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Identity in Violin Playing on Records: Interpretation Profiles in Recordings of Solo Bach by Early Twentieth-Century Violinists

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Performance studies relying on sound recordings as evidence have often focused on establishing trends and conventions in various periods and repertoires. There is a growing consensus that the pre-1940s was an era of diversity while the second half of the twentieth century witnessed increasing homogeneity.¹ This tendency is usually explained to be the result of the recording industry's influence while the earlier diversity is assigned to educational and cultural differences, such as national or regional violin schools or the influence of a particular teacher.² So far little attention has been paid to individual difference, whether in the early or the later half of the century or to differences in performance trends specific to particular repertoires.³ Yet without a close scrutiny of artistic profiles it is difficult to move beyond the broad categories and distinguish features of stylistic "language" from those of idiosyncratic expression. Such a distinction is essential if musicologists of European concert music wish to argue, in the wake of the "death of the author/composer," that a text/score exists only in particular renderings; that is,

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¹ For instance Robert Philip, *Performing Music in the Age of Recording* (London: Yale University Press, 2004).

² Mark Katz, *Capturing sound: How Technology has Changed Music* (Berkeley: University of California Press, 2004); David Milsom, *Theory and Practice in Late Nineteenth-Century Violin Performance: An Examination of Style In Performance, 1850-1900* (Aldershot: Ashgate 2003); Eitan Ornoy, "Recording Analysis of J. S. Bach's G Minor Adagio for Solo Violin (excerpt): a Case Study," *Journal of Music and Meaning* 6 (Spring 2008): Section 2, <http://www.musicandmeaning.net/issues/showArticle.php?artID=6>.

³ Dorottya Fabian, "The Recordings of Joachim, Sarasate and Ysaÿe in Light of their Reception in the British Press," *International Review of the Aesthetics and Sociology of Music* 37/2 (2006): 189-211; Dorottya Fabian, "Is Diversity in Performance Truly in Decline? The Evidence of Sound Recordings," *Context: A Journal of Musicological Research* 31 (2006): 165-180.

if they wish to elevate performance to equal status with the composed score. Analytical musicologists have methods to explain the characteristic features of compositions. But there is precious little beyond the journalistic that attempts to explain the uniqueness of performances and performers.⁴ If performance is as significant as the notated work⁵ and performers have played a decisive role in the reception and canonization of pieces,⁶ musicologists must be able to show what identifies a particularly famous interpreter just as they can state what characterizes the works of a prominent composer. Yet at this stage we seem able only to indicate and account for general trends—an equivalent of signposting periods of compositional styles, such as the Baroque, the Modern, or the Romantic.

We wish to contribute a step towards establishing individual signatures of famous violinists.⁷ As a starting point, J.S. Bach's sonatas and partitas for solo violin have been selected to build on two earlier studies that reported on their recorded performance history⁸ and to focus on works where a single, unaccompanied artist can be studied. Over sixty recordings of the Bach solos had been surveyed out of which the performances of two violinists, Jascha Heifetz and Nathan Milstein, have been chosen for the current investigation. There are several reasons for this choice: first, they both recorded the solos, or certain works of the solos at least twice (see more on this below), providing opportunity for establishing both within and in between these

⁴ An exception is Kevin Bazzana, *Glenn Gould: The Performer in the Work* (Oxford, New York: Oxford University Press, 1997).

⁵ Nicholas Cook, "Between Process and Product: Music and/as Performance," *Music Theory Online* 7/2 (2001), <http://mto.societymusictheory.org/issues/mto.01.7.2/toc.7.2.html>.

⁶ José Bowen, "Finding the Music in Musicology: Performance History and Musical Works", in *Rethinking Music*, eds. Nicholas Cook and Mark Everist (Oxford, New York: Oxford University Press, 1999), 424-51; Reinhard Kopiez and Andreas C. Lehmann, "Historiometric Analysis of Clara Schumann's Collection of Recital Notes: Life-span Development, Mobility, and Repertoire" in *Abstracts, Ninth International Conference on Music Perception and Cognition (August 22-26, 2006)*, eds. Mario Baroni, Anna Rita Addessi, Roberto Caterina and Marco Costa (Bologna: Bononia University Press, 2006), 103-4.

⁷ This project is being supported by the Australian Research Council Discovery Grant (DP0879616). The first author would like to thank Bridget Kruithof and Joe Hull for their contribution in providing measurement data, and Joe Wolfe of Music Science at UNSW for his advice on violin acoustics. Thanks are also due to Nicholas Cook for providing opportunities to present earlier versions of this research at CHARM seminars and conferences, and to the University of New South Wales and the Musicology Department of the Hebrew University of Jerusalem. The former provided a sabbatical to the first author during which the latter played a generous host enabling the tasks of this investigation to be mapped.

⁸ Dorottya Fabian, "Towards a Performance History of Bach's Sonatas and Partitas for Solo Violin: Preliminary Investigations," in *Essays in Honor of László Somfai: Studies in the Sources and the Interpretation of Music*, eds. László Vikárius and Vera Lampert (Lanham, Maryland: Scarecrow Press, 2005), 87-109; Ornoy, "Recording Analysis of J. S. Bach's G Minor Adagio."

variants and similarities. Second, they were close contemporaries, sharing similar biographical characteristics, a fact which is helpful when aiming to distinguish cultural and periodical trends from individual traits, or when examining the question of potential “violin schools.” Thirdly, they both started their career at the beginning of the recording industry and thus were educated in an era when recordings might not have influenced general norms of practice. They can be regarded as representing the “golden age” of seeming diversity and individuality. It is likely that marked differences in their playing will manifest themselves, while potential similarities may demark the stylistic language of the period (or school) that contributed most to the formation of their musical and technical maturity. To be able to address this last point, we will compare aspects of their recordings to other interpretations released contemporaneously. The selection includes recordings of Joseph Szigeti, George Enescu, and Yehudi Menuhin.⁹ Szigeti (1892-1973) recorded the complete set in 1955 and individual works (most often the A-minor sonata) in 1933, 1947, 1949. He was a pupil of the Hungarian Jenő Hubay and may be regarded as a representative of the Hungarian violin school’s German-influenced tradition. During the first 48 years of his life, Szigeti lived in Europe, but eventually moved to the United States in 1940. Enescu (1881-1955) represents the oldest generation in the selected sample. Although primarily a composer, he was also an excellent pianist and a renowned violinist and teacher who taught many upcoming violinists, including Menuhin and Ida Haendel. His master class in Paris was regarded as the alternative to Carl Flesch’s famous studio in Berlin, quite the opposite in terms of aesthetic and pedagogical ideals. He recorded the complete set of Bach’s solos during the 1940s.¹⁰ Menuhin (1916-1999) is included as a representative of the next generation; a child prodigy (just like Heifetz and Milstein) and a pupil of Enescu (1927-8), he was the first to record the entire set in 1934-36. His second recording of the works was made at a more mature age, in 1957. Other violinists active at the time have either not recorded the solos, or recorded only selections and only once.¹¹ Hence additional data will only be used when the argument calls for further evidence.

When studying the performances, we are not concerned primarily with how they may relate to historically-informed practices and Bach’s intentions or presumed intentions. Rather, we aim to distinguish general trends from individual style to enhance our understanding of twentieth-century violin playing as such. Although the provision of a transcription of the autograph in Joseph Joachim’s edition of the solos (1908) gave new impetus to the notion of

⁹ All recording details are listed in the Discography at the end of the paper.

¹⁰ The CD re-issue of Enescu’s set (IDIS 328/29) does not provide the exact date. At the March 2008 conference of ARSC (Association of Recorded Sound Collections) in Stanford, California where the first author presented a section of this paper, it was suggested that Enescu recorded the works around 1952. So far no definitive date could be located for the interpretation studied here, although it is likely that Enescu made only one recording of the set.

¹¹ Adolf Busch (1891-1952) is somewhat exceptional because he recorded the D minor *Sarabanda* twice (on its own in 1928 and then as part of the complete partita in 1929). However, he never recorded the complete set.

“fidelity to the score,” Bach’s manuscript has in fact informed the commonly used earlier edition of Ferdinand David (1843) as well.¹² The *Neue Sachlichkeit* era of the 1920s to 1960s nevertheless brought with it greater attempts by Bach performers to implement scholarly findings and directions. This was followed by intensifying debate in the 1970s-80s about “authenticity” and the “fidelity to the score” approach. Performance on period instruments has been gaining increasing popularity and eventually losing its marginal character for good by the 1990s.¹³ These trends provide the cultural backdrop to the recordings under scrutiny here stemming as they are from the 1930s, 1950s, and 1970s.

BIOGRAPHICAL BACKGROUND

Both Jascha Heifetz (1901-1987) and Nathan Milstein (1903-1992)¹⁴ were students of Leopold Auer in St Petersburg; Heifetz between the age of nine and fifteen, after two years with Malkin, a former pupil of Auer; Milstein from the age of twelve to fifteen, having first studied for three years in his native Odessa with Pyotr Stolyarski. During 1926, Milstein also studied with Ysaÿe, although according to his own recollections he “learned almost nothing.”¹⁵ Their biographies share further similarities: after extensive tours in Europe they both moved to the US in the 1920s; Heifetz taking out citizenship already in 1925, Milstein only in 1942, after more than a decade of touring and living there. However, Milstein re-established his European links after the war had ended while Heifetz decided to focus on teaching at the University of Southern California from 1959 onward. Although Heifetz’s fame rested first and foremost on his interpretations of the romantic repertoire, he recorded Bach’s D-minor partita and G-minor

¹² Robin Stowell, “Building a Music Library 5: Bach’s Violin Sonatas and Partitas,” *Musical Times* 128 (1987): 250-6.

¹³ Elisabeth I. Field, “Performing solo Bach: An Examination of the Evolution of Performance Traditions of Bach’s Unaccompanied Violin Sonatas from 1802 to the Present” (PhD diss., Cornell University, 1999); Fabian, “Towards a performance history.” For a general history of developments in twentieth-century performance of baroque and earlier music see Harry Haskell, *The Early Music Revival: A History* (London: Thames and Hudson: 1988). For a review of the debate on “authenticity” and “fidelity to the score,” see Dorottya Fabian, “The Meaning of Authenticity and the Early Music Movement: A Historical Review,” *International Review of the Aesthetics and Sociology of Music* 32/2 (2001): 153-167. For some of the key contemporary texts on these issues see the “The Limits of Authenticity,” *Early Music* 12/1 (1984): 3-25; Nicholas Kenyon (ed.), *Authenticity and Early Music* (Oxford: Oxford university Press, 1988).

¹⁴ According to Milstein’s autobiography his correct date of birth is 31 January 1903. When in 1925 he wanted to go on a concert tour with Horowitz, they both had to pretend to be a year younger, otherwise they “would not have been allowed abroad: the military were drafting [their] year.” See Nathan Milstein and Solomon Volkov, *From Russia to the West: The Musical Memoirs and Reminiscences of Nathan Milstein* (New York: Henry Holt & Co., 1990), 3.

¹⁵ Milstein and Volkov, *From Russia to the West*, 98.

sonata in 1935 and the complete set in 1952. In contrast, Milstein was noted for his exceptional dexterity and literalism.¹⁶ His pragmatic and intellectual predisposition also transpires from interviews and his autobiography, which includes frequent references to Bach's works. For instance, he notes that Bach was hardly ever played in Auer's classes: "Auer wasn't interested in listening to Bach. He didn't know what to say, and so he said practically nothing."¹⁷ This remark is all the more cautionary because in discussions of Auer's own background it is often highlighted that he studied Bach with Joachim, knew Ferdinand David (the first to prepare a complete edition of the Bach solos [1841] and to play some of them in public) and moved in the circles of Brahms and Clara Schumann.¹⁸ Yet, if one can trust Milstein's recollections, there might be little in either Heifetz's or Milstein's musical interpretation that could be directly linked to the famous teacher's instruction, let alone to sources further in the past.¹⁹ On the other hand, Milstein mentions that together with David Oistrakh and Edgar Ortenberg, they played the *Allegro assai* from the A-minor sonata all together in Stolyarsky's class in Odessa.

That allegro has to be played in controlled tempo, but we little Russians shot it out very fast, without problems, like a *perpetuum mobile*. And since we played together, Stolyarsky didn't have to work with each of us individually.²⁰

This indicates a rather technical orientation to the pieces, which is confirmed in Milstein's summary statement: "Bach was not at all popular in Russia then."²¹ A lack of public interest might be one of the reasons for the relatively little role of the solos in Heifetz's output. The Bach concertos are much better represented in both his concert repertoire and discography. His personal view might have been different. In a broadcast film from 1971 upon performing the chaconne he stated:

¹⁶ Margaret Campbell, *The Great Violinists* (London: Robson Books 2004), 135 [first published in 1980]. See also Boris Schwarz, "Nathan Milstein" in *Grove Music Online*, ed. L. Macy (Accessed 2 May 2008), <http://grovemusic.com>.

¹⁷ Milstein and Volkov, *From Russia to the West*, 23.

¹⁸ For instance Artur Weschler, *Jascha Heifetz* (London: Robert Hale, 1986).

¹⁹ The significance of Auer's role in Heifetz's and Milstein's respective development is further complicated by the often mentioned, but never detailed fact that Auer left the instruction of technical matters to his assistants whose identity is generally not disclosed. See Seymour Itzkoff, *Emanuel Feuermann, Virtuoso* (Alabama: University of Alabama Press, 1979), 28. Milstein's *From Russia to the West* does not mention the assistants. Schwarz's point that it might be "more appropriate to speak of an Auer style than of a school" seems sensible. See Boris Schwarz, "Auer, Leopold" *Grove Music Online*, ed. L. Macy (Accessed 23 April 2008), <http://grovemusic.com>.

²⁰ Milstein and Volkov, *From Russia to the West*, 23.

