies broadly to the 17th and 18th centuries, but as tradition is so strong in the craft the description may well hold in essentials for 16th-century practices too: certainly early woodcuts showing printers at work support this view. The press itself changed little until the 19th century. From 1800 to 1803 Earl Stanhope built one with an iron frame which would accommodate a larger sheet than the wooden press. Other iron presses followed and were much used for book printing until about 1830, but gradually the hand-press was replaced by the cylinder and later the rotary press, machines of different construction powered by steam and in time by electricity.

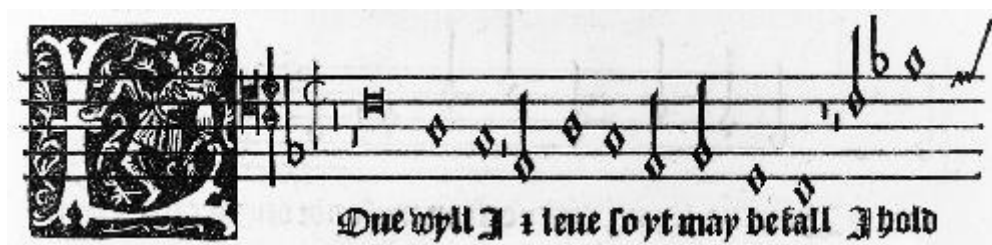
(ii) Early history.

The techniques of printing plainchant were highly developed by 1500 following the pattern described in the preceding section, but there was no corresponding evolution in the printing of mensural music from type during the same period: attempts were isolated and restricted in scope. The first example, four lines of music on a single page, appeared in the first edition of Franciscus Niger's *Brevis grammatica* (Venice: Theodor of Würzburg, 1480): only the notes and clef were printed, accurately aligned for anybody to rule the staves. Other examples appear in two books printed by Michel de Toulouse in Paris, both undated and assigned to about 1496. One was an edition of *Utilissime musicales regule* by Guillelmus Guerson and the other an anonymous treatise *L'art et instruction de bien dancier* (a unique copy is in **GB-Lrcp**). Music appears on 18 pages of the latter, mostly in chant notation, printed black on four red lines, but there are almost two pages of music in mensural notation. At first glance the achievement is not impressive but closer examination shows that, although the type from which the notes are printed has been badly cast, their typographical arrangement was workmanlike. A slightly later example is a mensural Credo printed by Johann Emerich of Speyer in his *Graduale* of 1499.

In Venice Ottaviano Petrucci transformed music printing and started the process which made polyphonic music generally available in greater quantity and over wider areas than ever before. In 1498 he obtained from the Signoria of Venice an exclusive 20-year privilege for printing and selling music for voices, organ and lute throughout the Venetian Republic. His first book was published in 1501: *Harmonice musices odhecaton A* (RISM 1501), a collection of 96 pieces arranged as partsongs with the cantus and tenor on the left-hand page of an opening and the altus and bassus on the right – a layout modified satisfactorily for three-part items. A second edition appeared in 1502/3 and a third in 1503/4. Altogether he printed some 40 or more musical titles in Venice, the latest in 1509. It is probable that Petrucci's type was designed by Francesco Griffio of Bologna, and actually cut and cast by Giacomo Ungaro. Both were working in Venice at the time, and had contacts with Petrucci or with music.

Petrucchi's music printing was splendid. He continued the practice of prints of liturgical music, with staff lines and notes on separate pieces of type: his note forms were elegant and with their equivalent rests varied enough to set the most elaborate works of the composers of his day. The presswork was so meticulous that he was consistently able to achieve perfect register of notes, staves and text though (at least initially) three impressions were required: first for the notes, second for the staves, and third for the text, initial letters, signatures and page numbers. The whole achievement immediately conveys typographical conviction which on analysis is found to derive from a skilful choice of size for the individual elements, and from the manner in which they are related. For example, the length of a note stem is the depth of four spaces on the staff, a relationship that has persisted to our own day; the stem of the B \flat key signature is longer than the stem of a note and in this way maintains its role as a flag. The directs are very noticeable, serve their purpose and balance the large initials and other display material at the left of the staves. Only by the use of notes, letters and spaces, all cast in sizes that worked exactly together without bodging, could such results be achieved. Petrucci had equal success with his system of tablature, the first to be printed from movable type

The shining example of Petrucci encouraged other printers into imitation. The first was Erhard Oeglin of Augsburg, who issued *Melopoeiae sive harmoniae* (1507: settings by Petrus Tritonius and others of Horace's odes) and a few later titles. The books do not achieve the elegance of Petrucci, in part because Oeglin's staff lines are assembled from short pieces of type. A book on the grand scale (folio: 44 x 28.5 cm) which approaches Petrucci's quality is the *Liber selectarum cantionum quas vulgo mutetas appellant, sex quinque et quatuor vocum* (Augsburg: Grimm & Wirsung, 1520⁴). The hand of a master is seen in *Rerum musicarum opusculum*, a treatise by Johannes Frosch (Strasbourg, 1532; 2nd edition: Peter Schoeffer jr and Mathias Apiarius, 1535): the scale of the work is much along the lines of Petrucci's and the achievement, by two impressions, is comparable. The sole surviving part (triplex) of *XX Songes* printed 'at the sign of the Black Morens' in London in 1530 (1530⁶) is equally elegant and well printed (fig.2).



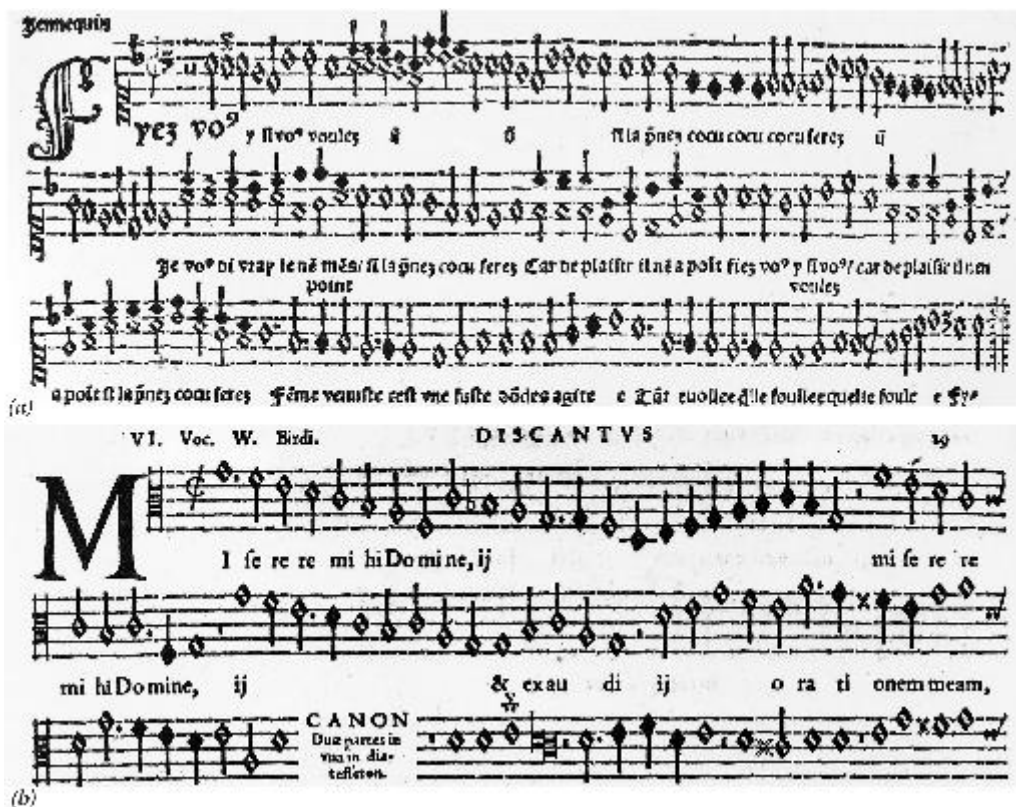
Part of a page from 'XX Songes' (London, 1530), showing the beginning of Taverner's 'Love wyll I' [67% of actual size]

In 1532 Jean de Channey printed at Avignon, at the composer's expense, the first of four volumes of sacred music by Carpentras. Although oval note heads had appeared in the woodcut music of J.F. Locher's *Historia de rege frantie* (Freiburg: F. Riederer, 1495; copy in **GB-En**), the Carpentras books are remarkable as the first to use type cast with a rounded, almost oval note form instead of the traditional lozenge and square. Cut by Etienne Briard of Bar-le-Duc, the open notes have stems with a strong downward stroke followed through with a splendid calligraphic swing, swelling and diminishing to reconnect with the stem. The black notes are rather lifeless by comparison. Briard not only

abandoned the accepted note forms but cast aside the whole system of proportional notation and replaced complicated ligatures with single notes. As with earlier examples, this music was printed in two impressions

Much more significant for the success of music printing and publishing was the development of music type which could print both staves and notes at a single impression. This was made possible by casting the note and a fragment of a complete set of staff lines together on the same type body. The first experiments towards developing such music type are to be found in Salzburg missals printed by Liechtenstein (1507 and 1515 in Venice) and Winterburg (1510 in Vienna), both of whom developed a series of single-impression types to cope with special problems in small sections of the Salzburg liturgy. These experimental types were of limited use, and they do not seem to have had any influence on other printers or repertoires. More significant are the fragments of two anonymous pieces printed by John Rastell in London (perhaps in 1523) each of which survives in a unique copy (in **GB-Lbl**). One, printed on part of a broadside, is an incomplete song for one voice; the other is a three-part song 'Tyme to pas with goodly sport' which is in Rastell's play *A New Interlude and a Mery of the Nature of the iiiii Elements* (see Rastell, John). The fragments are remarkable because all the music was printed together at one impression. The type, not undistinguished in design, looks rather shaky on the page, and as far as is known was used only once more – in Myles Coverdale's *Goostly Psalmes* (c1535-6); but if the date assigned to the type by King is accepted – and his argument is closeknit and persuasive – Rastell 'can be credited with several achievements: the earliest mensural music printed in England; the earliest broadside with music printed from type anywhere in Europe; the earliest song printed in an English dramatic work. Rastell also made the first attempt at printing a score, by any process in any country'.

If this survival has no known successor, the same cannot be said of the work of Pierre Attaignant in Paris, who finally established the technique of printing music from type at one impression. He issued his first such book, *Chansons nouvelles en musique a quatre parties: naguere imprimees a Paris*, on 4 April 1527/8 (1528³) and until 1550 maintained a steady output of music from the collections of the finest composers of the late 15th century and of his own day. Attaignant's typographical apparatus was accomplished in design and finish, and he used it with neat authority, demonstrating his powers as a publisher as well as a printer who gave to posterity a system that was to survive, little altered, for more than 200 years (fig.3).



Two examples of music printed by one pass through the press: (a) extract from Janequin's 'Fyez vous', in the 'Tiers livre contenant XXI chansons musicales a quatre parties' (F-Pm 20, f.152v), printed and published by Pierre Attaingnant (Paris, 1536); (b) part of the discantus of Byrd's 'Miserere mihi, Domine', from 'Cantiones sacrae' (with Tallis; London, 1575), printed by Thomas Vautrollier with type imported from France; both demonstrate the simplicity and logic, but also the shortcomings, of the one-note-one-type system with note head and stem cast on a single type containing segments of a complete staff system: observe also Attaingnant's use of alternative, 'squatter' type to print notes one above the other [(a) 85%, (b) 80% of actual size]

Photo Giraudon, Paris

The techniques of Attaingnant were much imitated, and his repertory of music was raided. The high estimation in which both were held, as well as the considerable savings in labour costs, can be measured by the speed with which printers inside and outside France procured types for single-impression music. Jacques Moderne, in Lyons, produced his *Motetti del fiore* in 1532 (1532¹⁰, 1532¹¹), printed in elegant note forms based on those of Petrucci rather than upon the squatter types of Attaingnant (for illustration see Moderne, Jacques). The enterprising Christian Egenolff of Frankfurt printed at one impression *Odorum Horatii concentus*, by Petrus Tritonius, in 1532. In Nuremberg Hieronymus Formschneider ('Grapheus') issued Senfl's *Varia carminum genera* in 1534. Georg Rhau of Wittenberg printed more than 60 primers and works of musical theory with examples cut in woodblock, and also music at single impression from 1538. Joanne de Colonia, in Naples, is said to have been the first in Italy (in 1537) to print music at one impression, but it was Antonio Gardano (from 1538) and the Scotto family in Venice who established that city as the pre-eminent centre of Italian music printing. Though the printing of music at one impression was not practised in the Low Countries until 1540 (by Willem van Vissenaecken at Antwerp), the process flourished in the hands of Tylman Susato. Susato used a splendid character which aligned very well with the staves and may be seen to advantage in his *Premier livre des chansons a quatre parties* (1543¹⁶). He was soon joined by Pierre Phalèse at Leuven and by Christoffel Plantin, who published important partbooks in the 1570s at Antwerp.

Throughout this period, and for at least the next century, virtually all printed music used the lozenge-shaped and square notes that were developed by Attaignant. This continued in France until the end of the 18th century, although there were few exceptions. The most elegant was the work of Robert Granjon, one of the great French punchcutters, who developed a music type that follows generally the style of the notes used for Carpentras's music at Avignon, though scaled down: the open notes are freely cut and calligraphic, the black notes rounded. Granjon's refined and elegant types match very well his *civilité* letter ('lettre française d'art de main') in which he set the words of Beaulaigue's songs published in 1559. His work was copied by Philippe Danfrie, who called his version 'musique en copie' or 'musique d'écriture'.

In 1559 the elder Guillaume Le Bé started to cut a system with rounded notes, large and small, for a 'tablature d'espinette', but designed for double impression. They were used for two tablatures by Adrien Le Roy and Robert Ballard, founders of a dynasty of French music printers. Towards the end of the 17th century Pierre Ballard had a character engraved in which the points at the corners of the lozenge and the open notes were rounded and the black notes were completely circular, with the stem central (for *see* Gando).

So far it has been assumed that (in general) the methods of setting and printing the type in music volumes were the same as those used for text, always bearing in mind that the nature of music might well call for modifications in detail. Books are set vertically because the reading eye is more efficient in dealing with short lines (10 to 12 cm according to the size of character) than with long ones. For aesthetic and practical reasons musicians have often liked their music lines long, with the depth of the page less than its width. Because of these preferences, special layout patterns have been used for music notation, calling in turn for peculiar formats. The practice of printing music in this oblong or 'landscape' format, which was adopted by Petrucci, survived very generally throughout the 16th and 17th centuries, gradually becoming associated with specific repertoires - keyboard music, solo cantatas, operatic scores - while other genres, such as orchestral scores and parts, were increasingly printed in book formats. The distinction survived well in to the 19th century (and indeed is still preserved for much organ music). As a result, in the first edition of *The Letter-Press Printer* (London, 1876), Joseph Gould showed among his schemes of imposition 'A sheet of Quarto the Broad Way commonly used in Works of Music'; in the second edition (1881) a sheet of octavo was shown arranged the broad way to meet the same need.

While single-impression music printing from type was economical, it did have one or two drawbacks, intrinsic to type itself. Because each piece of type carried both staff lines and note head, it was precisely located on a staff; the printer needed to have a fount of type that included examples of every note value (breve, semibreve, minim etc.) for each pitch, from above the staff to below it, and for some pitches on leger lines. The same was true for accidentals, for rests, and (to a lesser extent) for clefs. Even though some of these could be inverted, a note at *g'* on the treble staff, for example, serving for the *d''* as well, the fount was larger and more complex than one used for multiple-impression printing.

In addition, these types were harder to make: the details of superimposing a note precisely and cleanly on the staff lines, and of aligning these lines from one piece of type to the next, required skilful cutting and casting. Despite this, many printed pages of music show frequent breaks in the staff lines as the alignment slipped a little or as fragile edges of staff lines on each sort became bruised and chipped. To some extent, the effect could be reduced or prevented: a system of 'bonding' or fitting was developed,

using longer pieces of single or double staff line above or below a note cast on fewer staff lines. This was widely used, for example, in *Kirchengesäng darinnen die Heubtarticke* (1566) and *Selectae cantiones quinque et sex vocum* by Jacob Meiland (Nuremberg: Dietrich Gerlach, 1572).

Apart from the examples mentioned earlier, note heads were still cut as lozenges or squares and stems were centred almost to the end of the 17th century; by that time it was so much at variance with the taste of the day that punches were cut in the pattern of written notes, with the heads oval or roundish with stems to the left or right. The innovator of this style was the London printer John Heptinstall, who first used the face in the setting of John Carr's *Vinculum societatis* (1687⁶). The notes were cast with fractions of staves, and so were tails. Fractions of beam cut at a suitable angle – sometimes with a fragment of stem attached – were also provided to join successive quavers and semiquavers moving upwards and downwards. This feature gave the character its name 'the new tied note'. The note heads are overlarge and the type ill-fitted, but it continued in use until at least 1699.

The new style rapidly spread in England: Peter de Walpergen in Oxford cut two splendid examples which were used only once or twice. In 1699 William Pearson published *Twelve New Songs* (1699⁵), a collection of pieces by various composers, issued chiefly to encourage his 'new London character'. Smaller in scale than Heptinstall's, the type was better fitted and better cast and was used extensively by Pearson, most notably perhaps in *Orpheus Britannicus* (2/1706; fig.4), and by his successors into the mid-18th century.



Purcell's song 'When Teucer from his father fled' from the second edition of 'Orpheus Britannicus' (London, 1706), printed by William Pearson; the stems of quavers occurring in groups of two or more are 'tied' with a beam and the quavers are cast in two parts, looking forward to the 'mosaic' music types of the 1750s [86% of actual size]

Edmund Poole

(iii) 18th-century innovations.

By this time, however, the mainstream of music printing was increasingly served by the engraver and the offerings of the type printer were found in the backwaters of hymnbooks, small songbooks and the like. The mid-century, however, saw a revival of typeset music, largely owing to a series of innovative founts, which are now generically called 'mosaic types'. In these, most musical symbols were usually

made up of more than one piece of type, each with fewer than five staff lines. The act of typesetting therefore consisted of fitting together the various pieces that make up each single symbol exactly in the manner of a mosaic.

While in 1749/50 Jacques-François Rosart cut a series of punches for a revolutionary method of music printing, it was J.G.I. Breitkopf, working to the same principles, who took the credit for the innovation and brought the system to fruition. In 1754 Breitkopf started to have his punches cut and in February 1755 he published a *Sonnet* to demonstrate the quality of his system. In a preface to the *Sonnet* he commended his work to 'lovers of the musical art' and to printers. He continued:

the method used until now has fallen somewhat into disrepute, since it possesses neither the beauty demanded nowadays nor is it adequate to meet the needs of the art of music which has been brought to a state of perfection. The printers themselves are not very satisfied with the old method, partly because its intricacy is burdensome, but mainly because the typesetting is not so regular that it can be achieved without a lot of ingenious devices and botching which the compositor first of all has to work out for himself.

P.-S. Fournier (Fournier *le jeune*) described the essentials of Breitkopf's system in his *Traité historique et critique sur l'origine et les progrès des caractères de fonte pour l'impression de la musique, avec des épreuves de nouveaux caractères de musique présentés aux imprimeurs de France* (1765). All the types were cast on the same-sized body, 'being the fifth part of the body of each line of music' (i.e. the size of only one staff line). All symbols used were formed to this dimension, so that the clefs, notes and other characters which were necessarily larger than the body were made up of several pieces 'set skilfully one above the other. A note, for example, is made up of three and four pieces; a clef of two, the upper part formed by one punch, the lower part formed by another punch, and these parts joined together form the character of the complete clef'.

The first major work in which Breitkopf used his type was *Il trionfo della fedeltà* by Electress Maria Anna Walpurgis of Bavaria, issued in score in three volumes in 1756. In the same year he published a *Recueil d'airs à danser*, and thenceforth his output was extensive: according to Fournier, Breitkopf issued 51 musical works including operas, keyboard works and songs between 1755 and 1761. This output continued in bulk and variety well into the 19th century.

In 1756 Fournier published an *Essai d'un nouveau caractère de fonte pour l'impression de la musique, inventé et exécuté dans toutes les parties typographiques* as a specimen of a new character which aimed at rendering music from type as if it had been printed by copperplate engraving. It offered short dance movements, printed at two impressions to demonstrate the elegance and logic of the system. Fournier later developed this experimental character into a second music fount, this time for single-impression printing. It was based on a different system from that perfected by Breitkopf. While Breitkopf's type was designed on one body size and could be assembled into composite pieces as required, in Fournier's system the symbols were cut for casting on five different bodies, according to size. The minims, crotchets and simple quavers, key signatures, measures and other symbols of the same height were made in one piece (with segments of three or four staff lines incorporated), instead of in the three or four pieces that other systems required. In addition Fournier provided a wide range of characters which worked with the composite pieces. Fournier claimed that this arrangement made typesetting simpler, more reliable and quicker. The number of types required was reduced by half: as

he wrote, his 'character being only about 160 matrices instead of at least 300 that other systems carry'. Fournier's type was used in the 1765 *Anthologie française* (for illustration see Fournier, Pierre-Simon) and continued to be used for vocal music throughout the rest of the century.

Several imitations of Breitkopf's fount were also developed: the most important were by J.M. Fleischmann, used by Enschedé of Haarlem from 1760; by Johann Jakob Lotter in Augsburg, from 1766; and by Henric Fougts working in England from 1767. The most stylish of these was used by Enschedé: music printed from his type had the clarity and elegance of engraved music. Fougts type was extensively used for songsheets during the 1760s.

Two other systems of mosaic music are worthy of note. One appeared in a *Manifesto d'una nuova impresa di stampare la musica in caratteri gettati nel modo stesso come si scrive* published by Antonio de Castro (Venice, 1765). To show the capabilities of his type he printed a *Duetto* by Giuseppe Paolucci. The 'manifesto' type 'Inciso et Gettato dal M. Rev. Sig D. Giacomo Falconi' is ramshackle and loose but it holds together well enough to be read without confusion; it was used for extensive works – Paolucci's *Preces octo vocibus* (Venice, 1767), for example, and his *Arte pratica di contrappunto* (1765). The other was developed by W. Caslon & Son of London who printed a specimen book of 1763. Sturdy and economical, it was used widely during the latter part of the 18th century, notably on songsheets, and is well represented on inserts in the *Lady's Magazine*, the *Hibernian Magazine* and elsewhere. Caslon's types were much used in America. Christopher Saur of Germantown, Pennsylvania, was the first to print music from movable type in America with his *Kern alter und neuer ... geistreiche Lieder*, a collection of 40 tunes that he printed in 1752 from types he had apparently cast himself. In October 1783 the *Boston Magazine*, printed and published by Norman & White, issued 'A New Song', *Throw an apple*, set to music by A. Hawkins. According to Isaiah Thomas, the famous Massachusetts printer, 'Norman cut the punches and made every tool to complete the ... types'; he also cast them. Thomas himself had a complete series of the Caslon founts, including music, for in 1786 he issued *The Worcester Collection of Sacred Harmony*, 'printed typographically at Worcester, Massachusetts'. In addition to hymns and psalm tunes the collection includes the four-part vocal line of the 'Hallelujah' chorus from Handel's *Messiah* very competently set in score, eight lines to the oblong page.

Given a knowledge of music and the advice of an editor, the compositor setting types with note and staff incorporated would have few major difficulties, though the fitting together of sorts cast on different bodies would have been time-consuming. In effect, music type before Breitkopf was set line by line as ordinary text. Mosaic music had to be set in blocks across the staff systems and the compositor needed cool judgment and an intimate knowledge of his cases, fitted as they were with hundreds of different characters, in order to build his musical jigsaw accurately. Some of the problems he faced were examined by Christian Gottlob Täubel, a Leipzig printer, in his *Praktisches Handbuch der Buchdruckerkunst für Anfänger* (Leipzig, 1791). The setting of music, he warned, is much more difficult and needs more care than the setting of ordinary text; anybody proposing to become a music compositor must not have an irascible temperament or be in too much of a hurry; if he is too eager to get on he will overlook detail; music typesetting calls for the tedious and painstaking construction of involved pieces of music using only very small units; the compositor must be able to reproduce in type exactly what the author has drawn with his pen. Caution against hasty work runs through his advice about casting off copy, maintaining optical and musically even spacing, ensuring good underlay of words and arranging convenient turn-over breaks.

(iv) 19th-century developments.

Mosaic type was expensive and used large quantities of metal, and the fine-cut pieces were easily damaged. As a result, the types seldom looked convincing and unbroken across even a narrow page. There was a great deal of experiment in the early 19th century to counter these difficulties. Many of these trials used notes with head and tail complete. In 1802 François Olivier obtained a patent for ten years to protect the development of a system in which punches without staff lines were used to make the matrices. The staves were then carefully cut by hand, with a steel saw. This, with other similar experiments, had limited success.

In 1820 Eugène Duverger of Paris obtained a 15-year patent for a system which also separated the staves from the rest of the notation, though at a later stage in the process. He set his types, sometimes using notes with complete stems, sometimes with part only, in their correct positions vertically and horizontally, and added the other ancillary signs, the text and so on. The matter was proofed and corrected. The whole was then brushed over with oil and covered with a fine plaster that was allowed to set and then carefully removed from the type. Staff lines were then cut in the plaster producing a completed notation. The plaster mould was baked in an oven, put into a casting box and type metal alloy poured in. When the metal was solid and cool enough to handle, the casting was separated from the plaster. After a final inspection and finishing, the plate was ready for printing at one impression. The system, which received a 'Brevet d'addition et de perfectionnement' in October 1838, was widely used, and when skilfully manipulated produced very satisfactory results; but it was found costly and suitable only for editions in large numbers.

In England, Edward Cowper, a prolific inventor of machinery and processes in printing technology, patented in 1827 a revolutionary method of music printing, in which the printing surface consisted mainly of the ends of pieces of copper wire passed through a three-ply block of wood and made to stand 1.6 mm above the surface of the block. The ends of the wire formed the black notes; white notes were made up from two curved pieces, which were pushed into the surface of the wood to form the elliptical character. The edges of small pieces of brass were used for the stems of notes, slurs, beams and the like and were tapped into the wooden block to stand at the same height as the notes. The staves, with their clefs, were made and laid out separately. The two pages, one of notation and the other of staves, were placed head to head in the bed of the press, in precise alignment. Two pages were printed at once, one receiving the staves and the other the notation. After the pages had been rotated through 180°, each received the other component, completing the score. This method was much used in the 1830s.

