When Disability and Music Met Maker Culture: The Long(er) History of Accessible Music Notation

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In a recent think piece for the new-music media site *I Care If You Listen*, the London-based writer and director Jessica Bailey advocates for accessible notation practices in classical-music pedagogy ('Earned, Not Learned: How Classical Music Notation is Not Built for Neurodivergent Students' https://icareifyoulisten.com/2024/06/classical-music-notation/ (18 June 2024)). As an avid pianist with Nonverbal Learning Disorder, Bailey finds numbers and symbols more challenging than words and letters, and she recounts how forbidding conventional music notation was for her. Bailey developed her own workarounds, but advanced music study was essentially off limits. She now wonders what doors might be opened to her and other neurodivergent musicians through even small adjustments to notation systems. Drawing a connection between the accessible pre-grade piano-method books of her childhood and modern digital solutions like Lime Lighter and the Odla tactile console, Bailey ponders how notation technologies might help us 'reimagine and re-programme the sheet music model'.

Alternatives to five-line staff notation abound, of course, from instrumental tablatures and graphic scores to the streaming notation in video games like *Guitar Hero* and *Rock Band* (see Kiri Miller, *Playing Along: Digital Games, YouTube, and Virtual Performance* (New York: Oxford University Press, 2012)). This is not to mention the hundreds of systems of music notation worldwide, currently being catalogued by Jon Silpayamanant on his 'Timeline of Music Notation' (*Mae Mai*, https://silpayamanant.wordpress.com/timeline-of-music-notation/ (5 May 2024)). The long eighteenth century witnessed a proliferation of novel and experimental notation systems in Europe, most with the goal of simplifying symbols for ease and speed of learning. Many of these were developed by blind musicians or music educators working with blind students, in a flurry of 'disability-driven innovation' (to use a currently trending phrase). This coincided with the rise of institutes for the blind in Paris, Liverpool, Vienna and Berlin in the 1780s–1820s, which all made music central to their curricula. Until Louis Braille's system of music notation, first published in 1829, was adopted by these and other institutes in the late nineteenth century, a host of alternative notation systems for blind and low-vision musicians emerged, in what I like to think of as a kind of proto-'maker movement'.

Having gained worldwide attention in the first two decades of the twenty-first century with the founding of *Make* magazine in 2006, the maker movement refers to 'maker' culture, which marries DIY technology with artisanry, and individual experimentation with grassroots collaboration and exchange. Anyone who has been part of a music-making community will recognize these principles to varying degrees. Designing, tinkering, customizing and openly sharing the means of musical expression are fundamental to this human endeavour. Whether a practice room, repair shop, rehearsal space, recording studio or concert venue, all music spaces are, to some extent, 'maker-spaces', though they may not feature 3D printers or laser cutters. And many scholars and practitioners in both music education and music therapy already integrate 'making' into their

practices. One criticism of the first wave of the maker movement was its lack of inclusivity, emerging as it did out of the white-male-dominated tech industry of the Bay Area and privileging expensive digital fabrication equipment. Feminist makers, queer makers and makers of colour have cultivated alternative spaces and practices of belonging for marginalized makers, and expanded the definition of making to include more affordable and sustainable tools and processes. In 2013 Meryl Alper called for a 'mixed-ability maker culture' in which 'people with and without disabilities can co-exist and co-create . . . making useful things *for* people with disabilities, as well as getting people with disabilities involved *in* making' ('Making Space in the Makerspace: Building a Mixed-Ability Maker Culture', *Interaction Design and Children Conference 2013* https://merylalper.com/wp-content/uploads/2013/03/idc13-workshop_meryl-alper.pdf (10 May 2024)).

The heyday of tactile-music-notation experimentation in the 1770s–1830s can be understood as one antecedent to Alper's 'mixed-ability maker culture'. These decades saw the publication of a number of music-notation systems for and by the blind, many of which were mediated through wooden tables and boards, metal grids and other devices for the tactile writing and reading of music. The detailed descriptions, plans and illustrations of these DIY methods would not be out of place in a modern-day Maker Faire proposal. Take this addendum to the description by the blind musician John Christie – who co-founded and taught music at England's first institute for the blind, the Liverpool School for the Indigent Blind (established 1791) – of his 'Theograph, a Machine for teaching Music to the Blind' (Figure 1):

