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Notational Systems and Conceptualizing Music: A Case Study of Print and Braille Notation

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[1] To be honest, I never gave much thought to Braille music notation until a few years ago when I was told to expect a blind student in my theory class. But before we could make arrangements, we got word that his funding fell through and he wouldn't be attending after all. You might imagine my surprise when Matt appeared on our doorstep in September, having solved his funding problems. What ensued was a mad scramble for materials and strategies to best meet his needs. I tried to read up on what I could find about college theory classroom techniques for blind students, including an article by Anne-Marie de Zeeuw from the 70s in *College Music Symposium* (de Zeeuw 1977), which, while not reflecting the latest technology, was quite helpful nonetheless. Our disability support office assured me that Matt would have everything he needed in the form of his transcribed textbook, a portable note-taker, and funds for a tutor for 10 hours per week. What I was *least* prepared for, though, was the differences I began to notice between Braille notation and print. I had naively assumed that Matt's version of our textbook and other scores, which had been quickly committed to Braille, would be somehow a direct translation of my print ones. But as the result of long office-hours in which he and I worked through his lessons, we realized that our two versions of notation were markedly different, and I determined that I would need to learn more about how Braille music works in order to better meet his needs.

[2] My concern here is to acknowledge some of the differences between print and Braille music, and to take a deeper look at how the two notational systems represent music, especially with regard to the lessons undertaken in a music theory classroom. Before I do so, I want to make it clear that I'm not trying to privilege either system. I have corresponded with a number of tactile readers and transcribers as well as sighted musicians working with blind students while doing this research over the last few years, and I've found that perceptions of the two systems vary widely. Consider the following quotes, the first three of which are from personal email correspondence:

> "From the standpoint of someone who does not read Braille but has had to work with someone who does, Braille notation seems an impoverished method for transmitting visual musical scores."
>
> "Braille is digital, and as such, is far more logical to a blind reader .. print is graphic, and not consistently coded."
>
> "[Braille] is a code that has been designed to represent the same information as print."

And from a leaflet published jointly by The National Library for the Blind (UK) and The Canadian National Institute for the

Blind:

> "The music code uses Braille symbols to represent the music, and everything contained within the print version is shown in the Braille." (Baker and Murray)

[3] The first two quotes express a range of opinions about the two systems, one with a print bias and the other, a Braille bias. The last two quotes reflect a perception of equivalence shared by many of the people with whom I corresponded, and who were understandably hesitant to acknowledge any differences between print and Braille at all, perhaps so as not to risk further marginalization of Braille notation. Due in part to mainstreaming, Braille music literacy has plummeted in recent decades. My student, for example, had no more than a cursory experience with Braille music when he arrived on campus. Efforts to make Braille scores and training available to students have been renewed in recent years, although much of this activity is directed toward younger children.

[4] So, why is this an issue in a music theory class? Unlike courses with language-based content in which blind students are rarely asked to contemplate how the printed word looks on the page, music theory is at many levels a study that centers on notation. Much of the first semester of theory familiarizes students with the fundamentals of music literacy: key and meter signatures, unfamiliar clefs and the like. Sight-reading, ear training, and other activities all require that students refine their score reading and writing skills. Consequently, visually impaired students must navigate a three-part interaction between audible music, the concepts embedded in print notation, and Braille music notation, striking a delicate balance between the need for Braille literacy and the need to be able to work effectively with sighted musicians.

[5] Sighted musicians, on the other hand, are generally so notation-dependent that it's easy to accept notational conventions as "just the way music is." The influence of notation on what we hear and how we perform and compose goes almost unnoticed, and, despite what are sometimes tenuous mappings between sound and notation, the distinctions between the written and the audible blur in our musical discourse..

