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Tuning forks as time travel machines: Pitch standardisation and historicism

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For “Sonic Things”: Special issue of *Sound Studies*

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Abstract: Recent research at the intersection of music and science has described standards of musical pitch as the result of an increasing circulation of actors and artefacts and the rise of science in the musical field; like the metre, the kilo, or the second, the unified musical measure was invented to create a unified space. I argue here that there was another key factor in standardisation: the canonisation of music. As scores acquired unprecedented authority, fixing pitch over time became both a practical necessity and a constituent part of national musical canons, complete with sonic relics of a glorious past. This interest in history ultimately fostered the production of an archive of diverse sonic worlds, which contradicted the project of creating a uniform measure. Even today, pitch remains a “sonic thing” that escapes objectification within a unique material and immaterial standard. Analysing how pitch was invested with the ability to reference specific time periods, I show that tuning forks and other technologies embodying pitch became time travel machines, attesting to the entanglement of sonic standardisation with the constitution of the Western musical heritage.

Keywords: acoustics; standardisation; historicism; global politics

On 12 May 1939, Germany, Britain, France, the Netherlands, and Italy signed an international agreement in London, fixing the frequency of our current concert pitch: A 440 hertz.¹ They were getting in tune with the United States, where that pitch had been adopted as a national point of reference in 1935.² Amid increasing tensions in Europe just a few months before the outbreak of World War II, and contrasting with the failures of interwar cultural diplomacy, the adoption of a norm to unify musical practices and ease international musical relations appears as a significant achievement – especially since it put an end to over a century of international disputes. In Stuttgart in 1834, entrepreneur Johann Heinrich Scheibler had suggested adopting A 440 as a standard pitch during the annual congress of the German natural history association *Naturforscherversammlung*. However, the standardisation of sound first succeeded in France, where, in 1859, an *arrêté* or decree imposed the use of A 435 hertz in all state-funded musical institutions and for instrument construction. Over the next two decades, numerous countries, cities, and musical institutions adopted this “French pitch”, which was then chosen as a first international standard in Vienna in 1885 by eight European states.³

A few days after the London conference, a British delegate, the piano maker Evelyn Broadwood, received the representatives of all the national delegations at his country house in Surrey. The party was immortalised in photographs that show delegates listening attentively to the sounds of mostly English songs from the Renaissance performed *a cappella* by the

¹ British Standards Institution, “Notes of a meeting of ISA Sub-Committee No. 43/3B, Concert Pitch, held at Broadcasting House, London, on Thursday and Friday, May 11th and 12th, 1939.” UCLA Special Collections, Vern Oliver Knudsen papers, Coll. No. 1153, Box 25, Folder 4.

² A 440 was introduced for the first time in the United States by the percussion maker John Calhoun Deagan at the end of World War I. In 1925, the American Music Industries Chamber of Commerce adopted it as a national standard, and in 1935, the Bureau of Standards first broadcast it over the radio.

³ Myles Jackson, *Harmonious Triads: Physicists, Musicians, and Instrument Makers in Nineteenth-Century Germany* (Cambridge, MA: MIT Press, 2006), 205–26.

Tudor Singers (fig. 1).⁴ This musical moment raises a number of questions. Were the singers' voices tuned to the brand-new international pitch? And were the performers skilled enough to maintain it despite the challenging conditions of the concert – the lack of instrumental accompaniment, the outdoor setting, birdsong? Beyond the notion of pitch uniformity and the choice of a specific number of vibrations, the harmony that emanates from the pictures, confirmed by the written testimony of one audience member, also reflects the agreement of nations on another point: the value of early music.⁵

[Figure 1 near here]

The idyllic concert celebrated both English early music and the success of emerging acoustical cooperation initiated by the leading figures of the new radio broadcasting industry

⁴ Surrey History Centre, Broadwood Piano Manufacture, 2185/49/31 and 32. The programme of this outdoor concert was: William Byrd (1543–1623), “This Sweet and Merry Month of May”; John Wilbye, “Sweet Honey-sucking Bees”; Thomas Tomkins, “See, See, the Shepherd’s Queen”; “Brigg Fair,” folk song arranged by Percy Grainger; “Wassail” and “The Turtle Dove,” two folk songs arranged by Vaughan Williams; Anon., “Cuckow”; Orlande de Lassus, “Thou Knowest Fairest Maiden” and “Un jour vis un foulon”; Orlando Gibbons, “What Is Our Life?” It was followed by an indoor performance of popular songs and one early nineteenth-century song. “Reception at Lyne. Capel. Surrey to meet the Delegates of the International Committee on the Standardisation of Concert Pitch (International Standards Association) invited to England by the British Standards Institution. Saturday, May 13th, 1939,” Surrey History Centre, Broadwood Piano Manufacture, 2185/JB/71/4a.

⁵ “The success of the Conference was a happy vindication of the decision to go forward with the plans for bringing the delegates of the different countries together, despite the troubled nature of times. The delegates further consorted in complete and amicable accord on the occasions of visits to the Acoustical Laboratory by the kind invitation of the Director, and to Lyne, Capel, Surrey, at the invitation of Captain Broadwood, whose beautiful house and estate, in all the glory of the spring foliage, formed a lovely setting for his genial hospitality and the delightful unaccompanied old English melodies of the famous Tudor Singers under the direction of Mr. Cuthbert Bates.” G. W. C. Kaye, “International Standard of Concert Pitch,” *Nature* 143 (May 27, 1939): 905–6.

– the London conference was organised by the British Standards Institution on behalf of the International Standards Association, and hosted by the British Broadcasting Company.⁶ It was a moment of concord that epitomises the history of pitch standardisation. On the one hand, the invention of a “normal” pitch recalls the invention of other standards in the fields of science and technology.⁷ Directly inspired by the metric system, the creation of a norm regulating musical practices and instrument building in the second half of the nineteenth century went hand in hand with the growth of international trade, the regulation of industrial exchanges, and the constitution of international scientific and technological networks. Compared with other standardisation processes, however, the invention of a normal pitch cultivated a very different relationship to history. The promotion of the metric system and other standards had drawn on ideas of change and the superiority of the modern over the ancient – the metre, for example, was intended to replace the old system of local and arbitrary units of measurement with the solid grounds of modern science.⁸ The creation of a normal pitch, in contrast, paralleled the development of musical historicism during the nineteenth and the twentieth century.⁹

Whereas previous histories of scientific and technological standards have highlighted the spatial reorganisation introduced by such objects, in this paper I consider the relationship

⁶ On the conference, see Fanny Gribenski, “Negotiating the Pitch: For a Diplomatic History of A, at the Crossroads of Politics, Music, Science and Industry,” in *Understanding Musical Diplomacies: Sounds and Voices on the International Stage*, ed. Cécile Prévost and Frédéric Ramel (Basingstoke: Palgrave Macmillan, 2018), 173–92.

⁷ Myles Jackson offered the first account of the history of pitch standardisation (in nineteenth-century Germany) to link the invention of “normal” A₄ with other processes of standardisation in the fields of science and technology. Jackson, *Harmonious Triads*, 183–230.