> The portable size of this machine excludes the possibility of setting whole tunes thereon . . . When the student . . . is desirous to set movements at length, one or more frames may be provided with cushions, each a yard long, six inches broad, and one inch thick. (John Christie, 'Description of the Theograph', *The Monthly Magazine, and British Register* 4/24 (November 1797), 368)

Christie's flexible approach to user modification exemplifies the maker principles of iterative design and adaptation. A similar ethos informs this note from Johann Riedinger, accompanying a description and illustration of a composing board and notation system, similar to Christie's theograph (Figure 2), that he invented for his friend and frequent collaborator, the blind Viennese piano *virtuosa*, composer and pedagogue Maria Theresia Paradis (1759–1824):

> [Es ist] gleichgültig, was jedes, nach Verschiedenheit der Ansicht oder Meinung, daran abändern will. Die Tafeln sind übrigens Schreinerarbeit; die Drähte habe ich selbst eingezogen; die Taktstriche habe ich auch gemacht; die Figuren . . . sind Drechslerarbeit und von hartem Holze; die übrigen habe ich selbst aus Lindenholz geschnitzt. (Johann Riedinger, 'Notenschrift für Blinde', *Allgemeine musikalische Zeitung* (31 October 1810), 910)

> Anyone can adapt [this system] however they wish, depending on their different views or opinions. The tables were made by carpenters; I installed the wires [staff lines] myself, and I also made the barlines; the figures [notehead pegs] are wood turners' work and made of hardwood; I carved the rest myself from limewood. (All translations mine)

Riedinger denied publishing his plans out of self-aggrandizement or even to assert himself as an inventor, but rather 'simply out of a deep concern for the fate of a considerable number of suffering brethren' ('blos aus inniger Theilnahme an dem Schicksal eines ansehnlichen Theils leidender Brüder'; 'Notenschrift für Blinde', 906). Both Riedinger's and Christie's gestures toward utility and adaptability therefore prefigured key principles of the modern maker movement.

These and other innovators freely shared their plans in print, and news of their inventions circulated widely: Christie and his theograph were written up in Ernst Ludwig Gerber's *Neues historisch-biographisches Lexikon der Tonkünstler* (four volumes (Leipzig: A. Kühnel, 1812–1814),
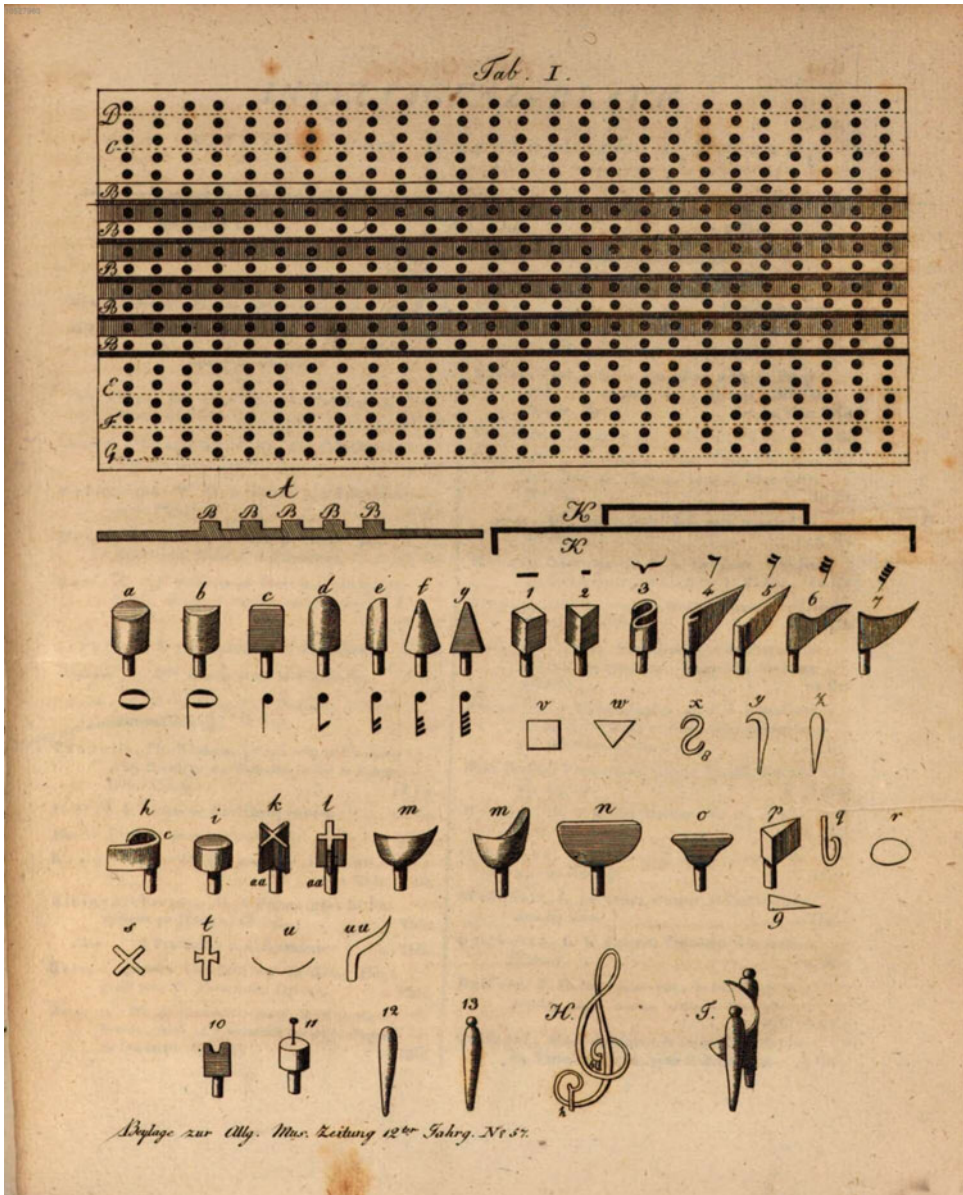
Figure 1. Plate accompanying article 'Description of the Theograph. By John Christie of Liverpool', *The Monthly Magazine, and British Register* 4/24 (November 1797), 368. Natural History Museum Library, London www.biodiversitylibrary.org/bibliography/173945. Used by permission