[6] As Joseph Straus and Neil Lerner point out, "the verbal language musicians use also says much about their assumptions." The term *sight singing*, they observe, implies "that one must have sight to read music. Actually, one does not have to have sight to read music, as revealed through a number of sight-singing books that have been translated into Braille—without any apparent irony over the paradox in the words (Lerner and Straus 2006, 1)." Such assumptions about music extend even to the most basic of musical concepts. Many of our conventions become second nature partly because of the graphic nature of print notation, which corresponds strongly with the way we think and talk about music. Zbikowski, Saslaw, Cox and others have written about how we make use of embodied notions called image schemas (like *verticality*, *in* and *out*, notions of *surface* and *background*) to structure our ideas about music. Print notation shares much of that image-schematic structure, and thus acts as an iconic representation of audible music by providing symbols that share many properties with the musical features they represent. For example, as Zbikowski points out, the way that musicians speak of high and low pitches corresponds more closely with the orientation of notes on the printed page rather than, say, notes on the piano where higher is to the *right* of the keyboard, or on the cello, where higher notes require that the fingers be placed *lower* on the fingerboard (Zbikowski 2002, 64).

[7] We also use the orientation of notes on the printed page to simulate the passage of time and envision the rise and fall of melody where vertically aligned notes occur simultaneously and notes that are closer together horizontally move more quickly. By "connecting the dots" we picture a *path* that has a specific contour. The concept of contour, however, as de Zeeuw points out, is one that blind students must learn, as it is not iconically represented in Braille (de Zeeuw 1977, 91). The question then arises, how are these visually-oriented notions represented in Braille music?

[8] Like other phonetic systems that use symbols derived from literary script, Braille music is an alphanumeric code, which uses configurations of raised dots that are designed to be read by touch. The system was developed by Louis Braille, who, blinded at age 3, might never have seen a print music score. Exposed in his teens to several different methods of written communication, he combined an existing system of raised letters with a code for transmitting messages during nocturnal combat to form what became literary and music Braille. As he was an accomplished organist, some speculate that Braille's music code may have actually preceded the literary code. In 1829, at age 20, he published his *Method of Writing Words, Music, and Plain Songs by Means of Dots, for Use by the Blind and Arranged for Them*. Since then, Braille's code has been revised many times in a variety of ways throughout the world. Efforts are underway to establish one worldwide standard for all Braille music transcriptions, with the most recent international edition published in 1997 (Braille Music Subcommittee 1997). Earlier transcriptions, however, are likely to use formats not in current use. Many libraries house large collections of Braille music

scores, including the National Library for the Blind in the UK, the Canadian National Institute for the Blind, and the Library of Congress in the US, and these scores can vary widely in format.

[9] The Braille cell itself is arranged in two columns of three dots each numbered 1–6. There are 63 possible combinations of dots, not counting the empty cell. Students learning Braille music do not learn new symbols, but rather new meanings for combinations of the symbols they already know. For example, according to the *Dictionary of Braille Music Signs* (Krolick 1979), the cell containing only dot 1, which can stand for a lower case “a” or the number “1,” has nine possible definitions in music code. If that cell appears twice, there are three more definitions, and, if a cell with dot 3 follows it, there are four more definitions. Other cells have even more meanings like the cell with dots 4-5-6, which has 48 definitions including all the multi-cell groupings that begin with that cell. Compare that with print notation in which note heads, clefs, flags, and beams generally have specific, one-to-one meanings.

[10] This economy of Braille signs results in some interesting quirks. As **Example 1** shows, the eighth notes C-D-E-F-G-A-B use the same Braille symbols that also signify the literary letters d-e-f-g-h-i-j creating an almost cipher-like substitution code. The use of the letter D here represents Do, and begins the sequence on C in the tradition of fixed-do solfege.

[11] Braille music uses neither staves nor clefs. Though there are symbols for these, they are often omitted because an octave identification symbol situates notes according to their relative placement on the piano keyboard. Early exercises in theory texts that ask students to identify a pitch on the staff by its octave placement—middle C is C4—are then trivial for the reader of Braille. Braille also doesn’t use beams or proportional note placement to aid in grouping rhythms, so the visual sense that “closer and blacker means faster” does not transfer. While there was a trend at one point to provide all the details of print notation in facsimile transcriptions, that trend is waning.