²¹ *Ibid.*

For all the years that I have played Bach, I don't think I really know him. Every time I play him I discover something new. This is our Bible. That's how we musicians call him.²²

Milstein's repeated recordings of the pieces are a testimony of the works' changing reception and his deep interest in them. He released the complete set twice throughout his life: in 1954-56 and in 1975, and performed them regularly on tour. He felt that his Bach playing had changed. The approach in the earlier recording "was less improvisation, more playing. Bach is always improvisational."²³ In addition to the two commercial complete recordings, we will also rely on analysis of the 1953 Library of Congress Recital recording of the D-minor partita. Some of his cited comments imply an analytical-intellectual approach, reflective of certain principles associated with the *Neue Sachlichkeit* era: an emphasis on steady tempo and literalism. Others imply that the later recording would be freer, more improvisatory. This second complete set was made in 1973 (but released only in 1975), the same year the journal *Early Music* was launched heralding a new era in twentieth-century performance of baroque music.²⁴ Milstein was most probably aware of the new awakening, and even though no prototype was yet at hand (Sergiu Luca's recording on baroque violin came three years later) he likely have heard about some of the historically-informed performance features. It remains to be seen if these assumptions are upheld by a close analysis of the audio documents.

ANALYSIS

To identify technical and artistic characteristics in the selected violinists' Bach recordings both aural and software assisted analyses have been conducted scrutinizing bowing, fingering, dynamics, the execution of multiple stops, rhythm and tempo, and the use of portamento and

²² NBC Hour *Heifetz on Television*, 28 April 1971; released on DVD by BMG in 2004: RCA Red Seal: "Legendary Visions: Heifetz in Performance DVD Video Documentary (BMG Classics 82876 63886 9).

²³ Quoted in Campbell, *The Great Violinists*, 135.

²⁴ Already in the very first years of the journal's publication one could witness the first signs of the subsequent heated critical debates regarding the validity and practicality of aiming at adhering to the "composers' intentions." The assumption that the meaning of a musical piece would be directly derived from the exploration of the original intentions of its composer and that these intentions could be established with confidence were presented side by side with a more skeptical and critical outlook legitimizing intuitive performance factors and calling for pluralistic attitudes to interpretation. For the first position see Howard Mayer Brown, "On the Performance of Fifteenth-century Chansons," *Early Music* 1 (1973): 3; Frans Brüggen, "On the Baroque Recorder," *Early Music* 2 (1974): 101-103; for the latter view see David Munrow, "The Art of Courtly Love," *Early Music* 1 (1973): 195-199; J. M. Thomson, "On playing the lute: Julian Bream in conversation with J. M. Thomson," *Early Music* 3 (1975): 348-351; Sol Babitz, "Style and Performer," *Early Music* 4 (1976): 491.

vibrato. For reference, the facsimile of Bach's 1720 autograph score and two *Urtext* editions were used.²⁵

Overall the results show that Heifetz employs bolder expressive means in repeats where he varies articulation and bowing, uses a greater dynamic range, more frequent and audible *portamenti*, and stronger accents, including *subito* piano effects and agogic stresses on melodic climax notes. Importantly, while his technical execution varies considerably across the two recordings and/or in repeats, his interpretative reading of the works remains fairly constant while becoming slightly more literalistic.

Compared with Heifetz, Milstein seems to be more consistent both in terms of technique and overall interpretation across the earlier and later recordings, although there are some differences in bowing, phrasing and dynamics between the earlier and later complete sets. In general, Milstein's style is more even and restrained, with little difference between repeats, steadier and less extreme tempos, hardly any portamento, and a rather narrow and impeccably regulated vibrato throughout, with frequent use of open strings. In his 1975 recording the range of tempi is even more limited (slow movements are faster, fast ones are slower), but the vibrato is slightly wider and there are greater variations of dynamics. Milstein's sound is round, mellower, and at times more resonant than Heifetz's, but both players deliver a considerably lighter and rounder timbre than the fierce, abrupt, and, at times, scratchy tone of the previous generation (e.g. Enescu and Sziget). This could be due to their Auer years. According to Weschler,²⁶ Auer placed great emphasis on developing the bow arm and even Flesch²⁷ acknowledged that Auer's students all had a colorful and *cantabile* tone.²⁸

Heifetz's more visceral and volatile personality becomes an asset in the D-minor *Sarabanda*, which he rendered in a rhythmically more flexible manner in 1935, creating the impression of embellishments. Although post-1980s historically-informed practice would argue in favor of rhythmic inflections and grouping of notes, and thus the description provided of Heifetz's playing may seem to come close to the composer's presumed intention, his frequent sliding, dynamic accents, and agogic stresses contradict this. His gestures do not stem primarily

²⁵ Ivan Galamian, ed., *Bach: Six Sonatas and Partitas for Violin Solo with Facsimile of the Autograph Manuscript* (New York: International Music Company, 1971); Peter Wollny, ed., *Bach: Drei Sonaten und drei Partiten für Violine solo* (Kassel: Bärenreiter, 2003); Klaus Rönau, ed., *J. S. Bach: Sechs Sonaten und Partiten für Violine solo* (München: G. Henle Verlag, 1987).

²⁶ Weschler, *Heifetz*, 46-8.

²⁷ Hans Keller, trans., *The Memoires of Carl Flesch* (Essex: Bois de Boulogne, Centenary Edition, 1973), 253-4.

²⁸ Otherwise Flesch was somewhat dismissive of Auer, attributing the successes of his pupils to their own talent and supporting this view by recalling Heifetz to "admit in confidence that he came to Auer fully trained and, after a brief term of study devoted to a number of standard works, embarked on a great career" (*The Memoires of Carl Flesch*, 253).

from metrical hierarchies, but rather from melodic considerations, even though these tend to coincide with harmonic motions—something later historically-informed musicians have become attuned to in their performance considerations. The dance element is often weak and the basis of his interpretation seems to be a personal, virtuosic disposition. On the other hand, Milstein’s relaxed and “clean” approach, narrow vibrato, and use of open strings lend his interpretation a contemporary sound that resembles future historically-informed performance (HIP) style in many respects. For instance, his performances of the fugues or the D-minor *Allemanda* are rhythmically shaped and projected, even if he does not go as far as some of the baroque violinists recording in the later 1990s. In other respects his playing is representative of the literalist school, with little variation of dynamics and tempo. The dance movements also tend to be rhythmically under-characterized. Bach’s presumed intention of providing the listener (and player) with a broad range of musical styles and characters across the six pieces is subdued in favor of a somewhat homogeneous tone, tempo, and metric profile.

PHRASING AND EXPRESSION: TONE, DYNAMICS, BOWING, FINGERING, AND MULTIPLE STOPS

As stated above, Heifetz makes considerable changes in repeats. The obvious ones are the wider range of dynamics and the varied fingering that allows for more *portamenti*. For closer analysis the Andante from the A-minor sonata could be selected. Here the phrasing is quite broad with longer legato lines. The rests are ignored and notes are over-held (see arrows in Fig. 1, next page); especially the down beats and structurally significant notes are elongated. The paired slurs of Bach’s score are projected through dynamic shading. The second half of the movement is dynamically more intense and emotional, with a wider vibrato, stronger *rallentandi*, and fluctuating dynamics. The legato approach blurs note repetitions while the accompanying double stops are subdued so as not to interfere with the continuity of the melodic line (Figure 11-b). Bowing is the same throughout, but the fingering changes in the repeats to allow for *portamenti* and to avoid open strings. [Play Audio Ex. 1a: mm. 1-11 & repeat to m. 7](#)
[Play Audio Ex. 1b: repeat of mm. 12-21](#)

Figure 1. Bowing, fingering and dynamics in Heifetz’s 1952 recording of the A-minor Andante, measures 1-11. Markings above staff indicate first play; below staff indicate repeat; slash between numbers indicate portamento. Only differences are marked in the repeat.

The image displays a musical score for measures 1 through 11 of the A-minor Andante. The score is written in 3/4 time and includes several layers of annotation:

- Staff 1 (Measures 1-2):** Starts with a dynamic marking of *p*. Red arrows indicate bowing directions. Below the staff, *mp* and *p* dynamics are marked with red arrows. Fingering numbers (1, 2, 3, 4) and portamento slashes (e.g., 3/2) are present.
- Staff 2 (Measures 3-4):** Includes dynamic markings of *mf* and *p*. Fingering numbers and portamento slashes are detailed. A blue box highlights a specific fingering sequence.
- Staff 3 (Measures 5-6):** Features *mp* and *mf* dynamics. A red dashed line labeled *cresc* indicates a crescendo. Fingering and portamento markings are included.
- Staff 4 (Measures 7-8):** Shows dynamics of *mf*, *p*, and *f*. Fingering numbers and portamento slashes are used to denote specific playing techniques.
- Staff 5 (Measures 9-10):** Includes *mf* and *p* dynamics. A trill (*tr*) is marked above the final note of measure 10. Fingering and portamento markings are present.
- Staff 6 (Measure 11):** Shows two endings. The first ending (*1.*) ends with a *pp* dynamic, and the second ending (*2.*) ends with a *p* dynamic. Red arrows indicate the bowing direction for the final notes.

In Milstein's performances the difference is not so much between first play and repeat, but between the earlier and the later recordings. In 1975 he used a broader, more *détaché* bowing. However, in the A-minor *Andante* there are slight differences between first and second play as well. In the 1950s recording there are greater *rallentandi*, and the dynamic range is also wider in repeats. Bowing creates sub-phrases of 2 or 4 notes to a slur the first time, but he tends to use longer slurs during repeats. Fingering does not change for repeats and the two soft *portamenti* in the second half of the movement (m. 17, m. 20)²⁹ are present both times, although more audible in the repeat.

In 1975, Milstein's phrasing places greater emphasis on separated notes, especially during first play. Dynamics are softer during repeats; bowing is *martalé* (detached notes in one bow) with slurred pairs of 16ths. Repeats are again more flowing (less *martalé*) with longer slurs. The fingering is similar to the earlier version, but with even more use of open strings. His refined voicing of multiple stops through differentiated dynamics, especially at cadence points, is striking. Interestingly, Heifetz, Szigeti, and Milstein play the D5 in m. 8 flageolet. Enescu and Menuhin play it stopped and vibrato.

²⁹ Throughout the paper the abbreviation "m." is used for measure and "b." for beat (or "mm." and "bb." for plural). The nomenclature of pitch names follows the one adopted in the USA for scientific work, according to which middle C is C4 (Llewelyn S. Lloyd and Richard Rastall, "Pitch nomenclature" *Grove Music Online*. ed. L. Macy (Accessed 8 May 2008), <http://grovemusic.com>)

Figure 2. Comparison of bowing, fingering, and dynamics in Milstein’s two recordings of the A-minor *Andante* mm. 1-11. Markings above staff indicate first play; below staff indicate repeat; fingering and bowing divergences between the two recordings are indicated by different colors. Red = 1954 and Blue = 1975. [Play Audio Ex. 2a: mm. 1-11 and repeat to m. 8, 1954](#)
[Play Audio Ex. 2b: mm. 1-11 and repeat to m. 8, 1975](#)

The musical score is presented in six systems, corresponding to measures 1 through 11. The notation includes various dynamic markings and performance instructions:

- Measure 1:** Starts with *mf*. Dynamic markings include *p* and *pp*. Bowing directions are indicated by *V* (down) and *^* (up).
- Measure 3:** Includes the instruction *cresc. poco a poco*. Dynamic markings include *mf* and *pp*.
- Measure 5:** Includes the instruction *Poco a poco cresc*. Dynamic markings include *p* and *cresc. poco a poco*.
- Measure 7:** Includes the instruction *Poco cresc*. Dynamic markings include *f*, *mf*, and *mp*.
- Measure 9:** Dynamic markings include *mf* and *f*. A trill (*tr*) is marked at the end of the measure.
- Measure 11:** Shows two first endings (1. and 2.) with dynamic markings *f* and *pp*.

Red markings (1954 recording) and blue markings (1975 recording) are used throughout to indicate differences in bowing, fingering, and dynamics between the two performances.

Fingering choices sometimes differ in the D-minor *Sarabanda*, too. Some of these can be stipulated by studying spectrograms of the audio files. In order to create a vibrato effect on the final D4 half-note (open D string), Szigeti seems to have stopped the G string at the unison (e.g. with second finger, third position) vibrating the string without actually playing the note. Performers often use this technique to create a full vibrato sound in what would otherwise be a pure and plain open string sound. It generates fairly equally strong harmonics and a very narrow vibrato. Busch and Milstein in the 1953 concert and 1975 studio recordings seem to do this too. Other solutions include stopping and vibrating the A string at the octave (D5; third finger, first position) or just playing the note on the stopped G string. The former tends to produce stronger signals in the even harmonics of the fundamental (i.e. all the harmonics of its octave). None of the selected violinists seems to have chosen such a fingering. In the last case proper vibrato can be generated; an opportunity that modern violinists, including Heifetz and Menuhin, but even Enescu and Milstein in 1954-6 tend to exploit.

In the E major *Loure* both Szigeti and Enescu opt for a mostly legato style with regular down-up bowing scheme. Menuhin uses a lot of “hooked” (down-down or up-up with a break in the sound, as opposed to slurs) bowing. Milstein also plays much legato (and slow) in 1955. In the later version the performance is still legato but a bit more articulated, mostly through subtle changes in dynamics and slight tempo fluctuation, creating a sense of forward motion and well-delineated phrases and sub-phrases. Heifetz (1952) starts off lighter, though legato. Eventually his style also becomes rather sustained with on-the-string bowing and weakened definition of rhythm.

There is quite a different bowing strategy in the fast movements, for instance the *Allegro assai finale* of the A-minor sonata. Szigeti chooses spiccato bowing (a rough *sautillé*) and throws the bow off the string mostly at the middle or top third of the bow resulting in squeaks and an unfocused, airy tone. [Play Audio Ex. 3: mm. 1-19, 1933](#). Heifetz’s bow bounces closer to the frog compared to Szigeti’s, creating a cleaner tone quality. But he uses a more staccato bowing in the repeat, which makes the movement sound like a showpiece and hinders tone quality. [Play Audio Ex. 4: mm1-3 and repeat of mm. 1-3, 13-17](#). Milstein’s choice is the classic *détaché* style (i.e. played separated in the upper half of the bow) both in 1954 and 1975. The sound is clean and resonant. Neither version has changes in the repeats.