A second patent from which much was expected was taken out in 1856 by Gustav Scheurmann, a music seller and publisher of Newgate Street, London whose aim was to separate the staves from the notes and other necessary symbols and words into two formes, printed one after the other by a specially adapted press. Scheurmann also devised a special mould that would cast beams at any angle for sequences of quavers and shorter values.

It is notable that each of these innovations returned to the early pattern of separating notes and staves. But they (and many other experiments) did nothing to displace the descendants of Breitkopf. It is remarkable how many different complete systems of type in different sizes were offered during the 19th century, in England, Germany and America, most of them demonstrating in the accuracy of their

fit and the superb quality of the punchcutting, matrix-striking and letter-founding of their day. These types, however, were not created merely to demonstrate technical brilliance: they were made to serve a market.

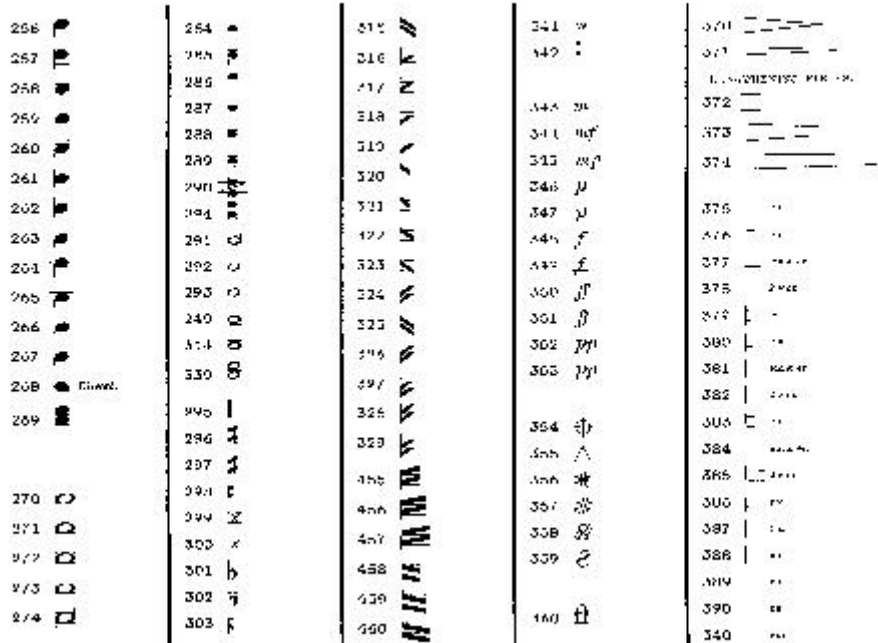
Despite the virtues of engraving and lithography for printing music, they were evidently not suited to supplying the needs of a growing musical public. This may be illustrated by two quotations from the *Musical Library* of 1834. In the preface to the first volume, 'Instrumental', it is stated that:

the Musical Library was commenced with a view to afford the same aid in the progress of the musical art that literature has so undeniably received from the cheap publications of the day ... before this work appeared, the exorbitant sums demanded for engraved music amounted to a prohibition of its free circulation among the middle classes; at a time too when the most enlightened statesmen saw distinctly the policy of promoting the cultivation of the art in almost every class of society.

In an account of the 'various processes applied to printing music' on the first four pages of the first 'monthly supplement' (April 1834), the writer said:

In each process [intaglio and lithography], the manual labour of printing off the copies involving considerable nicety and attention, is a source of constant recurring expense. In printing music from the *surface* of moveable types, or stereotype plates, either by the printing press or printing machine, the operation is rapid and certain; the market may be supplied at once to the extent of the demand; and the consumer may receive the full benefit of mechanical improvements, in the diminished cost of the article produced. Such a work as the 'Musical Library' could only be undertaken with the aid of musical typography.

The wisdom of this commercial argument was brilliantly demonstrated in practice by Alfred Novello some years later. His exploitation of the lower cost of typeset music was in great measure responsible for the growth of middle-class music-making in Britain during the second half of the 19th century. Joseph Bennett's *A Short History of Cheap Music* (London, 1887), effectively a history of Novello's publishing endeavours, stated that type was more economical for the large print-runs he was increasingly able to sell: 'for hundreds, plates are best; for thousands, type is preferable'. As late as June 1899, the *Musical Opinion* reported on the 'expensive editions from pewter plates' when compared with typeset editions. Therefore, from 1820, when William Clowes, printer of *The Harmonicon* and other music, imported from Germany punches and matrices for music type, a number of type founders offered a wide range of founts to the music publisher, often of great complexity (fig. 5), and in such variety that by 1876 manuals of instruction could give no reliable general information about typesetting. There was so much music printed from type in London during the latter half of the 19th century that the composers engaged exclusively in music typesetting were numerous enough to establish and maintain their own trade union, the London Society of Music Compositors (1872).



By the 19th century 'mosaic' music type systems had reached their maximum complexity: part of the specimen sheet of Diamond Music, offered by V. & J. Figgins in London, containing 452 separate types in the fount which had to be supplemented by a large supply of specially cast spacing material

Edund Poole

A major disadvantage of using type, when set alongside the other available processes, was that the prepared-pages type had to be broken up and redistributed after printing, for the material would be needed to prepare other pages of music. By contrast, plates or lithographic surfaces could be stored and re-used, sometimes as much as 100 years later. This disadvantage was largely overcome by the development of stereotyping and electrotyping, both processes that prepared a plate from the typeset forme, thus allowing for extended print-runs, and also releasing the undamaged type for use elsewhere. A stereotype is made by taking a plaster impression of the typeset forme, and then pouring molten type-metal over the plaster to create a metal plate which is used as the printing surface. In the 1820s, plaster was replaced by papier-mâché called 'flong', which had several advantages: it dried more quickly; it could be re-used, to make a second metal plate; and it could be curved to make curved metal plates for the new rotary presses, increasingly used for the large print-runs of newspapers and journals. The essentials of the process were discovered in Holland in the early years of the 18th century, and a patent was taken out by William Ged of Edinburgh in 1725. However, the process seems to have become widely used only at the end of the century, and adopted by Firmin Didot in Paris, followed by Duverger.

Electrotyping was discovered later, in Russia and England, and became a standard resource for printing illustrations, as well as for much book printing in America. The intention is similar, to make a plate using an intermediate stage. Here, the mould is made of beeswax, which is then suspended in a solution of copper sulphate close to a copper plate. When a current is passed through the solution, a process of electrolysis produces a copper coating, or 'shell', on the beeswax. This can then be backed with molten type-metal and a wooden mount, after which it is ready for printing. Electrotyping is more

expensive and complex as a process, and has remained less popular than stereotypography. Both, however, helped to ensure the continued use of type. In 1923, Gamble could report of England that 'type-set pages of music are invariably stereotyped or electrotyped instead of being printed direct' (Gamble, C1923).

The demand for typographical music was not a wholly British phenomenon. The publication of manuals of instruction, taking the beginner step by step through the rudiments of notation to the setting of scores and other intricacies, much more thoroughly than Täubel had done in 1791, provides some evidence of this. In Germany there were three such books, one in two editions, between 1844 and 1875. In America Thomas Adams (*Typographia*, 1856) devoted a page to music, with examples set in the type of L. Johnson & Co., Philadelphia. Thomas MacKellar (*The American Printer*, 1873 and 1879) was much more thorough, using the types of MacKellar, Smiths & Jordan of Philadelphia, and as late as 1904 Theodore Low de Vinne devoted 18 pages of his treatise *Modern Methods of Book Composition* to music. In both countries, type foundry continued to offer new and 'improved' founts of music type, well into the 20th century.

Any account of printing music from type will be largely concerned with the history of method and changing solutions to problems. While the outstanding printer could produce superlative results, there were many others whose editions were poorly set, often in a mediocre fount of type that had suffered damage during previous uses. At the same time, the use of type imposed restrictions on even the most artistic or diligent printer: each fount had only a limited number of different characters, and each provided something of a stylistic straitjacket, enforcing a particular visual appearance as well as specific restrictions on details of presentation.

4. Engraving.

Stanley Boorman

(i) Early history.

For as long as music was normally presented (in manuscript or printed edition) with one part per staff, and without many indications of chords, slurs or ties and the like, type was adequate for most printed editions. Many of the innovations outlined in earlier sections of this article represented attempts at extending the usefulness of type to keyboard music and vocal scores, and to 18th-century and later editions requiring phrasing and the addition of ornaments. Even earlier, Attaignant arranged moving parts together on the same set of staves in some of his keyboard volumes; the unknown German printer of an early collection of *Kirchengeseng* of the Bohemian Brethren (1566) used the same technique and William Godbid managed to print Thomas Tomkins's *Musica Deo sacra* (1668) in four parts on a two-staff system. But the hand equipped with the nimble and flexible pen was better able to meet the challenges of elaborate keyboard music or florid song, and it was the hand-driven line engraved in copper that furnished the needs of the composer and the connoisseur from the latter part of the 16th century onwards.

The earliest date known on any intaglio engraving is 1446, although there is evidence that plates were being produced at least ten years earlier. It is not known how they were printed. The first mention of a copperplate printing press is probably that in a document of 1540 in the Antwerp archives (cited in *GoovaertsH*); but the hand mangle had been developed commercially in the 14th century. The maps for

editions of Ptolemy's *Geographia* issued in Bologna (1477), Rome (1478) and Florence (1482) were printed from copper plates and show place names splendidly cut in various sizes of roman capital. It is not surprising that no music was prepared by engraving. The notation was still stylized, using relatively few symbols: woodblocks were used for the simple examples needed in treatises, and type soon proved its ability to present most Renaissance music. Perhaps too the techniques of copperplate engraving and, particularly, printing were not widely known, for, after the editions of Ptolemy's *Geographia* and a map of central Europe printed in 1491, very few maps were produced from engraved plates until about 1540. The earliest known practical music to be produced by copperplate engraving was perhaps *Intabolatura da leuto del divino Francesco da Milano novamenta stampada* published without printer's name or date. Francesco Marcolini's lute anthology *Intabolatura di liuto di diversi* (RISM 1536¹¹) seems also to have been engraved. However, he returned to type for his other extant musical volume, containing masses by Willaert; he also seems not to have used engravings for the decorative title-pages of his other books. This is not surprising, for the engraved plate could not be printed using the same press as type: it needed a greater pressure and special treatment, and was therefore more suitable for individual artistic production. Throughout the 17th century, for example, title-pages of typeset musical books might include a design (or the patron's heraldic device) printed from an engraving, at a separate impression, after the typeset title and publication details had been printed on the page.

There was therefore some lapse of time before any other books of music were prepared from plates. The table showing the finals and dominants of the 12 modes in Vincenzo Galilei's *Dialogo della musica antica et della moderna* (Florence: Giorgio Marescotti, 1581) is not fully mensural music. Otherwise, engraved music is next found in a number of devotional prints made after paintings or drawings by Marten de Vos and other Flemish artists. In some of the engravings a whole score is shown as an open book; in others the separate vocal parts – nine in one case – are disposed about the picture on scrolls or on tablets held by angels. The engravings contain complete works, some of them by known composers such as Andreas Pevernage, Cornelis Verdonck and Cornelis Schuyt, some by composers otherwise unknown, such as D. Raymundi. The earliest example, the Virgin and St Anne with Jesus, engraved in masterly style by Jean Sadeler after de Vos, appeared in Antwerp in 1584 (for see Sadeler [Sadeler], Jean) and was reprinted in Rome (1586) and in Antwerp (1587). Others (all but one by the same engraver) were published in Mainz (1587) or Frankfurt (undated). The engravings are superb as pictorial compositions, and the notation of the music, though small, is clear and accurately reproduced. In the same vein is *Encomium musices*, a book made up of 18 plates, each illustrating a different scene from the Bible (Antwerp: Philip Galle, c1590). The designs by Jaen von de Straet provide a mass of information about musical instruments of the day which the brilliant engraving of Adriaen Collaert and others has preserved in the copper. The title-page shows three female figures, Harmonia, Musica and Mensura, framed by a fine show of musical instruments and supporting an open score of a motet for six voices by Pevernage (for see Pevernage [Bevernage, Beveringen], Andreas).

This expansion in the use of plates, not restricted to musical subjects, was the result of the invention of the rolling press, specifically designed for copperplate engraving. The press was in use in the Low Countries by this time and seems to have spread through Europe very rapidly.

In 1586 Simone Verovio, a calligrapher and engraver in Rome, issued two collections of pieces printed from engraved copper plates. The first was *Diletto spirituale: canzonette a tre et a quattro voci composte da diversi ecc.mi musici, raccolte da Simone Verovio, intagliate et stampate dal medesimo: con l'intavolatura del cimballo et liuto* (1586³), a folio of 23 leaves (for illustration see Verovio, Simone).

The title describes the nature of the work. Each two-page opening shows the separate vocal parts with words, a version for keyboard in three or four parts and another for lute in Italian tablature, all elegantly engraved and skilfully printed. Verovio produced similar works until 1608 and his methods were adopted by his successors in Rome, some anonymous (as was the printer of J.H. Kapsberger's *Libro primo di mottetti* of 1612), but one of whom, Nicolò Borboni, was as accomplished as Verovio himself. He is best known for his *Musicali concerti a une' et due voci ... libro primo* (1618), which he composed and engraved, and for the editions of Frescobaldi's keyboard works, superbly engraved by Christofori Bianchi (from 1615), which he published. The elegance of the engraving may to some extent conceal how such music was impossible to print from type.

Meanwhile, music printed from engraved copper plates had appeared in England (1612-13) and the Netherlands (1615) and examples of engraved music appeared in typeset books in France and Germany in the 1620s and 30s. The English work was *Parthenia, or The Maydenhead of the First Musicke that Ever was Printed for the Virginalls: composed by Three Famous Masters: William Byrd, Dr John Bull and Orlando Gibbons* (1613⁴) engraved by William Hole for Dorothy Evans, and printed by G. Lowe. It is an accomplished piece of engraving showing a command equal to Verovio's, but with the parts so condensed that the music would have been extremely difficult to play. The first Dutch example was issued by Joannes Janssen in Amsterdam: *Paradisus musicus testudinis* by Nicolas Vallet, engraved by Joannes Berwinckel (*Le secret des Muses*, i; 1618⁶). In France, the royal monopoly on music printing given to the Ballard family covered only typeset music and did not extend to printing from copper plates: composers who did not wish to entrust their music to Ballard published it on their own account or through a music seller. The first of these was Michel Lambert who, in 1660, published in Paris *Les airs de Monsieur Lambert* engraved by Richers. Eventually the technique spread across the Atlantic where it was used in 1721 for *A Very Plain and Easy Introduction to the Singing of Psalm Tunes* by John Tufts, published by Samuel Gerrish in Boston, and for *The Grounds and Rules of Musick Explained* by Thomas Walter (Boston: J. Franklin).

(ii) Techniques and later history.

Engraving is distinct from etching, even though certain elements of the processes are virtually identical. Both were used at various times for preparing music for printing, although etching seems to have always been less common and effectively died out by the end of the 18th century. Engraving remained in use, with certain specific changes in technique, well into the 20th century.

The etching process presupposed the use of acid to eat into the copper plate, already coated with wax, to ensure that the acid only acted where wanted. The plate was covered with a thin coating of wax, after which the music was laid out with a sharp point, drawing staff lines and all other elements. The plate was then immersed in a bath of acid, which could eat into it only at points where the wax had been cut through; the acid therefore left the notation incised into the plate. The process seems to have been invented soon after 1500, by Daniel Hopper in Augsburg or by the Italian printer Parmigiano, according to different authorities. It was certainly used by Dürer after 1515 and was perhaps being used for music from the end of the century. Verovio, in one of his 1586 volumes (Peetrinus's *Melodie spirituali*), describes the music as 'scritto da Simone Verovio: Martinus van Buijten incidit'. This at least asserts that Verovio drew the music on the plate, while someone else cut it in.

In England, Roger North described (c1695) how he bought a copper plate 'polish't and grounded' and etched some music on it. He used too strong an acid and the result was not satisfactory. Later (c1715–20), he related how 'etching, with a litle graving (and perhaps worse ways) have been used' to meet the demand for printed music. Later in the century, Mme Delusse wrote in the *Encyclopédie* that when music was first printed from copper plates, the notes were drawn with a steel point and were then bitten in with acid. She cited collections of organ music, many of the operas of Lully and Mouret, the motets of Campra and Lalande and the cantatas of Bernier and Clérambault.

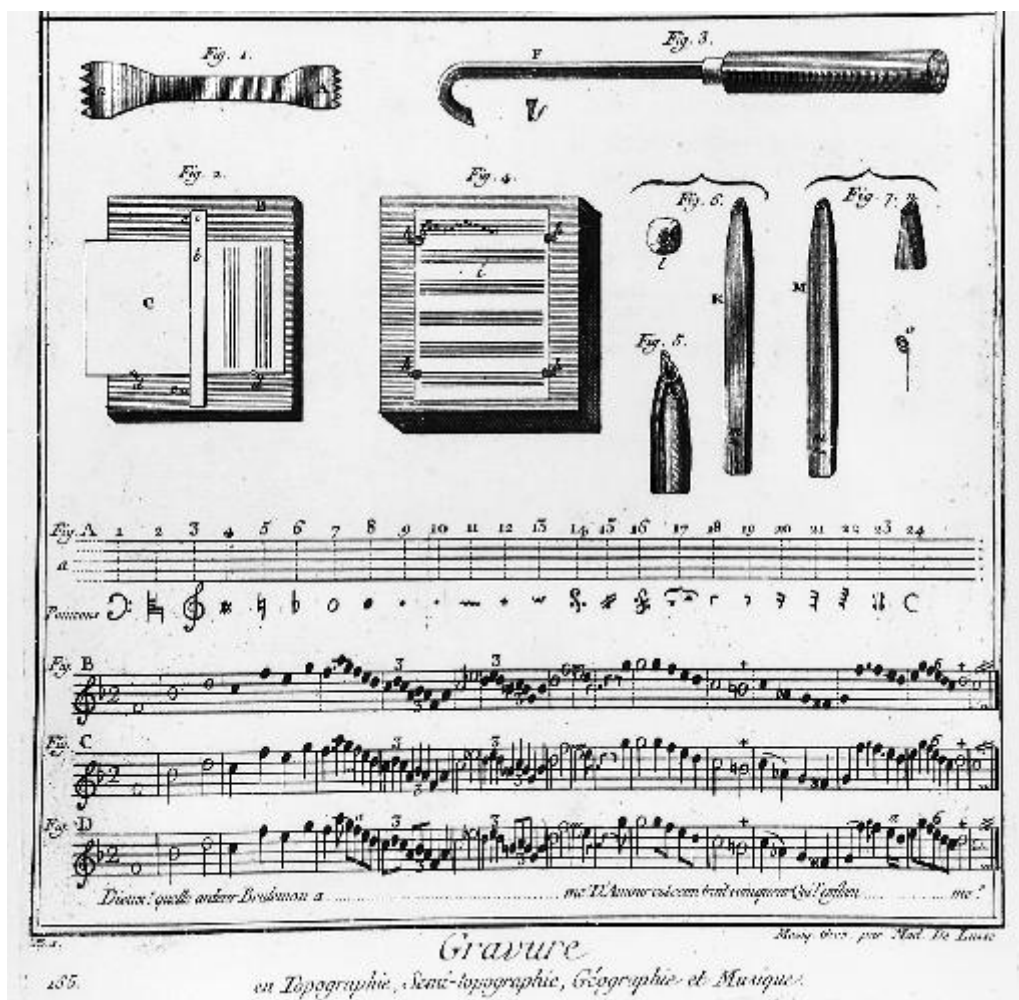
In practice, it is not usually possible to tell whether music has been printed from etched or engraved plates since both produce a plate on which the music has been incised. With engraving, the musical notation was cut directly into the plate, using special tools. At first all the symbols, including solid note heads for crochets or quavers, as well as words such as tempo indications were cut freehand, and the results show a pleasing and artistic irregularity of detail. However, a significant development led to the adoption of punches for recurring symbols, note heads and clefs in particular, though dynamic indications, accidentals and time signatures were increasingly punched.

Each engraver owned a set of tools, which were distinctive, and treble clefs in particular seem to have acted for some as signatures. The individual craftsmen working for Walsh, for example, can be distinguished as easily by their clefs as by any other aspect of the engraving and layout, and the same is true with some of the much later engravers working for Ricordi. The use of punches seems to have begun before 1700, for Thomas Cross advertised (c1690) that 'Gent may have their works fairly engraved, as cheap as Punct and Sooner'. Hawkins referred to Estienne Roger and other Dutch craftsmen who made an amalgam to soften the copper in order to 'render it susceptible of an impression from the stroke of a hammer or punch, the point whereof had the form of a musical note' (*HawkinsH*).

These printers certainly used the rolling press, essential for careful printing of engraved prints. This worked essentially in the manner of a kitchen mangle, so that the plate, the paper to be impressed, the frisket and the necessary support were passed between two rollers. These were able to exert considerably more pressure than that available with the conventional press for typeset music, and could draw out the detail of fine lines more precisely.

The other significant development was the adoption of pewter plates rather than the copper that had been normal at first. This change, which substituted a softer metal, was certainly in place by the middle of the 18th century. It made the task of cutting and of correcting errors much easier, and enabled a lower pressure to be exerted by the rollers of the press. Copper plates seem to have been retained for artistic work but, eventually, virtually all music was engraved on the cheaper material.

It is surprising that there are no early discussions of the processes of printing from engraved plates. Moxon, in his *Mechanick Exercises* (London, 1683–4), does not discuss the techniques, although he was well aware of them and had himself signed at least one engraved plate. The first valuable account does not appear until almost a century later with the commentary by Mme Delusse in the *Encyclopédie* to the second of two plates concerned with 'Gravure en lettres, en géographie et en musique' (fig.6).



18th-century music engravers' tools, reproduced from the 'Encyclopédie': 'Fig.1' shows the five-pointed tool for pricking the position of staff systems (in two sizes) on the metal engraving plates; in 'Fig.2' a squared-up plate rests flat on a stone under a straight edge (b), with two systems already cut by a scorer ('Fig.3'); 'Fig. 4' shows the plate completely scored, with some characters (made by the punches indicated in 'Figs.6-7') already in position; 'Figs.A-D' show a variety of punches; the text in the last line was engraved with a burin Edmund Poole

At the outset of her description of the current technique, Mme Delusse stated that the aim of the engraver was to reproduce the manuscript copy exactly, on a copper or pewter plate, freehand; the methods that she summarized persisted, with slight modification, to the 20th century. They began with a detailed planning of the layout of the music: this involved consideration of the style of the music and the format that corresponded to the genre, decisions about the number of staves on a plate and where the line ends might come, and provision of space for leger lines, for texts and for titles. This was not a simple mechanical count because the planning had to take account of the logic of the music, allowing space, as far as possible, in proportion to the value of the notes. This proved relatively simple in the quicker movements, but there are many indications in the manuscripts of second thoughts and recalculation in the slower movements. The next stage was to layout the staff lines on each plate, cut with either a single-tooth burin or a five-line rastrum. When the ruling was finished, the burr raised by the cutting tools was removed with a scraper, working across the lines with a light hand. This done (Mme Delusse wrote), everything on the manuscript was lightly drawn on the plate with a steel point, working from right to left so that all would appear the correct way round when printed. The pitch and

the value of each note were shown by conventional signs at the end of the mark indicating the position of their stems. At this stage, the engraver might well have had to modify some of the detail written on the manuscript at the planning stage.

Once the plate was completely marked, the copy could be laid aside. Apparently the favoured practice in France in the late 18th century was to engrave any words below the music first, and then to stamp the note heads, rests, clefs, sharps, flats, naturals, directs and so on, using punches driven by a hammer with a flat face. This done, the plate was transferred from the thick, smooth stone that supported it during the punching and laid on an anvil, where it was planished or flattened using a hammer with a slightly convex face, to remove the distortions and bulges in the metal caused by the action of the punches. The plate was then laid on a smooth surface to be finished. The note stems, bar-lines, slurs, tails to single quavers, beams connecting the stems of groups of quavers, and subdivisions of quavers, were put in with a burin or with a scorer. To enable all cutting to be done from right to left the plate had to be turned around and about; indeed to cut slurs the engraver often held his graver still and turned the plate on to it.

When the cutting was finished staves were re-cut to open any lines that might have been closed up during punching. The plate was examined carefully, touched up as necessary, burrs scraped, and unrequired scratches and dots burnished away. A proof copy was pulled and any errors noticed by the composer and the printer's reader were marked for amendment. For correction, the plate was rested on the edge of the bench, between the arms of correcting callipers, each of which carried a point turned inwards at its end. The point of the arm over the face of the plate was placed on the character to be changed and pressed down; the point of the arm resting on the bench under the plate met it and located the position of the fault through the metal. The mark on the back was ringed, the plate was turned over face down on the stone and the area around the error was struck with a dot punch. The plate was turned over again, and the metal raised on the surface was burnished to obliterate the defective work. The back was also gently tapped with a hammer over the same area. Once the surface was smooth and flat, the corrections were made; care was taken not to disturb the original work around it. The plate was then ready for printing at the rolling press

Some printers engraved each page on a single plate. The pressure exerted by an engraver's press habitually flattened the paper being printed by the plate, so that the edge of the plate shows as a change in texture on many extant pages of 18th- and early 19th-century editions. (In addition, the area of the plate is often slightly darker in colour on the paper, as the repeated inkings and pressings of the plate gradually led to a roughness of texture and a consequent laying of traces of ink on the paper.) These marks are by no means always present: for one thing, some printers, such as Estienne Roger, printed two pages on a single plate, and others could put four pages on one plate if the format was quarto or smaller.

The first comprehensive account of the printing of music from engraved plates is in *Nouvel manuel complet de l'imprimeur en taille douce* by Berthiaud, revised by P. Boitard (1837), in which a whole section is devoted to music. By this time, music was rarely engraved on copper with a burin but was usually worked on pewter with a hammer and punches. If music came to the printer on copper plates then it was printed as any other copperplate engraving, but the printing of music from pewter plates required different procedures: among them, the force of the press was reduced, and the top roller had to be of sufficient diameter to prevent the plate from bowing as it passed through the press and curving upwards to take the shape of the roller. The printing quality of pewter plates depended on the

alloy from which they were made. Generally the alloys were more brittle as the proportion of antimony was greater. This, taken with the reaction of the metal to the punch and working at the press, may explain the cracks that disfigure some music printed direct from plates, particularly during the 19th century.

