

# The Distribution of Music

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People have been distributing music in written form for at least three millennia, but just as with text, the ability to make large numbers of copies of a written work in a relatively short amount of time has had large effects on the culture of music. The technology behind this massification is fascinating, with several methods of reproduction competing over nearly five centuries. I had hoped to talk more about the social effects of cheap access to written music, but through lack of time and source material do not have anything of interest.

## 1 Handwriting

Music, like speech, is linear and so generally amenable to writing. Also as with speech, there are many possible writing systems. The earliest known system for writing music is analogous to a syllabic writing system. In such a system a symbol indicates a combination of consonants and vowels, while here the written name indicates a series of notes that are customarily played together [Kilmer, 1971]. This writing system is found on tablets from the 13th century BCE, discovered in the dig at Ugarit, in Syria.

We also have written music from Ancient Greece. Their writing system is more analogous to a phonetic writing system, as they had symbols for the individual notes. These characters, like our letters, were completely symbolic. We know that most musicians in Greece did not use this system, learning tunes by ear and with person to person instruction, the writing

being used mostly in philosophical texts.

The Greek system of musical writing was adopted by the Romans as well, where it was used again mostly for philosophical writings. The main Roman text on music we have is Boethius' *de institutione Musica*, a combination translation, harmonization, and expansion on earlier Greek sources. It is very much a theoretical work, and he writes "A musician is one who has gained knowledge of making music by weighing with the reason, not through the servitude of work, but through the sovereignty of speculation." [Boethius, 1989] There were many people who played music and had learned by the 'servitude of work' but if they wrote anything down we don't have it.

Early medieval musical notation is the first system we still have which was used by people who actually made music. In the 8th century monks began to write *neumes*, shapes that represented pitch contours, above words to serve as reminders of the melody. Like the Ugaritic system this is a syllabic system, but unlike the older (and unrelated) system it is not abstract. The height of a mark on the page indicates its relative pitch. Also unlike (the main interpretation of) Ugaritic notation, neumes did not unambiguously indicate the melody.

Over time people expanded on the neumes by writing them varying distances above the words they went with. While neumes had previously indicated pitch relative to the previous note, now they began to indicate pitch absolutely. They still did not encode all of the melodic content, but they were closer and perhaps could serve as a guide for people learning the melody.

The idea of a staff grew out of putting the neumes at varying heights. Drawing a line or several to make distances more clear became more and more common. In the early 11th century Guido d'Arezzo wrote a very popular (among monks) text, the *Micrologus*, which among other things included staff notation that told the melody accurately. It is likely that the idea of having the space between a line indicate twice the distance between notes in the

scale did not originate with him, but his book popularized and standardized the notation.

Part of why this new notation spread so well was that it could do two new things: encode melody for people who did not already know it and encode multiple simultaneous notes for harmony. The *Micrologus*, in fact, is a treatise on harmony, and may have served to popularize both the writing system and an application that made it necessary.

The church system was now capable of encoding melody fully, but remained limited in rhythmic capacity. Sometimes the spacing between notes would roughly indicate the time between them, but generally the rhythm was not determined by the writing. For the traditional monastic chants and songs that were usually encoded this was not a problem; they usually had rhythms that could be deduced from the normal meter of the text. Over time, however, the songs became more complex and several shapes were developed for the notes to indicate how long to hold them.

## 2 Mechanical Reproduction

### 2.1 Block Printing

By the mid 15th century, monastic musical notation was pretty well standardized. When people started using woodcuts for text, it seemed natural to start using them for music as well. The first use of woodcuts for printing music was in drawing just the staff, with the notes done in by hand, around 1442. By the 1460s, however, most musical printing was done by carving out both for the staff and the notes, as was the example in [Figure 1](#).