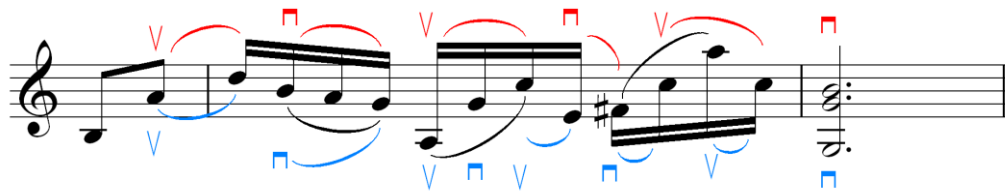
[Play Audio Ex. 5a: mm. 1-3 and repeat of mm. 14-18, 1954](#)

[Play Audio Ex. 5b: mm. 1-3 and repeat of mm. 1-3, 1975](#)

Bowing and fingering remain largely constant in Milstein’s two recordings of the *adagio* and fugue movements as well. In these, Heifetz’s bowing and fingering choices are also remarkably consistent across his two recordings: such are the bow changes he makes contrary to the markings of the score, which occur at similar places in the C-major *Adagio* (e.g. the unslurring of upper voice in m. 5 b. 1, the slur omitted between bb. 2-3 in m. 14, and the division into two of the originally slurred four sixteenth-notes in m. 10 b. 3). Similar fingerings can be observed at portamento placements (e.g. m. 13 b. 3, m. 36 bb. 1, 3), at moments of position change (e.g. m. 7 b. 1), or in the choice of harmonics (e.g. D5 of m. 46 b. 1).

There are also differences, especially in melismatic passages of the *Adagio*'s coda (i.e. from m. 40 to the end): more frequent bow division is observed in Heifetz's later recording. Recurrent bow-change affects brightness and power of sound and is therefore used during lines of dramatic developments, for instance in the descending melisma of m. 42 bb. 2-3, which is divided into two bows in the early recording while in the later version delivered with several bow-changes, but not quite as required by the slurring of the score. Similarly, the successive sixteenth-notes cadence in m. 46, where the three bows of four notes each chosen in the earlier recording are exchanged for extensive bow-changes in the later one (Figure 3).

Figure 3. Bowings in Heifetz's recording of the C major *Adagio*, mm. 46-47. Markings above staff indicate 1935 recording; below staff indicate 1952 recording; within staff (black) indicate original notation.



There are other melismas that are bowed differently, such as the one in m. 12 bb. 2-3, which is slurred in the later recording; or the one in m. 40 bb. 2-3, where the two bows of the earlier recording are replaced in the later one by one long bow, as per Bach's score.

In the fugues, bowing and dynamics serve to outline melodic contour and to portray the overall form. In Heifetz's 1935 version of the C-major *Fuga*, for example, while the exposition (mm. 1-66) makes use of a *semi-detaché* stroke (apart from several slurs between successive quarter or eighth-notes for easier bow distribution), the following episode (mm. 66-92) features successive eighth notes in a *spiccato* fashion, i.e. through the use of a bouncing, light and short stroke. This articulation alternates with *detaché* bowing, which highlights measures of charged harmonic contexts or is used to differentiate between assumed melodic lines (m. 72, 74, 76-77, 84-86). In the next fugal section (mm. 92-115), the subject is presented with a wide bow-stroke on the quarter notes, played legato when possible alongside quick-cut, short, and "chopped" execution of the multiple-stops. A sudden shift to soft dynamics in m. 115 is combined with long slurs highlighting the ascending sequences of the melodic line (m. 115 b.3-m. 121 b.3).

[Play Audio Ex. 6: mm. 1-129, 1935](#)

Heifetz's later recording provides further evidence for his consistent practice. He again uses *spiccato* in the first episode (mm. 66-92), drops the dynamic level suddenly in m. 115, followed by long slurs until m. 121 b. 3. The execution of the highly polyphonic texture of mm. 147-165 is also similar in both recordings: the chords are broken from top to bottom to highlight the bass line, while quadruple-stops are presented with firm attacks, their higher notes held out to convey the melodic contour (mm. 157-161). [Play Audio Ex. 7: mm. 147-172, 1952](#). It is debated

which way chords were delivered in Bach's time, whether they tended to be arpeggiated or not. In any case, Heifetz's concern for voice leading and harmonic function indicates carefully considered bowing choices informed by an in-depth analysis of the score.

Differences between his two recordings are slight and limited to a few select spots. For instance, presentation of the subject at the beginning sounds clearer in the later version because of the sharp shortening of the contrapuntal voices in the double-stops (mm. 4-8) and the delivery of quicker, shorter strokes than the semi-*detaché* used in the former version. The light, fast sound of his earlier recording during the pedal-point section (mm. 186-201) suggests an execution with the upper, lighter part of the bow. In the later recording, however, he uses the lower part of the bow, creating audible bouncing on the pedal point (D string), while gradually moving towards the upper half.

As usual, in Milstein's two recordings dynamics and tone contribute most to a different impression. The 1975 recording of the C-major *Fuga* presents a richer palette of inner changes and developments than his earlier version. Here the tempo and rhythmic nuances are more prominent, the dynamic spectrum has a wider range, and articulation is more frequently varied, all serving the large-scale structure. The exposition may provide a good example. It starts in a contemplative mood achieved through long legatos, soft dynamics, and a much slower tempo than the one presented in his earlier recording. Firmer dynamics are reserved for voice entries (m. 10 b. 3; m. 24 b. 3) while intermediary sections (e.g. mm. 20-4) are played more softly and lightly, with shorter strokes. Larger sections are terminated by tapering dynamics and slight *rallentandi* (e.g. mm. 26-30). Choice of bow strokes is also more varied in the 1975 recording. In mm. 52-56, for example, Milstein uses light *detaché* on the first pairs of eighth-notes, followed by a slur on the successive pair of notes to reach the lower half of the bow and to deliver the next pair of eighth-notes in a bouncing, spiccato fashion. Light, "airy" articulation (e.g. mm. 66-92), is contrasted with broad, wide, "on the string" *detaché* strokes on the successive eighth-notes episode of mm. 165-186. [Play Audio Ex. 8: mm. 1-189, 1975](#). Whether violinists of Bach's time aimed for such variations or performed in a more homogenous manner is not known for sure. But it is certain that the baroque bow bounced differently and created a less even tone quality than its post-Tourte modern version, which brought with it several apparently new kinds of bow strokes.³⁰ Given the variety of shades the baroque bow produced so naturally, perhaps it was less important to create variation through specifically diverse bow stroke types.³¹ However, this does not mean that virtuosos of Bach's time may never have used fancy bowing or that Bach would not have approved of such an interpretation.

³⁰“The number of different bow strokes employed c1760 was small and their discussion sparse compared with the wide range afforded by the Tourte bow and their detailed description provided by many early nineteenth-century authors.” Robin Stowell, *Violin Technique and Performance Practice in the Late Eighteenth and Early Nineteenth Centuries* (Cambridge: Cambridge University Press, 1985), 166.

³¹ Further discussion of bowing can be found in Robin Stowell, *The Early Violin and Viola: A Practical Guide* (Cambridge: Cambridge University Press, 2001), especially 76-9. For instance: “Few pre-Tourte bows were suited

In comparison with Heifetz's C-major *Fuga* recordings, Milstein's versions present obvious differences (Table 1): he plays the eighth-notes of measures 60-63 detached while Heifetz follows the slurring of the score. Milstein highlights the melodic contour in mm. 71-92 more clearly through dynamic nuances, agogic accents, and *ritenuti* (e.g. leaned-on pedal note, pause prior to return of subject). Other differences in interpretation include m. 115, where Heifetz creates a sudden drop of dynamics whereas Milstein makes the shift more gradual; mm. 137-142, where Milstein continues with firm, strong dynamics as opposed to Heifetz's shift towards a more "expressive" sound, emphasizing the held notes of the upper voice; mm. 165-186, where Milstein uses broad, wide "on the string" *détaché* strokes in contrast to Heifetz's light strokes; or mm. 172-174, 180-181 in which Milstein plays the first pair of consecutive eighth-notes legato while leaning on the first note of each measure in order to highlight the bass line (C#4-B4-A4; G#4-F#4-E4, respectively). Heifetz here plays more lightly and evenly with some audible bouncing of the bow, as discussed above.

Table 1. Comparison of Heifetz's and Milstein's recordings of the C major *Fuga*. Same color identifies similarities. Different shades of similar colors indicate differences within the single performer.

<i>Measure</i>	<i>Heifetz</i>		<i>Milstein</i>	
	<i>1935</i>	<i>1952</i>	<i>1954</i>	<i>1975</i>
1-10	mf, <i>détaché</i> , light	mf, shorter strokes	mf, <i>portato</i> (legato)	soft, legato
60-63	slurred as score	slurred as score	detached with leaned-on notes	broad but even
66-92	<i>spiccato</i> ; some grouping of beats; even dynamics	<i>spiccato</i> ; more literal rhythm; shifting dynamics	fluctuating dynamics; lightly detached; emphasized melody notes	lightly detached; shorter strokes; prolonged bass notes
92-115	wider bow strokes, chopped chords	wider bow strokes, chopped chords	<i>tenuto</i> , semi-detached; shorter strokes for chords	shorter bow strokes; melody broader
115-121	<i>subito p</i> ; long slurs; legato	<i>subito p</i> ; long slurs, legato	gradual dynamic change; legato	gradual dynamic change; legato
137-142	soft; lighter, shorter strokes;	soft; lighter, semi-detached strokes;	firm dynamics	firm dynamics
141-142	legato; tide notes highlighted	legato; tide notes highlighted	no change	no change
147-151	semi-legato, softer	firm dynamics; semi-detached	slows down; legato, softer	slows down; broader, firm dynamics
152-158	several top to bottom chords	several top to bottom chords	several top to bottom chords	several semi-arpeggiated chords
165-186	light strokes	light strokes	broad <i>détaché</i>	broad <i>détaché</i>
172-174, 180-186	light, even;	light, even; shifting dynamics	slurred down-beat; bass leaned-on	light <i>détaché</i> ; lightly accented downbeats

to accented bowing such as *martalé* or *sforzando* effect, which were used only rarely during the eighteenth century. Similarly, 'bounding' strokes such as *sautillé*, *spiccato*, and 'flying staccato' were sparingly employed for bravura effect," 77.

186-201	upper bow; light; accelerates	lower bow; light; bouncing; accelerates	short, light, even	short, light, even
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Multiple Stops

The specific characteristics of adagios and fugues—namely the appearance of autonomous voicing in a polyphonic context—pose considerable challenges for any violinist. The manner of execution of triple- and quadruple-stops, the articulation of inner voices, and the strategies for shaping large-scale structures can vary greatly.

In Heifetz’s recordings of the C-major *Adagio* and *Fuga*, for example, an emphasis of the melody in the bass line or an inner voice often results in chords being played from top to bottom or with a regular break followed by a jump back to the bottom note (e.g. mm. 18, 22-29, 41 and 45 of the *Adagio*; mm. 24-26, 100, 110, 127, 152-157 in the *Fuga*).³² Other times there is a delay in the sounding of the chordal notes in order to lean on and thus emphasize the melodically important pitch (e.g. mm. 121-123 of the *Fuga*). Quick-cut, short, and “chopped” or “whipped” execution of the multiple-stops, involving a firm attack on all strings for simultaneous playing of all notes, is used when the middle or top voices are important (mm. 92-115, 133-134, 158-161). Compared to Milstein’s interpretations of the *Fuga*, the leading voice in Heifetz’s performances is less clearly projected. Milstein uses much broader, wider, “on the string” *detaché* strokes that highlight the horizontal melodic line even within quick-cut and at times simultaneous execution of multiple-stops.

³² This type of execution might be similar to what nineteenth-century violinists of the North-German tradition (e.g. Karol Józef Lipiński) called “der zurückschlagende Bogen.” Unverricht has pointed to the so-called *zurückschlagender Bogen* as the type of bow stroke used by Johann Peter Salomon (1745-1815), one of the first to have performed J.S. Bach’s solo pieces in public and an acquaintance of C.P.E. Bach (Hubert Unverricht, “Spieltraditionen von Johann Sebastian Bachs unbegleiteten Sonaten und Partiten für Violine allein,” in *Johann Sebastian Bach und seine Ausstrahlung auf die Nachfolgende Jahrhunderte. Bachfest (55) der Neuen Bachgesellschaft. 22. bis 27. October 1980* (Mainz and Bretzenheim: Neue Bachgesellschaft, 1980), 176-184). Since the term is now absent from modern violin vocabulary, the question arises regarding the manner of execution designated by the term. One possible explanation could be gathered from the term’s linguistic roots (*zurück* meaning “to return,” *Schlag*, or *schlagen* meaning “to hit”). As such, it could be interpreted as a “retake” (i.e., the re-placing at the frog of a down-bow), followed by a firm “attack” resulting in the simultaneous sounding of all notes. Yet Joachim, who has been reported to use *zurückschlagenden Bogen* rejected such delivery and favored attacks on two successive strings during multiple stops. The details Kuhlentkampff provides in describing the musical context and execution of Joachim’s *zurückschlagenden Bogen* and Mendelssohn’s tirade against its use support the notion of the term referring to a certain kind of arpeggio (or “break and jump”), where the player returns to the melodic pitch of the chord in the lower voices, as was formerly suggested by Fabian. See Meyer-Sichting, ed., *Georg Kuhlentkampff: Geigerische Betrachtungen* (Regensburg: Gustav Bosse Verlag, 1952), 52 and Fabian, “Towards a Performance History,” 93. We are grateful to Ferenc Rados of the Franz Liszt Academy of Music in Budapest for drawing our attention to the Kuhlentkampff source.

Milstein's two renderings of these movements show greater differences than Heifetz's two versions: in the 1975 recording of the Adagio he does not hold the subsidiary voices to their full written value. In addition, he often arpeggiates chords or plays them more "calmly." Importantly, there are many exposed long, dotted notes on open strings played without vibrato (mm. 2, 4, 6, 12, 14 etc). All this contributes to a lighter, less tense tone than in the earlier version and lends his interpretation of this movement a sound quality not dissimilar to what is currently regarded as historically-informed and potentially reflective of what the composer might have envisioned.³³ In the following *Fuga*, his 1954 version delivers a more staccato articulation and the horizontal bass lines are delineated through short chords turned upside down (mm. 24-26, 109-111, 121-122, 127, 152 b. 3), as well as by prolonging the bass notes (mm. 3, 54, 58-59). In the later version, the inner voices are highlighted through clipping the rhythmic values of the subsidiary voices, leaving the inner, leading melodic line transparent (mm. 30-34, 109-111, 122-126, 154-156). Where the melody occurs in the higher or lower voice of the multiple-stop, chords are sometimes semi-arpeggiated (mm. 3, 99-103, 127, 144).