These imperfections give rise to bibliographical distractions, because cracks, missing or damaged notes and faint copies suggest late impressions taken from worn metal or new editions taken from 'the original plates'. Instead, many faults arose from causes intrinsic to the metals and processes, and might have declared themselves early as well as late or arisen too from human shortcomings. Cracks may be attributable to any one of several causes: they might have been in the blank plate before working, they might have been opened by a burin where the metal was weak, or they might have spread under machine pressure at any stage of the printing run. Although some plates could survive through very long print runs, others could easily suffer from such damage very early in their lifetime. This is particularly true for pewter plates, for cracks rarely appear in plates engraved on copper. On the other hand, 'the abrasive action of the plate printers' wiping canvasses ... could break down fine work on a copper plate within a hundred impressions' (Bain, E1974, quoting Pye). Thus, damage on plates cannot be taken as even a general indication of the age of the plate, any more than an apparent replacement plate can mean that its original had seen long service.

Discrepancies in engraving style that occur through the parts of any large work might stir thoughts of cancelled and re-engraved plates, but, if other evidence is lacking, it is safe to attribute such differences to trade practices. Much evidence shows that most engraved books of music were the work of more than one craftsman and, indeed, this makes good sense, for only by this means could the pressmen be kept busy. Thomas Cross, who appears at the foot of many editions as 'T. Cross *sculp.*', had 'good hands' to assist him, and William Forster shared the work of punching his editions of Haydn symphonies among a number of engravers. The editions of Ricordi and other publishers document the number of engravers involved with the addition of assigned initials to the plate numbers at the feet of pages, and Ricordi's own documents of his work, in the *Librone*, often indicate that a book was divided between different workers. In 18th-century France engraved music, with its decorative title-pages and engraved illustrations, was normally the work of more than one person, the music engraver being supported by specialists in illustration or lettering.

Predictably, music came in the 19th century to be increasingly standardized in its graphic character. Lines became finer in their execution, presumably because of the use of harder pewter with less lead in its alloy. The visual contrast between thin and thick lines could thus be emphasized, for instance between the endings and the middle of a tie or slur, or between the verticals and the diagonals attached to note heads or, most notably, in sharp signs.

In subtle ways the standard appearance of musical signs changed over the years: the G clef, for instance, rounded at the top around 1800, by 1850 was typically pointed. The musical page acquired a more dramatic appearance, but always short of interfering with the demands of performers. (These demands perhaps explain why music had no William Morris.) Standardization aside, engravers no doubt argued over the ideal layout and placement on the page for optimum legibility. Distinctive engraving house styles gradually replaced the distinctiveness of the individual craftsman, enabling the workmanship of particular firms to be identified, whether by contemporary persons in the trade (for instance as evidence of piracy in litigation) or by later scholars (as evidence of the date and source of particular exemplars). Priority and authenticity of editions can sometimes be inferred from such

particulars, sometimes even by the evidence of the printing process itself. German music after 1850, for instance late Schumann or early Brahms, often exists in two forms, an earlier one printed directly from the plates and a later one printed by lithographic transfer, to be discussed below.

This general standardization of appearance seems to have been matched by a consistency in the craft of music engraving, once the pattern had been established with 18th-century punches and pewter plates. It was a true craft, of course, and most of the skills and detailed practices remained secrets of the craft, to be handed down through apprenticeship and to be recovered only from detailed study of surviving editions and the few extant sets of tools.

At the same time, the craft also remained remarkably decentralized, and it seems not unreasonable to speculate that at the highpoint of production, just after 1900, music engravers were active in several hundred cities throughout the world. To be sure, large firms often did the work for smaller firms and personal publishers, undertaking the engraving, running off copies and storing the plates for later press-runs. Late 19th-century publishers as far away as London, St Petersburg and Latin America, for instance, were served by specialist engravers in Leipzig, of whom Röder, Johann Brandstetter and Engelmann were the best known, and whose warehouses were largely destroyed in World War II. Other major engraving firms included Lowe & Brydone in London and the New York publisher G. Schirmer.

Engraving held its own well into the 20th century as a medium for almost all musical repertoires. The strictures expressed by Novello (and others) about its expense certainly encouraged the parallel development of typeset music, but the engraving process was always more elegant and fluent, and seemed much better suited to music. Lithography was developed in order to achieve the same ends, but the various offset and transfer processes developed with lithography in mind also served to keep engraving alive as a force in music printing.

5. Lithography and more recent processes.

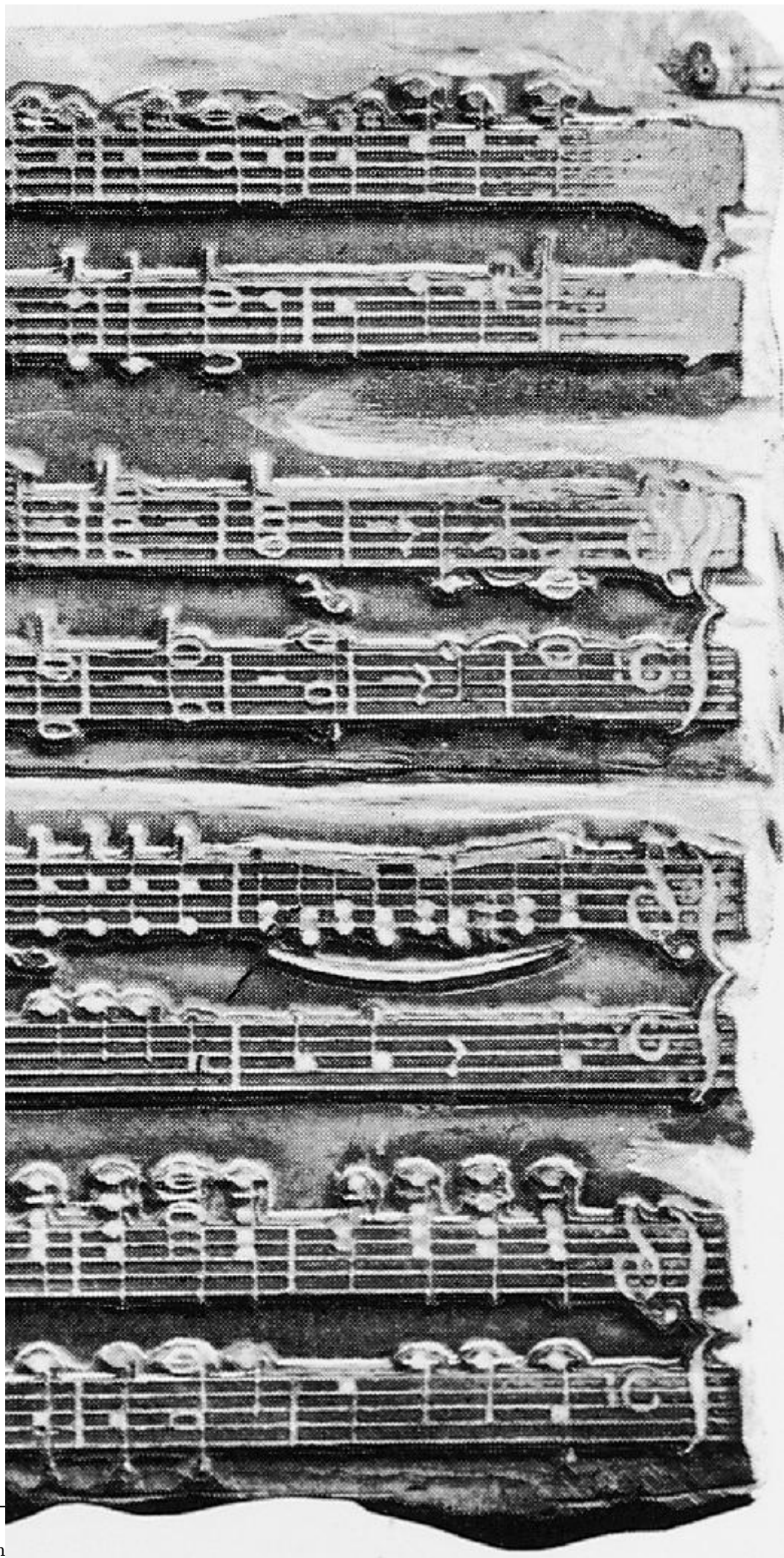
Stanley Boorman

(i) Lithography.

Lithography is similar to woodblock printing in that it involves printing from a text raised on the surface, with the surrounding material cut away; in this instance, the block is of stone, and the matter to be printed appears raised after the unwanted stone has been partly eaten away with acid. The practice is based on the fact that one greasy substance that will receive another greasy substance will repel a water-based liquid. The man who used this principle to develop a quite novel method of printing was Alois Senefelder. He wanted to be a playwright but could not afford to publish at his own expense through the trade; so he took up the study of printing techniques. He began by etching with acid on a copper plate. He later substituted a piece of Kellheim limestone and found that he could write with more command and more distinctly on the stone than on the copper plates. He used his own ink prepared with wax, soap and lampblack and decided to try the effect of biting the stone with 'aqua fortis' (nitric acid), wondering 'whether, perhaps, it might not be possible to apply printing ink to it, in the same way as wood engravings, and so to take impressions from it'. After pouring off the acid he found the writing 'elevated about a tenth part of a line', or about 2 mm, and that satisfactory impressions could be taken. A page of poorly printed music in a prayer book persuaded him that his 'new method of printing would be particularly applicable to music printing' and he began with the

work of a friend, Franz Gleissner. It is usually accepted that the first of Gleissner's compositions to be printed was the *Feldmarsch der Churpfalzbayer'schen Truppen* (1796), but in the first part of his *Complete Course of Lithography* (C1818; Eng. trans., 1819 - from which the above quotations are taken), Senefelder gave primacy to Gleissner's 12 *neue Lieder für's Klavier* (1796). He copied the music on stone and, using a copperplate printing press, assisted by one printer, took 120 copies. The composing of the songs and the writing, engraving and printing took less than two weeks.

These early techniques of relief etching and printing from stone, refined and developed by Senefelder, were used for music printing in Augsburg and Munich for at least ten years. In his study of Senefelder's life and work, *Aloys Senefelder: sein Leben und Wirken* (Leipzig, 1914, 2/1943), Carl Wagner showed a stone plate with music etched in high relief from the printing office of H. Gombart of Augsburg, dating from about 1800 (fig.7). Music printed by this method can sometimes be identified by the impression left in the paper by the raised characters, for example in *Sonate à quatre mains pour le pianoforte ... oeuvre II* by Franz Danzi (Munich: Falter, c1797).



However, Senefelder had continued to experiment, observing the chemical and physical affinities between different substances. He noticed that gum-water prevented the chemical writing ink (made of soap and wax) from adhering to the stone; he drew lines with soap on a polished stone, moistened the whole surface with gum water and applied oil-based ink which adhered only to the soap lines. He described his experiments:

In trying to write music on the stone, with a view to print it in this way, I found that the ink ran on the polished surface; this I obviated by washing the stone with soap water, or linseed-oil before I began to write; but in order to remove again this cover of grease which extended over the whole surface (so that the whole stone would have been black on the application of the colour [printing ink]) after I had written or drawn on the stone, it was necessary to apply aqua fortis, which took it entirely away, and left the characters or drawings untouched.

Out of these principles, rationalized in 1798, Senefelder developed the 'chemical printing' of true lithography, which allowed impressions to be taken from lines barely raised above the flat surface of a stone. He quickly extended the range of his procedures, or 'manners' as he called them. With the engraved manner the drawing was engraved in the surface of the stone with needles without being etched; this was used in the first work he produced after his discovery of chemical printing, *Eine Symphonie von vier obligaten Stimmen* by Gleissner, where, to make the title-page as neat as possible, the engraved manner was used. It was possible to combine the engraved manner with the elevated (surface) manner. In his *Rapport sur la lithographie ... adressé a la Société d'encouragement de Paris* (20 October 1815, p.3), G. Engelmann showed a piece of music in which the notes had been written in ink and the staff lines engraved; and Senefelder combined the methods in title-pages, 'where the finest hair strokes [were] drawn in first with the needle, and the thicker, or shade lines, added with the pen'. By 1800 Senefelder had demonstrated that the chemical printing process was not limited to stone; other substances 'as wood, metal, paper, even fat substances, as wax, shellac and rosin' could be used under certain circumstances.

Senefelder regarded his process as of universal application – apt for quick reproduction, in any quantity, of originals as various as orders of the day struck off on the battlefield, bill heads, advertising copy and works of art. The early development of lithography was very much associated, however, with the printing of music, largely because of Senefelder's own interests and needs, and because of his association with Gleissner (and Gleissner's wife), Falter, J.A. André and S.A. Steiner.

During his experiments Senefelder laid out his music complete and in detail direct on the stone, working from right to left with a sharp black-lead pencil; pen-work remained the basis of the technique in its commercial development. It may well be that the early lithographers followed the procedures of the pewter-plate engravers: ruled their staff systems first (line by line), established clefs, key signatures and indications of pulse, laid the note heads in position and, aided by drawing instruments, completed stems, beams, slurs, binds, indications of dynamics and the like as required. The note heads in early lithographic music are often circular, and various devices were developed which allowed the craftsman to produce consistent note heads evenly and rapidly.

(ii) Transfer and photographic processes.

The procedures required for writing directly on the stone were arduous. Senefelder himself, in various experiments, tried 'transferring [to the stone] from paper, upon which drawing or writing is previously executed with ink'. This much easier process was much used, particularly for ephemera. In this, the writing or drawing was copied from left to right with a flexible pen (using chemical ink) on to transfer paper, which had a specially prepared surface on one side. When the work was finished and the ink dry, the back of the paper was sponged with very weak nitric acid and the leaf put between sheets of dry blotting paper to absorb superfluous liquid and ensure that the paper was uniformly damp. While still moist the sheet was laid face down on the surface of a highly polished stone and, protected with backing sheets, was passed two or three times through the press. The stone was then removed from the press and bitten in, and pure water was poured over it until the paper was disengaged, leaving an exact image, reversed right to left in the correct sense for printing. The stone could then be used for printing in the normal manner.

Although Senefelder acquired a British patent for this process in 1801, he was still writing in the future tense, urging its adoption for music printing, in his *Complete Course* in 1818-19. It is impossible to judge by looking at printed sheets to what extent, and when, the transfer process became an accepted practice for music. It was certainly increasingly used in commerce and law from the 1820s onwards, and Wagner's writing of the full score of *Tannhäuser* in 1845 (fig.8) shows that the technique had by this time become reliable even in the hands of amateurs. In the same year, Wagner wrote, he had 25 copies made of the scores of *Der fliegende Holländer* and *Rienzi*, 'by means of the so-called autographic transfer process, although only from the writing of copyists'.

Erster Act.

Allegro molto. $\text{♩} = 102$. 1^{te} Scene.

1 Kleine Flöte.
 2 Große Flöten.
 2 Oboen.
 2 Clarinetten in C.
 2 Fagotte.
 2 Ventilhörner in C.
 2 Waldhörner in C.
 2 Ventiltrompeten in C.
 3 Bassen.
 Bassuba.
 Posaunen in Eⁿ & C.
 Triangel.
 Becken.
 Tamburin.
 große Horn.
 1^{te} Violine.
 2^{te} Violine.
 Bratsche.
 Chor der Sirenen.
 Violoncell.
 Contrabaß.

Allegro molto. $\text{♩} = 102$.

Beginning of Act 1 of Wagner's 'Tannhäuser', printed from the composer's autograph; the score was written on lithographic transfer paper which was then laid down on to the stone

The transfer process was not limited to using paper. In his British patent Senefelder described how 'plates of copper, tin, pewter, and various metallic compounds already etched or engraved' could be charged with a specially prepared ink and passed through a rolling press to yield impressions which could be readily transferred to stone. Although we do not know when or where this combination of engraving and lithography was first practised, it was a crucial development, and it set a pattern which has persisted in some guise or other.

Dans le temple d'industrie, a song dedicated to Louis XVIII on the Exhibition of the products of French industry, 'drawn, written and printed on the lithographic plates of A. Senefelder & Co., rue Servandoni no.13' (Paris, c1820), shows a splendid portrait and some accomplished writing, but the music

'engraved by Madame Pannetier' was printed from intaglio plates in a rolling press. In France the 1830s and 40s produced some examples that seem to have been transferred from intaglio plates to stone for printing. In London, D'Almaine & Co. announced that they had 'recently introduced a new and very superior mode of printing music at a charge infinitely lower than by the old processes, whilst the notation is rendered beautiful and agreeable to the eye'. This might well have been derived from a combination of the intaglio and lithographic methods. *The Official and Descriptive Catalogue* of the Great Exhibition provides clear evidence that such a combination was being worked in London in 1851, for it is recorded in Class 30 that Jullien & Co. of 214 Regent Street exhibited 'specimens of ornamental printed music: three of the titles are printed in oil colours, and three printed in colours from stone. The music was engraved on pewter, and afterwards transferred and printed from stone'. During the 19th century developments in the design of printing machinery led to experiments with metal plates treated to give the same results as lithographic stone. Although zinc, for example, offered satisfactory properties for lithography, its adoption for music printing was belated. Lowe & Brydone, one of the largest British music printers, used stone until 1895, when they started to print from zinc.

It is often difficult to tell with certainty whether music from the latter 19th century was printed from engraved plates or by a lithographic process. Illustrations such as appear on title-pages are easier to distinguish, given the ability of the stone to indicate half-tones and subtle shading; in any case, they are often signed with some indication of how they were printed, such as the inscription 'Lith Formentin & Cie.' This, however, does not necessarily mean that the music was also printed by lithography. Formentin's signature appears on the title of music that was printed in Paris by Meissonnier, directly from engraved plates. Printers in other countries, Italy and England in particular, continued to use stones for the music.

We also can not tell how many pages were printed on each stone. In 1797 Senefelder was using stones of about 2500 cm² in surface area for his music, but as presses improved it was possible to use larger stones and by the latter part of the 19th century stones and zinc plates were giving 16 pages in full music size or 64 pages in octavo, imposed by the same principles as those governing imposition in letterpress printing.

The next great step forward came with the introduction of the camera into the field of the reproductive graphic arts. As soon as photography had become a practical process in 1839 as a result of the work of J.N. Niepce, Louis Daguerre and W.H. Fox Talbot, attempts were made to apply it to lithography; but it was not until 1852 that R.J. Lemercier and his colleagues succeeded in devising a process - difficult and hazardous in its operation - which they described in *Lithographie: ou, Impressions obtenues sur Pierre à l'aide de la photographie*. Alphonse Poitevin's process, in which the lithographic stone was sensitized with bichromated albumen, was perfected in 1855 and won general acceptance; it still persists in certain applications. In 1857 Eduard I. Asser of Amsterdam succeeded in making transfers from photographic prints on to a nonsensitized stone, and in 1859 Henry James was the first to make photographic transfers on to grained zinc. Instead of being written on stone or on transfer paper and then chemically 'fixed', music could now be derived from any original that could be photographed, the negative printed down on to stone or zinc and subsequently treated to yield a printing surface.

It is not surprising that this technology gave tremendous impetus to the development of new methods or old methods - in new guises - in the origination of music for printing. Instead of writing and drawing in reverse on stone or from left to right on special paper it was now possible to write from left to right on ordinary smooth paper, photograph the result and transfer it on to the stone or zinc plate for

printing. Instead of punching and engraving metal plates it was possible to adapt traditional practices to paper, using (instead of gravers) pens and drawing instruments, and special stamps carrying note heads, clefs, letters and even complete frequently used words (for example *piano*, *accel.*, *ped.*). As a result of this development, the range of lithographic processes was greatly increased, without requiring new skills from the copyist. The music to be printed could be laid out either on lithographic transfer paper for direct transfer to stone or metal; or on ordinary papers for the camera and subsequent printing down for lithography; or for line engraving in relief. In the 1920s and 30s the photographic process was much used in France, where it was known as *similigravure*: its late developments are represented in the work of the Grafische Industrie, Haarlem, Netherlands, and Caligraving of Thetford, England.

The Halstan Process, a system unique to the company of that name in Amersham, England, was also graphical in essence. It was devised by Harold Smith, a master music engraver, and developed from 1919 onwards by him and his brother Stanley, a photographer and engraver; it was last used in 1997. The basis of the process was a meticulously planned original, four times the finished size, marked out in light blue pencil which would not reproduce photographically. Care was taken at this stage to ensure that the layout of the whole manuscript took account of the nature of the music, with suitable page turns and correct spacing of individual symbols; this required a mixture of musical and engraving skills. The image was then created in dense black ink using a variety of specially devised rulers and stencils, standard drawing instruments and pens. Any text on the page was set by photo-composition and laid down in position. After internal proofreading the original was reduced photographically to produce either a proof or final bromide or film. Emphasis on quality and flexibility ensured a strong worldwide following for the process. All the music examples in *Grove6* were set by Halstan, as were the Britten scores printed for Faber & Faber and the Verdi Edition published by Ricordi and the University of Chicago Press.

Each of these processes is to some extent limited by the range of symbols available to the lithographer. If a set of stencils, punches or other formalized symbols is to be used, the end result must necessarily lie within the conventions of 19th-century notation. These limits were considerably strained by much music written and printed during the middle third of the 20th century. Scores which merely required new layout on the page, or new relationships of conventionally notated parts, could be accommodated easily: famous examples include Stockhausen's *Klavierstücke XI* or Cage's proportionally spaced notations. Even more complex situations can be successfully overcome by the use of traditional printing processes: the requirements of Lutosławski's aleatory works, the complexities of Boulez's *Le marteau sans maître*, or the new notations of Berio's *Circles* or Stockhausen's *Zyklus* can all be met by an expansion of the range of standard symbols or stencils, or by using a straight edge. However, other composers have made demands on notation and layout that can not easily be met by any of the processes described above. The elegant arrangements of lines and notes that are intrinsic to the notation of Bussotti, the dense blocking of Ligeti's *Volumina*, or the endless range of graphical symbols in other scores all led to a different use of photography. The simplest solution to these scores was to take the composer's holograph as the prepared printer's copy, eliminating the need for the printer's own engravers or copyists. It is photographed and treated like any other prepared score, transferred to zinc or stone ready for printing.

This emancipation of notation through the printing process has spilled over into conventionally notated scores, for the costs to printer and publisher are evidently much lower. Thus, parts of the score of Ives's Fourth Symphony were printed as reproductions of the composer's autograph, and other

editions use fair copies prepared by the composer or a specialist copyist. The experiments in notation which encouraged the emergence of this practice seem to have largely been abandoned, which no doubt accounts for the survival of other practices, to be described in the rest of this article, all of which rely to a greater or lesser extent on the preponderance of conventional signs.

(iii) Stencils and dry transfer.

The Halstan process is not alone in using stencils for some of its notation. Indeed, stencils have been used for copying music for centuries and the results can be elegant, as in the case of the 18th-century volume of chant now in the Toledo Museum of Art, Ohio. However, stencils did not speed up the process of printing multiple copies before the invention of lithography. But they were well suited to transfer processes, especially once photography had taken a hand. The stencil would ensure consistency of shape and design, not only for note heads, but also for clefs, dynamic indications and standard words. Slurs and beams still had to be drawn by hand as they were neither standardized nor predictable in advance.

The stencil itself was largely replaced by the technique of dry transfer. In this, multiple copies of individual music symbols are printed in a dense black substance (plastic 'ink') on one side of a thin transparent film. When the face of the sheet is turned down on to paper and the form of any character is rubbed from the back, the 'ink' leaves the sheet and adheres to the paper. In this way a succession of note heads, clefs, rests and a wide range of other units in any quantity – each individual character in every respect uniform with its fellow – can be rubbed down in any position. Letraset in Great Britain offer music sheets, but the most comprehensive system was developed in the Netherlands as Notaset, and was much used such systems were also extensively used by Bärenreiter. As with all these processes, the technique demanded care in practice. Each work started as a detailed layout made on previously ruled paper by a musically trained planner and was then developed by operators using transfer sheets, rubbing down the necessary characters in place as they appeared. The whole was finished with a pen as required, after which it was photographed and printed down on to a zinc plate.

As will be apparent, the processes described in this section involve an extra step when compared with engraving or even typeset music; after the music has been laid out and copied, there is the additional stage of transferring it to the printing surface. All are therefore relatively slow, and also call for additional skills and many craftsmen, yet they and variants of them survived and sometimes prospered, while the amount of work done by the engravers of pewter plates has declined catastrophically. The shift from punching and engraving was much accelerated by the rapid development of efficient music typewriters.

(iv) Music typewriters.

To print from a typewriter requires the existence of a transfer process, usually photographic, for the typewriter does no more than prepare a copy of the music, laid out on the page ready to be copied. It also presumes a fairly conventional notation: if too many additional signs or characters have to be added by hand, any advantage that musical typewriting may have will soon be lost.

Attempts were made in the 18th century to use the action of a piano to record on paper notes as they were struck, but it was not until 1833 that the first practical typewriter for music was described in a French patent (no.3748) awarded to Xavier Progin of Marseilles for what he called 'une machine ou plume typographique'. Other machines followed, by Berry (1837) and Guillemot (1859), but the first serious, commercially distributed machine was probably the Tachigrafo Musicale introduced by Angelo Tessaro in 1887 and marketed in Italy by Ricordi. During the next 60 years there were literally hundreds of patents granted throughout the world, particularly in America, for music typewriters. Most, for one reason or another, fell by the wayside; some were developed; a few succeeded, as for example the machine patented by Lily Salmon (later Pavey) which was manufactured for a time by the Imperial Typewriter Co. in England. Two or three types of machine enjoyed wide and continuing use over a long period. One of these was the Keaton Music Typewriter, invented and developed by Robert H. Keaton of San Francisco, formerly a professional violinist. Intended for the individual musician and the small publisher, it was highly successful throughout the USA; the makers made no attempt to promote sales elsewhere, though some machines found their way to Europe.