⁸ Ken Alder, “A Revolution in Measure: The Political Economy of the Metric System in France,” in *The Values of Precision*, ed. M. Norton Wise (Princeton, NJ: Princeton University Press, 1995), 39–71.

⁹ On this question, see especially: Katharine Ellis, *Interpreting the Musical Past: Early Music in Nineteenth-Century France* (Oxford: Oxford University Press, 2000).

between standard pitch and historicity, arguing that the creation of a musical measure was first and foremost an attempt to manage time. While other creations of scientific and technical units aimed at connecting different territories and sites of activity, the initial impulse for pitch standardisation, at the beginning of the nineteenth century, was a desire to link different time periods. Throughout the nineteenth- and twentieth-century pitch negotiations, there was a shared belief that pitch was becoming sharper. With the historicisation of the musical field, this phenomenon came to be seen as a threat to the conservation of musical repertoires. Commentators feared that if pitch kept rising, the most precious works from the musical past would soon end up outside the range of voice and instruments alike. Debates about pitch were the site of a negotiation between past and present musical cultures and, beyond that, between competing visions of society.

Pitch's entanglement with imaginations of the musical past carried important implications for the negotiations. In contrast to the metre or the second, which were set in relation to nature, standards of pitch were mostly defined in reference to the authority of past composers. This was the source of many ambiguities and much instability over the course of the negotiations. While the veneration of the musical past triggered the opening of pitch negotiations and sustained them, it was also what ultimately jeopardised the creation of a unified measure for music. Historicism thus fuelled both the unification and diversification of pitch. The following pages examine this dialectic in three steps. I first analyse the earliest movements of pitch reform in mid-nineteenth-century France and England, showing that although they both intended to freeze time and protect the musical past, there were competing definitions of the musical past in these two countries, which resulted in the production of competing standards. I then consider how pitch negotiations triggered the excavation of pitch's historical diversity – a knowledge that ultimately contradicted the very project of creating a unique standard. Finally, I show that due to the entanglement between pitch

standardisation and imaginations of the musical past, pitch was – and still remains – the site of movements of sociopolitical resistance based on the promotion of alternative standards.

Throughout the paper, I show that despite efforts to halt its alleged escalation, pitch remained in flux during the nineteenth and twentieth centuries. Pitch was a moving target, as was the musical past that a sonic standard was meant to preserve. By considering the interplay between the musical past and pitch standardisation, I show that concert pitch offers an entry point into the production of modern musical soundscapes at the intersection of different historical periods. Following studies in media archaeology that emphasise the archiving potential and multilayered temporality of sonic technologies, I present tuning forks – the main vehicles of pitch unification – as “sonic time machines”.¹⁰ Whereas media historians have often considered individual technologies, however, I focus on *collections* of tuning forks. Starting from the interferences created by slight differences in pitch, I show the tension between the standardisers’ attempts to create a unified musical measure, on the one hand, and the consequent production of an archive of a diverse sonic world, on the other – a tension that continues to shape our musical soundscapes today.

Freezing time: Standard pitches as guardians of musical heritage

Over the last thirty years, historians of science have emphasised the historical contingencies of the creation of standards, while scholars in the field of science and technology studies (STS) have drawn attention to the ubiquity of standards and the ways in which they shape all dimensions of social life, from metrology to engineering, medicine, and education.¹¹

¹⁰ Wolfgang Ernst, *Sonic Time Machines: Explicit Sound, Sirenic Voices, and Implicit Sonicity* (Amsterdam: University of Amsterdam Press, 2016).

¹¹ For the first, see especially: M. Norton Wise (ed.), *The Values of Precision* (Princeton: Princeton University Press, 1995); Graeme J. N. Gooday, *The Morals of Measurement: Accuracy, Irony, and Trust in Late Victorian Electrical Practice* (Cambridge: Cambridge University Press, 2004); Theodore M. Porter, *Trust in Numbers: The Pursuit of Objectivity in Science and Public Life* (Princeton: Princeton University Press, 1996); Simon Schaffer, “Physics Laboratories and the Victorian Country

Collectively, this scholarship has demonstrated how standards were inseparable from historical processes that are often seen as part of the “modernisation” of Western societies, especially globalisation. As tools enabling circulation among diverse sites of activity, standards played a key part in regulating national and international markets from the beginning of the industrial revolution.

To some extent, the history of musical standardisation recalls that of other processes of technical and scientific unification. In the second half of the nineteenth century, pitch joined a cohort of subjects negotiated within the late nineteenth century’s “conference system”, such as submarine cables, customs tariffs, or technical standards for railways.¹² In its section on multilateral commercial agreements between Germany and the Allies, the Versailles Treaty mentions a conference held in Vienna in 1885 during which Austria, Italy, Hungary, Sweden, Russia, Prussia, Saxony, and Württemberg agreed to adopt a pitch previously chosen by France – an A of 435 vibrations.¹³ As the music critic Eduard Hanslick put it in 1864, since the second half of the nineteenth century, standard pitch has been “a musical railway network” that “connects all cities of culture”.¹⁴

House,” in Crosbie Smith and Jon Agar (eds.), *Making Space for Science: Territorial Themes in the Shaping of Knowledge* (Basingstoke: Palgrave, 1998), 149–80. For the second, see, for instance: JoAnn Yates and Craig N. Murphy, *Engineering Rules: Global Standard Setting since 1880* (Baltimore, MA: Johns Hopkins University Press, 2019); Martha Lampland and Susan Leigh Starr, *Standards and Their Stories: How Quantifying, Classifying, and Formalizing Practices Shape Everyday Life* (Ithaca, NY: Cornell University Press, 2009); Nils Brunsson and Beigt Jacobson (ed.), *A World of Standards* (Oxford: Oxford University Press, 2000).

¹² Craig N. Murphy, *International Organization and Industrial Change: Global Governance since 1850* (Oxford: Oxford University Press, 1994), 56.

¹³ Part X, Article 282, 22.

¹⁴ Eduard Hanslick, “Musikalische Briefe,” *Neue Freie Presse* (10 Sept. 1864), in Eduard Hanslick, *Sämtliche Schriften. Historisch-kritische Aufgabe, Band I/7, Aufsätze und Rezensionen 1864–1865*, edited by Dietmar Strauß (Vienna, Cologne, and Weimar: Böhlau, 2011), 138.