By glancing at the execution of their contemporaries, it can be noted that Menuhin's is closer to Heifetz: fierce and abrupt attacks, often off-the-beat, with the higher notes accented. The aforementioned "break and jump" technique can also be observed (mm. 18, 22-23, 27-28 in the Adagio, [Play Audio Ex. 9: mm. 19-29, 1934](#); mm. 58-59 in the *Fuga*). The sound is tense, aggressive, and at times "squeaky," due to the fierce execution of chords, fast and narrow vibrato and relatively small range of the dynamic spectrum. During highly polyphonic episodes of the *Fuga*, he sometimes uses "brushed," fast, and almost arpeggiated strokes amidst long slurs on eighth notes (mm. 98-111, 122-137). [Play Audio Ex. 10: mm. 52-118, 1957](#)

Enescu's and Szigeti's executions are even more strikingly tense and abrupt, at times heavy-handed. The fierce sound of the C-major *Adagio* is enhanced by their practice of using a fast up-bow prior to a multiple-stop so that the latter could be played as a down-bow. Frequent accents are put on eighth-notes preceding their paired multiple-stops. In the *Fuga*, quadruple chords are played ferociously and broken in two-plus-two fashion, i.e. the lower notes are played off the beat and the higher notes longer with a full sound. Triple-stops tend to be played simultaneously, with short down bows. All this reflects the conviction of the time that aimed to perform every note according to its written value and which provided ground for the idea that

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Addressing the complex issue of HIP practice is beyond the scope of this paper. For studies that discuss playing techniques and practices in detail see, for example, Colin Lawson and Robin Stowell, *The Historical Performance of Music: An Introduction* (Cambridge: Cambridge University Press, 1999); Dorottya Fabian, *Bach Performance Practice, 1945-1975: A Comprehensive Review of Sound Recordings and Literature* (Aldershot: Ashgate, 2003); Eitan Ornoy, "Between Theory and Practice: Comparative Study of Early Music Performances," *Early Music* 34 (2006): 233-247; Eitan Ornoy, "An Empirical Study of Intonation in Performances of J.S. Bach's Sarabandes: Temperament, 'Melodic Charge' and 'Melodic Intonation,'" *Orbis Musicae* 14 (2007): 37-76; Bruce Haynes, *The End of Early Music: A Period Performer's History of Music for the Twenty-First Century* (New York: Oxford University Press, 2007); Eitan Ornoy, "In Search of Ideologies and Ruling Conventions among Early Music Performers," *Min-Ad: Israel Studies in Musicology Online* (Special Issue 2008), http://www.biu.ac.il/hu/mu/min-ad/07-08/Early_Music_Perf.pdf.

Bach must have used a special curved bow able to sound all 4 strings at once. The bogus Bach-bow, advocated by Albert Schweitzer and created by the German Ralph Schroeder and the Danish Knud Vestergaard, was used primarily by Emil Telmányi. It was not until the early 1960s that this notion was seriously undermined by the findings of researchers and practitioners leading to the “airier” and lighter execution witnessed on Milstein’s second set, for instance, but also already on Grumiaux’s famous recording from 1961.³⁴

RHYTHM AND TEMPO

Generally speaking the recordings from the middle of the twentieth century display the literalistic approach to interpreting Bach’s music. Rhythmic values tend to be played accurately and evenly, without obvious differentiation between strong and weak beats. The more flexible, “gestural” approach to rhythm of the earlier generations (e.g. Joachim’s and Kreisler’s) gradually disappears.³⁵ Menuhin’s versions, which are quite rigid and inflexible, clearly indicate this generational change that seems to have impacted on even his elders, for the trend can also be observed when comparing Heifetz’s recordings of the D-minor partita from 1935 and 1952, or Szigeti’s recordings from the mid 1930s and the complete set from 1955. Both Enescu and Adolf Busch, Menuhin’s teachers, play in a fairly even and sustained style, although the younger Busch much more so than the older Enescu. Interestingly, Milstein seems to have always been rather literal and steady with rhythm and tempo, although he compensated for this evenness with well-placed accents and light (and sparingly used), agogic stresses. Yet even in his case a tendency for decreasing rhythmic flexibility can be noted between the earlier and the later versions—especially in this partita. Such a result somewhat contradicts his assertion that the 1975 recording is more “improvisatory.” Perhaps he was thinking more in terms of articulation and dynamics, both of which are more detailed and nuanced in the later version.

³⁴ Albert Schweitzer, “Reconstructing the Bach Violin Bow,” *Musical America* 70 (1950): 5–13; Emil Telmányi: “Some Problems in Bach’s Unaccompanied Violin Music,” *Musical Times* (January 1955): 14–18; David Boyden, *The History of Violin Playing from its Origins to 1761 and its Relationship to the Violin and Violin Music* (London: Oxford University Press, 1965). Grumiaux’s recording was made for Philips and is readily available on various re-issue CDs; see Discography for detail.

³⁵ Elasticity of rhythm traced in early twentieth-century recordings is suggested to reflect a rhetorical approach to music performance. See Robert Philip, *Early Recordings and Musical Style: Changing Tastes in Instrumental Performance, 1950-1990* (Cambridge: Cambridge University Press, 1992), 5-70; Timothy Day, *A Century of Recorded Music: Listening to Musical History* (New Haven: Yale University Press, 2000), 1-57; Mark Katz, “The Phonograph Effect: The Influence of Recording on Listener, Performer, Composer, 1900-1940” (PhD. Diss., University of Michigan, 1999), 138-157; Mark Katz, “Beethoven in the Age of Mechanical Reproduction: The Violin Concerto on Record,” *Beethoven Forum* 10 (2003): 38-54.

As the issue of dotted rhythms in baroque music has generated much debate throughout the twentieth century,³⁶ it might be instructive to look at the performance of dotted rhythms more closely. Three movements are singled out for their prevalence of dotted patterns: the C-major *Adagio*, the D-minor *Corrente*, and the E-major *Loure*.

Both Heifetz and Milstein play the C major *Adagio* rather slowly and legato, particularly in their respective earlier recordings. The sustained style and slow tempo lull the effect of dotting, but closer inspection and measurements of note durations indicate over-dotting. Generally, the first beat of each measure is most over-dotted and the ratio is sharper (Heifetz's around 0.82:0.18, Milstein's around 0.80:0.2) in measures with multiple-stops than when only one or two voices are present (Heifetz's around 0.78:0.22, Milstein's around 0.76:0.24).³⁷ Overall, the patterns are slightly more over-dotted in both artists' later recordings.

The D-minor *Corrente* is in 3/4 with alternating triplet runs and leaping dotted eighth-sixteenth pairs. Theorists often discuss how to perform the dotted patterns in such context. Some argue that dotting simply indicates long-short pairs in a triplet fashion³⁸ while others claim that over-dotting is necessary to really contrast these gestures with the smooth triplet motion.³⁹ The contrasting interpretations of Heifetz and Milstein exemplify these two positions. Heifetz tends to under-dot, playing mostly long-short dyads while Milstein's delivery in the 1950s is over-dotted. Although there are slight differences between Heifetz's earlier and later recordings his basic approach remains unchanged. In the 1935 recording, he plays a little slower and with more detached articulation. This makes the interpretation sound more dotted even though the long-short ratio has hardly changed (.66 in 1935 and .64 in 1952, for the dotted note). There are many accents and stressed notes that help to project the pulse and create rhythmic groupings.

³⁶ For an overview of the major issues of concern see Stephen Hefling, *Rhythmic Alteration in Seventeenth- and Eighteenth-Century Music*, (New York: Schirmer, 1997). For a review of the debate see Fabian, *Bach performance practice*, 169-74.

³⁷ Dotting ratios are expressed relative to the whole unit created by the dyads. In other words, the theoretical ratio of a dotted-eighth and sixteenth pair, equaling one quarter-note, is expressed as $0.75:0.25 = 1$. When the dotted note's value is greater than .75 of the whole, the note is over-dotted. For the current discussion of dotting ratios, all measurements were obtained in *Adobe Audition 1*, using the waveform and spectrogram displays as well as audio clues. Note durations (Inter-Onset-Intervals) were calculated from note on-set times.

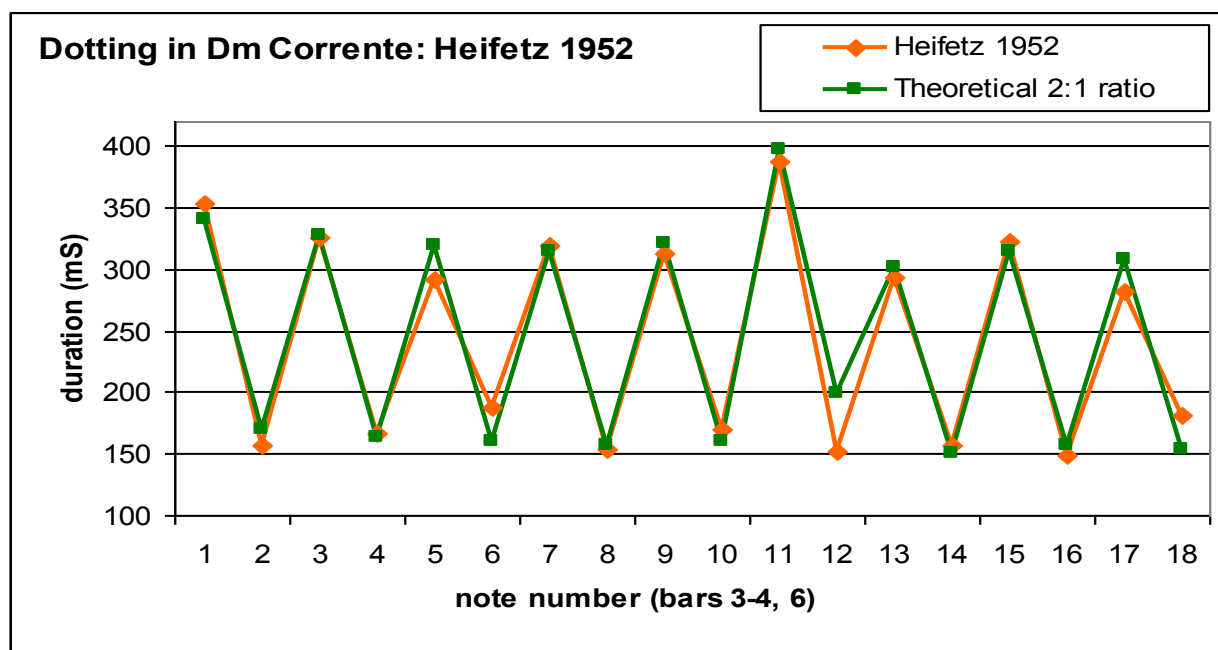
³⁸ Hans Engel, *Johann Sebastian Bach* (Berlin: de Gruyter, 1950); Robert Donington, *The Interpretation of Early Music* (London: Faber and Faber: 1989), 466-7; Boyden, *The History of Violin Playing*, 482.

³⁹ Arthur Mendel, ed., *Bach: St John Passion Vocal Score* (New York: Schirmer, 1951), xiv-xv. Frederick Neumann claims that either solution may be called for in Bach's scores, but generally leans towards the view that favors the softening of dotting to a 2:1 ratio. See Frederick Neumann, *Performance Practices of the XVIIth and XVIIIth Centuries* (New York: Schirmer, 1993), 96-97 and 151. The literature on how to perform dotted rhythms in Bach's music is extensive (see n. 36). Here, we only refer to the most important contributions to that literature, which discuss the specific issue of interlaced dotted and triplet patterns.

These are further emphasized through additional *portamenti* during repeats. In 1952 Heifetz's playing flows more evenly though the accented and stressed notes are present. Instead of delineating rhythmic groups, however, he tends to phrase through fluctuating dynamics. Most importantly, an even lesser dotting furthers the flowing character, the long-short pairs hardly disrupting the smooth stream of triplet runs (Figure 4).

Figure 4. Measured dotting ratios (calculated from note durations) of Heifetz's 1952 recording are plotted against theoretical long-short (2:1) ratios (calculated from measured beat durations) showing a close match. Durations were measured in *Adobe Audition 1*.

[Play Audio Ex. 11: mm. 1-7 and repeat of mm. 1-7, 1952](#)



The two earlier recordings of the piece by Milstein show the opposite. The performed dotting ratios are consistently over-dotted. The most consistent over-dotting occurs in the 1955 version, which is also played the most staccato (Figure 5). [Play Audio Ex. 12: mm. 1-7, 1955](#). Research shows that tempo and articulation impact on the perception of dotting, a finding that is supported here.⁴⁰ The dotting ratios of Milstein's 1953 and 1955 recordings are identical (.79),

⁴⁰ Emery Schubert and Dorothea Fabian, "Preference and Perception in Dotted 6/8 Patterns by Experienced and less Experienced Baroque Music Listeners," *Journal of Music Perception and Cognition* 7, no. 2 (2000): 113-132; Dorothea Fabian and Emery Schubert, "Musical Character and the Performance and Perception of Dotting, Articulation and Tempo in Recordings of Variation 7 of J.S. Bach's *Goldberg Variations* (BWV 988)," *Musicae Scientiae* 12/2 (2008): 177-203.

yet the 1955 version sounds more dotted because of the sharp staccato articulation, creating gaps (or kerning) between the dotted and the short notes. The earlier concert performance uses a more tenuto, almost legato articulation. The 1975 version is a little slower and the articulation is less detached. There are stressed and elongated notes (e.g. selected downbeats), but the dotting is quite literal, the average measured ratio fluctuating between .74 and .76 (Figure 6).

[Play Audio Ex. 13: mm. 1-24, 1975](#)

Glancing at the delivery of dotting in other contemporaneous recordings (Figure 6), it seems that Heifetz's choice of shifting the dotting ratio towards the triplet model may reflect the conviction of his era: both Enescu and Busch tend to under-dot. Enescu plays rather staccato, creating a performance that sounds over-dotted, and exemplifying the auditory illusion identified by Schubert and Fabian.⁴¹ In contrast, Menuhin's first recording, although from the same era, seems to herald the influence on the younger generation of Dolmetsch's doctrine to over-dot in pieces where dotted patterns are prevalent.⁴² Menuhin keeps this interpretative approach in his recording from 1957 as well. Szigeti, a player renowned for his intent to observe the composer's wishes (as transmitted by scores, documents and musicologists such as Dolmetsch), also over-dots. Milstein's return to more literal ratios in 1975 may reflect the influence of placing emphasis on the use of Urtext scores that started in the 1950s and reached its zenith around the 1980s.⁴³ Neumann's series of papers attempting to debunk the "doctrine" of over-dotting also started to be disseminated around this time.⁴⁴ [Play Audio Ex. 14a: mm. 1-6, Enescu](#)
[Play Audio Ex. 14b: mm. 1-6, Busch](#)

⁴¹ Schubert and Fabian, "Preference and Perception in Dotted 6/8 Patterns."