If Keaton's machine served a domestic market only, the typewriters invented and developed by Armando Dal Molin and Cecil Effinger each attained a wide influence in the commercial sphere. Dal Molin, Italian engineer and amateur musician, invented a music typewriter for his own use in 1945. The following year he patented it in Italy and went to the USA to develop it further, exhibiting it as the Music Writer at the New York World's Fair of Music. He started a business to manufacture the machine, and also set up a music typing studio. Refinements were added in 1955, and by the late 1950s the system was so successful that Dal Molin stopped making the machine for sale in order to develop his music origination business. Effinger, a composer and professor of music at the University of Colorado, conceived the idea of a music typewriter in Paris in 1945. He had made his first model the 'size of a large table - not functional' by November 1947. It was patented in March 1954 and the first production model was shown at Denver, Colorado, in July 1955; the machine was in demand throughout the world for 35 years. It was simple and robust in construction and engineered to fine limits (fig.9). It was best used by professionals working with previously planned copy.



Musicwriter (1973 model) designed by Cecil Effinger
Corinne Effingen - Owen, Music Print Corporation

6. Music publishing by computer.

Eleanor Selfridge-Field

The task of automating music printing attracted much attention in the last quarter of the 20th century. Although there were many obstacles to overcome, the proportion of newly published music produced by computer has risen from near zero to about 75%. This shift and its inevitable completion have changed the dynamics of music publishing in many ways and promise to stimulate further changes in the conduct of musical transmission in the years ahead. These dynamics are traced here first by looking at the range of methods employed, and then by considering some of the most important milestones and their implications for further change.

(i) Methods.

The process of publishing music by computer has three methodological components: input, editing and output. Output is the only one to date which is fully automatic. Editing by its very nature cannot be expected to be automatic. Input is the area in which the greatest variety of techniques has been employed. The physical methods by which all three processes are implemented are largely hardware-dependent, but the logic of the software that drives these processes is dependent on the views of the developer.

The complexity of the overall task of designing systems to print music is complicated by the fact that the methods available for implementing any one of these processes may influence the other two. The rapid pace of the evolution of computer hardware, which affects all three components, has produced a series of ever-changing limitations within which notation-software authors must work. Given the

complexity of the software and the consequent length of time required to write and debug it, this speed has worked somewhat against the efforts of the authors. Too often some technical requirement on which a program depends has become commercially obsolete before the program has become fully functional.

(a) Input methods.

The essential elements of a musical work that must be available to a computer in order for it to produce musical notation are pitch and duration. Many other elements of information may be required. The principal methods of input that have been employed to date are symbolic encoding from a computer keyboard, interpretation of sound data (usually from a MIDI hardware device) and optical recognition of scanned bitmaps (a grid of filled and unfilled dots). Schemes for symbolic encoding within the domain of computer applications can be traced to the 1960s; outside it they have a long prehistory particularly in pedagogical systems (e.g. Sarah Glover's Tonic Sol-fa system of 1835 and its popularization by John Curwen in 1875) and Braille musical notation, of which a skeletal version was in place by 1838. There are two principal advantages of symbolic encoding. First, the data, in addition to supporting the generation of visual notation, are usable for multiple purposes including sorting and searching. Second, excepting any intellectual limits owing to the intellectual design of the system, the data are explicit and unambiguous. Since a widespread criticism of symbolic encoding schemes has been that the systems are difficult to learn and remember, many special devices (electronic tablets, keypads, redefinitions of the computer keyboard, and so forth) have been introduced. However, none have stood the test of time.

The establishment of the MIDI (Musical Information Digital Interface) occurred in several stages. A provisional hardware standard was devised in 1983 and constantly improved in succeeding years; the Standard MIDI File Format was officially adopted in 1988. This flow of developments led to an avalanche of MIDI-input systems for notation programs. Earlier programs based on symbolic input were frequently retrofitted with MIDI input and output capabilities. The advantages of MIDI input are that the task is easily learnt, insofar as it involves playing a familiar instrument (usually an electronic piano keyboard) which generates the data, and that the data are much easier to check for errors than symbolic encodings, because the resulting sound-files can be played back for 'proof hearing'. However, MIDI data are machine codes that identify keys of the input device by number and record the exact amount of time (in milliseconds) for which the key was depressed. They do not record true pitch or duration. In relation to conventional notation MIDI data can be ambiguous, incomplete or too precise to support accurate construction of a score. For example, the black key a semitone above middle C is not explicitly C# or D \flat ; it is simply note number 61. The human interpreter can make an educated guess about the correct interpretation based on a previously learnt music-theoretic framework, but an enormous amount of program code is required to enable computers lacking that framework to make correct interpretations.

In relation to the data for the duration of notes, MIDI is optimized for the user, who is confined to the sound context for input, editing and output. To this user some graphical symbols (beams and slurs, for example) that support the mental grouping of notes by the performer are irrelevant. Bar-lines have no representation in MIDI data, and beams have no meaning in sound and thus no representation; no human threshold for hearing the effect of slurs consistently and unambiguously is defined. Rests are

similarly without meaning; they must be inferred by software from an absence of data. Ties cannot be inferred at all, since the individual values of two consecutive notes that are tied will be represented as the sum of the two values. Consecutive rests are similarly undetectable.

In other ways MIDI data may be too finite to be accurately accommodated by notation software. Once again, the pedagogical tradition that supports the human interpretation of common musical notation is at the core of the difficulty. Scores do not tell us explicitly how loud a *forte* is on a continuum from 0 to 127, for example; performers adopt relative values that suit their taste and circumstances. Therefore score-writing software cannot safely infer much about dynamics from MIDI 'velocity' data except by using arbitrary ranges; these in turn must accommodate continua of arbitrary spans (e.g. from Gabrieli's *p-f* range to Verdi's *pppp-ffff*). Different problems result from a disjunction between sound information that has meaning only in time and its symbolic representation in musical notation. The fermata symbol does not change the nominal durational value of a semibreve, but in playback it does alter the sounding value in milliseconds. The lengthening of a note with an associated fermata in keyboard input to a notation program will not produce a note of the correct duration plus an associated fermata; captured as 'one sound', it will produce an overly long durational value without the associated symbol. Staccatos, which reduce the actual sounding time without altering the pulse, are problematical for related reasons. For accurate printed music they are best added to MIDI input as part of the editing process.

As a method of data acquisition, optical recognition (which should not be confused with the unintelligent scanning of data for the purpose of producing a mere facsimile) was still in its infancy at the beginning of the 21st century. Just as MIDI input requires that each sound be translated to a meaningful symbol, optical recognition requires that each object first captured as a bitmap be translated to a meaningful symbol. Although accuracy rates of as much as 95% have been reported, the numbers should not be interpreted to mean that 95% of the time required by other methods is saved, because scanning errors are time-consuming to correct (Selfridge-Field, F(i)1993-4). Some common scanning errors are the misinterpretation of hollow items (e.g. semibreves) and large items (clef signs); the misinterpretation of accidentally discontinuous lines (as in poorly drawn or preserved staves) and uncompleted ellipses (e.g. note heads); and the construal of incidental specks of dirt as items worthy of being represented in the score.

Effectively, the range of music that can be scanned at a level of competence that is practical for later use is limited to short examples on the order of a Bach minuet (i.e. possessing simple metres, rhythmic regularity, uncomplicated rhythmic values and a low requirement for additional editorial marks). The scanned original must be of high graphic quality and consistency. Optical recognition has thus far proved more useful for the production of MIDI files, which represent few features, than for printed notation, which incorporates a great many features.

(b) Editing facilities.

All notation programs provide some method of editing the data. Generally the editing is done on the computer screen with a mouse. What the user sees on an editing screen is the program's first impression of what the score should look like; this impression is based on an intermediate representation that has attempted to convert the input to the selected output format. The intermediate files that produce the output must contain explicit information not only about the objects to be created (notes, rests, bar-lines etc.) but also about their absolute vertical and horizontal placement. These

absolute measures are applied from the rules of relative placement inherent in the visual grammar implicit in common musical notation. That is, the program must know when to put a dot at the right side of the note (to prolong its durational value) and when to put a dot above or below the note (to produce a staccato indicator). It must know that a cue-sized note is smaller than a regular note but larger than a grace note. It must know that in the production of parts, multi-bar rests are expressed in a form of shorthand not appropriate in the corresponding bars of the score. Some programs permit direct access to the internal files that produce the output. These files are usually difficult to read without some training, but to those who persist they offer the advantage of a fine-grained control of positional information.

Some of the editorial chores that result from the data-acquisition methods described above may be unfamiliar from manual experience in score preparation. Almost all notation programs have occasional difficulties with the vertical alignment of items in polyphonic scores. These difficulties can be compounded by such requirements as multiple simultaneous subdivisions of the beat (e.g. 3:4); non-concurrent metres (e.g. 4/4 against 3/4); concurrent ornament signs (e.g. a turn with chromatic alterations indicated; both of the above with associated fingering numbers); unmeasured cadenzas; and the complexities of text underlay (Selfridge-Field and Correia, F(i)1994). The correct presentation of beams and slurs in complex textures, particularly in piano music of the 19th century, the accommodation of many 20th-century innovations in notation, and the reconstruction of scores of many early repertoires will inevitably require editing by hand. Grace notes, the durational values of which lie outside the counted range of beats in a bar, often require repositioning. Some manual editing may be necessary to restore the optical illusions to which we have grown accustomed (the dimming of staves to a 'background' level in order to render them 'balanced' with a 'foreground' of notes and rests); the computer's consistency and impartiality are sometimes offensive to human perception.

(c) Output.

The last quarter of the 20th century saw a rapid evolution of output devices. Teletype machines, plotters, impact printers, dot-matrix printers, ink-jets and laser printers have all been employed to print music. The last two have become available in colour models, and programs that colour-code specific musical features of a piece are on the horizon. Programs that produce dot-matrix output rely on libraries of symbols formed of predefined patterns of dots and are not scalable. Although this kind of specification can be used to facilitate laser printing, most programs in current use define objects in terms of their splines (outlines), which are scalable. Scalability is important in adapting a score to different page sizes, layouts, levels of readability and so forth. Colour printing promises to support pedagogical uses (for example to highlight themes, subjects etc.). Laser output is generally preferred for professional work. Impact printing is necessarily retained for producing scores in Braille musical notation, where the dots of a cell must be raised to be detected by touch.

(ii) History.

Efforts to employ the computer in the production of musical scores can be traced to about 1960. During the era of mainframe computers, when computer memory, data storage and processing times fell far below those customary on desktop computers, all input was symbolic and most output was produced by plotters. Plotter output used splines, just as the PostScript page-description language (destined to support most current graphics applications) does today. The most articulate schemes for

symbolic input devised in the 1960s and 70s have proved to be an enduring contribution not only to efforts to print music by computer (Hewlett and Selfridge-Field, F(i)1991) but also to the more general notion of representing music symbolically. This has happened because the path from any input system to any output system requires an intermediate step in which data must be organized into files that describe the objects to be produced. Often this intermediate phase is invisible to the user.

The two schemes that have survived are DARMS (1964) and SCORE (1972). The survival of DARMS, initiated by Stefan Bauer-Mengelberg (in association with Columbia University), owes to the availability of extensive and open documentation, compiled in 1976 by Raymond Erickson. The value of DARMS's original virtue – compactness (essential in a time of very limited computer memory) – has gradually withered as machines have become more competent. Although in 1966 the DARMS encoding language operated in the absence of an actual printing program, Jef Raskin (then a graduate student at Pennsylvania State University) produced provisional plotter output from DARMS code one year later. Overall, DARMS has been allied with research applications as much, if not more, than with printing (Selfridge-Field, F(iii)1997). Among these are the music-bibliographic projects of such scholars as Harry B. Lincoln (16th-century madrigals and motets) and Jan LaRue (18th-century symphonies), while Jim Stanley's Web-based application for hymn-tune searching shows not only the durability of DARMS but also the persistence of tune-matching questions. The analytical possibilities of DARMS have been broadly explored by Brinkman (F(iii)1990).

SCORE, in contrast, is a flourishing program which has been developed solely by Leland C. Smith. SCORE software sustains the production of many of the collected editions of classical music (including those of Wagner, Verdi, Schoenberg and Berg). It also sustains a significant percentage of all popular-music editions produced in the United States. Its symbolic input code has been used relatively little in bibliographical and analytical applications. Its chief virtues are extensibility, finite control of spacing, overall aesthetic superiority and open documentation. The SCORE program has also been adapted countless times to the exigencies imposed by the evolution of operating systems and printing devices.

Other important pioneers of notation programs include Thomas Hall, Donald Byrd and Lippold Haken, whose efforts began in the 1970s. Hall devised the dialect of DARMS that supports the computerized printing system of A-R Editions (functioning since 1977). Hall experimented with mensural notation in the 1970s and explored the use of symbolic codes as a basis for source-filiation studies (F(i)1975, 1977). Byrd (F(i)1984) catalogued a great number of the problems inherent in generating musical notation and has continued to look at the broader challenges of ever-expanding hardware, editing and operating systems (F(i)1994). He has written a series of programs to print music; the most recent one is Nightingale. Haken's work at the University of Illinois has been of a more practical nature. From 1975 he devised a system that integrated musical transcription, interactive editing, playback and printing capabilities, principally for use in educational applications. Haken's LIME program (1993) is to date the only one of those mentioned here which supports the Notation Interchange File Format (NIFF) and the production of Braille musical notation. Interactive editing was a principal emphasis of several systems that followed.

Some important schemes that can be traced to the early 1960s but have now disappeared are Princeton's IML-MIR language, developed by Michael Kassler and others, and Indiana's Mustran (1962), of which Jerome Wenker was the chief architect. The multifaceted work of Norbert Böker-Heil at the Staatliches Institut für Musikforschung in Berlin (c1970–1995) resulted in myriad programs addressing particular problems in printing and analysis; many of his solutions, such as his colour-coded

'piano roll' notation familiar today from sequencer programs, anticipated later commercial developments elsewhere. Interested primarily in music of the Renaissance, he seems to have been the first to produce white mensural notation (F(iii)1971). Another distinguished printing system from Germany was Kurt Maas's Amadeus, based in Munich from the mid-1980s.

While the systems described above continued to evolve in the 1980s, a series of extraordinary advances in hardware devices redefined access to notation software. All the programs cited above were developed in research laboratories and were initially available to only one user at a time. Processing time was slow and access charges were prohibitively high. The development of the desktop computer (1982), buttressed by the advent of desktop laser printers (1985), the establishment of the PostScript Sonata font (1987), the MIDI interface and standard file format (1988) and desktop scanners (1990), unleashed a spate of new approaches to the production of music notation which continues to the present day. The first wave of these, such as the Mockingbird system developed by Ornstein and Maxwell (F(iii)1983), emphasized interactive editing; although an important prototype, Mockingbird was never commercialized. By around 1990, some 80 notation programs (predominantly for the Apple Macintosh and IBM-type personal computer) were reportedly under development (Correia, F(i)1992), and many more can be assumed to have come into existence. The majority of these relied on MIDI input. The wide variation in the aesthetic quality of the output is photographically documented in the journal *Computing in Musicology*, volumes i-ix (1985-93).

Since most programs initiated in this era were proprietary, their underlying codes have not been published. This lack has discouraged the development of auxiliary applications in bibliographical searching and analysis. The most significant survivor of this era is the popular Finale program, which has been developed (since 1987) by a series of programmers. Finale is noted for its excellent MIDI data capture and interpretation and has been popular with composers and arrangers. Sibelius, which was developed in the 1990s in Cambridge, UK (the home of at least two other music-notation programs), exhibits many of the same strengths as Finale with notational quality that some regard as superior. Capella, which comes from Söhrewald, Germany, emphasizes pedagogical use.

Among programs more orientated towards research applications, the SCRIBE system (1986) of John Stinson and others at La Trobe University in Melbourne, Australia, featured the transcription, editing and analysis of medieval and early modern music (see Selfridge-Field, F(iii)1990); it also could produce coloured output for mensural notation. Of the several music printing systems developed in Japan, the Toppan Scan-Note System (1983) employed elements of a symbolic representation system developed by Mogens Kjaer (Denmark, late 1970s), while the Dai Nippon Music Processor (1987) used dedicated hardware. Specialized needs for setting early, recent and non-Western repertoires have also been met by a wide range of smaller programs developed in the 1980s and 90s. An auxiliary need to place short snippets of notation in textual material have led to the creation of numerous special-purpose font sets. Among these Yo Tomita's Bach Font (F(i)1993-4) has facilitated the inclusion of rhythmic figuration in running text as well as spreadsheets and databases, while chant fonts such as that produced at St Meinrad's Abbey in Indiana, USA, support the integration of Solemnnes-style notation in liturgical programs.

After 1990, optimism about the practicality of optical recognition as an input method led to many efforts to make recognition technology practical as an input method for musical notation. This technology has foundered for several reasons. One is that some three-dimensional phenomena inhere in the two-dimensional page that we see in black and white. When a note head and a staff line overlap,

which one is on top? Object-identification tends to proceed on the basis of subtraction. If one of a set of overlapping images is removed, the other may be rendered insufficiently complete to enable accurate recognition. Of currently available programs, the acquisition engine designed in the early 1990s by Nicholas Carter, for example, produces SCORE intermediate files; thus the editing involves the use of SCORE. The Sibelius and Capella programs produce files in their own proprietary file-formats. The SmartSCORE program developed by Wladyslaw Homenda was initially designed to produce MIDI files but has since been broadened to support NIFF. The impetus for the creation of NIFF was in fact the interest of many vendors in an ability to exchange data between printing, scanning and MIDI software. The foundations for this interchange format were laid by Cindy Grande in the mid-1990s and have been furthered in recent years by Alan Belkin and others (F(ii)1996).

The latest stimulus to the further evolution of notation software has been the rapid development of the World Wide Web as a medium for the distribution of files containing both sound and notation. By changing the model of distribution, the Web poses a challenge to the social conventions associated with both publishing and recording. Self-publishing of scores, first made possible by desktop printing, led to the creation of many small presses for the production of music, which has in turn led to the diffusion of editorial control (and, some would argue, a diminution of critical standards). This trend can be expected to continue. Since the Web has the capability of offering an extensive and efficient distribution system which could operate independently of these established models, a current question is whether established publishers of music will survive as the purveyors of editions that exist only on paper. Publication on the Web essentially means providing electronic materials from which the user may produce his or her own printed copy, in some cases emending it before printing it. For the user there are many potential compensations in a new paradigm that is now only faintly realized. The Web offers the possibility of enabling collaborative work on common projects from multiple physical locations, which could improve consistency and greatly reduce the amount of time required to produce critical editions. In the case of sound files on the Web, however, music-redistribution sites often pool the voluntary contributions of a virtual group of anonymous suppliers; they thus offer no promise of quality or consistency.

Computer-based media in general and the Web in particular facilitate the creation of virtual editions – compositions (editions, arrangements etc.) that may exist in multiple versions in order to accommodate the interpretations of different editors or users and which may be ‘updated’ from time to time. In the hypothetical distribution model in which the master copy resides on only one computer and users download the music only when they need it, control of content may come to reside with the person controlling the website files, the editor who supplied the information, or a virtual community of users who can automatically update the content from some remote locations. Computers can support all of these lines of authority and many more besides.

In addition to the legal and commercial issues which use of the Web raises, it also calls into question many philosophical premises that underlie more than a century of musical scholarship. In contrast to the Urtext of yesterday we are likely to see a more phenomenal sense of the musical work evolve. Dumitrescu's Java-based system for mensural notation (F(iii), forthcoming), for example, comprises a primary visual layer that provides direct description of manuscript contents and a secondary editorial layer which provides a particular interpretation of the contents. This prospect raises fundamental questions about the identity of discrete musical works. While at each stage of the development of computer tools, various threats to the established order have been perceived, it would appear that

overall their increasing use has brought corresponding benefits to rank-and-file musicians, teachers, students, composers and arrangers. There is every likelihood that on balance this will continue to be the case, but hard-fought battles may be expected to accompany every gain.

II. Publishing

Donald W. Krummel

1. Definition and origins.

The music publisher issues musical editions that consist primarily of musical notation, whether for performance or study; a publisher who issues books about music, certain kinds of instructional material, librettos and other primarily verbal texts but does not also issue musical editions, is not generally regarded as a music publisher. As with general publishers, the music publisher's activities involve obtaining a text and working with the composer or editor, financing the printing, promoting, advertising, storing and distributing the copies and, increasingly over the past century, negotiating and administering performing rights.

The present survey of music publishing describes the changing environment in which music publishers worked and inevitably comes close to being a summary of the cultural history of music in general, seen from the perspective of the student of musical documents. Music publishing is part of the history of society and commerce. It owes its existence to three phenomena that date back to the Renaissance: the invention of printing; the growth of modern mercantile practices which provided publishers with a framework for their economic and promotional activities; and the rise of the professional composer, who needed the services of the music publisher. Music printing is part of the history of technology, although printing and publishing are necessarily related and in fact many music publishers – before 1700 almost all, subsequently only a few – did their own printing.

Musical texts may be printed but not published. Luxurious editions were often prepared as keepsakes for private and limited circulation, as, for example, were the earliest copies of *Parthenia* (London, 1613/14); later impressions of this book, however, were intended for sale and should therefore be regarded as having been published. Other music was printed but not published in order to ensure control over performances. Ten partbooks make up John Barnard's *Selected Church Musick* (RISM 1641⁵), but there is no extant continuo part; apparently the vocal parts were printed so that the singers could learn the music, but no performance could take place without a continuo. In the 19th century full scores and instrumental parts for operas and some large symphonic works were often printed but not published, so that the owner could more effectively demand royalties or specify conditions of performance. Vocal scores, which were both printed and published, could be used to familiarize the public with a work and to train singers, but full-scale performances with orchestra could not be given until arrangements were made with the publisher, involving royalty payments in return for the rental of the instrumental parts and the conductor's score.

The opposite condition can also exist: music may be published but not printed. Through history there have been music copyists whose manuscripts were presumably intended to be equivalent to a printed copy. William Byrd and Thomas Tallis secured a patent in 1575 for music printing that also specified control over music paper; this implies that they had a special working relationship with copyists. Reports suggest that the money they made came mostly from the paper; and when Thomas Morley

renegotiated the patent in 1598 he took pains to retain the coverage of music paper. In the early 18th century, Italian opera was rarely printed; yet, through manuscripts, it came to dominate European musical taste. Provincial newspaper announcements of the 18th and 19th centuries tell of men who made a living by copying music 'cheaper and more accurately' than printed editions. Today, through photography and lithography, any manuscript can be duplicated and hence can become the basis for a published edition. Various blueprint processes were also widely used, especially from 1920 to 1960, to copy and circulate contemporary music. The manuscript copy is an appropriate means of publishing a musical text of which few copies are likely to be needed.

Before Gutenberg's invention of printing, books were extensively distributed in manuscript; and the origins of book publishing are commonly seen as beginning well before that time. No evidence has been uncovered, however, of any copying shops that specialized in music. Music scribes were attached to courts and chapels, such as those at Mechelen or Ferrara; the music they copied was often widely circulated and much used, but their activity is distinct from the processes of publication.

During the period of incunabula, several dozen printers issued theoretical treatises, but few issued more than one such book. The printers of liturgical music, on the other hand, usually issued more than one book, perhaps because they had invested in music type. By 1480 liturgical books containing music in plainchant notation were being issued throughout Europe at the rate of several dozen a year.

Among the Italian printers who worked with music were Ulrich Han and Stephan Planck in Rome; Damiano and Bernardo Moilli in Parma; Christoph Valdarfer, Leonard Pachel and Antonio Zarotto in Milan; and, in Venice, a German lineage including Theodor of Würzburg, Johann Hamman, active later in Speyer, and Johann Emerich from Speyer. Books for service use in Germany and central Europe were produced by Bernard Richel in Basle, Johann Sensenschmidt and later by Johann Pfeyl in Bamberg, Georg Reyser in Würzburg and Georg Stuchs in Nuremberg. For a few years just before 1490 about a dozen books a year came from the press of Michael Wenssler in Basle. The most prolific German printer of music incunabula was Erhard Ratdolt in Augsburg. Steffen Arndes, working between Italy and north Germany, also produced major liturgical music texts. In Paris in the 1480s several dozen missals were printed for various French bishoprics by Jean Du Pré, who left space for manuscript music; in the 1490s Jean Higman issued such books, using music type. These men were still essentially printers. There were two stimuli to the separation between printing and publishing; first, printers had to sub-contract the work to other printers; and second, financial support was sought outside the trade, in order to cover the costs of materials as well as labour, whether as manifestations of the desire to circulate a text (as with centralized distribution of diocesan service books or, later, congregational hymnals and psalters), to demonstrate patronage (as evidence of the munificence associated with the courtly chapels) or to invest capital (as in the case of reprinting, typically of anthologies). The first music publishers who were not also their own printers appeared after 1480, when the Venetian merchants Luc'Antonio Giunta and Ottaviano Scotto called on local printers, notably Johann Emerich and Johann Hamman, to print music books, mostly Roman missals. The Giunta family was to be the major Italian publisher of liturgical music books throughout the 16th century.

The history of Roman Catholic liturgical books in the 16th century has yet to be studied in detail, but it appears that the output in the Low Countries and Germany declined sharply about 1515; in France it flourished longer and did not disappear until after 1550. England produced liturgical books for a few years around 1500 and again during the reign of Mary Tudor. Elsewhere, Jan Haller in Kraków issued a

splendid missal in 1503, and was succeeded by Hieronim Wietor, while Christoffel van Ruremund produced significant books in Antwerp at about the same time. Even so, more 16th-century liturgical music books probably came from the Giuntas than from all other publishers combined.

2. The age of letterpress printing, 1501–1700.

Petrucchi has been called the Gutenberg of music printing. The comparison is not quite appropriate, since he was not the first to print music; but in matters of craftsmanship and artistry the comparison is apt. Besides being the first printer to use multiple-impression movable type, he deserves to be recognized as the first publisher of polyphony. Between 1501 and 1509 in Venice he issued the three *Canti* volumes of the *Odhecaton* and five books of *Motetti* as well as mass books, collections of popular frottoles and lutebooks. Through them, the music of Josquin and his contemporaries became the earliest art-music repertory to appear in print. In 1511 Petrucci resumed printing in his native Fossombrone, with less exceptional results. His publications, the last dated 1520, provide an invaluable record of the musical works of Franco-Flemish polyphony and a testimony to their contemporary reputation.