Despite the similarities between musical standardisation and other processes of unification, however, pitch raises specific questions. Crucially, the first extensive efforts to regulate musical practice were not aimed at producing a unified space that would enable the circulation of musicians and musical instruments but were rather envisioned as a way to regulate changes over time. Although acousticians and musicologists have challenged this view more recently, a fundamental dimension at the start of the negotiations was a shared belief that pitch was rising inexorably.¹⁵ For instance, in 1858, the composer Hector Berlioz predicted that “pitch – having risen one tone in a hundred years, or half a tone in half a century – would, if its ascending march continued, go through all the semitones of the scale in 600 years, and would necessarily be up by an octave in 2458”.¹⁶ Two years later, Hanslick warned that orchestras’ use of high pitches would lead to the “ruin” of musical culture.¹⁷

In the same way that the calls for uniformity across space resulted from the encounters of musicians and artefacts belonging to different places, the perception of pitch diversity over time was the outcome of confrontations between musical works from different time periods. This is what the first recorded efforts to regulate pitch illustrate. These took place in Paris in the early 1800s, when the Opera administration addressed a tension induced by two competing phenomena.¹⁸ As the development of instrumental music gave rise to a new taste for “bright” sounds, standards of pitch became higher at the Opera; at the same time, music by

¹⁵ Émile Leipp and Michèle Castellengo, “Du diapason et de sa relativité,” *Revue musicale* 294 (1977): 7–10; and Bruce Haynes, *A History of Performing Pitch: The Story of “A”* (Lanham, Mar., and Oxford: The Scarecrow Press, 2002).

¹⁶ Hector Berlioz, “Le Diapason,” *Journal des débats*, 29 Sept. 1858: 1.

¹⁷ Eduard Hanslick, “Musik. (Hofopertheater.– Orchester.– Die Pariser Stimmung),” *Presse*, 7 Oct. 1861, in Eduard Hanslick, *Sämtliche Schriften. Historisch-kritische Aufgabe, Band I/5, Aufsätze und Rezensionen 1859–1865*, directed by Dietmar Strauß (Vienna, Cologne, and Weimar: Böhlau, 2005), 390.

¹⁸ Emmanuel Hervé, “Le diapason de l’Opéra de Paris,” *Musique. Images. Instruments* 12 (2010): 197–211.

Christoph Willibald Gluck and other eighteenth-century composers began to form a canon of musical works there, and some singers complained that their voices were challenged when they had to perform in higher pitches works written for lower standards. In 1824, responding to their calls, the state appointed a commission to restore earlier standards of pitch. The conductor of the Opera orchestra, François Antoine Habeneck presented seven forks to the commission, including three dating from the eighteenth century. Using these devices as sonic time machines and comparing their pitch with that of a flute and an oboe from the Opera orchestra, the commission decided to lower the pitch by three eighths of a tone, a decision that was intended to restore the standard in use at the Opera in 1810.¹⁹

Attesting to the aesthetic implications of this decision, the commission recommended that the Royal Academy's *diapason*, or standard pitch, become "at the same time the diapason of the lyrical theatres, the Royal School and the Chapel", for they feared that, "in the first days of its adoption, this improvement might surprise the audience by disaccustoming them to the brighter effects to which their ears have become habituated over the past few years".²⁰ In addition to these precautions, and similarly attesting to pitch's new expressive function, in the wake of the commission's decision, the floor of the stage was moved higher up to compensate the loss of sonority that the reform had induced.²¹ It was not long, however, before the 1824 reform was undone and the "brighter" sounds of the orchestra returned to the Opera stage. According to the musicologist Adrien de La Fage, "when Rossini finally introduced his works on the Opera stage [in 1826], the pitch he found was so low that it took away from the

¹⁹ Académie royale de musique, handwritten report on the meeting of the pitch commission of 21 June 1824. Archives nationales, AJ/13/114.

²⁰ Ibid.

²¹ Emmanuel Hervé, "Le diapason de l'Opéra de Paris," 201.

instruments their brightness and their vigour. The reasons of an artist whose authority had such great weight prevailed, and the pitch was raised again.”²²

This example shows how, at the beginning of the nineteenth century, pitch came to crystallise the tension between two contradictory trends: the canonisation of vocal repertoires, requiring a relative stability in performing pitches on the one hand, and a new taste for high sounds resulting from the development of orchestral music on the other. To be sure, canonisation was not a new phenomenon at the time: as William Weber has shown, from the end of the seventeenth century, “ancient music” had been at the centre of the Academy of Ancient Music’s activities in London; after the death of Louis XIV, the Royal Chapel at Versailles kept performing the works associated with the monarch’s reign.²³ What singers at the Paris Opera experienced, however, was a conflict between this persistent presence of past vocal musical works on European stages, and new instrumental developments which increasingly rendered pitch a feature of sonic aesthetics. In this context, tuning forks became pieces of evidence attesting to these chronological transformations. As witnesses to endangered, disappearing, musical worlds, they were turned into archives of sonic pasts and used to regulate the coexistence of musical works from different time periods.

The 1824 commission was only the prelude to a national standardisation of pitch during the Second French Empire that further reinforced the link between pitch standards and the French musical canon. In 1855, Jules-Antoine Lissajous, then a young physicist who had just developed a method to visualise sound vibrations, called for the convocation of an

²² *De l’unité tonique et de la fixation d’un diapason universel* (Paris: E. Dentu, 1859), 65–66. Quoted by *ibid.* Rossini’s first opera to be performed at the Paris Opera was *Le Siège de Corinthe* (premiered on 9 Oct. 1926).

²³ William Weber, *The Rise of Musical Classics in Eighteenth-century England: A Study in Canon, Ritual and Ideology* (Oxford: Clarendon, 1992); and “La musique ancienne in the Waning of Ancien Régime,” *The Journal of Modern History*, vol. 56, n° 1 (March 1984), 58–88.

international congress to take charge of stabilising and unifying pitches all over the world.²⁴ Although informed by his scientific views – referring to the metric system, he suggested adopting a decimal standard of 1000 vibrations for the note B – and by his hopes of becoming the guardian of such a norm, which would secure him prominence in the national scientific community, Lissajous’s intervention surprisingly took the form of a historical lecture on French opera.²⁵ Armed with seven tuning forks as sonic evidence, Lissajous delivered a spectacular demonstration of the “ascending march” of pitch since the late seventeenth century.²⁶ He asserted that pitch had risen by approximately one tone since the reign of Louis XIV, a monarch associated with the birth of the lyrical genres that still dominated the country’s musical scene at the time, *tragédie lyrique* and *opéra comique*, and the embodiment of French musical grandeur. Lissajous’s use of these artistic arguments was designed to catch the attention of the musical world. His talk echoed musicians’ and music critics’ warnings about the damage to singers’ voices caused by high pitches:

How many beautiful voices have been broken before going on stage and how few survive the theatre’s demands! So many prominent singers spend half their artistic life ruining the means that nature gave them and the other half hiding, through art, the early ruin of an organ that no longer matches their talent. This is the disastrous consequence of the diapason-pitch ascension.²⁷

²⁴ Steven Turner, “Demonstrating Harmony: Some of the Many Devices Used to Produce Lissajous Curves Before the Oscilloscope,” *Rittenhouse* 11, no. 2 (1997): 33–51.

²⁵ Jules-Antoine Lissajous, “Note sur l’élévation progressive du diapason des orchestres depuis Louis XIV jusqu’à nos jours et sur la nécessité d’adopter un diapason normal et universel,” *Bulletin de la Société d’Encouragement pour l’Industrie Nationale* 54, no. 2 (1855): 297.