⁴² Arnold Dolmetsch, *The Interpretation of the Music of the 17th and 18th Centuries* (London: Novello, 1949 [R1969]; first published in 1915), 75-79.

⁴³ Stowell, "Building a library;" Field, "Performing Solo Bach."

⁴⁴ Frederick Neumann, *Essays in Performance Practice I* (Ann Arbor, MI: UMI Research Press, 1982). This collection contains papers published between ca. 1966-1977. The performance of dotted rhythms was hotly debated during 1960s-1990s, or indeed until Neumann's death (who was an accomplished violinist as well as musicologist) in 1994. It is likely that even those performers who might not normally engage in reading music journals and magazines have heard about the various points of views.

Figure 5. Measured dotting ratios (calculated from measured note durations) in Milstein’s 1955 recording are plotted against theoretical dotting (calculated from measured beat durations) and show a consistently higher than literal (0.75:0.25) dotting ratio. Consistent with the findings of previous studies, over-dotting rarely reaches the extreme ratio of theoretical double dotting (0.875:0.125) in actual musical performances. Durations were measured in *Adobe Audition 1*.

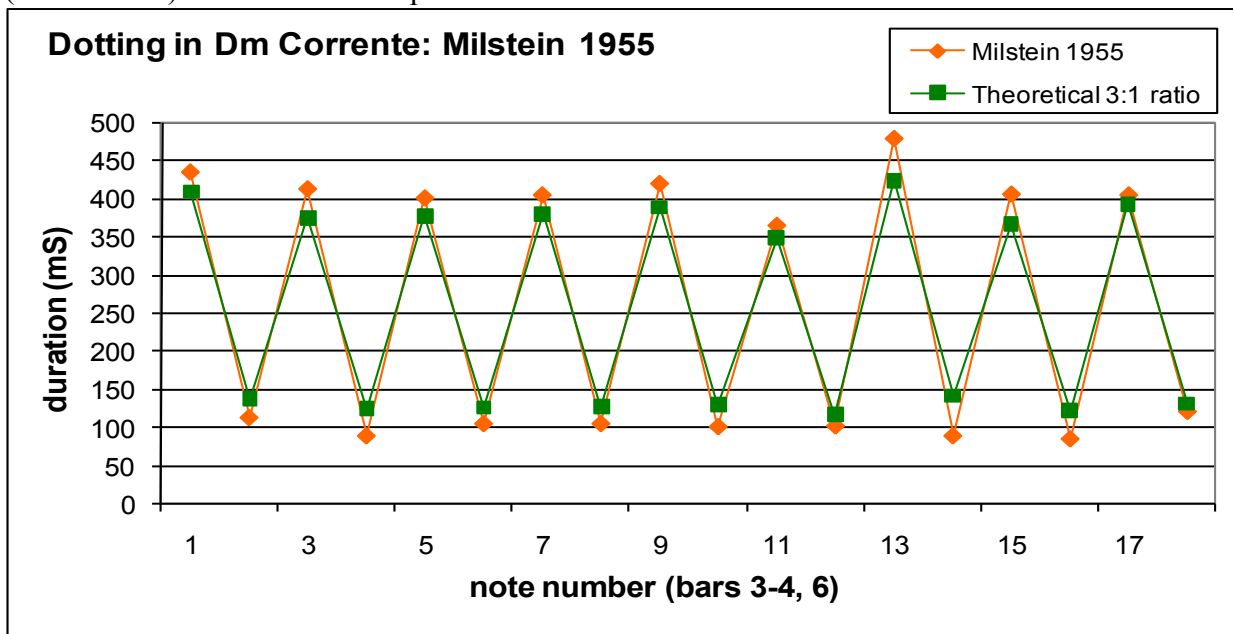
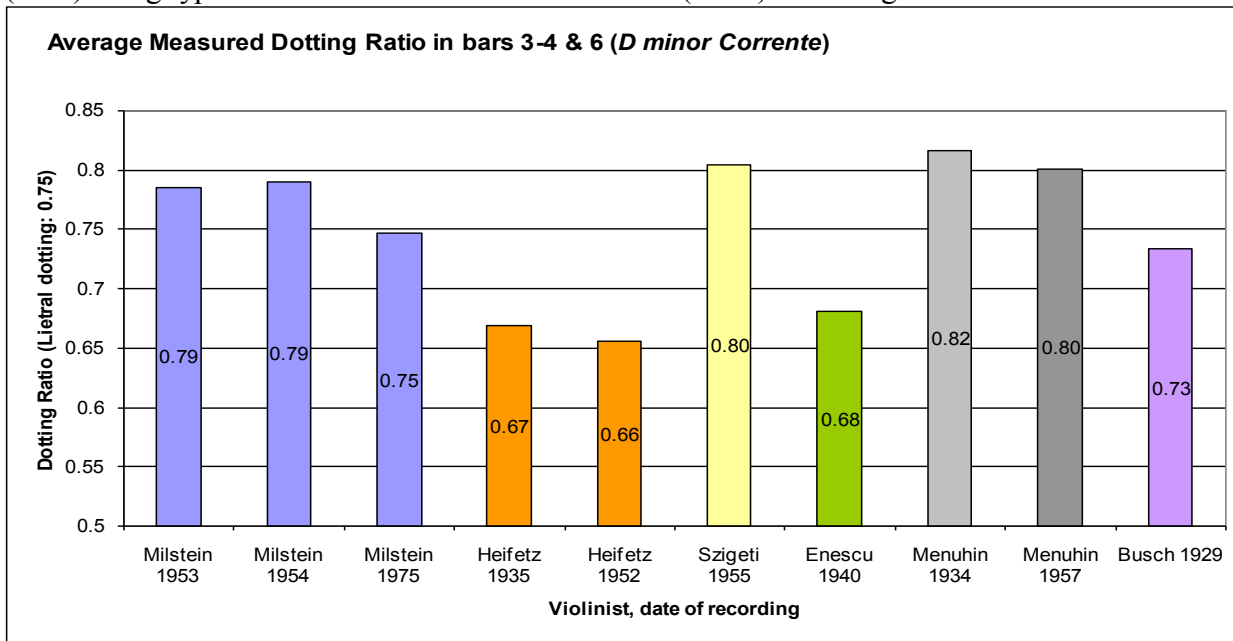


Figure 6. Average dotting ratio (calculated—using *Adobe Audition 1*—from measured note durations in measures 3-4 and 6) in recordings of the D-minor *Corrente*, showing over-dotting (>.75) being typical in the 1950s while under-dotted (<.75) renderings more common earlier.



In the recordings under discussion, the E-major *Loure* is performed in a slow tempo and legato style. This lulls the sharpness of dotting in most interpretations, but especially in Szigeti's and Enescu's. Software assisted measurements of note durations confirm the perception. Heifetz's ratio is under-dotted while Milstein's fluctuates between literal and slightly over-dotted values in 1975 and between under- and over-dotted values in 1955 (Table 2). Menuhin's dotting is literal in 1957 and slightly under-dotted in 1934. The other violinists deliver a similarly evened-out rhythmic profile, undermining the *Loure*'s hopping dance character. Instead of dotting, long-short triplet dyads are played.

Looking at the individual note values, it is clear that Enescu and Szigeti play the dotted-eighth—sixteenth patterns especially “flat” while the dotted-quarter—eighth dyads are more accurately rhythmicized. In contrast, Menuhin over-dots the smaller value patterns in 1957 pushing the average dotting ratio from under-dotted to literal. In Milstein's and Heifetz's interpretations such tendencies are not observed. Given previous investigations of dotting in performances of Bach's music⁴⁵ the prevalence of literal and under-dotted ratios is somewhat surprising. In recorded interpretations of relevant movements of the *Goldberg Variations*, *Brandenburg Concertos*, *Passions* and *Orchestral Suites*, over-dotting was found to be the norm throughout the twentieth century, but especially since the 1950s. A systematic examination of dotting in later recordings of the Bach violin solos remains to be conducted. This may clarify the role of musicological debate in shaping changes in performance style and whether violinists have different tendencies from pianists, harpsichordists, and conductors or leaders of ensembles.

[Play Audio Ex. 15a: mm. 1-11 Enescu](#) [Play Audio Ex. 15b: mm. 1-11 Szigeti](#)
[Play Audio Ex. 15c: mm. 1-8, Menuhin](#)

Table 2. Average ratio of dotted notes in recordings of the E-major *Loure*.

Artist, date	Average dotting ratio
Heifetz 1952	.73
Milstein 1955	.75
Milstein 1975	.76
Menuhin 1934	.73
Menuhin 1957	.75
Enescu 1940s	.68
Szigeti 1949	.70
Szigeti 1955	.66

⁴⁵ Fabian, *Bach Performance 1945-1975*, 170-179; Fabian-Schubert, “Musical Character and Dotting.”

Tempo Choices

We mentioned above that all selected violinists chose a rather slow tempo for the *Loure*; the slowest being Szigeti and the fastest Heifetz and Milstein in 1975 (Table 3). A study of all available recordings of the Solos indicates that the movement continued to be played fairly slowly throughout the century. If violinists playing on historical instruments are separated out then the average beat per minute for the dotted half note is 20 for mainstream players and 24 for historically-informed performers. Exceptions are Thomas Zehetmair, Sergiu Luca, Arthur Grumiaux, and Monica Huggett on the faster side and Schlomo Mintz and Gerard Poulet on the slower end of the spectrum.

Table 3. Average tempos in recordings of the E-major *Loure*.

Artist, date	Average bpm for dotted half note
Szigeti 1949	15
Szigeti 1955	16
Heifetz 1952	23
Milstein 1975	23
Zehetmair 1983	29
Luca 1977	28
Grumiaux 1962	26
Huggett 1995	26
Mintz 1983-4	13
Poulet 1996	13
Overall Average	21
Mainstream Average	20
HIP Average	24

Looking at tempo choices in the other movements of the solos, the results are similar. There are no real trends and all of the selected violinists perform outside the norm (i.e. $> \pm 1$ Standard Deviation) at times.⁴⁶ Heifetz tends to be faster (e.g. in the D-minor *Allemanda* and C-major *Fuga*), and Milstein can be faster (e.g. the *Bourée Double* of the B-minor *Partita* in both recordings) or slower (e.g. D-minor *Corrente* in 1975, C-major *Adagio* in 1955) than average. Szigeti's interpretations are usually slower than the norm (Table 4).

⁴⁶ By referring to the number of standard deviations from the mean (STDEV), information regarding the extremity of tempo choice can be obtained. If the STDEV number is smaller than ± 1 , this means that the performance falls within the tempo choice of approximately 66% of all performances. A number that is greater than ± 2 indicates that about 95% of the performances differ from that one. A negative number means a tempo that is slower than standard.

Table 4. Standard Deviation scores of the selected violinists in relation to the average tempo in recorded performances of the Solos calculated from duration measurements of approximately 40 commercially available CD releases of recordings made between 1903 and 2002. For a full discography see Fabian, "Towards a Performance History." The more extreme tempi are highlighted: STDEV scores between $\pm 1-2$ are in bold; those greater than ± 2 are in red.

G-minor sonata

Date	Performer	Adagio	Fuga	Siciliano	Presto
1940	Enesco	-0.59	0.53	1.12	-0.85
1935	Heifetz	-0.89	1.33	-1.24	-0.21
1952	Heifetz	-0.97	1.72	-1.15	0.71
1934	Menuhin	-0.48	0.49	-1.95	-0.56
1957	Menuhin	-0.79	0.78	0.33	0.25
1955	Milstein	-0.41	1.62	-0.19	1.69
1973	Milstein	0.3	1.01	0.22	-0.02
1946	Szigeti	-1.21	-0.48	-1.49	0.93
1931	Szigeti	-0.79	0.24	-1.47	1.09
1955	Szigeti	-1.4	-0.9	-0.79	0.16
Recorded Average MM		22	70	25	73

B-minor partita

Date	Performer	Allemande	Double	Courante	Db	Sarabande	Db	Bourrée	Db
1940	Enesco	1.47	0.95	0.58	0.77	1.76	1.6	0.7	1.6
1952	Heifetz	0.5	0.95	1.49	-0.85	1.86	2.24	2.09	1.33
1933	Menuhin	0.82	-1.47	-0.05	-0.05	-0.5	-1.82	0.91	0.66
1957	Menuhin	0.48	-1.76	0.55	1.52	-0.09	-1.66	1.23	0.38
1955	Milstein	0.08	0.85	-0.03	1.01	0.09	2.07	0.2	2.01
1975	Milstein	0.19	-0.06	-0.84	-0.56	0.2	0.31	1.12	1.36
1955	Szigeti	-0.34	-1.68	-1.12	-0.21	-1.11	-0.49	-1.71	-0.65
Rec. Average MM		33	34	131	133	56	83	78	84

A-minor sonata

Date	Performer	Grave	Fuga	Andante	Allegro
1940	Enesco	0.05	1.32	-0.41	0.75
1952	Heifetz	0.77	2.86	-0.36	0.75
1936	Menuhin	-0.69	0.3	-0.56	-0.91
1957	Menuhin	-0.26	1.12	0.1	0.87
1955	Milstein	-0.2	0.93	-0.08	0.2
1973	Milstein	0.02	0.69	1.11	-0.96
1949	Szigeti	-1.28	-0.12	-1	1.57
1933	Szigeti	-1.32	0.6	-1.39	1.86
1955	Szigeti	-1.73	-0.7	-0.98	-0.1
Recorded Average MM		23	74	30	42

D-minor partita

Date	Performer	Allemanda	Corrente	Sarabanda	Giga	Ciaccona
1940	Enesco	1.59	0.74	1.57	-0.13	-0.08
1935	Heifetz	1.98	-0.19	0.97	0.62	0.53

1952	Heifetz	2.72	0.34	1.46	1.1	0.71
1934	Menuhin	-0.7	0.24	-0.62	-0.27	-0.49
1957	Menuhin	-0.56	0.69	-0.3	1.51	-0.19
1955	Milstein	1.05	-0.47	-0.37	1.79	0.12
1975	Milstein	0.83	-1.42	0.07	0.09	-0.02
1955	Szigeti	-1.82	-1.48	-1.07	-0.27	-1.27
Recorded Average MM		57	115	39	77	56