[12] Braille music code has its strengths. Because many musicians need their hands to play their instruments, Braille music is designed to be more easily committed to memory. Also, since paper is expensive and bulky and the process of engraving has been—until the recent development of computer assisted transcribing—painfully slow, Braille music has a number of devices like “doubling” and “grouping” which act like the concept of *simile* to cut down on the need for extra repeated cells. Exact repeats, consistent tuplets, and recurring doublings can be signaled by a code that says “repeat until further notice,” which is then canceled by the same symbol.

[13] Now, let’s consider a few examples in more detail, starting with the paradoxically named task of “sight” reading. For instrumentalists, particularly those who play their instruments with both hands, tactile reading in real time can be impossible. Even so, a number of people I corresponded with were quick to tell their stories of Braille readers who could out-sight-read sighted students. Sight singing in theory class is somewhat less problematic, though, in that students can use their hands for reading. Braille provides the pitch and rhythm of each note in a single, easily scanned cell; augmentation dots and large leaps require additional cells, as do any articulation or expression markings. Thus a tactile reader would need to scan for cells that could slow them down in real time, just as a sighted reader might scan for large leaps or complicated rhythms. Braille does not benefit from proportional notation; so four half notes would take up the same amount of left-to-right space as four 32nd notes. **Example 2** provides both notational forms for the first phrase of “My Bonnie Lies over the Ocean.” The example represents the Braille cells in print with the function of each cell listed below it. In this example, only a few extra cells are needed in addition to the pitch-rhythm cells. Even so, scanning the Braille delivers information sequentially, unlike scanning print, which can give an overall picture with multiple bits of information a glance. Imagine reading: Treble clef – 3/4 – 4th 8ve – G quarter – Start Slur – 4th 8ve – E quarter – dot – D eighth – C quarter – D quarter – C quarter – A quarter – G quarter – end slur – E half. Much of the same information is available in the Braille as in the print, but the Braille is pixilated into discrete cells without the visual sweep of a curved line to simulate the phrase’s swell of intensity. One could, however, make similar critiques of many features of both print and Braille, in which isolated symbols represent events that occur over time, and indeed print notation leaves much musical detail up to the performer.

[14] The early semesters of music theory are saturated with exercises in writing and analyzing music in chorale texture. We help students understand the crucial concept of voice leading by following the notes on one staff with either stems up or down. Compare this with the system of Braille notation for four-part texture that my student encountered in his textbook, in which there are two parallel lines of symbols, one for treble and one for bass. Each line contains either a soprano or bass note, and indicates the alto and tenor notes by interval from those notes respectively, reading up for the bass clef and down for the treble. I invite you to imagine singing the following alto part in **Example 3a**. Remember the notes named are the soprano notes and the intervals situate alto notes (for example E 3rd indicates sopranos sing E and altos sing a third down or

C). Although you may be able to hear the alto line in your head, conceptually it's a lot of work for a freshman theory student to go through in order to arrive at the somewhat less than stimulating alto line in the print chorale shown in **Example 3b** (C–C–B–C–C–C–B–B).

[15] Even so, the Braille chorale highlights some concepts of four-part harmony that reinforce our musical intuitions. Reading just the upper and lower line note names and ignoring the interval signs reveals the two-voice counterpoint between bass and soprano that underlies thoughtful part writing. This format also strongly supports our auditory experience that outer voices are the easiest to hear while inner voices are less so (and according to some students they are nigh unto impossible to hear!). It also reflects keyboard chorale performance practice, which emphasizes outer voices, and it helps students with general notions of interval, although it resists translation to figured bass, since the alto is measured from the soprano voice. Keyboard players have the added advantage of immediate information about hand placement. Try reading the treble clef information again, and this time imagine your right hand placed on a keyboard with outer fingers playing the notes named and thumb playing the interval away from those notes.