volume 1, 715), and a profile of Paradis that mentioned Riedinger's composing board appeared in a children's magazine (Leopold Chimani, 'Eine merkwürdige Blinde in Wien', *Vaterländische Unterhaltungen*, six volumes (Vienna: Anton Doll, 1815), volume 3, 122–128). The blind Catalonian composer and inventor Jaime Isern was awarded a silver medal in 1827 from the London Society for the Encouragement of Arts, Manufactures, and Commerce for his 'Instrument to Enable the Blind to Write Music' (in *Transactions of the Society Instituted at London for the Encouragement of Arts, Manufactures, and Commerce, With the Premiums Offered in the Year 1827* (London, 1827), 86–90). Open knowledge sharing, also central to modern-day maker culture, was alive and well in this period when blind and sighted inventors, tinkerers and designers freely exchanged ideas and methods.

Collaborating with my own institution's makerspace, the Fimbel Maker and Innovation Lab at Mount Holyoke College, has given me a new appreciation of the affinities between musical and maker cultures 'then and now'. Luke Jaeger, a musician and the Technical Project Administrator at Fimbel, created a three-dimensional replica of an experimental one-line staff notation that I had shared with him. It was developed at the kaiserlich-königliche Blinden-Institut in Wien (Vienna Institute for the Blind) and codified in head music teacher Simon Sechter's contribution to Johann Adolf Klein's *Lehrbuch zum Unterrichte der Blinden* (Vienna: Carl Schaumburg, 1819). Exchanging a deer-hair cushion for foam board, Jaeger laser-cut the distinctive note-value shapes out of plywood (circle for a semibreve, pointed oval for crotchet, and so on), and punched sequences of small holes in each shape for pin placement to represent pitches (one dot for C and a horizontal pair for G, for instance). We then positioned these note shapes above, below and on an elastic cord that represented Sechter's reduction of the five-line staff. Sharing this modern reconstruction of Sechter's notation at a recent conference enabled both blind and sighted attendees to have a hands-on experience of this innovative system. And re-enacting the making of these tools and systems allows music historians like me to connect with past generations of makers, in what we might even call 'historically informed design'.