Woodcuts are difficult, and some aspects of musical notation made them especially so. The ‘white’ notes, or notes cut to have gaps in their centers, were troublesome when they fell on staff lines, as they were very tricky to carve. Not changing the notation system in response to technical challenges is a common theme we will see again, and probably reflects the greater

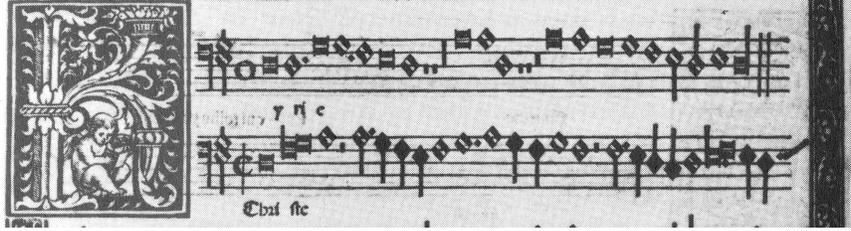


Figure 1: Woodcut music from 1516 [Poole, 1990]

volume of handwritten music.

## 2.2 Early Typographic Printing

The idea of printing text with movable type led shortly to typographic musical printing. The first attempts at musical type were two pass affairs, once for the staves and again for the notes. These were very nice when carefully done, but tricky because lining up the paper for a second impression and setting type in exactly the same place in the form were both difficult.

One solution was to create type that had both the note head and a horizontal section of the staff. This sort of type could be set very quickly, much faster than double impression printing or than carving woodblocks and quickly spread. It was not nearly as elegant as other systems, and the type aged poorly. Most of its problems were due to the sections of the staff not joining up exactly to make clear lines, a problem that was not solved until the invention of stereotyping in at the turn of the 18th century. These malalignments can be seen in Figure 2.

Typeset music was also not very adaptable. It was restricted to single lines of melody, had limited flexibility in spacing, and when people extended the notation to connect related notes horizontally, there was no way to support that. Bars and ties were eventually implemented with lines put in above or below the music, but they were hard to read, being so far from the notes they modified. These restrictions kept typographic music mostly in the high volume

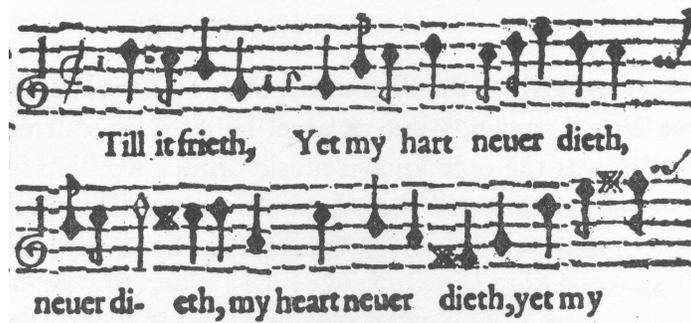


Figure 2: Typographically printed music from 1597 [Krummel, 1975]

religious vocal trade, with instrumental music left to engraving or handwriting.

## 2.3 Engraving

In the mid 17th century people adapted the process of copperplate engraving to the production of music. Engraving is an *intaglio* method, one in which the portions to be inked are removed or depressed. Printing from a plate is a matter of inking the whole plate and then wiping the ink off the non-engraved portions, so there is ink only in the indentations. The plate can then be put through a strong press with damp paper, and the paper gets precisely inked. We can see a major advantage of engraving in Figure 3, where three notes (those above “Love’s”) are both barred to mark rhythm and indicated as slurred, marks that could not be made with type.



Figure 3: Engraved music from 1695 [Krummel, 1975]

Because engraving requires only the black portions to be removed it is much faster to engrave plates than carve woodblocks. Woodblocks made up some of this time in being faster to

print with, requiring only a surface inking and a stamping, but were hard enough to inscribe music on that once engraving became workable for music woodcut music almost entirely disappeared.

In the early 18th century a method of using pewter instead of copper for the plates began to spread. Pewter was much cheaper than copper and it also softer, so notes could be inscribed with a punch. Punches dramatically sped up the work of the engraver, who no longer had to carefully remove an oval region for a single note. With punches the creation of a plate was now no slower than typesetting the same amount of music and still much nicer looking.



Figure 4: Engraved music from 1720, note heads, letters, etc. punched [Gamble, 1923]

Printing from plates was also nice because it could avoid the overstock problems common to typographic printers. Keeping type set for future printings would have been impractical as type was expensive and needed for other works. With a plate, on the other hand, the only expense was that of storage. This allowed engravers to ink the number they expected to sell and no more, knowing that if more were required they could simply ink additional ones.