²⁶ *Ibid.*, 294.

²⁷ *Ibid.*, 295.

Lissajous's lecture launched intense debates, which resulted in the appointment of a commission charged with investigating pitch on a national and international level, in 1858. Headed by the opera composer Fromental Halévy, the commission focused primarily on the cultural arguments put forth by Lissajous. The authors of its report blamed the music trade for having artificially raised the pitch in order to sell instruments with brighter sounds. They also expressed their concerns for vocalists and the legacy of secular and sacred musical genres.²⁸ Just as in 1824, the members of the commission based their deliberation on a collection of tuning forks, which they used as evidence of past and present tuning practices. This time, however, their collection was much larger, comprised of dozens of devices that the commission had gathered from across Europe, representing the pitches in use in several countries since the eighteenth century (see figure 2).

[Figure 2 near here]

The commission presented their selected standard of 870 vibrations (or 435 hertz) for A as a compromise between the original pitch of old masterpieces and the sharper tones used by military bands. In fact, however, the choice of this pitch represented a significant decrease and was actually a way of restoring the authority and pre-eminence of composers and French musical traditions inherited from the Old Regime over the ambitions of instrument makers and newer genres of instrumental music. In the words of the commission members, adopting this standard “would bring us back to the pitch used about thirty years ago, the time of the production of works that have remained, for most, part of the canon, and that would return to their prime conditions of composition and performance”.²⁹

²⁸ “Religious music and dramatic music suffer the movement without being able to defend themselves against it, or trying to escape it.” *Rapports et arrêtés pour l'établissement en France d'un diapason musical uniforme* (Paris: Imprimerie impériale, 1859), 10.

²⁹ *Ibid.*, 24–25.

The report expresses the same anxiety shared by Lissajous a few years earlier, but it illustrates how similar calls for the adoption of a fixed point of reference to protect the musical past could draw on competing definitions of that past. Instead of Gluck's lifetime or Louis XIV's reign, invoked by Habeneck and Lissajous respectively, the commission referred to the more recent golden age of Grand Opera marked by such masterpieces as *William Tell* (1829), *Robert le Diable* (1831), and *La Juive* (1835). At a time when opera houses and concert halls were perpetuating this canon, fixing a set pitch would preserve the most glorious era of France's musical history.³⁰ On 16 February 1859, a decree was issued to impose the new norm of 870 vibrations in all state-funded or state-controlled institutions. A prototype tuning fork deposited at the Conservatory would serve as the guardian of the musical past embedded in the selected norm (fig. 3). While recalling the creation of the platinum metre, the gold kilogram, and other material objects designed to materialise scientific units and secure their transmission to later generations, the tuning fork with its standard pitch, or *diapason normal*, was loaded with an additional chronological layer: it was a "sonic time machine" encapsulating the sounds of historic French grand operas.

[Figure 3 near here]

If the diapason normal owed much to cultural anxieties over the preservation of past vocal masterpieces, the measure's entanglement with Paris's operatic culture considerably undermined its authority. The French commission had envisioned its work as the prelude to not only a national, but also an international reform of musical practice. But while French and European audiences largely shared the commission's conviction that pitch change should be stopped and that a sonic prototype would be able to freeze time, views on which segment of history should serve as a point of reference varied widely. What is more, at a time when units

³⁰ William Weber, *The Great Transformation of Musical Taste: Concert Programming from Haydn to Brahms* (New York: Cambridge University Press, 2008).

drew their authority from nature – the metre and the second were thought to be, respectively, a portion of the earth and of the day – the diapason normal appeared as arbitrary. The standard’s tight relation to the musical past is what made it at once appealing and problematic in the eyes of other nations interested in the preservation of their national canon.

British efforts to emulate the French decision illustrate this tension. In 1859, just a few weeks after the French commission published the *arrêté* on the diapason normal, the chairman of the Council of the Society of Arts in London appointed a “Musical Pitch Subcommittee” to “discuss how far it would be practicable to do anything in this country in reference to it”.³¹ Like their French peers, the Society of Arts committee members were determined to halt the rise of pitch, and their first resolution recalled the decision adopted by France: “as the basis of any recommendation of a definite pitch, the capabilities of the human voice in singing the compositions of the great vocal writers should be the first consideration.”³² Reflecting the nation-based character of musical canons at the time, the reference points mentioned by the committee were not the fathers of French *tragédie lyrique*, but the English masters Orlando Gibbons, Henry Purcell, and Georg Friedrich Handel.

Eager to set itself apart from the authoritarian procedure of the French, the commission reached out to “the principal” musical associations and singers of the country, asking them whether they regarded uniformity as desirable and feasible, and if so, which pitch they would recommend for such a standard.³³ The representatives of these societies, the main promoters of the country’s musical canon, almost unanimously denounced the use of high

³¹ Minutes of the Council, 122 (1 June 1859). Royal Society of Arts (hereafter RSA), AD/MA/100/12/02/11.

³² Minutes of the Musical Pitch Committee, 124 (23 December 1859). RSA, AD/MA/100/12/01/105.

³³ Minutes of the Musical Pitch Committee, 102 (1 July 1859). RSA, AD/MA/100/12/01/105.

pitches that threatened to strain the voices of singers.³⁴ So did the most prominent British tenor at the time, Sims Reeves, who regularly participated in oratorio performances:

In respect to your note; I beg to state that I have long felt the consequences of the present high pitch of the orchestras – more especially at the Crystal Palace, where I have been called upon to sing the songs of Handel. I consider it quite . . . essential to reduce the present pitch at least one quarter of a tone, & in the course of another year a further reduction would prevent the ruin of many fine voices.³⁵

Echoing the concerns expressed by the committee, these words reveal that while British audiences shared France's concerns over the necessity to halt pitch's escalation and protect the musical past, they had a differing vision of the past, embedded in England's specific musical tradition of Handelian oratorio. Given the differences between national musical canons, it was clear that music history could not provide a universal reference for the determination of a unified measure.

Beyond a mere redefinition of the musical past, the deliberations of the Society of Arts marked a more fundamental shift from historical to natural definitions of the standard. During the first meeting of the committee, a letter from the eminent mathematician John Herschell was read, suggesting the adoption of *C* 512 as a standard – a figure derived from an initial, inaudible *C* producing one vibration per second, increased by a series of powers of 2.

³⁴ Recipients of such letters included the Windsor & Eton Royal Glee & Madrigal Society, the London Sacred Harmonic Society, the Musical Society of London, the Vocal Association, the Canterbury Musical Union, Trinity College Dublin University Choral Society, the Philharmonic Society, and a few soloists. "Campaign for the adoption of a uniform musical pitch: correspondence to the Society in response to questionnaire, 1860." RSA, PR/GE/121/10/5.

³⁵ Sims Reeves to P. Neve Foster [secretary of the Royal Society Council and Pitch Committee], London, 7 January 1860. RSA, PR/GE/121/10/5.