Petrucchi's success seems to have stimulated other printers to issue music. In Germany, Erhard Oeglin in Augsburg in the 1500s, and the itinerant Peter Schoeffer over the next two decades, used double-impression typography in direct imitation of Petrucci, as did Jean de Channey in Avignon in the 1530s. In Italy, on the other hand, Caneto, Sambonetto and particularly Dorico used woodblocks, as did Arnt von Aich in his noteworthy songbook from the 1510s, and Grimm & Wirsung in Augsburg in their sumptuous motet collection of 1520. Petrucci's most important successor, Andrea Antico, was, however, neither a printer nor a publisher but a woodcutter or engraver whose blocks were used by music printers in editions subsidized by others. The blocks can be identified in about a dozen books, most of them vocal canzoni, first issued when Antico was in Rome between 1510 and 1518. From 1520 to 1539 he worked in Venice, after 1532 in partnership with Ottaviano Scotto. About two dozen more music books were issued during this period, using his blocks. Blocks were also used in treatises and in instrumental anthologies such as Girolamo Cavazzoni's tablature book of 1543, now thought to be the work of Bernardino Vitali.

The first really successful music publishing concern was established in Paris during the reign of François I, at the time of the so-called scholar printers, by Pierre Attaignant, who issued his first anthology in 1527/8. His typefaces are not without precedent but they contributed to the distinctive appearance of his editions and determined the speedy production of them, through which the chansons of Janequin, Costeley and their contemporaries were disseminated. Attaignant flourished for a quarter of a century. His books follow formulae of many kinds – in their appearance, their content and even their titles for numbered series. Although he specialized in the early French chanson, which he issued in oblong partbooks, at first octavo and later quarto, he also issued several books of tablature and over a dozen folio mass collections, for which special music type was made.

Venetian music publishing after Petrucci and Antico is the story of two great names, Gardano and Scotto. Their output, devoted almost entirely to sacred and secular partbooks, was prodigious. Antoine Gardane (Antonio Gardano), originally from southern France, began printing in Venice in 1538, specializing in the music of Arcadelt and featuring series such as the *Motetti del frutto*. By 1545 he was issuing a dozen or more new titles every year; by 1600 the total had reached 30. His heirs continued to

publish music up to 1685, sometimes retaining the name of Gardano, elsewhere using that of Magni, the founder's grandson-in-law. Over its long history the Gardano dynasty issued some 3000 musical editions. The firm Girolamo Scotto produced perhaps half this total. It began in 1539 and for a time rivalled Gardano in the quantity and quality of its output. But before 1570 it had waned, and after 1590 its occasional publications were mostly reprints of Palestrina masses. Lesser Venetian publishers included Francesco Rampazetto (1561–8), who issued reprints in the 1560s; the composer Merulo ('Claudio da Correggio'), whose editions, from the same decade, were regarded as models of accuracy; and Alessandro Raverii, who printed over a dozen music books a year during his short career (1606–9).

The innovatory products of the 'nuove musiche' around 1600 were favoured by two younger Venetians, Ricciardo Amadino and Giacomo Vincenti, who were partners between 1583 and 1586 but worked separately thereafter. Amadino's firm disappeared during the economic decline of Venice and is last heard of in 1621; but the name of Vincenti persisted until 1667 and appeared on well over a thousand musical editions. The prolific Venetian trade in books, like Venetian commerce in general, enjoyed its greatest prosperity between 1540 and 1610: it was almost inevitable that the music publishers would also be important, although the quantity of their output is astonishing. The vast output of Venice – at its peak in the 1590s it was publishing more music than the whole of the rest of Europe – probably helped significantly in the spread of developments as different as polychoral and monodic styles.

The centre of early German music publishing was Nuremberg, thanks to two type cutters who also used their own type as printers: Hieronymus Formschneider ('Grapheus') and Johann Petreius. From 1532 onwards Formschneider issued works by Hans Gerle, using woodcuts. He then cut a music face and used it in about a dozen music books that he printed between 1534 and 1539. (His name also appears in the imprint of Henricus Isaac's *Choralis Constantinus*, dated 1550–55.) He is also important because his music type was used by most of the Lutheran printers in north Germany later in the century. Petreius issued several dozen music books between 1536 and 1550; but he too is important as a designer of music type, which was used in south Germany, central Europe and as far away as Antwerp and Paris. His two music faces are particularly attractive and complex in their construction. The most prolific of the Nuremberg houses, however, was the partnership of Johann Berg ('Montanus') and Ulrich Neuber. They issued over a hundred editions, mostly partbooks and vernacular song collections, using Petreius's type (1542–71), while their successors, Dietrich Gerlach (1567–75), Catharina Gerlach (1575–91) and Paul Kauffmann (1594–1617), issued several hundred more.

Other music publishers became established in Paris after the death of Attaignant. Of these, Nicolas Du Chemin issued about 200 music books (1549–76), including two series of chansons in the style of Attaignant and about 30 folio mass books. Michel Fezandat issued several tablature books and Calvinist psalm books (1550–58). But it was the partners Adrian Le Roy and Robert Ballard who in 1551 obtained the exclusive royal privilege for music printing; this monopoly was to remain in force for over two centuries, determining the course of French music publishing up to the time of Lully and, indeed, as far as the French Revolution. Their earliest editions were mostly tablature books and psalters; in 1557–9, 22 folio choirbooks appeared. Thereafter secular partbook anthologies predominated in their catalogue. At first they used type from Petreius in Nuremberg, but shortly before 1560 they began to use founts, commissioned from the master punchcutter Guillaume Le Bé. These were to serve as a distinctive hallmark of the firm's music for the rest of its long existence. After the death of Le Roy in 1598, the Ballard name alone was used.

The fourth major music publishing centre in the mid-16th century was Antwerp. Though the first *Souterliedekens* was printed there by Symon Cock in 1539, the history begins effectively the following year with a privilege issued to Willem van Vissenaecken, who had music type specially cut for him but seems to have issued only one collection. His competitor and successor was Tylman Susato, whose shop issued about 60 music books between 1543 and 1561; most were devoted to reprints of chansons and motets, but some were Flemish songbooks and psalm books. Jean de Laet and Hubert Waelrant produced about 20 attractive vocal collections (1554–65). The major music publisher in the Low Countries was Pierre Phalèse (i), who began his career in Leuven in 1545 and then set up a partnership with Jean Bellère in Antwerp. After his death his son Pierre Phalèse (ii) moved to Antwerp, where the family continued to publish music up to 1691. The Phalèse imprint appears on nearly 200 chanson, motet and lute collections. It must be assumed that the Antwerp reprints reflected a considered judgment of market demands, thus providing us with a useful perspective on the popularity of different kinds of music. Music was also issued in Antwerp by Christoffel Plantin, famed for the printing shop which survives today as a museum in Antwerp; his books are impressive and distinctive both visually and musically

Like book publishing, music publishing favoured commercial centres in preference to university towns. Mostly before the ascendancy of the four cities discussed above, Frankfurt, Lyons and Augsburg also housed music publishers. The Frankfurt printer Christian Egenolff worked for several decades from 1532, issuing collections of German folksongs and of settings of Horatian odes. Following sporadic activity in Lyons, including woodblock efforts by Antoine Du Ry in 1525 and Etienne Briard's double-impression round-note typography of 1532, Jacques Moderne began printing there with a folio missal and three motet collections, also in 1532. After five years of inactivity, he resumed with a series in the style of Attaignant called *Le parangon des chansons*; 'Grand Jacques' (as Moderne called himself) also issued about a dozen other music books during his last years between 1541 and 1556, mostly reprints of Venice or Paris editions. His major successor was Godefroy Beringen, whose several extant music books, neat in appearance, are distinctly Calvinist in their repertory. In Augsburg anthologies were printed by Melchior Kriesstein (1540–49) and Philipp Ulhart and his son, also Philipp (1537–79), devoted mostly to music taken from other publishers' books. Other printers around 1550 included Mathias Apiarius in Berne and the Zürich punchcutter turned lute intabulator Rudolf Wyssenbach; the itinerant Jacob Baethen, whose music books were printed successively at Leuven, Maastricht and Düsseldorf; Johannes Honterus, the Romanian humanist scholar whose press at Braşov produced a songbook in 1548; and the Hungarian György Hoffgreff, who printed a songbook in 1553 at Kolozsvár (now Cluj-Napoca, Romania).

The commercial centres, in the mainstream of activity, could be expected to produce editions of a musical repertory that was stylish and distinguished but also essentially conservative. The character of the music produced in each centre was distinctive, but activity elsewhere varied much more widely in character and in quality, reflecting decisions that typically were either less informed or made in the light of local demands and circumstances. Because of religious conflict and the political decentralization of the country, German publishing was particularly diversified in appearance and scattered geographically. Nuremberg was the principal exception, producing attractive editions of the music of well-known composers and never completely losing its cosmopolitan outlook. But music was also issued by over a thousand different music printers in nearly 200 other German cities in the 16th and 17th centuries. Lutheran music books, at first using woodcuts, bear the imprints of more than a dozen different cities, most of them producing only a single title or two before 1540. Hans Hergot in

Nuremberg was the first to print music to Luther's mass (1526), while his widow Kunegunde also printed pamphlets including music, as did her second husband, Georg Wachter. Wittenberg became the earliest important centre: Georg Rhau, who had printed some musical treatises as early as 1517, obtained a fount of music type from Formschneider in the 1530s and produced several dozen of the most important early Lutheran service books (from 1538). His successors included such men as Johann and Andreas Eichorn in Frankfurt an der Oder (1556–1615), Andreas Hantzsch in Mühlhausen (1583–99), Johann Schwertel (1565–80) and Matthäus Welack in Wittenberg, Georg Baumann in Erfurt (1573–90) and in Breslau (1590–1607), and Gimel Bergen in Dresden (1570–97, his heirs to 1716). In south Germany the major publishers included the shop of Adam Berg in Munich (1564–1629), whose many Lassus editions include the folio *Patrocinium musices* (1573–89), one of the most sumptuous musical editions ever produced; later collections of Lassus were issued by Nikolaus Henricus. In Frankfurt, Sigmund Feyerabend produced several major collections (1570–85), while to the east interesting editions were also produced, in Latin or the vernacular. These included sacred anthologies from Kraków from 1550 on, printed at first by the firm of Florian Ungler using woodcut music, later by Maciej Wirzbięta and the lineage of Szarfenberg, in whose editions movable type came to be intermixed; several elusive editions of the hymns of the Bohemian Brethren, in which the recurring music typefaces identify a fount that moved with the itinerant printers; and over a dozen collections issued by Jiří Černý (Nigrin) in Prague (1578–1604), either composed or at least encouraged by Jacobus Handl.

In Germany around 1600 courtly patronage supported extensive music publishing activity by the Saxon printers Justus Hauck (1604–18) and Johann Forkel (1624–35, his successors to 1713) in Coburg, Johann Weidner in Jena (1605–29) and Nikolaus Stein in Frankfurt (1602–21, working mostly through the printer Wolfgang Richter); to the north by the Fürstliche Druckerei in Wolfenbüttel (1607–14) and by Phillip Van Ohr (after 1597) and Heinrich Carstens (1609–25) in Hamburg; and to the south in Augsburg, Valentin Schönig (1591–1614) and Johannes Praetorius (1600–35). A great many 'occasional' works (*Gelegenheitskompositionen*), for events such as weddings, baptisms and funerals, appeared throughout the 17th century. The leading centre of such publishing in the 1620s was Leipzig, where Johann Lanckisch (1619–56) and Johann Gluck (1618–24) issued many of the works of Schein, among others. Jakob Rebenlein in Hamburg (1632–60, his heirs to 1684) was the major printer of the 1630s. By far the most prolific centres for the publishing of occasional music, however, were those on the Baltic Sea, in Lübeck, Rostock, Greifswald, Stettin (Szczecin), Danzig (Gdańsk) and, above all, Königsberg (Kaliningrad), which included among its printers Georg Osterberger (1577–1602, his heirs until 1609), Lorenz Segebade (1623–38, his heirs to 1671), Pascha Mense (1643–51) and Johann and Friedrich Reusner and their heirs (1639–93), who issued Heinrich Albert's song collections. Publishers of Lutheran hymnbooks included Georg Runge in Berlin (1616–39, his heirs to 1685), who issued many editions of Johannes Crüger's *Praxis pietatis melica*, Balthasar Wust in Frankfurt (1656–1702) and the Endter family in Nuremberg (1617–99). Major printers of the Catholic south included Georg Widmanstetter in Graz (1587–1614), Matthäus and later Tobias Nenninger in Passau (1602–19, succeeded by the shop of Georg Höller later in the century), Adam Meltzer in Dillingen (1603–9, his widow until 1610), Michael Wagner in Innsbruck (1639–68), Andreas Erfurt in Augsburg (1655–72), Rudolph Dreher in Kempten (1660–81), Johann Kaspar Bencard in Frankfurt and later Augsburg (1670–1720, his heirs at least until 1723), and the Salzburg firm of Mayer, whose occasional output extended from the 1670s to past 1800. Frankfurt and Cologne were among the major centres producing Catholic

service books. Among the earliest music distributors were Georg Willer and Caspar Flurschütz, both active in Augsburg early in the century, and responsible for particularly interesting early dealers' catalogues.

German music publishing declined during and after the Thirty Years War; but the disappearance of a number of large firms around 1600, particularly in Nuremberg, suggests that the war hastened rather than caused the decline. Decentralized as they were, German music publishers were also book publishers, to a greater extent than those of Italy or France: one also finds, particularly after 1630, imprints which name two men – a printer and a publisher – occasionally in different cities. From Germany, Lutheran music publishing spread to the east and north, to Prussia and Poland with Georg Rhetus in Danzig (now Gdańsk) and Thorn (Toruń; 1634–43, his heirs to the end of the 17th century) and Andreas Hünefeld in Danzig (1609–47); to Copenhagen in 1537, where the major press was that of Henrik Waldkirch (1602–40); and to Stockholm in 1586 and Iceland in 1594. The Viennese firm of Cosmerovius (1636–1715) produced sumptuous librettos for court productions, often with engraved illustrations.

Calvinist psalm books were also printed in great quantities. Those dating from before 1560 are modelled largely on Lutheran service books. In 1560, at Calvin's request, Antoine Vincent of Lyons arranged for various printers to issue 20,000 psalm books for service use. In recognition of the noteworthy tradition of punchcutting in France and Flanders at the time, a distinctive appearance came to identify both the psalm books themselves and a lineage of later books. Physically the latter are neat and well proportioned and printed from very small type. Examples include the lutebooks of Simon Gorlier and the partbooks of Godefroy Beringen, both in Lyons in the 1550s, along with the diminutive sets of Simon Du Bosc and Guillaume Guérout in Geneva. Among the major punchcutters of the day whose music faces earned them brief careers as music printers were Michel Du Boys, who issued several early books of Philibert Jambe de Fer; Jean Le Royer, whose work was issued under the name of the Lyons bookseller Charles Pesnot; Jean II de Laon, responsible for the 1582 edition of *L'Estocart*; Robert Granjon, famous for his typefaces even today, who issued music in various locations from Flanders to Rome; and Pierre Haultin in La Rochelle, whose aesthetic is reflected in the English madrigal partbook tradition begun by Thomas Vautrollier. Another printer whose repertory and printing style suggest a Calvinist character, and who thus presumably enjoyed an exemption from the Ballard monopoly, was Jacques Mongeant, whose several anthologies date from the decades around 1600. The rich typographical resources of this tradition no doubt facilitated and inspired the Calvinist predilection for solfège music typefaces, manifest most notably in the 1560 psalm book of Pierre Davantes.

Editions of Calvinist psalms appeared in great profusion. Modest in scale and in time distinctly crabbled in appearance, they were at first largely modelled on Lutheran service books. Several hundred editions of the Marot and Bèze versions, many with music, were issued over the next two centuries, at first from Paris, Lyons (Jean de Tournes was the notable printer of them), Geneva and elsewhere, most frequently around 1650 in Charenton, near Paris. Geneva also produced a number of Italian psalm books for use by Piedmontese Calvinist congregations. Dutch psalm books, mostly in the Dathenius versions, were issued in the 17th century by Plantin in Antwerp and Gislain Manilius in Ghent, among others, usually in small format and with painfully tiny and ill-printed notation. The leading German printer of psalm books was Christoph Rab at Herborn in Nassau, who around 1600 brought out not only Lobwasser's German versions but also George Buchanan's Latin paraphrases and at least one Hungarian psalm book. In England, the psalms of Sternhold and Hopkins, which had first been printed

in Geneva, went through many editions, based on Dutch models. While William Seres issued the forerunners of these in 1553, it was John Day – apparently exiled to Emden during the reign of Queen Mary but later returning to London – who in 1559 received a royal patent to print those psalm books that included music. He printed nearly 40 editions of the Sternhold and Hopkins psalms before his death in 1584; his son Richard inherited the patent and worked with several London printers in issuing nearly 50 more. In 1604 the Company of Stationers bought up the Day patent and used it to provide work for their printers. Until 1650 several hundred more editions of the psalm book were printed with musical notation. John Playford later attempted to revitalize the music of the psalm book. In Scotland the publication of psalm books culminated in the edition printed by Andro Hart in Edinburgh in 1635.

Venice may have been the dominant centre of Italian music publishing before 1600, but it was not the only one. In Ferrara in the late 1530s a partnership of Johannes de Buglhat, Henrico de Campis and Antonio Hucher issued several admirable sets of partbooks. In Rome the brothers Dorico and their heirs issued several dozen music books between the 1530s and 1572; the shops of Antonio Blado (1551–80) and Antonio Barrè (1555–64) printed editions that were distinguished both musically and visually, while Alessandro Gardane (from the Venetian Gardano family) issued several dozen editions in the 1580s. Some interesting madrigal partbooks came from Vincenzo Sabbio in Brescia (1579–88) and Vittorio Baldini in Ferrara (1582–1614), while Francesco Franceschi in Venice is named in the imprints of Zarlino's treatises (1562–99). Music printing in Bologna began with a 1584 partbook from the shop of Giovanni Rossi, whose heirs issued several collections by Banchieri in the 1610s.

In Florence the Marescotti family (1580–1611) produced epoch-making editions of Galilei, Caccini and Peri; their successors included Zanobi di Francesco Pignoni (1607–41) and Pietro Cecconcelli (1623–30). In Milan the Tradate family were succeeded by the prolific lineage begun by the heirs of Simone Tini, eventually managed by Filippo Lomazzo (1583–1628). Later Milanese publishers included Giorgio Rolla (1610–51) and the families Camagno (c1650–86) and Vigoni (1680–c1750). This period also saw typographic adaptations of alphabetic notational systems, by Giovanni Ambrosio Colonna in Milan for guitar music and by Nicolò Tebaldini in Bologna. Music also appeared occasionally from Perugia, mostly from Pietroiacomo Petrucci (1577–1603); from Palermo, largely from the press of Giovanni Battista Maringo (1603–35); and from Naples, at first from Constantino Vitale (*fl* 1603–23) and Gargano & Nucci (1609–21), later from Giovanni Giacomo Carlino (1597–1616), whom Gesualdo engaged to print his own madrigal partbooks; and from Vicenza, where Angelo Salvadori issued several items in the 1620s. To sum up: around 1600 Venice was still the most prolific centre; Milan came second, albeit remotely; and printing took place in about a dozen other cities. As Venice waned, Rome became a centre for editions of the elaborate music of the Counter-Reformation; among the major publishers were Nicolo Mutii (1595–1602), Bartolomeo Zannetti (from 1607), Luca Antonio Soldi (1619–25), Giovanni Battista Robletti (1609–50), Andrea and Giacamo Fei (1615–85), Antonio Poggioli (1620–68), the Mascardi family (c1620 – after 1719), Paolo Masotti (1621–37), Lodovico Grignani (c1630–50), Giovanni Battista Caifabri (1657–95) and Giovanni Angelo Mutij (1670–89). After 1650 Bologna slowly supplanted Rome as a printing centre (particularly for instrumental music), as Rome had supplanted Venice. The composer Maurizio Cazzati was particularly assiduous in seeing that his works were published; the printers of them included Vittorio Benacci (1659), Alessandro Pisarri (1660–62), the heirs of Evangelista Dozza (1663–4) and Gioseffo Micheletti (1687, also works by other composers in the surrounding decade). Giacomo Monti was active from 1639, and his successors

issued large amounts of music between 1668 and 1702, often in partnership with the publisher Marino Silvani (1665–1711). Venice re-entered the scene with Giuseppe Sala (1676–1715), also mainly a publisher of instrumental music, and the Bortoli family, active mostly in the decade after 1700.

English secular music publishing began with Thomas Vautrollier, who in 1570 printed a Lassus anthology; apparently it was commercially unsuccessful. As we saw above, five years later Tallis and Byrd received a royal patent, covering music printing and music paper. Their own *Cantiones sacrae* (1575³), also printed by Vautrollier, sold badly too. A hiatus of 12 years followed; by 1585 Tallis was dead, and Vautrollier's music type had been acquired by the printer Thomas East. Between 1588 and 1596 East printed for Byrd well over a dozen important partbook collections, mostly of madrigals. Byrd's patent expired in 1596, and Peter Short then began printing music (as well as Thomas Morley's *Plaine and Easie Introduction to Practicall Musicke* in 1595); William Barley also sponsored music books. In 1598 Morley became the successor to Tallis and Byrd, by obtaining another royal patent (although psalm books were excluded). Barley became his associate, and East and Short were forbidden to print music. But in 1599 Morley failed in an attempt to take over part of Richard Day's psalm book patent, and he died in 1602. This allowed East and Short to resume their music printing, and in 1607 John Windet entered the field as a printer, as did the publisher Thomas Adams as a claimant to the Barley patent. Their various successors were Humfrey Lownes (1604–13), Thomas Snodham (1609–24), William Stansby (1611–38) and Edward Allde (1610–15), all of whom printed madrigal partbooks. Folio books including lute tablature appeared alongside madrigal partbooks from 1597, but by 1610 the momentum to sustain an English music publishing industry was fading, and by 1620 new music was rarely published in England.

In northern and western Europe in the 17th century there arose a new kind of 'gentleman's musical edition', secular in its repertory, quiet, tasteful, often highly allusive in its texts in the manner of the emblem books of the day, and correspondingly neat and skilful in its printing. French *airs de cour*, issued by the Ballards in annual numbered series, were profitable enough to dominate the firm's production throughout the century; they also issued much French dramatic music, beginning with Cambert's *Pomone* (1671), continuing with more than a dozen tall folio scores of Lully operas (1679–88), and ending with another dozen by other composers (1688–94), mostly in large oblong quarto. In both of these genres one detects an aristocratic aura, in contrast to the mercantile character of their counterparts in other countries. German illustrated poetical-musical anthologies, for instance, challenge rather than flatter the reader to delight in them. Many of these songbooks, involving the poet Johann Rist and his circle of friends in the Elbschwanenorden, were issued after 1650 by the Stern family of Lüneburg. Much the same nationalistic spirit informs Adriaen Valerius's famous Dutch folksong collection, the *Neder-landtsche gedenck-clanck*, published in Haarlem in 1626 (1626¹⁴), as well as the later anthologies of Hendrik Aertssens in Antwerp, and the Czech songs issued by Jiří Labaun in Prague at the end of the century. Distinctly italianate gentlemanly tastes, on the other hand, are reflected in the music issued around 1600 by Pierre Phalèse (ii) in Antwerp and by Jean Bogard in Douai, in the 1640s by Paulus Matthysz in Amsterdam and in the 1650s by Jan van Geertsom in Rotterdam.

English music printing resumed with John Playford (i) (1651–84), who sensed the distinctive spirit of England's middle-class audience. He deserves to be recognized as the first great promoter among music publishers; and, judging from the quantity of his output and the extent to which many of the volumes seemed to be directed at a new musical market, he was one of the most successful. Printed at first by Thomas Harper and later by William Godbid, Playford's output ranged widely over song

anthologies, psalm books, instrumental works and instructional books (see Playford family family, fig. 3). It served to establish England's musical identity in the period culminating in the music of Henry Purcell, and enhanced the country's musical literacy in the generation before the advent of the popular sheet-music edition just after 1700. Among Playford's imitators were John Carr and his son Robert in London, sometimes in partnership with Playford; John Forbes and his son, also John, in Aberdeen (1662–1704/5), whose songbooks suggest an instructional market; and the little-known Robert Thornton in Dublin (*fl* 1682–1701). On Playford's death his son Henry continued his work, but with notably less success. Whereas John Playford's books had few competitors, Henry's shared the market with those of John Heptinstall (1686–1700) and William Pearson (1699–1735), both of whom used 'new round-note' music type in creating editions more legible and stylish than Playford's. Minor printers, mostly anonymous, issued broadside ballads with musical notation, many of them political in their messages, particularly during the days of the Popish Plots and conflicts over the succession during the final years of the century. The division of labour between printing and distribution is further reflected in the proliferation of music booksellers; John Hudgebut and in his later years Henry Playford were among the distributors, Edward Jones and Thomas Moore among the printers.

Music printing in the New World dates from the 1540s, when several plainchant books were issued in Mexico by Juan Pablos, followed by several other immigrant printers from Spain. In 1631 Juan Perez Bocanegra printed a ritual in Lima, in which polyphony appears in woodcuts on two pages, set to a vernacular text. The earliest surviving book printed in the English-speaking New World, the Bay Psalm Book, was issued in 1640 by Stephen Day at Cambridge in the Massachusetts Bay Colony. Containing no musical notation, it names the tunes to which the texts were to be sung, and the many editions that appeared during the next few decades showed a strong English influence in both content and method of production. Musical notation appeared for the first time only in the ninth edition ('printed by B. Green and J. Allen for Michael Perry' in Boston in 1698); crude woodcuts were used to produce the eight-page tune supplement and were re-used in several later editions.