Figure 2. Johann Riedinger, 'Notenschrift für Blinde', *Allgemeine musikalische Zeitung* (31 October 1810), table after 920. Bayerische Staatsbibliothek München, 4 Mus.th. 1800-12 urn:nbn:de:bvb:12-bsb10527960-2. Used by permission

Riedinger's friend Paradis is the subject of a bicentenary symposium I co-organized in November 2024 with my colleagues Annette Richards (Cornell University) and Christopher Parton (Princeton University), for which Jaeger and his Fimbel colleagues painstakingly designed and fabricated a full-size replica of Riedinger's composing board (Figure 3). Paradis was a lifelong innovator and early adopter of new technologies and tools for blind communication and learning, within and beyond music. She corresponded with the blind writer Johann-Ludwig Weissenburg and the inventor Wolfgang von Kempelen using a proto-typewriter Kempelen had designed for her (Sébastien Durand, 'Parole et musique d'aveugle: la correspondance de Maria-Theresia von Paradis
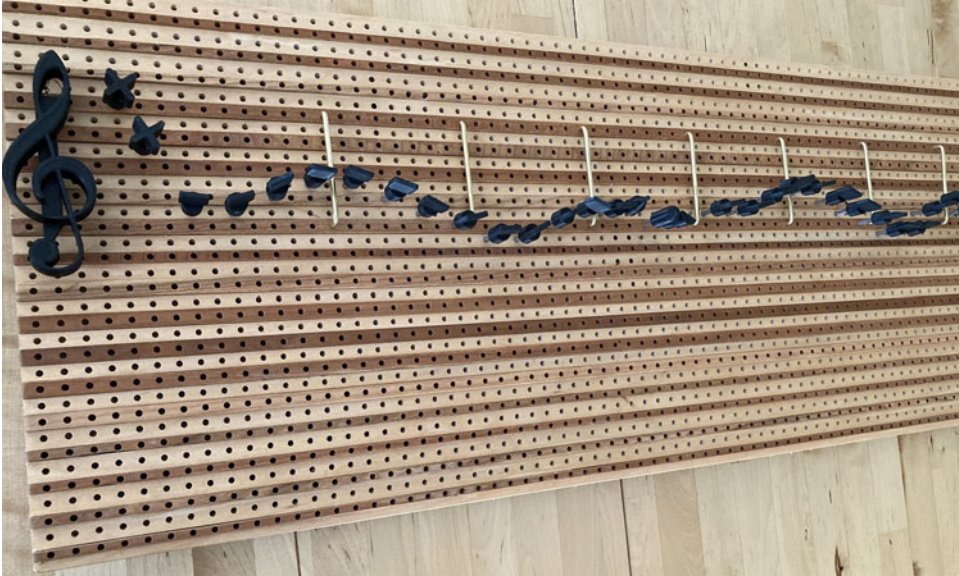
Figure 3. Replica of Riedinger composing board and pegs, produced by Luke Jaeger and staff at Fimbel Maker and Innovation Lab, Mount Holyoke College, 2024. Photograph by Adeline Mueller

(1759–1824) avec Johann-Ludwig Weissenburg (1752–1800)', in *Discours et representations du handicap: perspectives culturelles*, ed. Céline Roussel and Soline Vennetier (Paris: Classiques Garnier, 2019), 101–118). She fashioned her own tactile maps and playing cards. She consulted with Valentin Haüy, who established the first school for the blind, the Institut des Jeunes Aveugles in Paris, in 1784. And in 1808 she opened a music school out of her own home for blind and non-blind girls and young women, holding public concerts that were acclaimed in the Viennese press. Her school predates the first recognized Austrian public conservatory, the Wiener Konservatorium, by nine years, and may well have inspired its founding. The composing board Riedinger designed for her may have influenced the one-line staff notation used at the Vienna Institute for the Blind and drawn up by Sechter – after all, the Institute had in its collection over a dozen different tactile music scores and tools, including one identified as 'a music board with wooden pegs, after the style of Fräulein von Paradies' (Johann Wilhelm Klein, *Die Anstalten für Blinde in Wien* (Vienna: A. Strauß's sel. Witwe, 1841), 170–171). This collection of accessible music-notation systems surely gave the Institute's students and teachers alike models for their own experiments, just as Paradis offered blind youth a model of an accomplished blind artist integrated into upper-class Viennese society.