There remained advantages to typeset music, and in high volume works it continued to be the standard. The inking and imprinting processes for plates were very time consuming compared to taking an impression from type. One solution to this time problem that was not widely adopted was to ink the plate directly and make impressions from that as a normal printer would. This would put the notes and staves in white while the background would be the color of the ink, which was usually blue or green. This method was the normal one for the

creation of proofs and most printers could easily create impressions in this manner, but the only attempt we know of to sell such prints, starting in the 1840s and lasting around twenty years, was a commercial failure. Despite the marked per copy cost difference, musicians were not willing to buy music sheets that were not black on white, refusing again to make concessions to the technology.

## 2.4 Lithography

Lithography, now used for almost all high volume reproduction, was invented for the reproduction of music. Invented in 1796, it did not become well known until the early 1820s, but soon was the standard. To print a lithograph the printer would through various methods get a pattern on a lithographic stone in a greasy substance. An acid would be applied to the stone, removing the surface in non-greasy areas. The acid would then be washed away and the stone could be inked. Impressions taken from the stone would get ink only where the greasy substance had been.

Initially most printers wrote directly on the lithographic stone with a greasy ink. This allowed the printer to reproduce anything that could be handwritten, but it did not look as regular as music that was produced on punched plates and could be harder to read. One solution was to create a plate, make a single print with a greasy ink, and put that print on the lithographic stone, and use chemicals to get the ink to transfer to the stone. This method produced stunning results, left a plate that could be stored, and made reproductions rapid. It did require a lot of equipment, everything required for both engraving and lithography, but was very common.



Figure 5: The first lithographically reproduced music (1796) [Poole, 1990]

## 2.5 Mosaic-based Typographic Printing

As the notation for music became more complex the old typographic system became less and less well suited for the reproduction of music. The idea of setting each individual notational element separately had been around for a while, but it was not until the late 19th century that type founding became accurate enough to make it practical. People began to cast musical fonts with thousands of tiny components which would be combined in a mosaic to set the piece.



Figure 6: Mosaic based typographic music circa 1900 [Gamble, 1923]

Because musical type was expensive and the mosaic system required a very large amount of type, the stereotyping<sup>1</sup> process was essential to this sort of printing. In stereotyping the printer sets type as normal, but instead of making an impression oils the type and makes a plaster cast from it. This cast can then serve as a mold for casting a single large ‘piece of type’ that can be treated as ordinary type. This saves wear on the type, frees up type for use on other pages, requires less type over all, and allows for very large print runs. It

<sup>1</sup>The common word ‘stereotype’ for a generalization about a group of people comes from the name of this process.

also allows saving an intermediate representation for future print runs, getting some of the advantages of plate based methods.

The stereotyping process also provided a stage at which some engraving techniques could be applied, when the plaster was still wet. This was used primarily for fixing places where the staff lines did not quite meet. Other modifications could be done at this stage too, such as the addition of ties between notes if the music font did not support them. Changes at this stage were tricky because they had to go to exactly the right depth but it was freeing to be able to make them.

Typeset music was also advantageous if there was to be any text. Text could be included on plates, either by engraving or punching, but it was slow and, especially if punched, tended to look uneven. For small notations on instrumental music it wasn't really a problem, but for lyrics it was troublesome. The easy mixing of music type with ordinary type helped typographic music compete with engraving, especially in songbooks.

### 3 Conclusion

While the technology for mass reproduction of music has improved to the point where music can be distributed cheaply and in high volumes, this has had remarkably little effect on the notational system. People want printed music to look like handwritten music, only neater and easier to read, and have been unwilling to accept printed works that differ from the handwritten. This suggests that the people using the music did not make strong mental distinctions between printed and handwritten music, thinking of them both as simply written music. So while we may find the distinctions even among engraved and typographic music technologically engaging, this suggests that this whole study is antiquarian and not historically important. It is possible that the different economies of typographic and engraved music promoted some forms of music over others and that the greater availability of

printed music changed what people played, but while these might rescue us from the charge of antiquarianism they remain unaddressed in this paper.

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