Isolated single engravings notwithstanding (among them the superb picture motets executed by Jean Sadeler in the 1580s), the credit for being the first publisher to use engraving successfully belongs to Simone Verovio, who issued about 20 editions in Rome between 1586 and 1608. Although some were reprinted, he seems not to have recognized the powerful advantages of the process. Before the 18th century, music engraving was largely a luxury; it was useful because it conveyed better than letterpress printing the peculiarities of manuscript music notation, but it lacked the potential for the wide market of which merchants and earlier patrons assumed typeset music was capable. Music was printed from engraved plates before 1700 in several parts of Europe, almost all of it of considerable visual and musical distinction. Among Verovio's successors in Rome was Nicolò Borboni, who issued several lavish collections (1615–41). In Holland, the sumptuous Dutch *Bildmotetten* of about 1580 were followed in the 1610s by several delightful books by Nicolas Vallet called *Le secret des Muses*. The venerable *Parthenia* and parts of *Parthenia In-violata*, along with other collections, by Orlando Gibbons and Angelo Notari, were also engraved during this decade by William Hole in London. Occasional functional productions from around the mid-century (like William Slatyer's polyglot psalm book of 1652 and John Playford's edition of *Musick's Hand-Maide* of 1663) were followed by such sumptuous productions as the volumes of songs by Henry Bowman (1677) and Pietro Reggio (1680). In Germany, though broadside music engravings from the Augsburg shop of Lucas Kilian date from the early 17th century, extensive engraved editions, devoted mostly to instrumental music, do not appear to predate Sebastian Anton Scherer's *Tabulaturam* (Ulm, 1664). In France engraving seems to have been viewed

at first as an alternative to the typography controlled by the Ballard patent. Most of the engraved music is instrumental; it includes collections by Michel Lambert (1660–61), the Gaultiers (c1670), Chambonnières (1670), Corbetta (1671), Lebègue (?1678), Marais (1686–92), Raison (1688), D'Anglebert (1689), Nivers (1689) and Jacques Boyvin (1689–90). Hiérosme Bonneüil is named among the engravers. The hiatus during the 1690s reflects Ballard's successful injunction against the engraver Henri de Baussen and his publisher Henry Foucault. Resumption of engraving just before 1700, in editions that superseded the pretentious typeset Ballard editions of Lully operas of the previous decades, and in other works by Foucault and Pierre Ribou (1704–20), suggests that the commercial advantages of the process were now generally recognized.

In summary, the history of music publishing before 1700 is one of early brilliance and extended decline. The peak was reached before 1580, in Venice, Nuremberg, Paris and Antwerp. The decline was apparent by 1600 and is reflected in a diminished output, and in printing that was less spacious, less skilful and less original. Throughout the 17th century not only the same faces but, judging from the worn images, the same type was used, well past readability. The quality of the printing should be seen as a reflection of social conditions, which themselves reflect the changing interrelationships between composer, performer, patron and publisher as well as printer. Patronage was no doubt declining as a means of subsidizing music; thus, while lavish performances of new compositions continued to take place, publication of the scores was less frequently considered necessary (Lully's were the conspicuous exception).

The demise of music publishing over the course of the 17th century raises the question of why printed scores might have been deemed necessary and desirable in the first place – especially in view of the apparently modest degree of musical literacy at the time. The belief that performers (chapel singers especially) were taught by rote and the absence of signs of use on most extant copies (a counter-argument as much as a point in its own right) further support the speculation that early musical editions were printed less with the intention of circulating a composer's repertory, than as a demonstration of a patron's munificence and taste. Some works were clearly issued on the basis of guaranteed distribution of copies – hymnals, psalters and other service books for use by particular congregations, dioceses or churches, for instance, as well as *Gelegenheitskompositionen* – in order to obviate much of the need for formal publishing circumstances at all. Patronage, involving art music and made evident through a dedicatory text following the title-page, is presumably reflected in the great majority of other publications, although we still know little about the precise relationship between patron and musician (for instance as reflected in performance or other forms of subsistence rather than in subventions for publication) or about the precise forms of intervention by the music publisher. Venture publishing, as generally understood today, may thus be indisputably evident only in reprints, presumably prepared at the publisher's own expense and thus issued on the basis of his calculated speculation that copies could be sold. It is noteworthy, moreover, that the production of reprints follows a curve that, if anything, reinforces the production curve of music publishing in general: few reprints at first, many just before 1600 (and most of these from the four commercial centres), a rapid decline in production soon after 1600, and very few for the rest of the 17th century. Petrucci and his immediate followers had shown that music could be printed and published; it remained for the publishers of the following century to learn how this could be done to the best advantage.

3. The age of engraving, 1700–1860.

Music publishing during the next period – from the start of the careers of Bach and Handel to the height of the careers of Verdi, Wagner and Brahms – begins with the extensive commercial use of engraving and continues up to the first extensive use of offset lithography. It is a story of four cities: London from around 1700; Paris from between 1740 and 1760; Vienna from just before 1780; and Leipzig from around 1800. The activity in each city continued after the next rose to prominence; and the quantity of published music became cumulatively greater, as did the competition between publishers and the stimulation of general public interest in music.

In spite of the development of engraving, letterpress printing and manuscript copying continued to be used extensively throughout the 18th century. As late as the 1730s, Lelio Della Volpe in Bologna and Francesco Moücke in Florence were still issuing oblong anthologies of Italian cantatas badly printed from movable type. German publishers, chief among them Lotter in Augsburg, issued a variety of musical editions, notably treatises but also including a few instrumental collections and songbooks, using crude but complicated movable type, most of which had been cut around 1680 for use in Nuremberg. In Vienna, Van Ghelen and, later, Trattner issued handsome typographic music books after 1750. Throughout the 18th century and into the 19th, in France, Spain and Italy, typeset liturgical books and treatises on plainchant were still printed from movable type, as were the many Dutch and Genevan psalm books and German and Scandinavian hymnbooks. In certain circumstances, letterpress printing remained the most desirable method: when the musical notation was simple (or, in some cases, complicated but not requiring speed in performance); when fixed and generally large press-runs were involved; and when most of the volume consisted of text, as in treatises. After 1700 the publishing of typeset music thus came to be associated largely with pedagogic and amateur music and, to a degree, with the provincial more than with the cosmopolitan press. Conservative linear music type continued to be provided, notably by such firms as Gando in Paris and Caslon in London. Music typography was revived around 1750 through refinements introduced by men working in four countries; of these, however, Fournier in France and Enschedé (along with Rosart) in Holland produced little as publishers, while the English editions of Fougé and his successor, Robert Falkener, were mostly imitations of those of Leipzig engravers. The impact of Breitkopf throughout Germany and central Europe was much greater, since this firm was the only one of this group to survive into the next century and to involve a publishing programme built around the use of other graphic processes besides.

The competition between the various processes for disseminating musical documents involved not only letterpress and intaglio printing but also the manuscript-copying trade. One of the chief virtues of music ‘publishing’ in manuscript form, such as was used for 18th-century Italian opera, was that the use of manuscript offered the opera house or the composer a measure of control over the text that was unavailable when copies were printed and widely distributed. Before any forms of copyright were established, such a system of limited distribution seemed highly desirable. Furthermore, an opera house considering performance of a particular work that needed adjustments to suit local conditions could alter a neatly assembled typeset edition only with some difficulty; and because of the needs of singers and others involved in opera production, changes were always being called for. Instrumental music also came to appear often in manuscript rather than in typeset form, but for notational reasons. Type was harder to read than handwriting – short note values were particularly troublesome, since the beams were seldom continuous, and chords were impossible without breaking individual sorts of type.

Such problems did not exist with manuscript or engraving. By 1700 most of the current musical repertory had moved outside the world of music publishing as it involved letterpress printing. Italian music, if it was printed at all, was printed abroad, usually in Amsterdam or London. J.S. Bach saw little of his music printed, almost all of it instrumental, with utilitarian titles such as 'Übung', while aspiring German publishers themselves, such as Johann Wilhelm Rönningel, met with little success. In contrast, a study of the documents of the two dominant musical styles that were widespread throughout Europe in the 18th century – Neapolitan opera at the beginning and Viennese Classicism at the end – shows that manuscripts served the purposes of publication (in its widest functional sense) very effectively.

Extensive music publishing from engraved plates began in London and Amsterdam. Estienne Roger set up his shop in Amsterdam about 1690 and was soon engraving small oblong quarto piracies of Bolognese instrumental music. By 1700 his editions were large oblong folios, well executed with hand-drawn music on copper plates. His emphasis on Italian music suggests an international distribution of copies through northern and western Europe. After Roger's death in 1722, his son-in-law, Michel-Charles Le Cène, continued to publish until 1743. Dutch music publishing declined thereafter, although there were some important firms, among them Amédée Le Chevalier (1689–1702), Gerhard Fredrik Witvogel (1731–44), Joseph Schmitt (c1772–1791) and, especially, the family of Hummel (Amsterdam, by 1753–1822; The Hague, 1755–c1801; also in Berlin from 1770; for illustration see Vanhal [Vanhall, Wanhal, Wañhal, Wanhall], Johann Baptist). Nicolaas Barth (1775–1805) was succeeded by Lodewijk Plattner (1805–43) in Rotterdam, while the leading Belgian publisher from later in the century was Benoit Andrez in Liège.

London music publishers, inspired by the success of John Playford, experimented with new ways of printing and distributing music. While popular music was favoured by letterpress printers and their associates in London, engravers were attracted to Italianate instrumental music. Thomas Cross, who had engraved Purcell's *Sonnata's* in 1683, also prepared many single songsheets, undated but probably almost all from the last decade of the century; he later did the printing for the publisher Daniel Wright. He apparently used hard copper plates on which the signs were drawn by hand; in contrast John Walsh (i), who began publishing in 1695, later in partnership with Joseph Hare, seems to have used soft plates of pewter or lead, on which the signs were impressed with punches. Although their catalogues consisted at first of songsheets (sometimes collected into periodical series) and works of other publishers which he sold at his shop, Walsh soon began to issue instrumental music, much of it taken from continental sources. His speciality, however, was the anthology of 'Favourite Songs' from the London stage; in time he became the principal publisher of Handel's music. By 1736, when the elder Walsh died, London music publishing was well established.

Few competitors challenged Walsh during his lifetime. John Young was active just after 1700, while John Cluer, mostly in the 1720s, issued some handsome scores of Handel operas, neatly engraved by hand rather than punched, and in small format; so did the younger Richard Meares and, somewhat later, Benjamin Cooke. English letterpress printers, such as John Watts, also issued early ballad-opera librettos and song anthologies that included crude woodcuts of the tunes. There also appeared a multitude of songsheets naming no printer or publisher, which must have been sold casually at music shops, much like the earlier broadside ballads. George Bickham, famed for his engraved drawings and writing book, also engraved music, drawn free-hand and decorated with delicate illustrations; his style served as a model for Benjamin Cole. The French engraver Fortier also did striking work on several books, perhaps most notably the superb 1739 edition of Domenico Scarlatti's *Essercizi*. James Oswald,

active in Edinburgh in the 1730s, later published Scottish music in London, as William Thomson had done in the 1720s, while in Dublin John Neale was active in the 1730s, William Manwaring in the 1740s, and Samuel Lee from 1752.

Walsh's son John maintained the firm for another 30 years after his father's death. Other publishers came into prominence, notably John Simpson (1730s and 40s); John Johnson (c1740–1762, his widow to 1777); the Thompson family, including variously Ann, Peter, Charles, Samuel and Henry (c1750–1805); Robert Bremner (by 1757–1789); Peter Welcker and his heirs (1762–85); William Forster, the violin maker, with his son (c1762–1821); the firm of William Randall, the heir to Walsh (1766–83, in turn succeeded by Wright & Wilkinson, and Wright alone to 1803); William Napier (1772–1809), Robert Wornum and his heirs (c1772–1900, also a piano maker); John Preston (c1774–1798), whose son Thomas ran the firm for the next 36 years; James Harrison (1779–c1803); Joseph Dale and his heirs (1783–1837); James Longman (beginning c1767) with various partners, most notably Francis Broderip (1776–98), important as the first music publisher to deposit his new publications at Stationers Hall for copyright purposes, and probably the most prolific of all London music publishers in the 1790s; Robert Birchall (1780–1819), whose catalogue is distinguished by music from the Continent, including early Beethoven editions of notable textual authenticity; and John Bland (c1776–1795), famous as one of the first publishers to announce his new editions through thematic catalogues. The editions of these publishers consisted of instrumental music in imitation of the editions which were appearing at this time from Paris and Amsterdam (including, for example, series of 'Periodical Overtures') and songs from English comic operas and from the pleasure gardens. Prominent music engravers whose names are occasionally inscribed in the editions include Henry Roberts (c1737–c1765) and John Phillips (c1740–1775).

English music publishing continued to flourish during the 19th century as firms sprang up, dissolved, merged and separated, and sold their titles, plates and stocks. Thompson was succeeded by Robert Purday (with S.J. Button, 1806–8, thereafter as Button & Whitaker), Preston by Coventry & Hollier (c1833–1849). George Goulding (c1786–1798) merged with Thomas d'Almaine, who after further partnerships eventually managed the firm alone (1834–67), while Lewis Lavenu's firm (1796–1818) underwent several changes of ownership before passing to Addison & Hodson. The flautist Tebaldo Monzani worked alone (1787–1800), then in partnership with Giambattista Cimador and Henry Hill, the latter eventually managing the firm alone (1829–45). Several workmen early in the century began firms that are still active, notably Samuel Chappell (1810–), Vincent Novello (1811–), Thomas Boosey (working in music from 1816) and Johann Baptist Cramer (from 1824). The last of these was one of several London firms established by a virtuoso pianist, the most important earlier one being that of Muzio Clementi; the Corri family and J.L. Dussek are among the other notable composer-publishers. Other firms included Metzler (1812–1931), and Keith, Prowse & Co. (1815–). By the 1840s special emphases were beginning to emerge: George Henry Davidson (c1833–81) concentrated on cheap editions of popular music, as Novello did with serious music; Robert Cocks (1823–1904) maintained a large circulating library; Leader & Cock (1842–87) issued art songs of William Sterndale Bennett; while Joseph Williams (1843–1961, based on his mother's firm, founded 1808) emphasized light opera. John Distin (1845–74) specialized in brass music, as did Boosey, which eventually acquired the firm. Christian Rudolph Wessel (in business with William Stodart from 1823, with Frederic Stapleton 1839–45, alone 1845–60, succeeded by Edwin Ashdown) specialized in foreign music and issued important Chopin editions, while Ewer (c1823–67, merged to become Novello, Ewer & Co. to 1898) specialized in Mendelssohn. Augener (1853–), initially also an importer, at first issued only lithographed editions.

British music publishing was not confined to London. Samuel and later Philip Knapton worked in York (c1796–1829), while the elusive firm of Wheatstone was active around 1815 in Bath. Country psalmody printers flourished particularly in the 1740s, among them the itinerant Michael Beesly in the Berkshire-Oxfordshire area, and Michael Broome in Birmingham. Smollet Holden, specialist in military music, issued several collections in Dublin shortly after 1800. The Dublin haberdashery shop of Benjamin Rhames and his heirs (1756–1810) and later the family of Hime (before 1790–1879), active in Liverpool, Dublin and Manchester, specialized in songsheets, many of them copied from London editions. William Power in Dublin, with his brother James in London, was responsible for two of the most famous editions of folk music, the *Irish Melodies* (1808–34) and *National Melodies* (1818–28) of Thomas Moore. Equally important were the editions of national songs by George Thomson in Edinburgh (1793–1845), to which Pleyel, Haydn, Beethoven, Weber and Hummel contributed. The Edinburgh firms of Bremner and Corri – branches of London firms bearing these names – often published their own music. Other Edinburgh publications bear the imprints of the cellist J.G.C. Schetky (mostly 1780s and 90s), Muir & Wood (1798–1818, in time succeeded by Penson, Robertson & Co., c1807–37) and Purdie (c1809–1887). James Johnson (1772–1811) served as the engraver for most of these editions, although he also published several major works. The firm of Paterson (c1819–1964) eventually expanded from Edinburgh to several other Scottish towns as well as to London (it was taken over by Novello in 1989). Glasgow’s music publishers began with James Aird, working around 1780, and culminated with J. Muir Wood (1848–99, earlier a branch of an Edinburgh shop begun in 1798 by John Muir and Andrew Wood). Irish music publishers included Dennis Connor, who issued harp music in the late 18th century, and Anthony Bunting, who was active around 1820.

British music publishing never forgot its origins in the popular songsheet. The annual output of several hundred such editions a year, a level established soon after 1700, appears to have persisted throughout the 18th century and into the 19th. Gradually the single sheet, printed on one side, was expanded into two sheets, printed on inside pages. A cover was often added; later, especially with the advent of lithography, a picture was sometimes included. Most publishers were happy to include in their catalogues both songsheets and other popular forms, as well as more ambitious forms such as sonatas and symphonies. Through agreements for simultaneous publication between British publishers and continental publishers or composers, a kind of international copyright was effected. British music publishers remained largely committed to the process of engraving, and thus they tended to maintain their identity (apart from the publishers of religious service books and song anthologies issued in small format and in large press-runs with movable type). Three 19th-century uses of movable music type by music publishers, however, deserve mention. Editions using solfège notation promoted by such firms as Curwen (founded 1863) were printed with type: they played a large part in the spread of the English choral tradition. William Clowes in London, later in Beccles, also used type for such popular publications as Charles Knight’s *Musical Library* (1834–7). Novello used type for its ‘cheap music’ programme begun in 1847, through which major vocal works were widely circulated for many years.

In 18th-century France the Ballard family continued to hold its royal monopoly for music printing up to the Revolution. But the output of its press was neither particularly large nor central to Paris music, consisting mainly of popular songs and treatises. Music publishers were again established in Paris, on the basis of a court decision that engravings fell outside the Ballard privilege, in effect thereby destroying its monopoly. Extensive activity did not flourish until the second third of the century, when some composers arranged for their music to be issued by Charles-Nicolas Le Clerc (1736–74), a

violinist who served as publisher, and distributed by François Boivin (1721–33, his wife, who was of the Ballard family, to 1753). Typically, these editions are small oblong folios, devoted to anthologies of dances, *airs* and cantatas and to current dramatic music.

The 'classical' period of Parisian music publishing, which began well before 1750, reached its peak in the 1770s and 80s. The main early operatic publisher was La Chevardière (1758–84); other publishers, such as Le Menu (1740s–1790), Marie-Anne Castagneri (1748–87), Jean Baptiste Venier (1755–c1784), the Bureau d'Abonnement Musical (1765–c1783), Antoine Bailleux (1760s–1798) and Georges, and later Jacques-George, Cousineau (1760s–1822, the family later important as harp makers and harpists), specialized in instrumental music. François-Joseph Heina (1773–c1785) specialized in chamber music by his fellow Czechs. Whether issued serially, in annual cumulations, or as 'periodical' symphonies or overtures, editions from this period are mostly in large folio format, usually upright for operas but oblong for instrumental music. Many of the leading engravers of the period were women, among them Mme Leclair (wife of the composer) and Mlle Vendôme. This was the time when publishers' catalogues – expandable lists engraved on separate plates which called attention to other available titles – were commonly added to their editions.

Parisian classical editions proved successful enough to be widely imitated in London and Amsterdam and eventually in Germany. In Lyons, Guéra (c1776–88) and Castaud were active; through Anton Huberty, an engraver in Paris in the 1760s, French music publishing practices were transplanted to Vienna when he moved there in 1777. In Paris, the classical style persisted until the Revolution, after which three changes gradually took place: single songsheets began to be issued more frequently; the slender and well-spaced pre-Revolution opera score, with few instruments and on large staves, was replaced by a full score, thicker and with more parts exactly specified; and the method book, usually for specific instruments but also for singing and solfège, gained importance while the editions of chamber music parts slowly declined. Among the firms that particularly flourished in the decades after the Revolution were Jean-Georges Sieber (c1770–1822), Naderman (1770s–c1835), Lemoine (from 1796), Leduc (Pierre and, later, Auguste, 1775–1837), Imbault (c1782–1812), Pleyel (1795–1834) and the Gaveaux (1795–1829). This period also saw the establishment of two firms named Magasin de Musique, the first (1794–1825) resulting from government decree and later associated with the Conservatoire, the second (1802–11) based on a partnership between six composers.

Soon after 1750 the Breitkopf shop in Leipzig began to show an interest in music. His importance in music typography apart, Johann Gottlob Immanuel Breitkopf deserves mention for his music publishing strategy. His remarkable plan involved the three major methods of the day for committing music to paper: manuscript copying, engraving and letterpress printing. He chose to do battle with the engravers, now well established in London and Paris and beginning to appear in Amsterdam and various German cities, by using the other two graphic processes instead. His typeset music had the disadvantages and advantages of typeset books: the size of the edition needed to be determined in advance before copies were sold, and internal changes were difficult; but presswork was likely to be much cheaper once the type was set, and thus Breitkopf could print editions in large numbers and distribute them widely at a low price, creating his own market. His contribution to the rise of the sentimental German song of the *Sturm und Drang* period is probably considerable. He was also willing to sell his type to other printers and to print music for other publishers – among them Winter (1750–87) and Rellstab (1779–1812) in Berlin, Hartknoch (1763–1803) in Riga and Schwickert in Leipzig (1776–92) – thus increasing the use of his kind of musical edition. He developed his own copying programme, through which he provided on demand a very wide repertory of music that would not have

justified large, typeset editions; his great thematic catalogues were issued for these manuscript copies. Breitkopf thus attempted, in effect, to head off the efforts of the music engravers: with his popular editions, set in type, he undersold them, and with his manuscript copies he circulated a larger repertory than they could afford. This strategy apparently succeeded for a time. Its effectiveness had declined by 1800, probably because the music engraving industry had become too extensive and thus was much closer than Breitkopf to the musicians themselves in Paris, England, the Netherlands and Italy. Even so, the firm was now well established as a music publisher, and much of the groundwork was laid for Leipzig to become the centre of European music publishing a few years later.

During the second half of the 18th century, music publishing spread from Paris and London to Amsterdam and various German cities. Several Nuremberg engravers from around the mid-century, including Balthasar Schmid and his heirs (1725–c1786), Johann Ulrich Haffner (c1740–1767) and members of the Weigel family (active through most of the century), produced only a few editions, but with interesting music and distinctive appearance. The Dutch firm of Hummel, established in Amsterdam about 1754, competed strongly with Paris and London for many years, especially through its extensive chamber music catalogue. Particularly important about 1780, the firm declined around 1800, and Amsterdam ceased to be an important music centre. In several German cities music publishing was established before 1800, based on practices derived from Parisian engraving rather than from Breitkopf's typography. Among the important men who began to work at this time were Johann André in Offenbach (1774), Bernhard Schott in Mainz (1780), J.M. Götz, mostly in Mannheim (1780), H.P. Bossler, mostly in Speyer (1781), F.E.C. Leuckart in Breslau (from 1782, later in Leipzig), Macarius Falter in Munich (1788), Nicolaus Simrock in Bonn (1793), J.A. Böhme in Hamburg (1794), J.P. Spehr in Brunswick (1791) and G. Gombart in Augsburg (1795). Of these, André and Falter were additionally important in the first years of the 19th century as early users of the lithographic process.

Vienna became the earliest major centre of German music engraving, and the third important European centre, thanks mostly to the diversity of its musical market – manuscripts from Italy, engravings from Paris, typeset editions from Leipzig – but also because its music shops had been affiliated more closely with art dealers than with booksellers. Parisian-style engravings were first available in Vienna after about 1770, and the Parisian publisher Huberty settled there in 1777. No less important as an engraver was Christoph Torricella, and through the efforts of two other Italians, Carlo and Francesco Artaria, Viennese music publishing began to flourish in 1778. Artaria's editions were immediately successful, and this firm dominated Viennese music publishing until the end of the century. The composer Franz Anton Hoffmeister, who founded a firm in 1784, ranks alongside Artaria both for his important and ambitious editions and for his varied dealings with other publishers, notably his sale of selected titles to Artaria in the 1780s, his ties to Kühnel in Leipzig from 1800, and his eventual merger with Senefelder in 1807. Other early Viennese music publishers included Hieronymus Löschenkohl (c1770–1806), a specialist in cheap engravings; Johann Traeg (active as a dealer in manuscript material from 1781), later Breitkopf's agent as well as his own publisher; Laurenz Lausch (1782–?1801), also a copyist; the composer Leopold Kozeluch, trading as the *Musikalisches Magazin* (active 1784–1802); Joseph Eder, who was later in partnership with and eventually succeeded by his son-in-law, Jeremias Bermann (1789–c1840); the several partners who made up the Hoftheater-Musik-Verlag (1796–1822); Ignaz Sauer (1798–1825, latterly in partnership with Maraus Leidesdorf, who was sole owner 1826–32); and Carlo Mechetti, succeeded later by his nephew Pietro and Pietro's widow (1799–1855).

By 1798 Tranquillo Mollo had left Artaria and set up his own shop, and three years later Giovanni Cappi did likewise. In 1801 the Kunst- und Industrie-Comptoir (or Bureau des Arts et d'Industrie) opened, managed by five men including Joseph Sonnleithner, the librettist of Beethoven's *Leonore* (1805). In 1803 the inventor of lithography, Alois Senefelder, moved to Vienna to establish his Chemische Druckerey, in competition with the various engravers of music, maps and other documents. Thus a period of diversification in Viennese music publishing began, as publishers experimented with new technical processes to challenge the established firms. Major aspirants from the next few years include Thaddäus Weigl (1803–31), Pietro Cappi (founded 1816), Ludwig Maisch (1810–16), Anton Paterno (founded 1820), modest in his ambitions, and Anton Pennauer (1825–34). Not until after 1820 did clear leaders begin to emerge. Anton Diabelli (founded 1817, jointly with Cappi in 1818) is also known for the famous piano waltz on which many composers, notably Beethoven, wrote variations. Sigmund Anton Steiner acquired Senefelder's shop in 1812 but soon returned to engraving for his editions, moving the lithographic production to the short-lived Lithographisches Institut. By the mid-century the main publishers were S.A. Spina (partner of Diabelli 1824–51, succeeded by his nephew Carl Anton Spina, publishing alone to 1879) and Tobias Haslinger (1826–42, his heirs to 1875; successor to Steiner), whose catalogues were rich in earlier publishers' titles but also distinguished by ambitious and imaginative projects of their own. After 1874 the firm of Doblinger became important in the city's musical life. Viennese publishing owed much to the local community of composers, not only Mozart, Beethoven and Schubert, but also the many *Kleinmeister* whose efforts were devoted more to amateur instrumental music than to the songs so popular in Paris and London, and prepared the way for the lucrative properties of the Strauss waltz repertory. In appearance the early Viennese editions – clumsily punched with crudely designed signs, and printed from plates that were frequently cracked and were seldom wiped completely clean – recall the 18th century, in contrast with the handsome, well-executed London and Paris editions. As the centre of music publishing moved to Leipzig, Viennese editions improved in appearance, at a time when their repertory was moving in the direction of virtuoso keyboard music and Strauss waltzes.