Another oft-cited component of maker culture is autonomy: makers often pursue their interests independent of institutions (at least in theory). Independence in the broader sense is also a cornerstone of the modern disability-rights movement: for example, the 1990 Americans with Disabilities Act cites self-sufficiency alongside full participation and integration as its core goals, and the annual commemoration of its signing on 26 July is known as 'National Disability Independence Day'. But the ethos of self-determination for disabled people had already influenced the writings of educators, reformers and advocates for the first institutes for the blind in Europe. Klein cited 'Selbstständigkeit' (independence) as a founding principle of the Vienna Institute for the Blind, encouraging individual industriousness as an alternative to dependence on charity. The language of independence also shows up in inventors' descriptions of accessible music-notation systems. Sechter intended his one-line staff-notation system to give blind musicians the ability to study a score without a sighted

companion or teacher, and to notate their own compositions. This section of the text is even, in the table of contents, entitled 'Noten zum Selbstcomponiren für Blinde' (Notation for Independent Composition by the Blind). Isern's instrument was described as 'free[ing a blind composer] from the necessity of employing another person to re-write and translate (so to speak) his thoughts' ('Instrument to Enable the Blind to Write Music', 87). Isern's device was merely a tactile score grid for writing with a pen or pencil, and thus did not permit immediate rereading by the blind composer (as opposed to the systems of Christie, Riedinger and Sechter, which did). Yet Isern's invention was extolled for the 'power' it would give the composer, who 'has therefore rendered himself much more independent in this particular than he was before' ('Instrument to Enable the Blind to Write Music', 87).

Many contemporary blind musicians continue to praise Braille music notation for the independence it affords in engaging with music scores. In the UK Association for Accessible Formats' 2018 podcast series 'Journey through Braille Music', the organist and pianist James Bowden observes: 'If I learn something by ear it's very quick to give me a rough idea of what the piece is going to do. But for serious music learning, Braille music will give me access to all the little details and so on in the score' ('Journey through Braille Music', episode 1 www.youtube.com/watch?v=XQSRutJFBNs, from 2′41″ (1 August 2024)). In that same podcast another blind musician, the recorder player James Risdon, describes Braille music as 'a tool that allows me to work independently and on the same terms as sighted colleagues' ('Journey through Braille Music', episode 1, from 3′39″). Risdon's remark about working 'on the same terms' as his sighted colleagues recalls an additional use proposed by both Christie and Sechter for their one-line staff notations: they allowed blind teachers of sighted musicians equal access to the score when providing corrections. These inventors thereby normalized the idea of blind musicians being in a position of authority over sighted students. Whether inspired by Paradis's own renown as a blind teacher of both blind and sighted students, or by the possibilities of the notation itself, this speaks to modern-day disability-rights goals of integration, autonomy and authority.

Another present-day adage, 'universal design is good design', also finds a precursor in accessible music-notation systems of the pre-Braille period. Riedinger asserted that his composition board had advantages for sighted as well as blind users, citing two high-profile testimonials:

> Uebrigens ist diese Manier, die Musik aufzusetzen, von der Art, dass auch Sehende sich derselben, vornämlich bey Partituren, vortheilhaft bedienen könnten wie das nicht nur der k. k. Hofkapellmeister, Hr. Salieri, eingestand, sondern auch der sel. Haydn versicherte, dass eine Partitur auf diese Art viel leichter zu übersehen und abzuändern sey, als in der gewöhnlichen Schrift, und dass sie überdies viele Bequemlichkeit beym Studium des vierstimmigen Satzes darböte. (Riedinger, 'Notenschrift für Blinde', 906)

> Incidentally, this manner of composing music is such that sighted people could also use it to their advantage, especially in the case of scores, and not only has the court Kapellmeister Salieri acknowledged this, but also the blessed Haydn has assured us, that this kind of score is much easier to scan and modify than in ordinary writing, and that it also offers much convenience when studying four-part music.

Riedinger here evokes the modern-day 'curb-cut effect', in other words disability-driven innovation that benefits individuals other than those for whom it was originally designed.