C-major sonata

Date	Performer	Adagio	Fuga	Largo	Allegro assai
1940	Enescu	0.21	-0.08	-0.32	0.03
1935	Heifetz	0.3	1.59	-1.87	0.56
1952	Heifetz	0.73	2.02	-1.64	1.28
1934	Menuhin	-0.14	0.17	-1.05	-0.9
1957	Menuhin	-0.75	0.44	-0.74	-0.17
1955	Milstein	-0.57	1.31	-0.48	2.04
1975	Milstein	0.02	0.78	0.47	0.1
1955	Szigeti	-1.37	-0.82	-0.71	-0.05
Recorded Average MM		33	67	25	122

E-major partita

Date	Performer	Preludio	Loure	Gavotte	Minuet 1	Minuet 2	Bourre	Gigue
1940	Enesco	-0.34	-0.37	1.6	1.52	-1.54	-0.56	-0.54
1952	Heifetz	0.89	0.58	0.04	1.73	1.34	0.57	0.13
1934	Menuhin	-0.7	-0.29	0.11	0.76	0.11	-0.36	-0.85
1957	Menuhin	1.16	-0.36	0.74	0.94	0.11	1.11	1.14
1955	Milstein	0.99	-0.11	0.66	0.12	0.11	0.08	1.57
1975	Milstein	-0.04	0.58	-0.18	-0.49	-1.21	-0.14	-0.64
1949	Szigeti	-0.04	-1.46	-0.46	-1.51	-0.28	-0.14	-0.43
1955	Szigeti	-0.96	-1.12	-1.29	-2.1	-1.03	-0.96	-0.95
Recorded Average MM		119	21	72	115	119	49	72

To discuss just one example in a little more detail, the C-major *Adagio* and *Fuga* can be singled out. Heifetz's two recordings of the *Adagio* display a similar tempo (around ♩ = 68-70 beat per minute [bpm]) although the earlier one is less steady with several sections where the tempo slows. Milstein's two recordings on the other hand differ from each other (and also from Heifetz's versions) considerably. The earlier rendering is very slow, like Menuhin's in 1957 (averaging around ♩ = 55 bpm, but starting slower), fostering a contemplative mood, but the fierce and tense tone also lends a feeling of "grandeur." Only Szigeti in 1955 performs the movement even slower (around 50 bpm). The early version has other similarities with Menuhin's 1957 recording: structural points of departure tend to start slower for phrasing purposes (mm. 15, 40) and melismas are displayed in a rhapsodic, free manner during the final coda. Milstein's later version has a lighter tone, faster and steadier pace (around 70 bpm), and more flow. In the subsequent *Fuga*, Heifetz starts slower and then accelerates on both occasions (from around 69 bpm to between 76-84 bpm in 1934 and from around 76 bpm to c.84 bpm in 1952). Milstein's

tempo is slightly faster and significantly steadier in the earlier version (around 77-80 bpm in contrast to c. 70 bpm in 1975).⁴⁷

Tempo flexibility

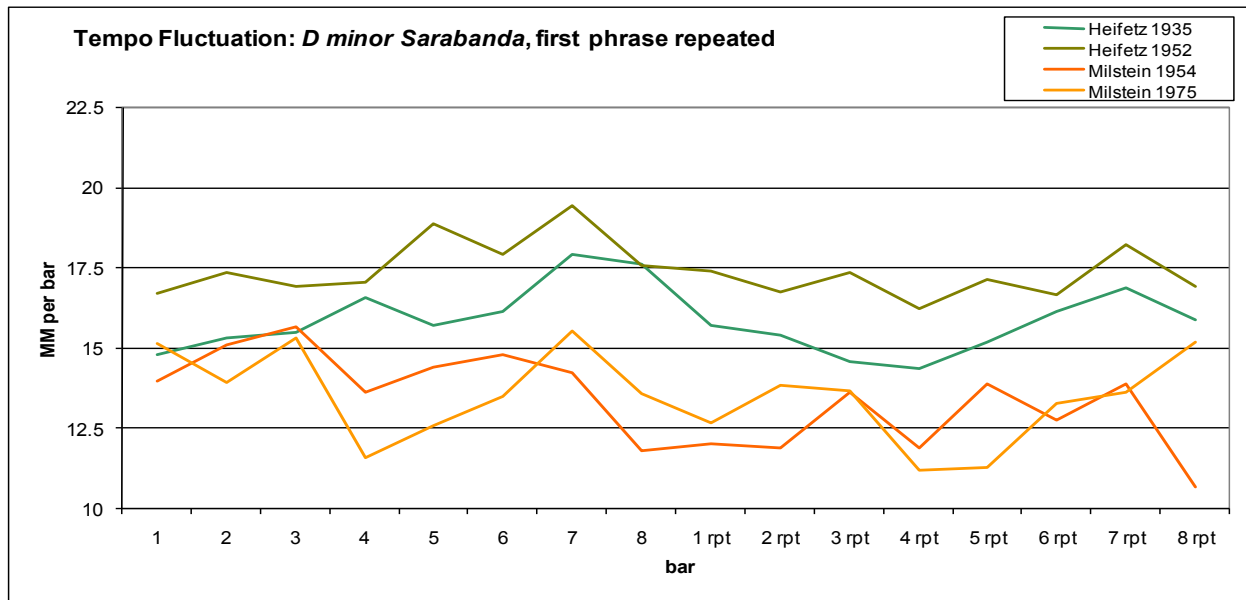
As mentioned earlier, Heifetz's 1935 interpretation of the D-minor *Sarabanda* is quite flexible. He accelerates from the very start all the way to m. 4 then relaxes the tempo at the beginning of m. 5 before another continuous push ahead to the emphatic dominant chord (either a V^4_3 or vii^6) in m. 7. The tempo slows only slightly for the cadential final measure of the phrase. In 1952 the strategy is slightly different. The tempo is steadier at the beginning and the acceleration starts only with the sixteenth notes in mm. 4-5. After a momentary *ritenuto* on the climactic high notes of m. 6, Heifetz continues the acceleration until the penultimate measure. The degree of *rallentando* in m. 8 is greater than in 1935. Importantly, in both recordings the tempo at the end of the phrase is faster than at the beginning and the repeat of the phrase starts with a gradual slowing of tempo until m. 4. During the repeats, the second half of the phrase is similarly shaped as the first time, but the relaxation of the tempo at the end is greater, bringing repose prior to the start of the next section of the movement (Figure 7).

Milstein's strategy is somewhat different and quite consistent across his two versions, especially in the first playing: a slowing down in m. 4 is followed by a steady acceleration from m. 5 to m. 7. The final measure and the repeats are slower than the beginning. In 1975 Milstein pushes ahead with the tempo at the end of the repeat. Interestingly, the tempo fluctuations of the repeats show similarities with Heifetz's strategy: the 1955 version to his recording from 1952; while Milstein's later version to Heifetz's earlier reading from 1935 (Figure 7).

[Play Audio Ex. 16a: Heifetz 1935](#) [Play Audio Ex. 16b: Heifetz 1952](#)
[Play Audio Ex. 16c: Milstein 1954](#) [Play Audio Ex. 16d: Milstein 1975](#)

⁴⁷ For these observations on tempo, a metronome and a stopwatch were used. The overall tempo of long-line segments was obtained with a metronome. The tempo of short fragments (1-2 measures) was calculated using a stopwatch. Each sample was timed twice to the thousandth-of-a-second. The average time was divided by sixty and multiplied by the number of beats in the segment. This final figure was considered as the tempo rate (beats per minute).

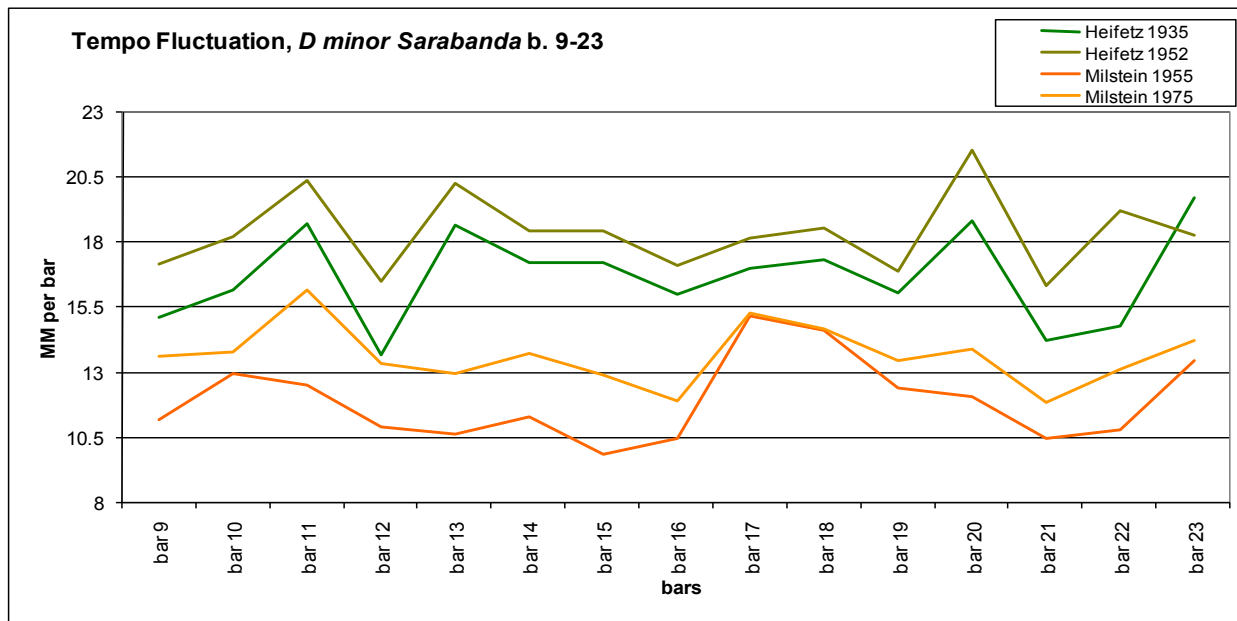
Figure 7. Tempo fluctuation in the first phrase (mm. 1-8 repeated) of the D-minor *Sarabanda* in Heifetz and Milstein's respective two recordings. Heifetz's 1952 performance shows similarities with Milstein's 1975 recording in the first play, and with his 1954 version in the repeat. Metronome values for each measure were calculated from beat durations using the *Sonic Visualiser* (2007) shareware program.⁴⁸



The two artists display a consistently different approach in their shaping of the second half of the movement (Figure 8). After a common initial acceleration to and sudden slowing in m. 12, Heifetz (both versions) plays in a fairly even tempo until m. 20. The swift rush in this measure is balanced by a drop in tempo in the next with further fluctuations in the final measures preceding the repeat. In contrast, Milstein (both recordings) hurries ahead in m. 17 (probably to minimize the impact of the cadence in m. 16) and then gradually slows until the saraband rhythm in m. 21 (vii^4_2 moving to i^6_4), followed by a resurging tempo that leads to the repeat. Milstein does not do the second repeat in 1955, however the repeats in all the other recordings show similar trends in tempo fluctuation.

⁴⁸ *Sonic Visualiser* (version 1, 2007). Shareware developed by Chris Cannam of Centre for Digital Music at Queen Mary, University, London. See: <http://www.sonicvisualiser.org>.

Figure 8. Tempo fluctuations in the second half of the D-minor *Sarabanda* (mm. 9-23) in Heifetz and Milstein's respective two recordings show a consistently different approach taken by the two artists. Metronome values for each measure were calculated from beat durations using the *Sonic Visualiser* (2007) shareware program.



Given his consistent approach in the *Sarabanda*, the differences in Milstein's subsequent recordings of the C-major *Adagio* and *Fuga* are striking. The earlier *Adagio* has more pronounced fluctuations of tempo. The extensive *rallentando* in m. 14 to about $\text{♩} = 50$ bpm is followed by a gradual *accelerando* from m. 16 to m. 31, which is intensified by an abrupt speeding up from m. 22 onwards, reaching about $\text{♩} = 76$ bpm towards the end of the fragment. Immediately after, there is a sudden drop of tempo on beat two of m. 31 to about $\text{♩} = 58$ bpm. The coda also has a slow, rhapsodic character terminating with an extensive and conspicuous *rallentando* (m. 46). Although the faster and steadier pace of the later recording impresses as being a different interpretation, similar conceptual strategies can be identified upon closer inspection. The *rallentando* in m. 14, the acceleration between mm. 16-31, and the flexibility of the penultimate measure are all there, the differences in interpretation thus proving to be in degree, not in kind.

Generally speaking, in the *Fuga* alterations of tempo occur prior to ending and commencing new sections and during dense polyphonic textures (for easier deliverance of multiple-stops) in most recordings. In Heifetz's two recordings and Milstein's earlier version the tempo is quite steady, and the overall form is projected through differences of articulations and other idiomatic devices. However, compared to Heifetz, Milstein utilizes more pronounced *rallentandi*, *fermatas*, and *accelerandi* at the end and beginning of long sections (mm. 64-66, 92,

146-147, 164, 200 etc.) and adds more agogic accents to inflect the rhythm for clearer delineation of inner-lines (mm. 106-115, 136-137 etc.). His tempo modifications are enhanced by sudden shifts in volume and/or tone. A good example is the section between measures 147 and 165: after a *rallentando* in mm. 146-147 followed by a fermata on the D-major chord, the new section starts soft and “lyrical” and at a much slower pace (ca. 64 bpm). In contrast, Heifetz’s tempo fluctuations are limited to speeding up in sections of successive eighth notes (e.g. mm. 115-121 and 165-201) and slowing down during highly polyphonic textures of triple- and quadruple-stops (e.g. mm. 121-137). Such alterations of tempo in the episodes (e.g. mm. 66-92) and the use of fermatas prior to voice entrances (e.g. mm. 111-121) are common in other recordings as well (e.g. Menuhin, Szigeti) and unlikely to have been practiced during Bach’s time according to current knowledge of baroque performing conventions.