About 1800 Leipzig began to emerge as a fourth centre of music publishing, and in due course the greatest. Breitkopf's firm, now Breitkopf & Härtel (and managed by G.C. Härtel), still experimented with different methods of printing, including lithography, but finally settled on engraving around 1811. In 1801 the Viennese publisher Hoffmeister entered into a highly successful partnership with Ambrosius Kühnel as the Bureau de Musique: it was acquired by C.F. Peters in 1814. In 1807 Friedrich Hofmeister (not to be confused with Hoffmeister) began his activity as a publisher; he later acquired from Carl Friedrich Whistling the rights to the great bibliography of new German printed music now commonly known by his name. Other major Leipzig firms founded before 1860 include Heinrich Albert Probst (1823–36, thereafter in partnership with Carl Friedrich Kistner; in 1919 it merged with the firm of Siegel & Stoll, 1846–50, thereafter C.F.W. Siegel), Bartolf Senff (1847–1907), Merseburger (1849–, specializing in Lutheran church music), C.F. Kahnt (1851–) and A.R. Forberg (1862–, important for its affiliation with the Moscow firm of Jürgenson). The firm of F.E.C. Leuckart moved from Breslau to Leipzig in 1870. Leipzig, drawing its support from the local book-publishing industry and from the Gewandhaus and the conservatory, inevitably became the centre of German music publishing at a time when German tastes prevailed in most of the Western world.

Established German firms outside Leipzig continued to flourish, among them André in Offenbach, Schott in Mainz (which in due course acquired the rights to Wagner) and Simrock (which moved from Bonn to Berlin in 1870, having established a close relationship with Brahms and, through him, Dvořák);

so too did Spina, Mechetti and Haslinger in Vienna. Berlin challenged the primacy of Leipzig through Simrock as well as important new firms such as A.M. Schlesinger (1810–64, succeeded by Robert Lienau), Traugott Trautwein (1820–1902), C.A. Challier (1835–1919, succeeded by Richard Birnbach), Bote & Bock (1838–), Adolph Fürstner (1868–1986, whose operatic properties included many by Richard Strauss) and Ries & Erler (1881–; Hermann Erler from 1872, Franz Ries from 1874). Important firms elsewhere were Gombart (1795–c1844) and Andreas Böhm (1803–) in Augsburg, Joseph Sidler (1812–28/9) and Joseph Aibl (1825–1904) in Munich, August Cranz in Hamburg (1814–, later in Leipzig, and, through acquisition of the Spina firm, publisher for the Strauss family), Anton Benjamin in Altona (1818–, later in Hamburg, Leipzig and London), Tonger in Cologne (1822–), Julius Schuberth in Hamburg (1826–91, at times in Leipzig and New York), F. Pustet in Regensburg (1826–1978, specialists in Catholic church music, with offices in the USA and Rome), Karl Ferdinand Heckel in Mannheim (c1822–, who issued Hugo Wolf editions), Heinrichshofen in Magdeburg (active from 1797, but in music only from the mid-19th century), Henry Litolf in Brunswick (1828–1940, owned originally by E.M. Meyer), Adolph Nagel in Hanover (1835–) and the brothers Pazdírek (in Vienna, 1868–80, also in Moravia, and creators of the massive *Universal-Handbuch*, 1904–10, listing music in print). Music publishing involved both the music of famous composers like Schumann, Mendelssohn and Liszt and a vast output of salon orchestrations, arrangements of operatic favourites, sentimental songs (singly and in series) and instructional pieces.

Important new firms active in 19th-century Paris included Erard (1798–1840, an adjunct to the harp factory), Richault (1816–98), Carli (c1805–1919), Pacini (1808–46 and later), Janet & Cotellet (1810–91), Frey (1811–39), Maurice Schlesinger (c1821–1846, affiliated with the Berlin family firm), Troupenas (c1825–1850), Georges Schonenberger (1830–75), Heugel (1839–1980), Alphonse Leduc (c1842–; not related to the earlier firm of Pierre and Auguste), Escudier (1842–), Choudens (1854–), Brandus (1846–99), Flaxland (1847–69), Georges Hartmann (1866–91) and Costallat (founded in 1880 with the acquisition of the earlier firm of Enoch, 1867–, and known as Enoch Frères & Costallat). The musical repertory of Parisian publishing broadened considerably, although the three basic forms persisted. Songs, for instance, enjoyed a vogue after 1830 with the rise of lithography, although, as in England, works with rudimentary accompaniment and printed on a single sheet were replaced by songs with a florid vocal line and sentimental text, heavily accompanied by piano or often guitar, printed in an edition of several pages with a decorative cover. Thanks to current interest in music pedagogy, and stimulated by the Paris Conservatoire's acting as a publisher in its own right, the method book enjoyed great popularity. The published opera full score, on the other hand, did not prove feasible and declined during the first quarter of the century. About 1840 it was succeeded by the smaller vocal score in so-called Parisian format, which served to circulate the music of French and Italian Romantic grand opera.

Before 1810 there were very few music publishers in Italy, where the scene was dominated by copyists, and those who did attempt to publish, such as Luigi Marescalchi (c1770–99) in Naples and Alessandri & Scattaglia (c1770–1803) and Antonio Zatta (1786–c1806) in Venice, encountered great difficulties. The control was not broken until 1808, when Giovanni Ricordi began issuing the operas of Rossini and his contemporaries. His firm's pre-eminence among Italian publishers was assured with the advent of his son Tito Ricordi, and their most successful composer, Giuseppe Verdi since then the name of Ricordi has been virtually synonymous with Italian opera, with rights to major works of the *verismo* period and onwards. Other firms included Luigi Bertuzzi (1820–47), Ferdinando Artaria (1805–37), Luigi Scotti (c1815–1845), the Carulli family (1822–32), Lucca (1825–88), Giovanni Canti (c1835–1878)

and Sonzogno (active in music from 1874) in Milan; Lorenzi (1812–19) and Guidi (1844–87) in Florence; Girard (1815–70) and his successor Teodoro Cottrau (1848–84), also Clausetti (*fl* c1850), in Naples; Ratti, Cencetti & Comp. (1821–?1844) in Rome; and Giudici & Strada (1859–1930) in Turin. Ricordi and Sonzogno in particular extended their activities beyond the work with scores into matters of production, reputedly involving the choice of singers and the inevitably convoluted politics of the opera house.

In Switzerland the firms of Hans Georg Nägeli in Zürich (1791–, renamed Gebrüder Hug in 1817) and Rieter-Biedermann in Winterthur (1848–84, later in Leipzig) followed the practices of their German and Viennese counterparts. Germans were also responsible for the important early work in countries to the east. The Kunst- und Industrie-Comptoir in Pest (1805–22), for instance, began as a branch of the Vienna shop with the same name. Other shops in Pest (later in Budapest) included those of József Wagner (1839–58) and József Treichlinger (1844–74, successor to several earlier Budapest publishers), as well as Julius Rosenthaler (Gyula Rózsavölgyi, 1850–), who acquired most of the earlier firms and whose shop survives to today; Gusztáv Heckenast (1834–78); and Nándor Táborosky, who issued many Liszt editions. In Warsaw the leading early publishers were Franciszek Klukowski (c1816–1858), Antoni Brzezina (1822–31) and his successor, Gustaw Sennewald (1828–1905), and Rudolf Friedlein (1839–65) and his successors, Gebethner & Wolff (1857–1939); in Kraków, Stanisław Krzyżanowski (1870–1964) developed a catalogue strong in contemporary Polish music. Prague's earliest important publisher was Karel Vilém Enders (?1809–1832). Marco Berra (1811–1853), who began work in Vienna before returning to Prague to become its major publisher, was succeeded by his son-in-law Jan Hoffmann and Hoffmann's heirs (c1841–?1918); also important in Prague were Emanuel Starý (1870–1949) and Urbánek (1872–1949). In Bucharest Anton Pann specialized in psalmody and native music publications around 1850; the firm of Gebauer also flourished there for nearly a century (1859–1945). In St Petersburg, J.D. Gerstenberg (1792–) acquired the stock of most of the smaller firms to become the leading publisher of his day. Among Swedish publishers, Olof Åhlström (1783–1835) was the earliest, while J.C. Hedbom (1827–52), Abraham Hirsch (1829–84) and Abraham Lundquist (1837–1915) were the most prolific; Carl Warmuth began publishing in Christiania (Oslo) in the 1840s. In Copenhagen, Søren Sønnichsen (1783–1826) was highly productive, as were the composer C.C. Lose (1802–79) and Horneman & Erslev (1846–79). Music publishing in the Hispanic world was slow to be established. The Lisbon firm of Sasseti began in 1848, while around 1900 the Bilbao firm of Ernesto Dotesio acquired many smaller Spanish firms and in 1914 became the Unión Musical Española.

Freehand music engraving was introduced into English colonies in New England as part of the reform movement of congregational singing, and in two celebrated instruction books published in Boston in 1721: John Tufts's *A Very Plain and Easy Introduction to the Singing of Psalm Tunes* (the first extant edition is the third, 1723, 'printed from copper-plates, neatly engraven ... for Samuel Gerrish'), and Thomas Walter's *The Grounds and Rules of Musick*, printed by James Franklin, also for the bookseller Gerrish. Freehand engraving continued to be used in the early Yankee tune books, which bear the names of America's prominent copperplate engravers: Thomas Johnston, who engraved his own booklet of rules for singing (1758) as well as several editions of Walter's *The Grounds and Rules of Musick* around 1760; Henry Dawkins (James Lyon's *Urania*, 1761); Paul Revere (Josiah Flagg's *A Collection of the Best and Most Approved Tunes*, 1764, and *The New-England Psalm-Singer* by William Billings, 1770); John Ward Gilman, who engraved several books around 1770, including American editions of works by the English psalmodist William Tans'ur; and Amos Doolittle, who prepared most of Daniel Read's compilations.

Movable type was introduced in the English colonies by Christopher Saur in Germantown, Pennsylvania; his sacred collection *Kern alter und neuer ... geistreicher Lieder* (1752) was the first of several German religious books with music issued from his press in subsequent decades. Although Saur is thought to have cast the type himself, his matrices came from Europe, probably Frankfurt. The music typeface used in William Dawson's *The Youth's Entertaining Amusement* (Philadelphia, 1754) appears to be unique; Wolfe identifies the printer as Anton Armbrüster, who also issued the collection *Tunes in Three Parts* in 1763. The last of the early American music typefaces, acquired from the Dutch firm of Enschedé, is seen in two books printed for the Reformed Protestant Dutch Church in New York; Francis Hopkinson's translation of *The Psalms of David* (1767) and *A Collection of the Psalm and Hymn Tunes* (1774).

Movable type began to be used more frequently in the 1780s, when the founts were first imported from the Caslon foundry in London. This also marked the rise of specialist publishing (exemplified by a broadside songsheet printed by William Norman in Boston in 1783) and of religious music publishing. In 1785 Isaiah Thomas in Boston and Worcester and William McCulloch in Philadelphia imported founts, and the adoption of this practice eventually led to the decline of freehand engraving, as well as to the establishment of a formal repertory of religious music and the tune book as a distinct physical object. Set in movable type, such tune books were oblong in format and bound in heavy boards; a theoretical introduction generally preceded the music. Most of the several hundred different tune books that appeared around the turn of the century were printed in the Caslon typeface, in the special music type without staff lines developed by Andrew Law for his solfège system, or in a new and tidier face (which also had a special solfège version) introduced soon after 1800 by the Binney & Ronaldson foundry in Philadelphia. Centred at first in the cities of the East Coast, religious music publishing eventually spread to the west and south and resulted in the publication of collections of sacred music (especially hymns) by Lowell Mason and his contemporaries, as well as the shape-note tune books.

As early as 1768 John Mein and John Fleming prepared a broadside engraving of *The New and Favourite Liberty Song*, the plates for which were used in *Bickerstaff's Boston Almanack* for 1769. In 1786 Chauncey Langdon's *The Select Songster* was engraved in New Haven by Amos Doolittle, and during the course of the next few years a group of prominent Philadelphians – Alexander Reinagle the composer, John Aitken the engraver, Thomas Dobson the pressman, Henry Rice the bookseller and Francis Hopkinson the composer and patron – assembled their talents to produce several major anthologies: vocal and instrumental collections by Reinagle (notably a set of keyboard variations thought to be America's first purely secular musical publication), Hopkinson's famous *Seven Songs* (1788), and a Roman Catholic service book. The introduction of music engraving punches in America can probably be traced to these books.

Sheet-music publishing was firmly established in America by the mid-1790s. In 1793 J.C. Moller and Henri Capron established a music shop in Philadelphia and published four issues of *Moller and Capron's Monthly Numbers*, a periodical collection of vocal and instrumental music, although their business was soon taken over by George Willig (1794–1856). Benjamin Carr settled in Philadelphia in 1793 and soon published music (1794–c1820); that year J.H. Smith and James Harrison founded short-lived companies in New York, as did the more successful James Hewitt (1793–1825) and George Gilfert (1794–1814). In 1794 Carr's father Joseph moved from London and opened a shop in Baltimore and Frederick Rausch established another in New York. Peter Albrecht von Hagen started his own firm in Boston (c1798–1803). These firms, all located in urban centres, had close ties with the theatrical companies that were also being founded at the time. Many of the publishers themselves had been

theatre musicians, and their catalogues consisted largely of theatre songs. At the turn of the century two more major publishers were established, Gottlieb Graupner in Boston (by 1797–1835) and George E. Blake in Philadelphia (1802–c1850). While Philadelphia maintained its leadership through the shops of Willig and Blake, New York grew in importance through the work of somewhat smaller firms, including those of Edward Riley (1806–51), John Paff (1798–1817), Joseph Willson (1812–20), the Geib family (1814–58) and William Dubois (1813–54, successor to Paff). John Rowe Parker was important in the music trades in Boston (1817–24) as well as for many other musical activities, while Oliver Shaw in Providence (1817–48) was also a respected composer. Early publishers in Charleston, South Carolina, included Charles Gilfert (1817–27) and John Siegling (1819–1970).

A significant development occurred in the late 1820s, when lithography, first used about 1822 by Henry Stone in Washington, was taken up more extensively in New York by Edward S. Mesier, Anthony Fleetwood and G. Melkham Bourne. Notable early examples of the process can be found in editions of *Jim Crow* and other works in the emerging repertory of blackface minstrelsy. These developments further reflect the rise of ‘Jacksonian democracy’, with its emphasis on the new values of the western frontier rather than the more traditional values cultivated in the eastern cities. Early music lithographs, with their imperfectly drawn musical text but better prospects for music illustration, interested a public different from the one that purchased engraved music editions, now largely devoted to the fashionable repertories of Italian opera and guitar songs. While the London repertory thus ceased to dominate music publishers’ catalogues, the fashions of guitar accompaniments, sentimental texts and illustrated covers suggest that America’s music publishers still generally retained their London models. Lithographic sheet music virtually disappeared in the 1830s, perhaps because the engraved editions looked so much less amateurish. The process re-emerged, however, in the 1840s with the development of chromolithography for cover illustrations; notable among the specialist shops using this technique, by which several colours could be printed, were John H. Bufford, W.S. and J.B. Pendleton, and B.W. Thayer in Boston; Peter S. Duval and Thomas Sinclair in Philadelphia; and Nathaniel Currier (famous through his later partnership with J. Merritt Ives), George Endicott, and Napoleon Sarony of Sarony, Major & Knapp in New York.

In the 1830s Baltimore publishers were particularly active, notably John Cole (1822–39, including the production of sacred music) and the younger George Willig (1829–74, his heirs to 1910). The 1840s saw the emergence in Boston of Henry Prentiss (1825–47), Charles Keith (1833–47), Elias Howe (1843–50, 1860–1931) and George D. Russell (variously with George P. Reed, Nathan Richardson and Henry Tolman, 1849–88); in Philadelphia James G. Osbourn (1831–48), Leopold Meignen (alone and in partnership with Augustus Fiot, c1835–55), Lee & Walker (1848–75) and, more famous but less extensive, the brothers Winner (Septimus and Joseph, 1845–1918); and in Baltimore Frederick Benteen (later Miller & Beacham, 1838–73). Also in the 1840s the family of William Cumming Peters (1820s–1892) became active in Pittsburgh, as well as in Baltimore, Cincinnati and Louisville. Music publishing in San Francisco flourished during the Gold Rush years, the firms of Atwill (1852–60), Matthias Gray (1858–92) and Sherman (1870–, as Sherman & Hyde 1871–6, then as Sherman, Clay & Co.) being particularly important. While several important new firms were active on the East Coast in the 1850s (among them S.T. Gordon, mostly in New York, 1846–1941, Henry McCaffrey in Baltimore, 1853–95, and Horace Waters in New York, 1845–1940s), more significant activity was taking place in the west, involving such major firms as Balmer & Weber in St Louis (1848–1907), Root & Cady in Chicago (1858–72) and Silas Brainard in Cleveland (1845–1931). Smaller firms in the west included William F. Colburn in Cincinnati (1849–59), Henry N. Hempsted in Milwaukee (1851–98), John Sage in Buffalo (1850–71), David P. Faulds (1854–1903) and Louis Tripp (c1857–1875) in Louisville and H.M. Higgins in Chicago

(1855–67). Confederate firms included A.E. Blackmar (in Vicksburg, Mississippi; Augusta, Georgia; and New Orleans, 1858–88) and W.T. Mayo (1841–54), Philip P. Werlein (1853–) and Louis Grunewald (1858–1969) in New Orleans. Foremost among America’s music publishers by the middle of the century were the various partnerships in New York of Firth, Hall & Pond (1815–75 and later; they issued much of the music of Stephen Foster) and Oliver Ditson in Boston (1835–1931, perhaps the most important of all American music publishers in the late 19th century).

4. The age of offset printing, 1860–1975.

The third main era in the history of music publishing began with the introduction of offset lithography. In Leipzig, established as the centre of music publishing, the firm of C.G. Röder, specialists in music engraving and printing from 1846, successfully used a lithographic steam press as early as 1863, and by 1867 was engraving and printing music for Peters as well as other publishers in Leipzig and throughout Europe. The effect in time was a vast increase in the amount of printed music, the output of which reached a highpoint around 1910, gradually receding thereafter in response to the advent of sound recording and broadcasting. Throughout much of the world, music publishing prospered as never before in the late 19th and early 20th centuries, although particular firms have waxed and waned under the impact of commercial events and fashions in the musical repertory. Whether in Paris, London, Milan or New York, affluence is evident from the vast quantity of published music. Generally, the successful publishers were either those who were perceptive enough to identify emerging musical tastes or those who were able to fix the graphic appearance of their editions and devote their content mostly to salon music or other works that would sell – what are now frequently disparaged as musical trivia. The basic format became the single songsheet, supported by arrangements for salon orchestra or dance band. World War I stimulated the publication of patriotic songs, especially in the larger countries.

Qualitative considerations became interwoven with commercial considerations, however, as publishers promoted their titles beyond national boundaries. To the extent that quality is determinable through analysis, furthermore, the very function of the musical document may be seen to change. Before 1860 music was issued mostly for the use of performers, and thus was (as it still is) likely to be sold at stores that also sold violin strings, piano-tuning supplies, music stands, guitars, small instruments and the like, rather than at bookshops. Music designed for study purposes first appeared in the late 19th century, as a result of the rise of public concerts and, later, sound recordings, and the growth of the academic study of music and the rise of musicology. Public concerts and recordings contributed to the popularity of the miniature score, while musicology fostered historical and critical editions. Miniature scores, issued briefly in the mid-19th century by firms such as Heckel in Mannheim and Guidi in Florence, proliferated as the speciality of Albert Payne, who, working in his father’s music shop in Leipzig, began his *Kleine Kammermusik Partiturausgabe* in 1886. Several years later he sold the series to Ernst Eulenburg (Leipzig, 1874–), whose editions have dominated the market ever since. Many of the small scores – variously designated as ‘study’, ‘miniature’, ‘pocket’ or ‘reading’ scores – are photographic reductions of conductor’s scores; but in modern times some contain original material, such as analytical notes and scholarly corrections which are not found in print elsewhere. Other publishers slowly entered the market, including Ernst Donajowski in Leipzig (later Wiener Philharmonischer Verlag) and Hawkes in London, publishing the standard classics; by the mid-20th century nearly every publisher issued ‘study scores’ of the most important of its copyright works.

The modern historical edition, intended for study rather than for use in performance, has many ancestors, such as Arnold's Handel edition (1787–97) and Breitkopf's 'Oeuvres complètes' of Mozart, Haydn and Clementi (1806). Its modern beginnings derive from the mid-19th century and the collected editions by Breitkopf & Härtel of Beethoven, Mozart and other major composers. The same firm acted as publisher of the Bach-Gesellschaft edition. Other auspicious series also appeared about this time, some of them not sponsored by either a commercial publisher or government patronage; Friedrich Chrysander's great Handel edition, produced largely in the editor's home, is an example. Informal assemblages of enthusiasts who published useful editions included the Musical Antiquarian Society in the 1840s, and the Plainsong & Mediaeval Music Society, beginning in 1888, both in London. The publication of scholarly editions was well established throughout Europe by the end of the 19th century.

The impact of scholarship may also be seen in the 'scholarly performing' edition, which reflects the publisher's scrupulous concern for accuracy of detail and respect for the composer's intentions. The firm of Steingraber (Hanover, later Leipzig, 1878–) was long respected in this field, particularly for its variorum edition of Bach's keyboard music prepared by Hans Bischoff. In the 1950s Bärenreiter in Kassel (1923–) became pre-eminent in the production of scholarly performing editions, a reputation shared in particular instances with the firm of Henle (Munich, Duisburg, 1948–) and the newer Wiener Urtext Edition (Vienna, 1972–), so as to offer performers, at least for the most celebrated works, a gratifying if bewildering choice between alternative conceptions of authenticity. The private press of L'Oiseau-Lyre (Paris, Oxford, Monaco, 1932–) is also noted for its sumptuous editions, imposing in their scholarship, of specialized repertoires, while the American Institute of Musicology (Rome, 1946–) has undertaken an ambitious publishing programme of scholarly editions of early music. Major publishers specializing in scholarly editions today include Arno Volk (Cologne, 1950–80), A-R Editions (Madison, WI, 1962–) and Garland (New York, mid-1970s–).

The increasingly historical character of the music repertory during the early 20th century was fostered by, as it also influenced the outlook of, the major German publishers, particularly those, such as Breitkopf & Härtel, Peters, Schott and Simrock, who invested in editions of leading composers. The major addition to the group was Universal Edition in Vienna (1901–), which began by acquiring several other major German firms, and after 1907, under the leadership of Emil Hertzka, entered into contracts with Mahler, Schoenberg, Bartók and many other major composers. Gustav Bosse in Regensburg (1912–) has been a major publisher of folk, school and church music. Max Brockhaus (Leipzig, 1893–) has promoted contemporary opera. Other firms came to be recognized for their particular niches in the rich and diversified world of central European music. Theodor Rättig in Vienna (c1877–1910) was an early champion of Bruckner; more diversified in its riches was the short-lived firm of Lauterbach & Kuhn (1902–8). Operettas were a speciality of Weinberger in Vienna (1885–1938) and the Drei Masken Verlag in Munich and Berlin (1910–), among others; Ars Viva (1950–53), founded by Hermann Scherchen to promote avant-garde composers, was acquired by Schott and contributed to that firm's strong presence in this field. Hänssler in Stuttgart (1919–) has emphasized Lutheran music, while Kallmeyer in Wolfenbüttel (1925–) has concentrated on scholarly works in general. Ugrino in Hamburg (1921–) catered originally to the Ugrino religious community. However much they are respected for art music, German publishers probably issue as high a proportion of popular tunes as does the rest of the world. Hans Sikorski in Hamburg (1935–) and Hans Gerig in Cologne (1946–) have served the pop and educational markets, while the Österreichischer Bundesverlag in Vienna (1771–) issues national folk and educational editions.

World War II devastated many German music publishers, many of whom moved to England or America, sometimes founding new firms but usually contributing to established ones. The bombing of German cities, Leipzig in particular, took a heavy toll of stocks and plates. In 1954 the Deutscher Verlag für Musik in Leipzig became the state music publishing house of the German Democratic Republic. Numerous firms had already moved to the West, for instance Benjamin and Fürstner to near London (the latter based on a pre-war office there), Breitkopf & Härtel to Wiesbaden, Brockhaus to Lörrach, Heinrichshofen to Wilhelmshaven, Kahnt to near Konstanz, Peters to Frankfurt (with separate firms as well in London, under the Hinrichsen name, and in New York) and Steingraber to Frankfurt; some of them had counterparts or rival offices in East Germany, and enjoyed only short-lived success. The arrival in England and the USA of experienced music publishers escaping the Holocaust - many of them from Universal, including Hans W. Heinsheimer, Edwin and Alfred Kalmus and Ernst Roth - helped serve the increasingly sophisticated tastes of performers and listeners during the 1950s.

The German musical hegemony prevailed throughout the 19th century, although German music publishers themselves were probably not notably more prolific than their counterparts elsewhere, who flourished mostly by providing songs in the vernacular languages, the distinctive dance music of the community and other material of regional interest. While the early nationalist composers typically began by publishing at home, later success usually found them happy to promote the cause of their country's distinctive music through German editions: Smetana may have published most of his music through Urbánek in Prague, for instance, but Dvořák worked to a great extent with Simrock; Grieg began publishing with his friend Horneman in Copenhagen but much of his later music was issued with the support of Peters; Sibelius was published mostly by Breitkopf & Härtel. In time Leipzig became the home of publishers from abroad, among them Bosworth (1889-1998), set up to protect English copyrights, and Arthur P. Schmidt from Boston (1889-1910).