As present-day music instructors absorb and adapt our teaching to the principles of accessible, inclusive instruction and Universal Design for Learning, many are continuing the tradition of experimenting with alternative systems of music notation in their pedagogy. Brendon Bussy, an artist, community-theatre creator and special-needs teacher who taught for years at the Dominican School for Deaf Children in Cape Town, has developed a body-percussion notation system called Shape Beats, inspired by graphic notation, dance notation and sign-language symbol systems

('Making Shape Beats: Rhythm and Creative Arts in the Deaf Classroom', presentation at 2024 Creative Arts Conference, www.youtube.com/watch?v=FYz4LkGkpHI&t (10 June 2024)). Four basic symbols for four main audiovisual gestures (clap, fist on table, open palm on table and upturned palms) can be combined in various rhythmic patterns to enable interlocking rhythms to be created, notated, performed and shared by d/Deaf students. Chi Kim, a blind composer and producer and Associate Professor at Berklee College of Music, founded the College's Assistive Music Technology programme to improve access for blind and visually impaired music students. His pedagogical and technological innovations – which include adaptations to music-notation software for blind users – are motivated by a desire to help blind musicians gain independence. 'In the past', he says, 'if they had a song in their heads, they had to get assistance from a sighted person. But it takes a long time to dictate note by note, so the sighted people would fill in the gap. Now, they can have full control over what they write on the charts and record' ('Chi Gook Kim, Berklee College of Music', https://college.berklee.edu/people/chi-gook-kim (14 June 2024)).

Teachers and historians alike must be wary, then as now, of techno-utopianism, even techno-ableism, in the discourse surrounding accessible design. Critics argue that adaptive technology risks implicitly framing disability as inconvenient or unpalatable, 'mainstreaming' disabled individuals in a way that flattens difference, or worse, slips into paternalist pity and what Eli Clare calls the 'insidious and pervasive . . . ideology of cure' (Clare, *Brilliant Imperfection: Grappling with Cure* (Durham, NC: Duke University Press, 2017), 14). This ideology suffused the discourse of education for the blind in the late eighteenth century. For example, Haüy, in his 'proof-of-concept' sample of raised-print music in 1789, *Epreuves des caractères des aveugles* (Figure 4), used a passage from Ezekiel: 'Ecco ego aperiam tumulos vestros, et eucam vos de sepulcris' (Behold, I am going to open your graves and bring you up from them) (Sebastien Durand, 'Lire et écrire la musique sans voir: genèse d'une notation musicale pour les personnes aveugles de Valentin Haüy à Louis Braille', *Canadian Journal of Disability Studies* 8/6 (2019), 70). The saviour trope of Paradis' time continues today. As Ashley Shew writes, 'nondisabled people believe – and expect us to believe – that technology will "solve" the problem of our disability and save us, or those like us, in the future' (*Against Technoableism: Rethinking Who Needs Improvement* (New York: Norton, 2023), 8).

The hubris of Haüy and others behind the institutional education of blind and deaf children became apparent later in the nineteenth century, when the failings of the institutional system were exposed. And the stereotype of the 'supercrip' – an individual who manages to 'overcome' or efface their disability through talent, genius and striving – shaped the reception of exceptional artists like Paradis as well as informing modern-day discriminatory policies and attitudes towards disabled people. As Jessica Holmes summarizes in her study of d/Deaf musicking, supercrip tropes shift 'the burden of stigma from society to the disabled individual' (Holmes, 'Expert Listening beyond the Limits of Hearing: Music and Deafness', *Journal of the American Musicological Society* 70/1 (2017), 181). Scholars and educators working at the intersections of disability and music, especially those who present as non-disabled, must therefore remain vigilant against ideologies of cure, rescue, rehabilitation and overcoming, and work to keep disabled perspectives centred in both historical narratives and modern initiatives concerning accessible music. Organizations like RAMPD (Recording Artists and Music Professionals with Disabilities), Drake Music and Disability Arts Online are demonstrating how this can work for today's music industry.