[16] So why notate chorales in this fashion? In writing on different notational formats for pieces, Zbikowski points out that musical scores carry the aura of authority, but they actually follow from conceptual models for pieces. He writes, "A score is an artifactual manifestation of the elements of the conceptual model deemed most relevant to the musical practice of which the model is a part, created as a means of stabilizing the model " (Zbikowski 2002, 221). In short, the chorales in my student's version of our text followed the conceptual model for keyboard pieces, comfortably played by two hands with two notes in each hand. The notation reflects the embodied experience of hands that *mirror* each other when placed on the keyboard, with bass and soprano outer fingers and opposable tenor/alto thumbs. The immediate feeling of intervals in the hand for a keyboardist makes sense of the Braille chorale in a way that is similar to a guitarist playing from tab or frames. In some ways it also resembles figured bass, which reflects keyboard style hand placement with one bass note played in the left hand and three others notes played in the right, figured by interval.

[17] Print chorales, meanwhile, follow the conceptual model of SATB vocal pieces sung by individuals (or groups of individuals) on each of the voice parts. Altos, for example, only have to follow the line of stems-down notes in the treble staff—even though we hope they also attend to the other voices while doing so! As an aside, there is an open-score format for Braille SATB pieces, just as there is in print, as well as a "note-for-note" format that lists the inner voices as pitched "subnotes," but a transcriber would generally follow the format given in the text or score unless asked to do otherwise.

[18] Analysis is another activity that occupies music students in theory class. Consider Vicky Chapman's story of her experience with theory and analysis, which appeared in 1999 in the *Braille Monitor.*

> While in college I attempted a degree in music therapy. I was not allowed to use a reader for theory classes, and the instructor refused to read aloud what he had written on the board. Although I was passing my music therapy classes, I found myself exhausted from fighting with instructors and trying to obtain the assistance I needed in order to learn. Finally, when a theory instructor assigned a fugue to be analyzed using a graph, the difficulty I would have completing the assignment on my own became obvious. When confronting the instructor with my dilemma, he immediately informed me that the task had to be completed independently, with no assistance. The instructor clearly stated that if the assignment could not be completed on my own, I had no business in a music program. I dropped out of the program and completed my degree in early childhood education. (Chapman 1999, 49)

Happily, Vicky went on to excel in music without a music degree, and realized her dreams of singing on stage by performing with several regional opera companies. But her story magnifies—so to speak—the visual emphasis often placed on scores and graphs when analyzing, an emphasis that is, for obvious reasons, unsupported by Braille music. Consider, for instance, the print score for the exposition of Bach's G Minor fugue from the *Well-Tempered Clavier,* Book 1, shown in **Example 4a**. When reading this score while listening, it's likely that one would visually follow the subject and answer from voice to voice through the exposition, as we might ask students to do in their analyses in order to understand the concept of imitation. Our musical notions of fugal process draw on the image schema *object* to group pitches into a unit that can be *superimposed* in a *sequence* on other objects, which then allows us to think of each voice as a *layer*. Like the notion of *contour*, the application of the *layer* metaphor to fugue analysis is one that readers of both print and Braille learn. Print notation subtly reinforces the idea of layers by adding lines one after another as we read left to right, preserving their coherence as discrete entities with stem direction in keyboard notation. When we *listen* to a fugue, not only do we sense the increasing complexity of accruing layers but also our attention shifts to familiar patterns as each subject enters. In performance practice, students learn to draw attention to these familiar patterns as each layer begins by playing those notes slightly louder than surrounding notes.

[19] **Example 4b** graphically represents the way this fugue was transcribed in Braille symbols in my student's text in the common bar-over-bar format used for piano texture. Rather than go through the cell-by-cell transcription, I've merely created a visual map of the Braille page with horizontal rectangles indicating the situation of rows of Braille cells. In Braille keyboard music there are typically two rows of Braille cells (one for each hand), and in each row the beginnings of measures are aligned. In my map, letters show the portion of the row of cells dedicated to each of the SATB lines. Within each row of cells, the voice parts are written sequentially, proceeding from lowest to highest. For example, in the beginning of the second row, which represents the left hand for measure 1, the cells describe the bass for that measure (which is a rest), then the tenor (another rest), then the alto notes (which happen to be the subject). As in many keyboard fugues where the middle voices can migrate from hand to hand and staff to staff, the alto begins in the left hand and moves to the right later on. An "in-accord" (two Braille cells that together resemble a set-theory union symbol) connects segments that are to be played concurrently. Notice that, unlike in print where vertical alignment helps us organize time, not all of the Braille symbols for simultaneities are aligned vertically. Part of the reason for the non-alignment in Braille is that extra cells are needed to show articulations, ties, octave signs, accidentals, and dynamics. In addition, it would be difficult for the hands to read four simultaneous voices. Also, notice that measure 2, 5, and 7 are split in order to save space.