Among significant new firms in Victorian England were Hutchings & Romer (c1866-1916), Stanley Lucas, Weber & Co. (1873-93) and Murdoch, Murdoch & Co. (before c1880-c1946). Popular music publishing became highly lucrative in the late 19th century through two promotional devices, the illustrated cover and the royalty system of publicity by star performers. Music-hall ballads and theatre tunes flourished alongside Gilbert and Sullivan. Chappell, thanks to the Dreyfus brothers - Louis in London and Max in New York - effectively controlled much of the music of the London and Broadway stages, sharing the market with Francis, Day & Hunter (1877-1972) and Ascherberg, Hopwood & Crew (1906-70). Other firms were established by interests abroad, including Alfred Lengnick (1893-) by Simrock, Hinrichsen (1938-) as a branch of the Peters family and Galliard (1962-72) as a subsidiary of Galaxy in New York. Stainer & Bell (1907-) was originally established by a consortium. Recent British publishers of art music have been sustained by their major composers, for instance Oxford University Press by Vaughan Williams and Walton, Boosey & Hawkes and later Faber Music (1966-) by Britten, Novello by Elgar, the London office of Schott by Tippett, and Joseph Williams (1808-1962), Chester (1874-) and Murdoch by others. Among firms outside London, Gwynn Williams in Llangollen (1937-) has developed a speciality of Welsh folk music.

Publishers in other countries have emphasized their national music, among them Alsbach in Rotterdam (1866-98) and Amsterdam (1898-). Wilhelm Hansen in Copenhagen (1853-, heir to Sønnichsen, Lose and Horneman) has been Scandinavia's major music publisher; alongside it in Denmark the Samfundet til Udgivelse af Dansk Musik (1871-) is more important for national historical editions, the Kgl. Hof-Musikhandel (1880-1929) for theatre music, the scholarly antiquarian Dan Fog (1953-) for significant bibliographical works. In Norway, H.T. Winther (1823-78) and the Hals brothers (1847-1908), like

many north European shops, worked as both publisher and rental library; their successor Carl Warmuth (1851–1908) was in turn succeeded by the Norsk Musikforlag (1909–). Sweden's major firm has been Gehrmans in Stockholm (1893–), while Finland's is Fazer in Helsinki (1897–).

As well as older-established firms such as Choudens, Costallat, Escudier, Heugel, Leduc and Lemoine, the array of major Paris publishers includes more recently founded firms such as Durand (1869–), the original publisher of most of Saint-Saëns, Debussy and Ravel; Hamelle (1877–1993), specializing in 19th-century French music, including most of early Fauré, Salabert (1894), publisher for several of Les Six; Fromont (c1885–1922), the early publisher of Debussy; Célestin Joubert (1891–1970), known for operettas and other light works; Max Eschig (1907–), at first largely a French agency for foreign firms; and Jobert (1922–), successor to Fromont. Other publishers recognized as promoters of contemporary composers include Rouart-Lerolle (1905–41), Senart (1908–41) and Editions de la Sirène (1918–36). Foetisch in Lausanne (1865–) has been the major promoter of contemporary Swiss composers. The recent major Italian publishers of art music include Carisch in Milan (1887–), Curci in Naples (1912–), De Santis in Rome (1852–, latterly specializing in avant-garde music), Suvini Zerboni in Milan (1907–, specializing in contemporary music from Japan as well as Italy) and Zanibon at Padua (1908–). The major publisher in Portugal has been Valentim de Carvalho in Lisbon (1914–), in Spain Boileau Bernasconi in Barcelona (1906–), complementing the Instituto Español de Musicología in Madrid (1943–) set up by the Spanish government for scholarly works. Israeli Music Publications in Tel-Aviv (1949–) was set up to serve the needs of Israel's serious composers.

Russian composers, like those elsewhere, worked at first with nearby publishers, for example, Tchaikovsky in Moscow with Jürgenson (1861–1918), The Five in St Petersburg particularly with Bessel (1869–1907); Gutheil in Moscow (1859–1914) became as prominent as those two publishers, especially later on as the publisher of Rachmaninoff. As Russian music became increasingly popular abroad, M.P. Belyayev (1885–, originally from St Petersburg) set up a successful enterprise in Leipzig for distributing Russian music in the West and was able to secure copyright protection outside Russia. The last major firm to be established before the Revolution was Edition Russe de Musique, founded by Sergey Koussevitzky (Moscow, 1909) to promote new Russian works, successor to Gutheil, and active later in Berlin and Paris as the major publisher of Stravinsky and other Russian émigré composers. After the confiscation of Jürgenson in 1918, music in the USSR was published exclusively by Muzika.

Numerous firms established before the war in eastern Europe are today part of national enterprises. Polskie Wydawnictwo Muzyczne (1928–) is uncommon on three counts: it was established before World War II; it is a consortium of musicians and scholars; and it is located in Kraków rather than Warsaw. Among the earlier Polish firms was Michał Arct (1900–49). The Czech firms of Urbánek and Starý were nationalized around 1949; today they are under the imprint of Supraphon, successor to Hudební Matice. In Hungary, Editio Musica Budapest was created in 1950 through a merger of several firms, including Rózsavölgyi és Társa (1850–), Magyar Kórus (1931–, specialists in art music) and Rozsnyai (1889–, specialists in pedagogic materials). In Romania, the general firms of Doina in Bucharest (1914–47) and the Morawetz brothers in Timișoara (1930–33) and the pop firm of Stefan Kiritescu in Bucharest (1941–8) have been succeeded by the state-managed Musikstaatsverlag.

The period between the Civil War and World War II in the United States saw an even greater expansion in publishing activity and an increase in specialization. A torrent of music for domestic use was published; indeed the label 'the age of parlor music' appropriately evokes the image of a piano stool in the home filled with sheet music. Oliver Ditson acquired many of the older small firms during the

depressions of the late 19th century to become the country's major publisher. He was in a good position to become the prime mover behind the Board of Music Trade, founded in 1855 to address the common concerns of music publishers, though it was moribund by the end of the century. Ditson also set up subsidiaries, notably John Church, Jr (later John Church & Co.) in Cincinnati (1859–1930). Other firms were established, mostly by German immigrants, the largest and best known of these being G. Schirmer in New York (formally established in 1861 but active earlier); it was later known for its special series of the classics, and it extended its catalogue to contemporary music under the wise guidance of Theodore Baker, Oscar Sonneck and, later, Carl Engel. Other firms established by German immigrants included Carl Fischer in New York (1872–), specializing at first in band music, then in choral and orchestral works; Arthur P. Schmidt in Boston (1876–1960), noted for its sponsorship of American composers; and the smaller firm of J. Fischer in Dayton, Ohio (1864–1970), specializing in Roman Catholic choral music. Theodore Presser, founded in Lynchburg, Virginia (1883), soon moved to Philadelphia and enhanced its catalogue by publishing what became the major music journal of the time, *The Etude*.

While the conspicuous thrust of America's major music publishers was towards the polite, German repertory – as earnest, classical, cosmopolitan and transcendental as the market would bear – in truth the vast bulk of the output, from these and countless minor firms, was of entertaining, commonplace, provincial and pedestrian repertory, which the market indeed would bear. The measure of music publishing after 1850 must involve not only the easily recognizable large firms but also the smaller regional and specialist firms, less easily describable as a reflection of the totality. Perhaps most conspicuous among the specialist firms were those that cultivated sacred music; they produced tune books, hymnals and school collections, usually set in type in quarto format, at first oblong, later upright. The major early publisher of these was Mason Bros. (1853–69), established by the family of Lowell Mason (i). From its model derive two music publishing traditions. One was devoted to evangelical song and included Biglow & Main in New York (1867–1922), James D. Vaughan (Lawrenceburg, Tennessee, 1890–), Homer Rodeheaver, mostly in Winona Lake, Indiana (1910–), Charles Henry Pace in Chicago (1910–, focussing on black gospel music) and J.R. Baxter in Dallas (1926–72). The other tradition was devoted to public-school and other educational music and included, among the firms originating in the 19th century, Silver Burdett in Boston (1885–) and the Boston Music Co. (1885–1977, originally a subsidiary of G. Schirmer). The manifest trend, however, was towards an emphasis on popular song, such as would be reflected in the sentimental ballads that made up the monthly issues of *The Folio* of the White-Smith Co. (Boston, 1868–1976) as well as the catalogues of Benjamin Hitchcock of New York (1869–1941). It should also be noted that, much as music publishers served also as retailers, a number of firms best known as retailers were also occasional publishers, among them Lyon & Healy in Chicago (1864–, noted as a harp manufacturer as well).

American music publishing was by no means centralized in New York. Chicago enjoyed a bustling activity, its practitioners including the composer Will Rossiter (1891–1954) and Sol Bloom (1896–1910), who was later prominent in the US House of Representatives. Detroit publishers, beginning with Adam Couse (1844–59) and Stein & Buchheister (1854–65), came later to be known for musical comedy firms including Clark J. Whitney (1857–95), Joseph Henry Whittemore (1858–93), Roe Stephens (1868–93) and Jerome H. Remick (1898–1930, also in New York); Sam Fox (1906–) originally worked in Cleveland before moving to Tin Pan Alley. Sedalia, Missouri, could claim John Stillwell Stark (1882–1922), who issued the early rags of Scott Joplin, while Memphis housed W.C. Handy's commercialized blues publishing, under the imprint of Pace & Handy (1908–20, later in New York). As Hollywood became the

home of the film industry, Los Angeles developed a music publishing community of its own. In later years, however, it degenerated into the centre of 'song shark' practices, whereby dealers with questionable reputations extracted exorbitant fees from the gullible novices in return for printing and copyrighting songs and ostensibly 'plugging' them, with the help of famous performers and other influential parties, into lucrative hits.

American popular music publishing emerged as a specialism after the Civil War as publishers began to look for hit tunes. Its centre was an area of mid-town Manhattan, moving upwards from East 14th to West 28th and eventually West 50th Street, known as Tin Pan Alley. Among the major firms were Belwin, Inc. (1918-), founded by Max Winkler, which in 1969 merged with Mills Music (1919-); Famous Music Corp. (1928-66), with strong ties to several Hollywood studios; Leo Feist (1895-, which merged with Miller and Robbins to form the Big 3 Music Corporation: see below); Charles Foley; T.B. Harms (1875-1969), which enjoyed its greatest success when it enlisted Jerome Kern and, later, Richard Rodgers among its composers; Miller Music (c1930-1973), an offshoot of Harms; J.J. Robbins (1927-39), active in the 'big band' movement; Shapiro, Bernstein & Co. (1895-); Joseph W. Stern (1894-1920), whose partner, Edward B. Marks, later acquired it; and M. Witmark & Sons (1885-1941), active among the founders of ASCAP. Composers also established their own firms, among them Harry Von Tilzer (1902-), George M. Cohan and Irving Berlin. The proximity of these firms, and later ones like Frank Music Corp. (1949-), to the Broadway musical stage, with its favourite performers and composers attuned to the rising mass audience, greatly enhanced their access to current tastes, while the commercial environment ensured that they were among the first participating publishers in the performing rights movement. Corporate flexibility was as important as musical insight in this world, as directors moved from firm to firm and mergers and acquisitions flourished. Many firms were absorbed into larger units, such as Warner Bros. Music of Los Angeles (1929-, through its Music Publishers Holding Corporation), the Big 3 Music Corporation (1939-, a subsidiary of MGM, later of United Artists), and MCA Music in New York (1965-); and they were unified through trade organizations such as the Music Publishers' Association of the United States (MPA, founded 1895, at first made up of publishers mostly of serious music), or the National Music Publishers' Association (NMPA, founded 1917 as the Music Publishers' Protective Association, made up of popular music publishers), or the Church Music Publishers' Association (CMPA). Recently many publishers have chosen to centralize their marketing, distribution or other activities through specialist firms such as Charles Hansen (1945-) and Hal Leonard (1949-). The spiritual home of America's pop music is probably neither New York nor Hollywood but rather Nashville, although in fact publishers, like record companies, are today scattered across the country.

Educational specialists also emerged to issue books for school use, band parts, music for large choirs, collections of favourite songs for amateurs, charts and other supplies for pedagogic purposes, and juvenile instructional music. In the United States the Lowell Mason tradition culminated in the 'basic series' (i.e. sets of graded materials for use at the elementary school level), which have sustained publishers such as the American Book Company, Allyn & Bacon, Follett, Ginn, Summy-Birchard (1888-) and Neil A. Kjos. Band music continued to be issued nationally by Carl Fischer and another general music firm, John Church, as well as by specialist publishers like E.F. Ellis in Washington, J.W. Pepper in Philadelphia, Vandersloot in Williamsport, Pennsylvania, and C.L. Barnhouse in Oskaloosa, Iowa. Choral music was a speciality of E.C. Schirmer (1921-) in Boston and H.W. Gray (1906-71) in New York, as well as Shawnee Press (1939-), which was devoted at first to Fred Waring choral arrangements. Major denominational firms of special prominence include James D. Vaughan (1890-),

originally serving southern rural hymnody and now affiliated with the Church of God; Augsburg (1841-) in Minneapolis, serving various Lutheran churches, along with Concordia (1880-) in St Louis, active in promoting early music for service use; Lillenas (1925-) in Kansas City, with the Nazarene Church, and Broadman (1934-) in Nashville, with Southern Baptists. The gospel song was largely a speciality of Homer Rodeheaver of Winona Lake, Indiana, whose catalogue was acquired in 1969 by Word, Inc. (1951-) of Waco, Texas. Other major religious music publishers include the Hope Publishing Co. (1892-), originally in Chicago; E.S. Lorenz (1890-) of Dayton, Ohio; and the Zondervan Music Group of Nashville, specialists in evangelical song. Songbooks are also issued by or for innumerable political, ethnic, social, fraternal and occupational groups. Fred J. Rullman, associated with the Metropolitan Opera, long dominated the market for opera librettos, while Oak Publications in New York (1950s-) has focussed on folk music, and Hargail, also in New York (1941-), on recorder music. The possibilities of camera-copy music printing have also nourished the 'cottage industry' publishers, whose catalogues contain only a few titles, directed to highly specialized audiences, announced on a highly strategic basis and available only from the publishers directly. The range of specialist activity embraces a vast array of smaller American publishers: the *Musician's Guide* of 1980, for instance, listed 25,000 different firms.

American art music, meanwhile, found its early champions in Arthur P. Schmidt in Boston (who was apprenticed in Germany and, through P.L. Jung, acquired rights to the music of MacDowell), and in the Wa-Wan Press in Newton Centre, Massachusetts (1901-12), set up by the composer Arthur Farwell to encourage a distinctive national style based on Amerindian music. The Society for the Publication of American Music (1919-69) prepared and promoted important new works, as did Henry Cowell's New Music series (1927-58), substantially underwritten by Charles Ives and prepared for publication by Herman Langinger. Serious music was also issued by academic presses, the activity around 1950 in the Smith College area of Northampton, Massachusetts, being noteworthy. The Cos Cob Press (1929-38, leased to Arrow Music Press, to 1956), Peer-Southern (1928-), Galaxy (1931-89), Broude Bros. (1930s-), Alexander Broude (1954-82) and Boelke-Bomart (1948-) have also issued the music of American composers. Among the large general music firms, Schirmer over the decades 1920-50 specialized in American art songs, while since the 1960s C.F. Peters has been strong in avant-garde works. Belmont in Los Angeles (1960s-) concentrates on the music of Arnold Schoenberg. Distribution of music for a limited audience has been addressed by organizations such as the American Composers Alliance (1937-) and the American Music Center (1939-), as well as by music rental services.

The problems in distributing European editions in the USA often led to special American offices, beginning with agencies in New York of Novello in the 1850s and later of Ricordi and, through P.L. Jung (1891-8), of Breitkopf & Härtel. Later cooperative agencies included Associated Music Publishers (1927-64), Peer (1940-, for several Latin American firms), Elkan-Vogel (1929-70, working mainly with French publishers), Am-Rus Music Corp. (directed by Eugene Weintraub, 1940-) and Leeds (c1940-1964) - the latter two handling music from the USSR - and European American Music Distributors (1977-). The situation after World War II in particular, when German music was generally unavailable in England and America and when the technology of offset lithography was well developed, gave rise to extensive reprinting, mostly of standard editions. From the 1960s, small editions of important out-of-print texts have been prepared for libraries and scholars; these have often been of monumental historical editions in reduced format. Among the major specialists in this activity are Edwin F. Kalmus (1926-), International Music Co. (1941-) and, more recently, Dover (1941-), all in New York.

Music was printed in Canada as early as 1800, with many different models reflecting various purposes. Prior to the Confederation in 1867, the major firm was A. & S. Nordheimer (1844–c1927) in Toronto, whose output reflects American sheet-music practices. Overseas ties are reflected in the Anglo-Canadian Music Publishers' Association (Toronto, 1885–1920), set up to protect English copyrights, as well as in the catalogue of Frederick Harris (1910–), originally an English agency but now specializing in conservatory editions. Among other specialist firms have been Whaley, Royce & Co. (1888–1930s) in Toronto, issuing salon music; Gordon Thompson (1909–) in Toronto, educational music; the Waterloo Music Co. (1922–), wind instruction and band music; and Berandol (Toronto, 1969–), whose serious music catalogue has grown out of earlier BMI commitments. Protestant hymnals, Sunday school books and similar texts also appeared in other parts of the British Empire in the 18th century and the 19th (e.g. *The Oriental Masonic Muse*, Calcutta, 1791, and a song, *Jesus de Ware Zoondaars Vriend* by F. Logier, in a Cape Town newspaper of 1840, provisionally recognized as the first music publications of India and South Africa, respectively), but there was no continuing tradition of production in these areas. Australian music publishing began in Melbourne in 1850 with Joseph Wilkie, predecessor of the more important firm of Allan, and in Sydney a few years later with William Henry (Willem Hendrik) Paling and around 1890 with Jacques Albert. While Allan and Paling came to be noted for their support of Australian composers, Albert worked extensively with English and American firms, as did the branch of Chappell (1904).

Music publishing was also introduced in Latin America by European immigrants, who worked mainly as music teachers and retailers, and often as impresarios. In addition to selling imported editions (sometimes presumably with subsidy from the European publishers) the imaginative shopkeepers identified and promoted music of a distinctively local character, issued separately or as supplements to literary journals devoted to music, cultural topics, general or current affairs. As early as 1824 sheet music was being issued in Rio de Janeiro, later imprints naming J.B. Klier (1834–47), Pierre Laforge (1836–51), Filippone (1846–1911) or Bevilacqua e Napoleão (c1869–1968). Music was even published in the Amazon River settlements around 1900 during the rubber boom, also in São Paulo, where Vicente Vitale was particularly active after 1923. Europeans who kept music shops in Spanish communities included Engelmann (from Strasbourg) in Havana, Niemeyer (from Hamburg) in Valparaiso, Chile, and Wagner in Mexico City and Breyer in Buenos Aires (both also from Germany), as well as Giusti (from Corsica) in San Juan, Puerto Rico. Local opera house repertoires are also reflected in their catalogues, notably in Buenos Aires, where Ricordi was active as early as 1885 and a powerful force in local music publishing after 1924. Among the major recent composers to benefit from a close working relationship with one particular publisher was Alberto Ginastera, with the Buenos Aires firm of Barry.

5. Music publishing today.

The changing circumstances of today's music publishers, in historical perspective, reflect several larger trends. The first is based on measurement of production: more music is available than ever before, although the quantity seems actually to be decreasing slightly from the highpoint reached early in the 20th century. The evidence is very incomplete, although the overall historical trend is obvious. Up to 1700, the annual world-wide production of musical editions probably never exceeded 100 titles. On the basis of data suggested above, it seems fair to fix the total at no more than five titles a year before about 1525 (i.e. from the beginnings to the age of Petrucci); 30 titles a year from 1525 to 1550 (during Attaignant's major activity); 80 titles a year from 1550 to 1600 (when the four major centres

were particularly active); and 60 titles a year during the 17th century. The vast increase during the 18th century reflects the rise of engraved music and the proliferation of songsheets. While any estimates are frustrated by the practice of not dating music, the first half-century, with London as the main centre, probably produced about 150 titles a year; the next three decades probably saw around 300 new titles each year, as Parisian publishers entered the picture; while the last two decades saw a further proliferation, with the growth of Viennese and German publishers, so that the total swelled to about a thousand a year by 1800. The trend continued, stimulated by commercial pressures during the 19th century, with annual outputs reaching perhaps 2000 by 1835, 10,000 by 1850, 20,000 by 1870, and 50,000 by 1910, probably the apogee, just before the extensive distribution of commercial sound recordings. The totals are guesswork, which at best may give rise to questions of what exactly to count, although the slow decline over the intervening decades, when viewed in gross quantitative terms, is hard to regard as a cause for alarm. Underlying factors that contribute to the changes, however, deserve closer attention.

A quantitative decline is possible, in today's intensely active musical society, partly because music itself is more widely available than ever before. Concomitantly, local music retailing has declined disturbingly, as outlets have closed or been forced to provide a more limited range of services to their customers. The attrition, generally an international phenomenon, is partly compensated for by the rise of national and cooperative retailing activities and of public and academic music libraries, along with better bibliographies and repertory lists and (to music publishers themselves a dubious blessing) modern photocopying technology. Along with the benefit of a greater availability of musical documents probably also comes the loss of respect for those documents. The very abundance no doubt can contribute to a 'musical information overload' of sorts. At the same time, better access has clearly helped scholars to discover, and performers to promote, the little-known and forgotten repertories that enjoy wide favour today.

The resulting diffusion of musical taste may be less specific, but is readily appreciated by inspecting music shop inventories, catalogues, advertisements and collections. There is no longer such an institution as a general music publisher: specialities are called for. With a few notable exceptions, general music journals have also perished, to be replaced by the plethora of specialist periodicals that now overflow the library's current periodical shelves. Generally higher in quality than their departed brethren by being better focussed, they nevertheless further contribute to the fragmentation of our musical communities. Similarly, over the course of the past century, music publishers have discovered the necessity (not to mention the pleasures) of becoming part of specific musical communities through the character of their catalogues, as favouring band or orchestra music, or choral music or songs; in offering conservative or adventurous repertories; in promoting particular composers, schools and trends; and whether catering for amateur or professional audiences.

The trends, once in motion, proliferate, as for each audience a different music publisher or group of publishers seems necessary. It is no longer a matter of the classical performer having trouble talking to the pop performer, so that 90 years ago this maxim could have been proposed: serious music publishers needed support, which popular music publishers earned. Wealth is no doubt still to be amassed in music publishing, particularly where commercial pop music is concerned and when a publisher can develop a successful relationship with recognized composers and styles. The recent experiences of many music publishers with the giant financial conglomerates suggest that the giants usually discover the successful innovators well after their vital and lucrative periods of activity. Yet in the 1960s many of the stable giants of music publishing found themselves, for better or worse,

absorbed into the great financial conglomerates. While the music publisher's financial circumstances are probably no less mysterious today than they ever were, a high proportion of today's firms, both classical and popular, would appear to be in the business more as an outgrowth of a commitment to a particular musical community and repertory than in search of lucrative profits.

The music publishing industry has also been profoundly affected by the rise of the modern commercial sound recording, along with the all-pervading sound of music in modern society. The musical mass media, whatever the quality of their offerings, inevitably inspire cases in point of Gresham's law: listeners drive out performers, as bad music drives out good. The possibilities of coordinating a music publishing programme with the related activities of a recording company, a sound-equipment manufacturer, a film producer or the entertainment industry, has further attracted the more imaginative among music publishers, from smaller firms (particularly in areas without a rich music publishing tradition) to the giant conglomerates (notably those lured by potential marketing advantages), albeit so far with mixed results.

Declining concern for the physical objects of music publishing goes hand in hand with the increasing emphasis on music as intellectual and artistic property, which publishers share with or manage for the creator. Many major publishers still flourish by selling copies on paper, although one publisher enjoys recalling how in the 1920s, as sound recording and radio became more pervasive, his firm sold its entire stock – 70 tons of paper – for pulp, for \$210. Still other music publishers, for the most part those commercially in the ascendant, find themselves drawn increasingly into the world of copyright law – involving both 'performance rights' over public presentation, broadcast and diffusion and 'mechanical rights' controlling sound recordings – and further away from the world of printing, promotion and distribution.

The distribution of performing parts in the form of manuscript copies during the 18th century no doubt provided a kind of protection, thanks to the restricted access to the musical texts themselves, but the proliferation of printed copies in the 19th century, while it provided for wider distribution, also limited the income of the creator. Thus in Great Britain the 'Bulwer-Lytton Act' of 1833, providing protection for performance of dramatic works, was in 1842 extended to cover music as well. Enforcement was not widespread until the 1870s, however, through the infamous Harry Wall and the Authors', Composers', and Artists' Copyright and Performing Right Protective Society. Revision of the British copyright act in 1911 led to the founding in 1914 of the Performing Right Society Ltd, which covers performance rights; the Mechanical-Copyright Protection Society Ltd (MCPS) was formed in 1924 through the amalgamation of several bodies which had been set up as early as 1910 for the purposes of covering mechanical rights. Previously the Société des Auteurs, Compositeurs et Éditeurs de Musique (SACEM) had been founded in 1851 in France, as well as the Anstalt für Musikalische Aufführungsrechte (AFMA), established by the Genossenschaft Deutscher Tonsetzer (Association of German Composers) in Germany in 1903, today succeeded by the Gesellschaft für Musikalische Aufführungs- und Mechanische Vervielfältigungsrechte (GEMA). The earliest such organization in the United States was the American Society of Composers, Authors and Publishers (ASCAP), founded in 1914, which in 1940 engaged in the pitched battle with the major radio networks that led to the incorporation of its major competitor, Broadcast Music, Inc. (BMI). SESAC (formerly the Society of European Stage Authors and Composers) is another group important in the United States and through bureaux in several other countries, many of which, however, also have their own national organizations. International coordination of these groups involves the Confédération Internationale de Sociétés d'Auteurs et

Compositeurs (CISAC) for performance rights, and the Bureau International de l'Édition Mécanique (BIEM) for mechanical rights over sound carriers such as regular and compact disc recordings and tapes.

The rise of rapid photocopying machinery has no doubt further diminished the sale of copies for music publishers, calling for price increases, threatening publishers' historically close working relationship with performers and forcing them to look all the more to performance rights for their income. Such circumstances, influenced variously by the different kinds of repertory, documentation and audience, have no doubt served to diminish even further the features shared by music publishers. The general belief today is that, after a quarter-century of continued happy expansion, from about 1945 to 1970, the music publishing industry has been experiencing an unsettling period of economic uncertainty and volatility. At the same time, the overriding generalization to be drawn from the history summarized here suggests that published music can always be expected to fluctuate in its accessibility as well as in its significance, as a reflection of publishers' sensitivity to the changing musical, social, technological and commercial contexts of their activity, and of their ability to identify, prepare, distribute and promote the repertories that reflect those contexts.

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