As mentioned earlier, Milstein’s later *Fuga* recording makes use of a richer palette of tempo and rhythmic nuances. The exposition of mm. 1-34, for example, is presented at a much slower tempo (around 63 bpm) than in the earlier version, yet both tempo and dynamics become more tense and urgent as the third and fourth voices pile up, reaching 80 bpm in mm. 24-33, amidst frequent bow changes. Another example is the episode between mm. 92-137, where the flexing of tempo and rhythm assists the bringing out of short phrases and inner-line groupings (notice, for instance, the strong *rallentando* over leaned-on bass-notes in mm. 109-110, 113 -118, or the use of fermatas on the multiple-stops ending the phrases in mm. 111, 118).

PORTAMENTO

It is well known that the practice of portamento (sliding from one note to the next for expressive purposes) has declined rapidly over the course of the twentieth century. Several studies have demonstrated this in various genres.⁴⁹ It is also known that Heifetz continued utilizing the device quite liberally. Our investigation confirms the status quo. Heifetz plays *portamenti* much more frequently than anyone else. He is especially keen to pepper his repeats with them for additional emphasis or expression. Szigeti follows fairly closely while the others hardly ever play one. With regards to Milstein’s practice it is worth noting that if there is a portamento in the first play, it will recur in the repeat. The others seem less consistent. Careful listening highlights the problem that slight or soft slides might not have been intended *portamenti*; they do not seem to serve any obvious expressive purposes. Rather, they are likely to be simply audible shifts. Earlier violinists seem less concerned with trying to avoid them. This attitude could be a reason for the frequent slides in Heifetz’s playing; he makes them much

⁴⁹ In orchestral, solo, and string quartet repertoire: Robert Philip, *Early Recordings and Musical Style*, 143-204; in string quartets, Richard Turner, “Style and Tradition in String Quartet Performance: A Study of 32 Recordings of Beethoven’s Op. 131 Quartet” (Ph.D. diss., University of Sheffield, 2004), 168-224; in solo pieces, Mark Katz, “Portamento and the Phonograph Effect,” *Journal of Musicological Research* 25 (2006): 211-232; and in concerti Heejung Lee, “Violin Portamento: An Analysis of its Use by Master Violinists in Selected Nineteenth-Century Concerti” (Doctor of Education diss., Teachers’ College, Columbia University, 2006).

louder and slower when the apparent intention is to add emphasis or to heighten the force of expression. Such sliding occurs less frequently, mostly in the repeats. By the same token, and given the legendary status of his technical prowess, Heifetz's varied types of slides could all be intentional, contributing to his unique sound and colorful tonal palette, i.e. part of his artistic signature.

VIBRATO

The analyses of vibrato using a spectrogram display similarly confirm expectations. Readings in various movements give slightly different results, but by and large the rate of vibrato is fairly steady and normal (6-6.5 cycles per second) across all recordings and artists. Heifetz tends to be on the faster end and Szigeti's rate slows considerably with age. Heifetz's vibrato is quite irregular, fast, and often quite wide (averaging half a semitone in 1952). In terms of speed, it is similar to Menuhin's later recording, but its width is considerably shallower than Szigeti's and Enescu's, unlike Menuhin's practice in 1957. In contrast, Milstein's vibrato is shallow and regular (Figures 9a-b). He plays many notes without vibrato (for instance in all three recordings of the D-minor *Sarabanda*, see Figure 10, or in mm. 34-36, 43, 45, 47 of the C-major *Adagio*). Longer notes often start and finish straight, with vibrato added only in the middle (e.g. C-major *Adagio* m. 12 b.2: C#4), like in the practice of several latter-day baroque violinists (e.g. Monica Huggett, Lucy van Dael).⁵⁰ At times the vibrato is so shallow that the undulations in intensity seem more crucial than oscillation of frequency. In 1975, his vibrato is a little more continuous and wider (especially towards the end of notes) but still the shallowest among the examined violinists. With regards to his control of the technique it is worth highlighting the evenness of Milstein's vibrato even in passages with double stops or secondary voices. In such instances the vibrato of others tends to drop out around the onset of the additional voice (Figures 11a-b).

⁵⁰ Fabian, "Towards a Performance History," 91.

Figure 9a. Vibrato rate averaged across all measurements (A-minor *Andante*, E-major *Loure*, D-minor *Sarabanda*).⁵¹

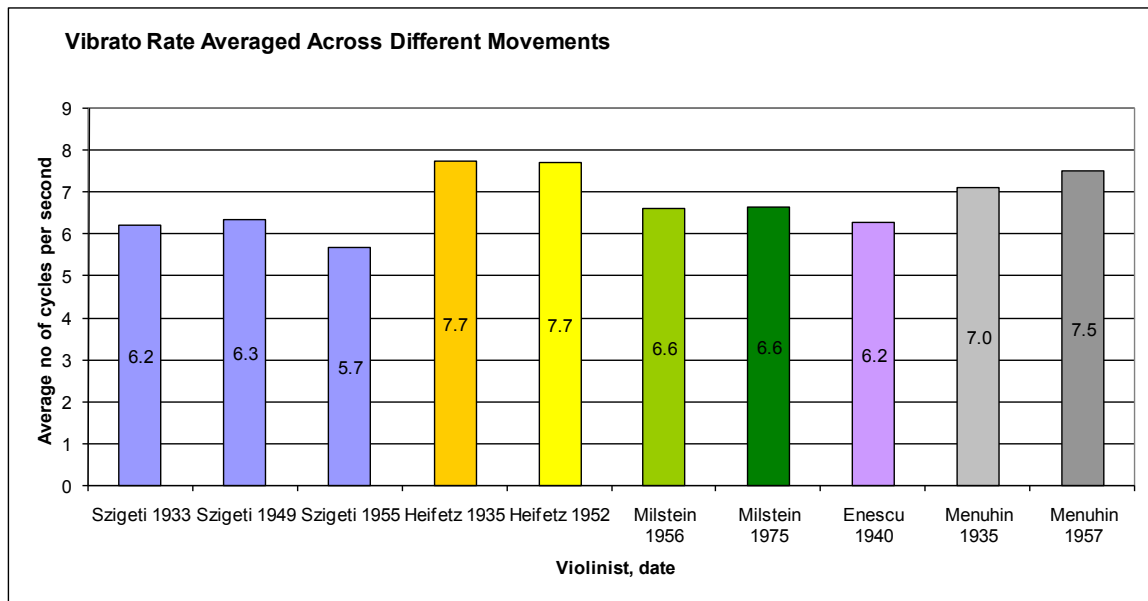
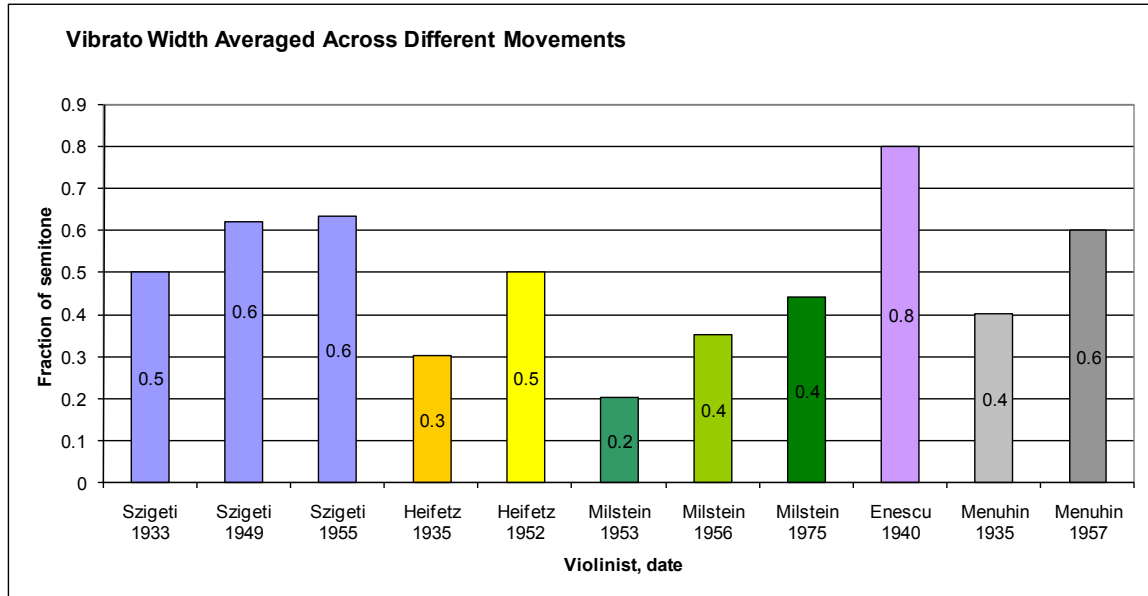


Figure 9b. Vibrato width averaged across all measurements (A-minor *Andante*, E-major *Loure*, D-minor *Sarabanda*).



⁵¹ For vibrato measurements, the audio visualization freeware developed by Richard Horne *Spectrogram* (version 14) was used. See: <http://www.visualizationsoftware.com/gram.html>

Figure 10. D-minor *Sarabanda*, mm. 5-6 in Milstein's 1953 live concert recording. Notice the non-vibrato notes (straight rather than wiggly lines) and the overall shallowness of the vibrato. Undulating intensity (changes of color in signal) is more obvious than fluctuation of frequency. [Play Audio Ex. 17: mm. 5-6, Milstein 1953](#)

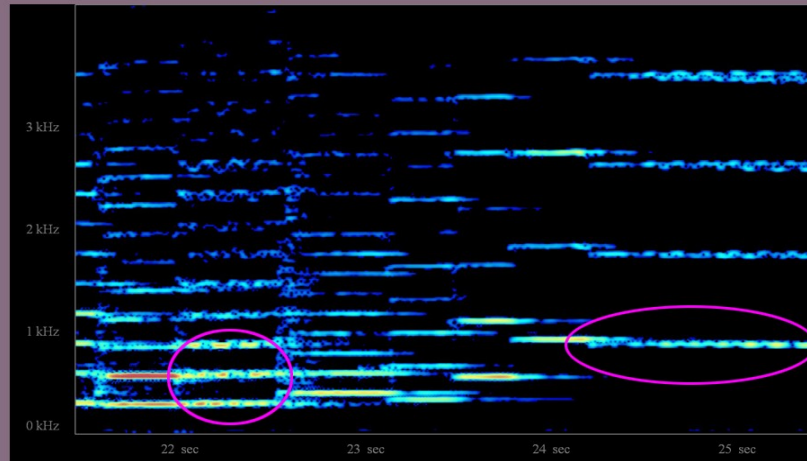


Figure 11a. Milstein (1955) playing C6 in m. 17 of the A-minor *Andante*. The spectrogram shows how Milstein's vibrato remains relatively unchanged during the sounding of the double stop which is also vibrated slightly. [Play Audio Ex. 18a: m. 17, Milstein 1955](#)

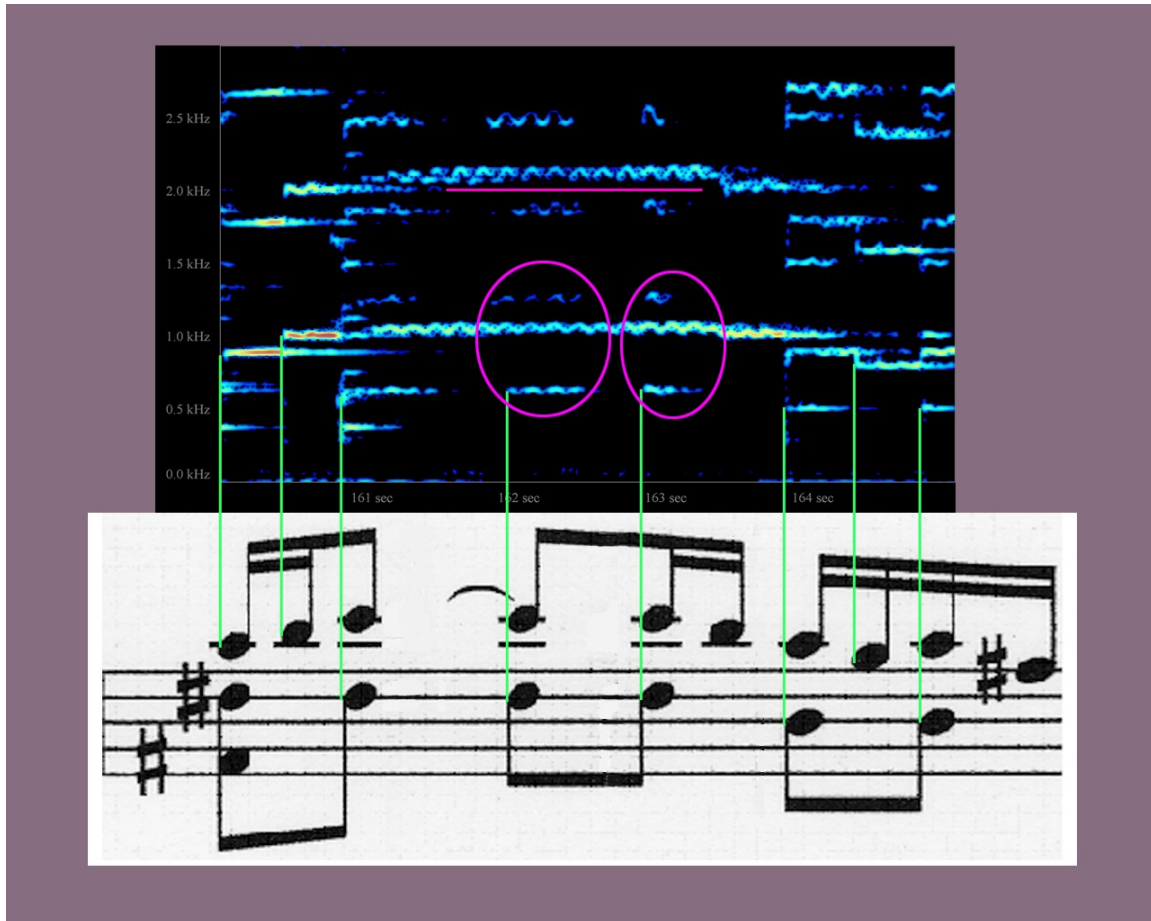
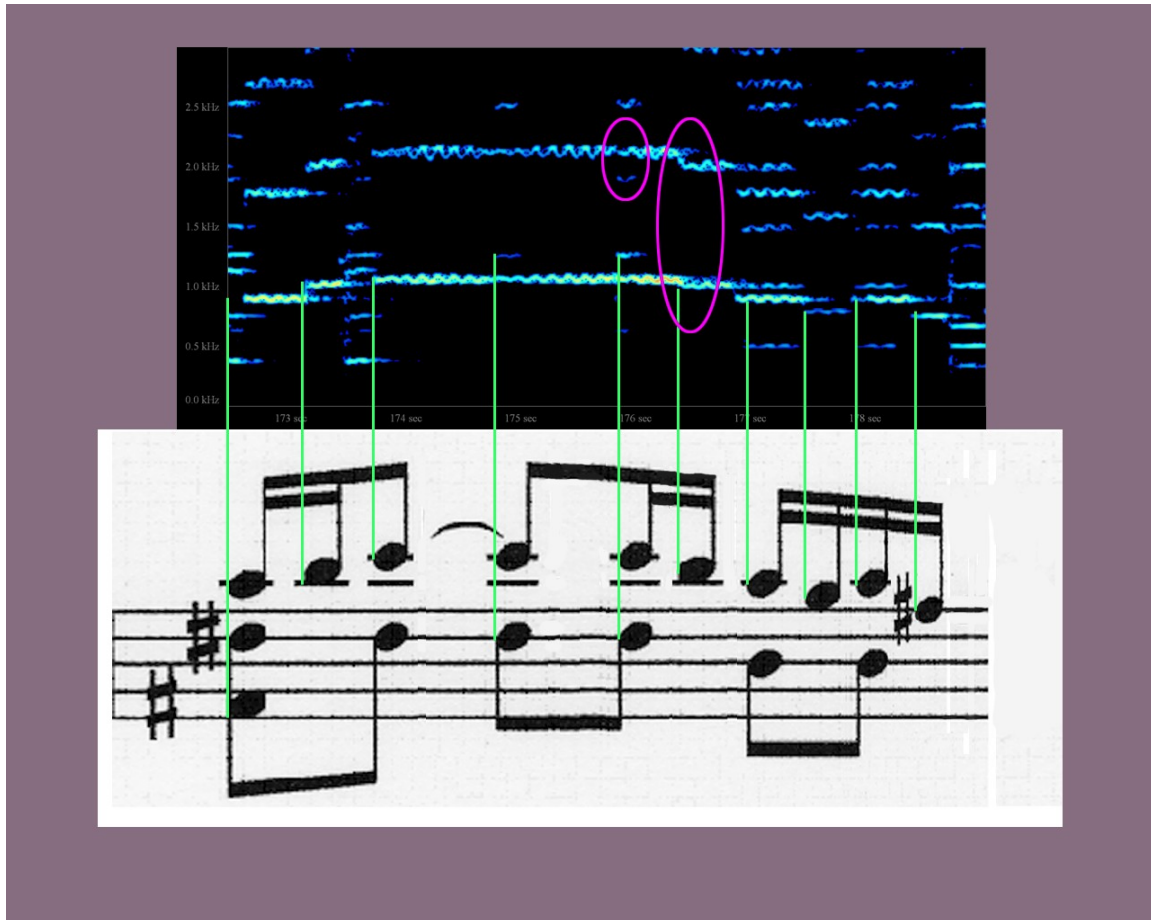