Although the committee considered this pitch to be too far from the standards that musicians employed at the time, they used it as a point of reference to establish the national pitch of Britain, which they fixed roughly half way between this measure and the pitch C 546 in use at the London Italian Opera: at C=528 vibrations.³⁶

Like Britain, other Western countries attempted to replicate the French creation of a national standard – mostly adopting the French norm. If politics, commerce, and science were driving forces in the transnational history of A 435 just as in that of other scientific and technical standards, more crucial for its diffusion was the emergence of musical historicism. In the United States especially, actors from the worlds of acoustics and instrument making joined conversations on pitch standardisation only after the French norm was introduced as part of a historicising “reform” of Boston’s musical life. The city’s socialites were trying to popularise British oratorios and other classical European masters in the United States, and after the French *arrêté* of 1859, they became eager to introduce the A 435 – in the hope that this would both ease the performance of vocal works and tune Boston to the sounds of Europe’s musical heritage.³⁷

Cultural considerations rooted in the musical past’s growing authority are characteristic of the *longue durée* of pitch standardisation. The text of the resolution passed by the British Standards Institution in the wake of the 1939 agreement, largely reproduced in later ISO norms, starts with the cultural implications of pitch standardisation, and in 1971, a

³⁶ Heschel’s letter was published a few weeks later: John Herschel, “Uniform Musical Pitch,” *Leeds Mercury*, 2 Aug. 1859.

³⁷ One of the main promoters of the French pitch in the United States in the 1860s was John Sullivan Dwight. Many articles published in his *Journal of Music* reflect his attempt to introduce the overseas standard in Boston.

resolution by the council of the European Economic Community opened with similar claims about “action to safeguard the musical heritage”.³⁸

Excavating sound’s historical diversity

As these negotiations show, fixing a musical measure was not only intended to enable the smooth circulation of musicians and musical artefacts across space. It was also meant to set the stage for a coexistence of musical works from different time periods. Putting an end to the alleged rise in pitch became a way to freeze time and thus protect what was considered to be Western musical heritage. While these anxieties over the preservation of historical musical works fuelled attempts to unify pitch, they were also what ultimately jeopardised the very project of pitch standardisation. Throughout the nineteenth century, growing fears that pitch was rising triggered the assemblage of ever-larger collections of tuning forks, raising increasing awareness of the variety of ancient sonic worlds. Although initially aimed at demonstrating the need for a unified musical measure, the excavation of this historical diversity also fostered the opposite claim. Drawing on the authority of these collections of “sonic time machines”, some actors indeed began to ask: Why should musicians adopt a single pitch? Would it not be more consistent with the musical past to use as many pitches as have existed over the course of history?

Of course, there were considerable practical and commercial advantages to securing the adoption of a single pitch. Not only would it allow singers to perform their work in the same conditions across their tours, it would also enable instrumentalists to play with the same instrument everywhere, while granting large businesses the opportunity to send their products throughout the world. These interests and the voices of unification’s advocates mostly

³⁸ British Standards Institution, *British Standard Concert Pitch*, “Foreword,” 11 December 1939 (London: British Standards Institution, 1939); *On the Standardisation of the Initial Tuning Frequency*, Resolution (71) 16, adopted by the Ministers’ Deputies on 30 June 1971.

prevailed in the debates, as the adoption of the ISO norm on standard pitch reveals. Yet throughout the negotiations, historicism fuelled alternative understandings of pitch and tuning practices, which have continued to shape musical soundscapes to this day.

The first formal attempts to excavate pitch's historical variations took place in Paris in 1835, against the background of growing fears over pitch's alleged escalation. Together with the acoustician and inventor of the siren Charles Cagniard de la Tour, the piano tuner and maker Claude Montal measured the pitch of tuning forks in use at Paris's main musical institutions in 1829 and compared them with the ones currently in use at the same venues. Over the following decades, various scholars uncovered further historical evidence of past tuning practices by assembling more "sonic time machines". In 1854, the French physicist Charles Delezenne put together the first table demonstrating the historical variations of pitch, followed by Lissajous, who presented the results of his investigation during his 1855 conference, and by the musicologist Adrien de La Fage, in 1859.³⁹

The work of the French commission of 1859 shows how efforts to excavate the historical diversity of pitch shaped the government's deliberation and decision to halt pitch's escalation. But this was not the only application of this research. In 1862, the Austrian government initiated a pitch reform across its empire and the German confederation. The foreign minister addressed a letter to Austrian diplomatic missions stationed in Germany, asking them to enquire whether the local governments were "inclined to introduce the French pitch".⁴⁰ In response to this enquiry, several local powers and musical authorities expressed their opposition to the reform. Among them, Karl Näke, a Kappelmeister from Dresden,

³⁹ Delezenne, "Sur le Ton des orchestres et des orgues," *Mémoires de la société des sciences à Lille* (1854), 8; Adrien de La Fage, *De l'unité tonique*.

⁴⁰ Circular letter from Meysenberg (for the foreign minister) to the Imperial and Royal Austrian diplomatic missions in Germany, Vienna, 13 May 1862. "Orchester-Simmung. Akten, 1862–1869." OeStA:HHStA MdÄ AR F60 35-1. Vienna, Staatsarchiv.

launched a “crusade” against the French pitch. In revealing the ambivalent nature of the evidence that the French commission had assembled, Karl Näke used it to contest the very principle of pitch unification. Declaring that “the only true utility of the Parisian Commission are the measurements of the various older and current pitches from different locations”, the Kappelmeister drew on these examples to support a completely opposite claim. Rather than unity, Näke argued, one should follow the example of the old masters and re-introduce their diverse pitches.⁴¹

Whereas Näke’s voice did not prevail in Germany nor in broader debates during the nineteenth century, this example shows how the growing awareness of pitch’s historical diversity and the constitution of an archive of diverse sonic worlds could feed the exact opposite of standardisation: diversification. Although Näke was isolated in his own time, his position persists today in historically informed performance practices, which rely on increasingly varied standards supposedly reflecting pitch’s historical variety. Since the 1960s, early music performers’ practices have largely drawn on nineteenth-century pitch historiography. They particularly rely on the work of the linguist, mathematician, and acoustician Alexander J. Ellis, who gathered an unprecedented assemblage of witnesses of past sonic worlds, from tuning forks to organ pipes, pitch pipes, and oboes, which he measured over the course of a decade, from 1869 to 1880. Ellis completed the direct observations of this collection of “sonic time machines” with information he gathered from old treatises, as well as from scholars and musicians of his time. He presented the result of this intense historical enterprise in an 1880 article entitled “The History of Musical Pitch”, which lists over 300 values representing historical pitches from across Europe since the late

⁴¹ Karl Näke, *Ueber Orchesterstimmung: den deutschen Kapellmeistern bei ihrer Versammlung in Dresden, den 28. September, 1862* (Dresden: Liepsch und Reichardt, 1862), 5. Quoted by *ibid.*, 216.

fourteenth century.⁴² This text became very influential when it appeared as part of an appendix to the second edition of Ellis's translation of Helmholtz's *Die Lehre von den Tonempfindungen* (*On the Sensations of Tone*, 1885) and is still a key source for studies on musical pitch.⁴³ Ellis's trajectory once again attests to the ambiguities of enterprises aimed at excavating pitch's historical diversity. By assembling a large archive of diverse sonic worlds, the scholar initially aimed to support pitch unification. In 1885, in the wake of the Vienna conference, during which six countries adopted the French pitch as their national standard, Ellis directed a new inquiry at the Society of Arts and proposed that Britain adopt the French pitch.⁴⁴ But Ellis's work also reveals a tension between this initial aim and the scholar's growing interest in specific historical standards, which ultimately laid the groundwork for alternative tuning practices. His activities thus offer a striking example of the ways in which, due to history's central role in pitch standardisation, this process introduced both unity and diversity.