Antecedents to the maker culture that is driving new investments in arts, technology and design at so many American college campuses can be found in plenty of other corners of the European Enlightenment besides accessible music notation for the blind. Music boxes, clocks and other sounding automata, musical dice games and even Feuillet-Beauchamp dance notation represent avenues of lively experimentation in technologies and inscription systems for music, a counter-narrative to the dominant historiographical narratives of ever-increasing reification of the score and the primacy of composers in the music cultures of this time. Students familiar with the maker mindset might be surprised to learn of kindred practices of innovation and resource-sharing
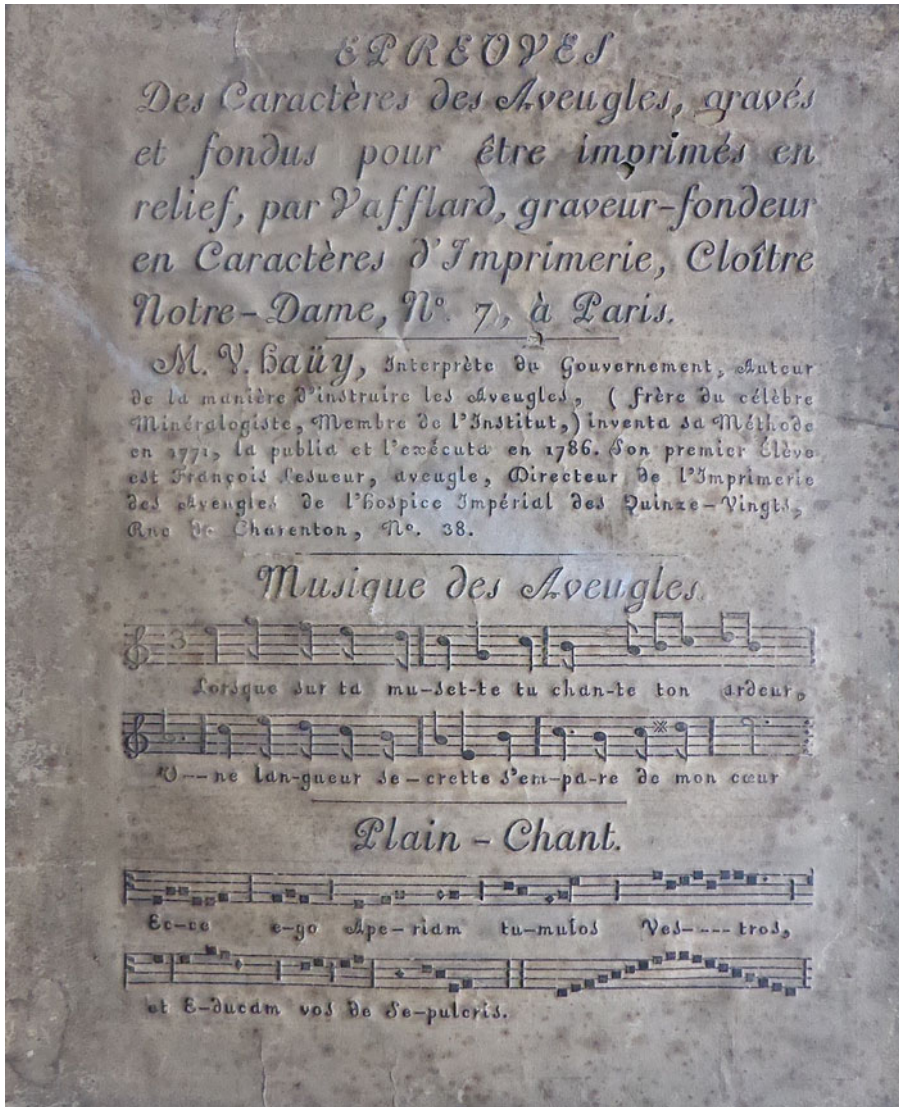
Figure 4. Valentin Haüy, *Épreuves des Caractères des Aveugles, gravés et fondus pour être imprimés en relief* (Paris: Vafflard, 1789). Musée Valentin Haüy, Paris, No. 1386. Photograph by Mireille Duhen. Used by permission

in centuries past, while the focus on disability as a minoritized identity can help them make connections with historically marginalized figures in music history.

Critical disability history offers important perspectives on the histories of music notation, publishing, theory, pedagogy, education, instrument design and reception. As our discipline responds to calls to 'create a more ethical history of the Western art-music tradition' (Ayana O. Smith, 'Editorial', *Eighteenth-Century Music* 18/2 (2021), 245) and to 'center crip ways of being, knowing, and making in the long eighteenth century' (as in Emily Stanback's call for papers for the Disability Studies Caucus' 2023 American Society for Eighteenth-Century Studies panel on Eighteenth-Century Cripistemologies), we have a new partner in collegiate and public-library makerspaces. These spaces are not just design labs for the inventions of today; they can also help

us recuperate and even reverse-engineer inventions of the past to generate new perspectives on history's music makers.

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