[20] It is clear that a tactile reader would have great difficulty analyzing the imitation in real time with the Braille score due to the lack of shared image-schematic structure with our notions of musical layering. In addition, the layers of a fugue tend to overlap metrical boundaries. The vertical alignment of measure beginnings in Braille, though, realigns each downbeat, thus emphasizing metrical divisions that are generally *de*-emphasized in this type of polyphony. In fact, the isolation of downbeats from preceding music (as also happens with print bar lines) presents a hurdle to many students when learning to write counterpoint where musical energy leads across bar lines *into* the next downbeat.

[21] Like the Braille chorale, this notation can be quite logical for a keyboard performer. It emphasizes the linear aspects of counterpoint, and tactile readers become very quick at assembling linear code into simultaneous events. I have heard that some Braille readers like the in-accord arrangement because it helps with learning and counting and memorizing each line in isolation. The in-accord arrangement causes me to reflect on my own assembling of vertical simultaneities when reading from piano (or worse, orchestral) score. As much as I might like it to be, the perception of simultaneities is not simultaneous! When I think of the sheer frustration of trying to read a student's composition in which they have failed to align vertically notes that sound together, it makes me admire even more those tactile readers who can quickly assemble individual lines.

[22] Working with my student on this score reminded me that sighted students, too, have trouble with inner voices of print keyboard fugues, which can wander from staff to staff. A way to mediate these issues for both print and Braille readers would be to begin the study of fugal layering and imitation with a piece notated in print open score and Braille line-over-line score, perhaps one that's written for different instrumental timbres, so that each polyphonic voice would remain distinct. Another option would be to use the Braille paragraph format (also known as section-by-section). This method presents a convenient group of measures, say those of the exposition, for each of the parts in turn.

[23] David Pacun, in a recent post to the AMS/SMT Disability Interest Group list, made an interesting comparison between Braille assembling and the assembling we do in analysis. He wrote,

> For all its cumbersome aspects, Braille is or can be—again to me at least—a very analytical notational system; and as it involves "chunking," evaluating and memorizing as you go along, the way one learns the score from the [Braille] notation resembles analysis. In fact, you might even find yourself borrowing a bit from the visually impaired side of things: for instance, why not ask students to memorize a short chunk of music and have them reproduce it on a quiz. (Pacun 2008)

While I'm quoting David, I'd like to draw attention to a paper also given at the 2008 meeting of SMT in Nashville on which he and Janna Saslaw collaborated: "Teaching Blind: Reflections on and Recommendations for Teaching Visual Impaired Students."

[24] Another post to the Disability list suggested a strategy I employed myself at times, which is simply to rely less on notation and to work with students aurally. In this post, Arnie Cox reported that he teaches blind students primarily in private readings. His focus has been on "reproducing lines by ear vocally and/or on their instrument" and this has "contributed to a more ear-oriented approach" in his usual classroom teaching (Cox 2008).

[25] In conclusion, let me return to the quotes with which I opened this paper. Is Braille an impoverished method for transmitting visual scores? At times, but I would maintain that is not its intention. Braille music is designed primarily as an aid to memory and performance, with its own logic and syntax. Is Braille far more logical to a blind reader? Sometimes yes, and sometimes no, and I think we could probably say the same for print and sighted readers. As for presenting the same information as print, clearly Braille does not consistently do so, but it does function in a similar way: to convey musical ideas between musicians. In that sense it is a rich tool for music making for many people. Finally, working with a blind student has made me think more about notation in general, and of how notation influences the way I think and talk about music in the classroom. I have renewed my efforts to focus on sound and to avoid using sight-centric terminology to describe aural events. Most of all, I try to help my students to focus on listening and to express more creatively what they hear.

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