Despite Ellis's commitment to pitch standardisation, his work largely contributed to the contestation of sonic uniformity. Crucially, the concept of "baroque pitch" and the custom of performing early music a semitone below concert pitch A 440, at A 415, can be traced back to Ellis's invention of the concept "European mean pitch for two centuries".⁴⁵ With this expression, Ellis referred to the pitch that musicians across Europe allegedly used throughout the seventeenth and eighteenth centuries. The scholar created this standard in reference to one of the nineteenth-century's most famous time machines: a tuning fork that was thought to

⁴² Alexander J. Ellis, "On the History of Musical Pitch," *Journal of the Royal Society of Arts* 28 (5 March and 2 April 1880): 293–336 and 400–3.

⁴³ The first edition of *On the Sensations of Tone* was published in 1875. On Ellis's central role as a source for recent studies on performing pitch, see: Bruce Haynes, *A History of Performing Pitch: The Story of "A"* (Lanham, MD: The Scarecrow Press, 2002).

⁴⁴ RSA PR/GE/121/10/6.

⁴⁵ Ellis, "On the History of Musical Pitch," 305.

have belonged to Handel and producing a pitch of A 422.5. The unassailable authority of the composer in the British musical field at the time justified the significant extrapolation made by Ellis, whose work tuned two centuries to the sound of a single artefact associated with a single composer.

According to the legend spread by Ellis, Handel gave this tuning fork to the Foundling Hospital – an orphanage founded in 1739 and supported by many fashionable artists – after a performance of the *Messiah* held to raise funds for the institution in 1750.⁴⁶ Whether accurate or apocryphal, the attribution of the fork to the great master, and its association with his most famous work, ensured its preservation and transmission.⁴⁷ After Handel's death, the fork became a relic, one of the many accessories of the cult dedicated to the composer. Lovingly stored in a wooden box, for most of the nineteenth century it was in the possession of the Reverend G. T. Driffield, a clergyman and composer of vernacular hymns and a member of the pitch committee appointed by the Royal Society of Arts in 1859. Attesting to the authority of the musical past in pitch negotiations, it was the possession of this precious fork that had granted Driffield the privilege of sitting on the 1859–1860 pitch committee of the Society of Arts. In turn, the work of this committee considerably contributed to the fork's fame.

With the birth of pitch historiography, "Handel's" fork was to become more than a tuning device and a sacred relic. Viewed as a crucial piece of historical evidence, it was carefully measured by several acousticians and eventually shaped Ellis's influential history of

⁴⁶ Handel wrote an anthem for a charity concert held in the hospital's chapel in 1749 and donated several objects, which formed the foundation of the current Gerald Coke Collection at the Foundling Museum, London.

⁴⁷ The whereabouts of this fork before and after it was Driffield's property remain unknown. The Foundling Museum holds a fork associated with a similar history to that described by Ellis. See R. C. Bickerton and G. S. Barr, "The Origin of the Tuning Fork," *Journal of the Royal Society of Medicine* 80 (1987), 771. According to curator Katharine Hogg, who gave me information on this object, it is actually a C fork (and the one Ellis and associates wrote about is an A fork).

pitch. While the overwhelming authority of Handel's fork affected only literature during Ellis's time, it found a sonic translation in the practices of early music revivalists after the Second World War.⁴⁸ Although the history of A 415 still remains to be written, musicians' testimonies and material constraints suggest that the adoption of this measure represented an application of Ellis's notion – that a different, lower, standard had dominated Europe's early modern musical practice – to the material conditions of a standardised musical world. Just a semitone lower than 440 in equal temperament, this pitch enabled easy transpositions on keyboards and other instruments tuned to A 440.⁴⁹ While resulting from a striking reduction of historical variety, A 415 illustrates how the excavation of sonic pasts opened the door to sonic diversity.

In the context of pitch negotiations, tuning forks, the primary witnesses of past musical cultures, had become an archive of diverse sonic worlds – the paradoxical outcome of the quest for sonic unification. While the authority of musical history played a key role in movements of pitch unification, to some degree, this history also was – and still remains – a centrifugal force that triggered the adoption of dissonant standards. Whereas commercial and practical realities mostly contained this trend, pitch remains in flux and an increasing number

⁴⁸ Fortepianist, harpsichordist, and early music revival pioneer Isolde Ahlgrimm used A 422 in 1937, a gesture that musicologist Peter Watchorn considers “a unique insight” and “decades ahead of its time.” Peter Watchorn, *Isolde Ahlgrimm, Vienna and the Early Music Revival* (Aldershot and Burlington, VT: Ashgate, 2007), 113. In 1968, the American musicologist Arthur Mendel introduced Ellis as a founding figure of this research trend by reissuing his last history of pitch with a substantial commentary: Alexander J. Ellis and Arthur Mendel, *Studies in the History of Musical Pitch* (Amsterdam: Frits Knuf, 1968). On the importance of Ellis for performance practice studies, see also Arthur Mendel, “Pitch in Western Music since 1500: A Re-Examination,” *Acta Musicologica* 50, no. 1/2 (1978): 1–328; and Haynes, *A History of Performing Pitch*.

⁴⁹ See, for instance, explanations by one of the central figures of the early music revival: Barthold Kuijken, *The Notation Is Not the Music: Reflections on Early Music Practice and Performance* (Bloomington: Indiana University Press, 2013), 19–26.

of early music performers are turning to the authority of the musical past to justify their use of diverse pitches.

Early music performers are not the only ones contesting the authority of standard pitch. As the last section explores, because of their entanglement with history, musical standards have become the sites of broader negotiations between the past and the present. Attesting to music's large cultural implications, battles over pitch carry important political implications. They reveal how pitch, due to its entanglement with historicity and its having been invested with the ability to reference specific time periods, became the site of conflicting political, social, cultural, and religious claims. Turning to the successive technologies that have embodied standard pitches over the course of the twentieth and twenty-first centuries, from radio waves to computer software, I show that the historical knowledge and cultural values embedded in tuning forks have been inscribed in these new devices, rendering them time travel machines.