Figure 11b. Heifetz (1952) playing C6 in m. 17 of the A-minor *Andante*. The spectrogram shows the legato approach; the double stop is hardly audible and the melodic pitch regains its intensity and vibrato width to continue the line; bow change is minimized at note repetition and avoided until at least the 3rd beat (no gap in signal between Cs just a touch decrease in intensity); from C6 to B5 there is sliding. Note also the growth in intensity (amplitude is 46+ when signal turns yellow). Vibrato is wider in dynamically more intense passages. Commonly, vibrato almost drops out during the sounding of the accompanying D (i.e. double stop).

[Play Audio Ex. 18b: m. 17, Heifetz 1952](#)



CONCLUSIONS

This study aimed to contribute a step towards establishing individual “signatures” of performers in a manner equivalent to musicologists’ attempts to explain the characteristic features of a prominent composer or a musical piece. By focusing primarily on the recordings of Bach’s solos made by Jascha Heifetz and Nathan Milstein, several characteristics were detected that could clearly point to individual interpretative vocabulary and personal style.

Fingering choices have been seen to assist the overall musical approach. In Heifetz's playing, extensive use of position shifts and rich utilization of portamento seem to serve expressivity. Avoiding open strings by placing fingers on its lower neighbor creates a denser, darker sound as well as facilitates a constant use of vibrato. Milstein's fingering vocabulary brings about a much brighter, transparent tone in its more widespread use of open strings (especially in his later recording), first position, and sparse sliding. In this regard, Milstein's interpretations are closer to Bach's presumed intentions and baroque performing conventions.

Dynamics is yet another element contributing to an individual mark. A subtly rich and varied palette of the dynamic spectrum characterizes Milstein's vocabulary; and he utilized dynamic nuances to assist expressivity and musical structure. Heifetz exploited a wide dynamic range mainly during repeats, pointing to its treatment as idiom, i.e. something to call upon in this repertoire rather than it being part of his general approach to musical phrasing. This idiomatic use of dynamics was also noticed in his performance of the adagios and (especially) fugues, where terraced, block-dynamics are presented in contrast to Milstein's inner, local nuances. Although the fine distinctions in Milstein's rendering are subtle, again, his approach is more in line with views on baroque performing conventions current since the 1990s than Heifetz's, which is more representative of the earlier beliefs that proclaimed a single constant affect per movement and rejected the use of graded dynamics. Nevertheless, compared with both Heifetz's and historically informed interpretations by recent period instrument violinists, Milstein's reading would seem to belong best to the literalistic school that underplays the expressive depth of Bach's music.

Rhythmic interpretation has also been evaluated as exemplifying personal mark. Heifetz's tendency to under-dot dotted figures and deliver marked accents is constant throughout the years and seem to reflect a possible convention of the previous generation. Milstein's reversed approach of over-dotting accompanied by the use of sharp staccato seems in turn to herald a new trend and parallels the many concurrent publications debating the "correct" performance of dotted rhythms as discussed in eighteenth-century documents.

Tempo fluctuations were common in most movements of all recordings by both artists and have been used to assist phrasing and the projecting of the overall structure. Generally speaking, Heifetz presents rather locally varied tempo fluctuations throughout, while Milstein's treatment of tempo is steadier and executed over longer periods of time. However, in the fugues, Heifetz's tempi are more consistent whereas Milstein's speeding and slowing more pronounced. In this regard then, the playing of Heifetz may be closer to the presumed conventions of baroque performance practice. Baroque historical treatises discuss local, bar-level *rubato* within an overall steady tempo; it is not until the nineteenth century that speeding up in the middle of a phrase becomes commonly mentioned.⁵²

⁵² Richard Hudson, *Stolen Time: The History of Rubato* (Oxford and New York: Clarendon Press, 1994). A short summary of the different kinds of rubato can also be found, for example, in Stowell, *The Early Violin and Viola*, 99-100.

Vibrato is yet another idiosyncratic element of expression that could be specifically examined. Heifetz uses quite irregular, wide, and fast vibrato throughout the note. Milstein's vibrato was found to be shallow and even, added at times only in the middle of long notes (creating a slight swell or *messa di voce* effect) or omitted all together. His attitude thus may be considered to be in line with what is believed to have been the baroque practice.

When comparing the different versions by the same artists various disparities emerge. Obvious ones are Milstein's later turn to more literal ratios in the performance of dotted-figures or the richer palate of tempo and rhythmic nuances presented in his second recording of the C-major *Fuga*. Milstein's articulation also seems more varied in his later years, with greater emphasis on separated notes on the one hand (through extended presentation of *martalé*, *détaché* etc.), and a lighter sound on the other hand (through bouncing spiccato and longer slurs, which force the violinist to economize in speed and bow-pressure in a way that affects tone brightness and power). All this confirms the validity of his own assessment of the two versions quoted at the beginning of the paper, that by and large the earlier one was "less improvisational." The differences in Heifetz's subsequent recordings show the reverse. Tempo, rhythmic projection, and phrasing are less flexible in 1952 than in 1935. While Heifetz utilizes various means of articulation to differentiate voices in both versions (e.g. in the C-major *Fuga*), divergence between the recordings is most pronounced in his variegated bowings—especially in the repeats of binary-form dance movements. Frequent bow division and the use of quick, whole-length bow strokes used for single notes dominate his later recording, bringing about a bright and intense sound.

Similar evolution could be traced in the execution of multiple-stops. While Heifetz demonstrates various ways of playing chords in both recordings, Milstein's transparent sound, achieved through the shortening of rhythmic values in subsidiary voices, use of arpeggio, and lack of vibrato, is a later development. That said, personal traits were clearly observed throughout the years. Such is Heifetz's use of "break and jump" bow strokes and, at times, his quick-cut, fierce chord execution presented in a manner resembling his other contemporaries. Milstein's clearer projection of the leading voice, achieved through the use of wider strokes, and quickly decaying subsidiary voices, seems also an immutable characteristic (Table 5, see next page).

Table 5. Summary of overall differences and similarities in Heifetz's and Milstein's recordings. Same color identifies similarities. Different shades of color indicate differences within the single performer.

<i>Feature (Technique)</i>	<i>Heifetz</i>		<i>Milstein</i>	
	<i>1935</i>	<i>1952</i>	<i>1950s</i>	<i>1975</i>
Fingering	shifts, slides	shifts, slides	open strings	more open strings
Dynamics	block-like	block-like	rich, varied	nuanced
Dotting	under-dotting	under-dotting	over-dotting	literal
Phrasing	shape large structure	shape large structure	shape large structure	shape large structure
Tempo	extremes common	extremes common	extremes common	lesser range
Flexibility	varied, gestural	more literal	more literal	less literal but steady
Articulation	varied	broad, sustained	broad, sustained	more detailed
Bowing	changes in repeats	changes in repeats frequent division	broad détaché; wider strokes	lighter détaché; slurred / bounced frequent division
Vibrato	irregular, wide, fast	irregular, wide, fast	shallow	omitted but wider when used
Chords	“break & jump”; often from top down	“break & jump”; often from top down	longer held chordal notes; some top down	semi-arpeggiated; short decay of non melodic notes
Repeats	Different and/or more exaggerated bowing, fingering, dynamics, more slides	Different and/or more exaggerated bowing, fingering, dynamics, more slides	similar	similar

All in all, it appears that when a particular era is examined in detail (e.g. the 1950s), individual differences may outweigh the significance of possible period trends: general approach to bowing, phrasing, shaping of rhythm, tempo choices, and even vibrato and portamento differed across the recordings of Szigeti, Enescu, Menuhin, Heifetz, and Milstein. Observed similarities did not easily form generational trends (or fall into assumed “violin-schools”), but seemed rather occasional: Szigeti, Enescu, and Heifetz tended to under-dot while Menuhin and Milstein delivered over-dotted patterns. Yet in terms of portamento practice Enescu was more like Menuhin and Milstein, and even Szigeti used less sliding than Heifetz. A comparison of their vibrato yielded further potential groupings: Heifetz's vibrato speed was similar to

Menuhin's, the width of it closer to Szigeti's and Enescu's. Szigeti's vibrato speed was slower than Enescu's. Milstein's shallow, even vibrato and, especially, his sparing use of it proved to be a unique trademark challenging assertions regarding the widespread adoption of continuous vibrato around the turn of the twentieth century. Tempo choices were more extreme in Szigeti's (slow) and Heifetz's (fast) recordings, but all other three examined violinists occasionally played a movement very slow or very fast.

With all the selected artists it was possible to observe a slight tendency for a more evened-out, less inflected approach in the recordings of the 1950s. Menuhin, the youngest of them all, seems to provide the clearest example, while Enescu, the oldest in the pool, the least conforming one. This tendency is illuminated through the comparison with the earlier or later recordings of the same artists. Szigeti's, Heifetz's, and Milstein's other versions all show greater flexibility and variety. Given the dates of their respective recordings of the solos, the difference between Heifetz and Milstein may be erroneously assigned to a generational gap, assuming Heifetz to be older and representative of a more subjective attitude, while Milstein to be younger and representative of the more positivistic approach typical of mid-century. However, as is known, they were born only two years apart and they both seem to have been influenced to a greater or lesser degree by the vogue of "objectivity" and "faithfulness to the score." After the fairly free and personal recordings of the 1930s, Heifetz's complete set from 1952 is more literalistic. In Milstein's case the scenario is reversed: the later, 1970s version shows more flexibilities and expressive nuances together with a greater use of open strings and low positions, indicating perhaps the impact of changing scholarly beliefs regarding baroque performing conventions and Bach's presumed intentions.

Importantly, the examination showed that although similarities are often more obvious than differences when subsequent stages in an artist's life are scrutinized, the interpretive models shaped early in one's artistic development are far from being set in stone. Divergence over time in bowings, tempo or rhythmic execution was clearly observable alongside relative consistency of practice in elements such as sound production, chord-progression, fingering, and vibrato. While technique seems to direct interpretative choices, thus limiting the influence of changing trends, over the years artists may gradually adapt their technique to suit changing aesthetics. At the same time, consistency of practice indicates the fundamental nature of formative years as well as the importance of artistic temperament. The recordings of the virtuosic and idiosyncratic Heifetz provided less consistency in execution (except for the prevalence of sliding) than the more introspective and "intellectual" Milstein. In terms of musical approach, however, Milstein's style appears to have changed more than Heifetz's, developing further in the interpretative direction that shows some surface similarities with the practices of latter-day period instrument violinists.

The observed differences between Heifetz and Milstein's technique draw attention to the fact that while both completed their training in Auer's class, they received their technical foundations from different teachers; Heifetz from Malkin, Milstein from Stolyarsky. The claims that Auer left technical matters to his assistants, or that he expected his pupils to be technically

“ready” are supported here (see fn. 17). On the other hand, the identified artistic differences question the importance of Auer’s influence altogether, or, rather, underline the validity of the view that Auer’s greatest gift as teacher was his ability to foster his pupils’ individuality. In comparing Heifetz and Milstein’s Bach playing not even a similar artistic outlook can be demonstrated that would hark back to a potential Auer-school. Perhaps all that remains is the richness of tonal palette that Carl Flesch noted, but even this seems to be generated by individual means rather than specific fingering or bow stroke choices. To further clarify these issues and enhance understanding of the role of teachers, period trends, and artistic temperament in the formation of Heifetz’s and Milstein’s individual styles, their playing of other repertoires needs to be studied in similar detail.

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