The “good old days”: Changing pitch to travel in time

In both Britain and the United States, as we have seen, the introduction of the French standard A 435 was part of larger endeavours to develop the practice of oratorios and classical music. These projects reflect the emergence of bourgeois audiences and concerns over the role of music as a vehicle for the dissemination of political and religious values in society.⁵⁰ But the ideological resonances of pitch were revealed nowhere more clearly than in a number of controversies during which actors tried to replace existing standards with norms from previous eras, whether actual or mythical. In these disputes, changing pitch was a way of travelling in time and restoring the lost authority of composers or musical traditions – and,

⁵⁰ William Weber, *The Great Transformation of Musical Taste: Concert Programming from Haydn to Brahms* (New York: Cambridge University Press, 2008).

through them, of political and religious orders. The particular good old days to which actors wished to return by changing pitch varied considerably. In some cases, they went as far back as the origins of music.

An illuminating example of pitch's time-travel function can be found in the interwar period, when both the collaboration of nations and the field of pitch negotiation were being reconfigured. Following the lead of private actors from the music industry, the United States introduced a dissident standard to the international stage. American instrument makers and representatives of the broadcasting industry raised the pitch and started using A 440 as a standard, in a move to distance themselves from the authority of European states as crystallised in the dominance of A 435, which had been adopted by a number of actors in the United States in the nineteenth century's final decades.⁵¹ In 1926, reacting to the adoption of A 440 by the American Music Industries Chamber of Commerce and pressure from several European instrument makers, the League of Nations then agreed to tackle the question of pitch.

The League's investigations were led by the International Commission for Intellectual Cooperation, a body created in 1922 and increasingly interested in musical matters.⁵² Apart from pitch standardisation, the Commission took charge of encouraging international musical exchanges through the circulation of musical works, artists, and collections of popular songs. After two years of work, the Commission declared in favour of the previous international pitch A 435: "The Sub Committee for Arts and Letters concludes that the arrangements

⁵¹ Charles R. Cross, "Historical Notes Relating to Musical Pitch in the United States," *Proceedings of the American Academy of Arts of Sciences* 35 (1900): 453–54.

⁵² On the musical policies of the League of Nations, see Christiane Sibille, "La Musique à la société des nations," in "Musiques et relations internationales," ed. Antoine Marès and Anaïs Fléchet, special issue of *Relations internationales*, nos. 154–55 (2013): 89–102; Sibille, "Harmony Must Dominate the World": *Internationale Organisationen und Musik in der ersten Hälfte des 20. Jahrhunderts* (Bern: Quaderni di Dodis, 6, 2016), 125–61.

presented by the Committee in charge of establishing a uniform musical pitch during the 1858 [i.e., 1859] Conference, are still fully valid today [It] expresses the wish to see all possible means taken by relevant authorities to maintain the 1858 standard.”⁵³ Although the decision was presented as a means of safeguarding the Western musical heritage and promoting peace through art, it might better be interpreted as an attempt to restore the good old days of nineteenth-century cultural diplomacy; the Committee was contesting the legitimacy both of the United States and of commercial interests in tuning the musical world. The League’s advocacy for the French pitch thus articulated broader efforts to reinstate the geopolitical order of the second half of the nineteenth century, marked by the international authority of European states under the aegis of Napoleonic France.

The League’s view did not prevail, and the United States soon confirmed its position through the voice of the American Bureau of Standards, which accepted the music industry’s decision by broadcasting a 440-hertz signal from a radio station located in Beltsville, Maryland. It was this gesture, demonstrating the unforeseen but decisive application of radio for the implementation of standard pitch, that prompted European broadcasters to adopt A 440 as a standard in 1939. Adding to the historical layers contained in the sound of the 1859 model of the diapason normal tuning fork deposited at the Conservatoire, the radio signals emitted on both sides of the Atlantic Ocean after World War II encapsulated over a century of negotiations loaded with competing cultural references. While radio secured for the new standard unprecedented authority over musical practitioners, instrument makers, and listeners,

⁵³ Société des Nations, Commission internationale de Coopération intellectuelle, *Rapport présenté par M. Destrée au nom de la Sous-Commission des Lettres et des Arts*, July 19, 1928, 9. UNESCO Archives, C.I.C.I./L.A./16.

this new guardian of Western musical heritage went on to reshape technological soundscapes, from musical recordings, to radiophonic signals, to telephone ringtones.⁵⁴

The expression “the good old days” may also refer to mythical times, in which case pitch serves to support a utopia. This is what we find in the controversies on pitch that are currently developing on the Internet. For several years, numerous blogs have been denouncing the use of A 440 and calling for its replacement by what they regard as the pitch of the “origins”: A 432. Several examples of software and applications offer users the possibility to retune any music to this pitch.⁵⁵ The “origins” which the supporters of this measure invoke are varied, spanning from Mozart and Stradivarius to ancient Greece, Egyptian antiquity, and the Mayans. This complex phenomenon, which covers a wide political and aesthetic spectrum, would require a full study unto itself.⁵⁶ But the main claims made by the promoters of the counter-standard A 432 can certainly be viewed in light of the politics of pitch as a time-travel machine. Presented as a remedy against the detrimental imposition of a standard pitch, in fact, A 432 is itself, as a counter-standard, a product of that process. The origins of A 432 can be traced, if not all the way back to the time immemorial invoked by its supporters, to the decades following the creation of the French diapason.

The adoption of A 432 was first suggested by the Belgian acoustician Charles Meerens in 1876, in reaction to the French decision of 1859. Like many others, Meerens criticised A 435 for its lack of a scientific basis, and suggested instead a pitch derived from an initial,

⁵⁴ On May 29, 1947, the BBC transmitted a show entitled “Can we have an A?” designed to explain to the public the change in their radiophonic soundscape (R54/21/2, “Technical General. BSI. Standard Pitch.” BBC Written Archives Center, Reading. Telephone ringtones in Europe are still mostly tuned to 440 hertz.

⁵⁵ See, among others: <https://www.conversion-tool.com/432hz/>, <https://www.432player.com>, <https://432music.org/gb/content/9-logiciels-432>.

⁵⁶ Ruth Rosenberg, associate professor of ethnomusicology at the University of Illinois at Chicago, is currently leading a project on the controversy.

inaudible C producing 1 vibration per second via a series of powers of 2.⁵⁷ To justify this proposition, just as other reformers of his time, Meerens drew on the authority of the past. But instead of turning to Handel or other representatives of ancient musical cultures, the physicist referred to generations of eminent acousticians, including the natural philosophers Joseph Sauveur, Charles Delezenne, and Gaspard de Prony, and the acclaimed maker of tuning forks Rudolf Koenig.⁵⁸ Meerens's proposition secured numerous adherents in Europe during the following years and, in 1881, the Italian association of musicians adopted it as a national standard. During the 1885 Vienna conference, the Italian delegation made the case for this alternative measure that reconciled musicians' need for a low pitch with scientists' demands for mathematic rationality. Despite acknowledging the scientific qualities of this mathematical ideal, however, other delegates contrasted it with the reality of trade and musical practices: the French pitch had already spread in Europe, and it would cost a lot of money to change standards now.⁵⁹

But that was not the end of A 432's life as a counter-standard. After World War II, the French composer Robert Dussaut led a campaign against the standard adopted in 1939 and in

⁵⁷ Charles Meerens, *Le Diapason et la notation musicale simplifiée* (Paris: Schott, 1873).

⁵⁹ Composer and librettist Maestro Boito, one of the Italian delegation's two members, said that "the rays of the sun of science heat and pierce all disciplines of human knowledge and the arts. Choosing 435 hertz instead of the scientific standard would therefore be sort of anachronism." University of Vienna professor of physics Josef Stefan replied: "The number 432 has the advantage of the mathematical aesthetic. But one has to consider it in light of the fact that in France, Belgium, and Russia, the French pitch has already been introduced, so that [this change] would represent a great cost for German institutions as well as for Austria and one has to adopt the French pitch." *Beschlüsse und Protokolle der Internationalen Stimmton Conferenz in Wien 1885* (Vienna: Kaiserlich-Königlicher Schulbücher, 1885), 16.

favour of A 432, which he called “logical pitch”.⁶⁰ Suggesting that A 440 was German and defending the authority of French musical and scientific traditional institutions, Dussaut organised a referendum amongst French musicians and contested the legality of granting standardising agencies the power to decide on state reforms. In a 1951 letter to Claude Delvincourt, the head of the Paris Conservatory, Dussaut attacked the ISO and the Association Française de Normalisation, which had represented France in London in 1939: “*these organisations are not official. They are far from having the great prestige of the Academy of Sciences. . . . Physicists agree with us, the musicians. They consider A 440 illegal.*”⁶¹ Responding to his call, in August 1951 the French state appointed a new pitch commission formed by members of the Academy of Fine Arts, the Conservatory, and the Academy of Sciences, a few performers (especially singers), and instrument makers. The composition of this commission rebutted the recent evolution of the musical field, with its increasing empowerment of the broadcasting industry, and as such implicitly defended the authority of the state and traditional experts in acoustics. The latter recommended travelling even further back in time, to the origins of Western sound knowledge: A 432, they argued, was the pitch of Pythagoras. By so doing, in Ernst’s words, they were using the Pythagorean monochord “not simply [as an] instrument for creating audible frequencies that we understand culturally as music”, but also as “a sonic time machine into this way of knowing”.⁶²

In the late 1980s, activist Lyndon LaRouche deployed the strategic hints of Dussaut and his supporters about the “German” character of the London standard, and the short Italian

⁶⁰ On this anti-A 440 campaign, see “Fixation du diapason: avis, rapports, correspondance. 1933–1936 et 1950–1954,” AN, AJ/37/486. See also the material held in the file “Commission du diapason” at the Académie des Sciences.

⁶¹ Robert Dussaut to Claude Delvincourt, 30 March 1951, AN, AJ/37/486. Dussaut’s emphasis.

⁶² Ernst, *Sonic Times Machines*, 14.

life of A 432, to advocate what he called “a return to the Verdi pitch.”⁶³ His slogan encapsulated the reactionary politics of his project: “Revive Verdi’s tuning to bring back great music.”⁶⁴ Today, the Dutch political party *Vrijzinnige Partij* argues for A 432 as a standard on the grounds that Goebbels was responsible for the adoption of A 440 as particularly well suited to military music, and that it causes “disarray” in music and society.⁶⁵

What are the exact ties between the various lives of A 432 and the continuing claims of a return to the origins of pitch history? Further investigations remain to be pursued, but it is already clear that despite insisting on a mythical past predating the standardisation of musical pitch, the utopias of A 432 perfect the very project they denounce. They reveal that, after two centuries of negotiations, pitch remains a highly political and culturally charged object. The history of A 432 also recalls the same entanglement of culture, politics, and new developments in sound technology that we saw in the concert that concluded the 1939 London conference. Supporters of the counter-standard aim to overcome the artificial, capitalist, and harmful character of our current pitch by reconnecting with idealised pasts immemorial, yet A 432 hertz is the product of the electrification of pitch measurement, and owes its present life to the ability to retune music to whatever pitch is desired by controlling the speed of sound. The popularity of this standard reveals how, as standards of pitch have moved from tuning forks to radio waves and digital applications, these new tuning devices have become loaded with the same values carried by their steel predecessors.

⁶³ Verdi’s biographers have shown that the composer only briefly endorsed A 432. After the Vienna conference, eager as he was to facilitate the diffusion of a standard pitch, Verdi advocated the adoption of the French norm.

⁶⁴ Lyndon LaRouche, “Revive Verdi’s Tuning to Bring Back Great Music,” *Executive Intelligence Review* 15, no. 32 (1988): 24–34.

⁶⁵ Ariejan Korteweg, “Vrijzinnige Partij: verlaag de grondtoon, deze wekt verdeeldheid en agressie op,” *Volkskrant*, March 3, 2017, <https://www.volkskrant.nl/nieuws-achtergrond/vrijzinnige-partij-verlaag-de-grondtoon-deze-wekt-verdeeldheid-en-agressie-op~b718e98c/>. I thank Leendert van der Miesen for bringing this to my attention.

Although dependent on mechanisms that are common to other standards – the development of central states, the intensification of international trade, and the regulation of industrial exchanges – the diffusion of A 435 and then A 440 also obeyed patterns specific to the artistic realm: the constitution of a Western musical canon and the hardening of a relationship to the musical past. The interactions between musical historicism and pitch standardisation shed light on the cultural and political resonances of the standard, which have been silenced by its naturalisation. The creation of an international pitch owed much to a shared valuation of the musical past, but definitions of that past differed from nation to nation, and changed over time. As nicely captured by the example of the 1939 concert, with its celebration of British identity through a display of past English works, the revivals of ancient early music throughout the nineteenth and early twentieth centuries were shaped by nationalist conceptions. By drawing from history, pitch standardisers were thus simultaneously addressing a shared concern for the preservation of musical heritage and articulating different, even conflicting, images of that heritage.

The tension between pitch unification and historical diversity has shaped approaches to sound and music in ways that are still audible today. The fabrication of early music sounds drawing from the dissemination of A 415 strikingly illustrates how efforts to unify pitch actually laid the ground for further diversification of the standard, fuelled by historicism. By attending to the cultural resonances of pitch standards, it becomes possible to understand past and present battles of pitch, and to hear what tiny – indeed, barely audible – sonic variations can tell us about society, culture, and global politics. Calls for particular standards privilege specific musical genres (symphony, opera, mass, oratorio), traditions (ancient and modern, secular and sacred, classical and popular, civil and military), and styles (light and “serious” music). Attempting to fix pitch is always a way of arbitrating between these different

categories, and defining what music should be. Of course, such claims are inextricable from broader political, social, and religious conceptions.

Although the London conference of 1939 marked a temporary pause in international disputes over pitch standardisation, it contained the seeds of future battles: calls for historical “authenticity” would soon fuel further redefinitions of the standard. Up to the present day, pitch remains a “sonic thing” that continues to be reobjectified in different ways by scientific and historical practices.