Looking back and moving forward:

From Baillot's *L'art du violon* to Boulez's *hyper-violin*

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Montreal, Quebec

April 14th, 2014.

A doctoral paper submitted to McGill University in partial fulfillment of the requirements of the degree of Doctor of Music in Performance Studies

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Acknowledgements

I'm very grateful to the following individuals and organizations:

To the Social Sciences and Humanities Research Council of Canada (SSHRC) and the Schulich School of Music for funding this degree.

To the members of my doctoral committee for their constant support: Dr. Tom Beghin, Dr. Sean Ferguson, Prof. Denise Lupien, Dr. Eleanor Stubley, and Dr. Bruce Haynes, whose memory and support lives on.

To Evan Campbell, Gabrielle and Denis Lambert.

To Sallynee Amawat, Emmanuelle Bourrassa Beaudoin, Mitch Burke, Christa Marie Emerson, Frédéric Lambert, Christopher Matthews, Amina Myriam Tébini, Jeremy Tusz, and my family and friends; you know who you are, and you know you mean the world to me.

Final thanks to the McGill Digital Composition Studio (DCS) and the Centre for Interdisciplinary Research in Music, Media and Technology (CIRMMT) for letting me use their facilities in my *Boulezian* adventure.

Abstract

The establishment of the Paris Conservatoire, in 1795, resulted in a new type of violin teaching, and subsequently violin playing, one that was institutionalized and standardized. Pierre Baillot, an eminent violinist and pedagogue, was especially influential in this regard, as he co-wrote and edited the first official violin method of the Conservatoire, the *Méthode de violon* (1803). He revised and expanded this method as *L'art du violon* (1834) to account for technological breakthroughs and new repertoire. This study revisits this groundbreaking violin method from a performer's perspective, and applies it to Pierre Boulez's *Anthèmes 1 pour violon seul* (1991-1992) and *Anthèmes 2 pour violon et dispositif électronique* (1997).

The study is divided into five parts. First, it discusses the historical and cultural link between Baillot and Boulez. Second, it elaborates on the history of the violin and bow and their construction from the eighteen century to the present day. Parts three and four then illustrate how Baillot's *L'art du violon* addresses technical challenges in Boulez's *Anthèmes 1*. This explanation accounts for Baillot's methodology and etudes, and is divided into right- and left-hand techniques, respectively. Finally, part five, investigates how the live electronics in *Anthèmes 2* redefine the violin's sound, as well as the violinist herself. This section accounts for performance difficulties and techniques resulting from the live electronics in *Anthèmes 2* and solutions to overcome these difficulties.

The primary focus of this work is the application of Baillot's methodology to Boulez's *Anthèmes 1* and *2*. Nevertheless, parts three, four, and five examine violin techniques found in a wide range of repertoire. Baillot's method remains full of musical treasures and insightful remarks applicable for new repertoire far beyond the nineteenth century.

Abrégé

La création du Conservatoire de Paris, en 1795, a donné lieu à un nouveau type d'enseignement du violon, et par le fait même de jeu violonistique, celui-ci étant désormais institutionnalisé et normalisé. Pierre Baillot, un éminent violoniste et pédagogue, fut spécialement influent à cet égard, en collaborant à l'écriture de la première méthode officielle pour violon du Conservatoire, soit la *Méthode de violon* (1803), de laquelle il fut également l'éditeur. Il révisa et enrichit la méthode en *L'art du violon* (1834) pour y intégrer les avancées technologiques de l'époque, ainsi que le nouveau répertoire disponible. L'étude qui suit revisite cette méthode de violon révolutionnaire du point de vue d'un interprète, et l'applique aux *Anthèmes 1 pour violon seul* (1991-1992) et *Anthèmes 2 pour violon et dispositif électronique* (1997) de Pierre Boulez.

Cette étude se divise en cinq parties. Premièrement, il y a une discussion sur le fil historique et culturel partagé par Baillot et Boulez, puis, deuxièmement, une élaboration sur l'histoire du violon et de l'archet en lien avec leur construction depuis le dix-huitième siècle. Dans les parties trois et quatre se retrouvent les problèmes techniques présents dans les *Anthèmes* de Boulez illustrés à travers *L'art du violon* de Baillot. Les explications sont ancrées dans la méthodologie et les études de Baillot, et sont divisées en techniques pour la main droite, et techniques pour la main gauche, respectivement. Finalement, dans la cinquième partie, le dispositif électronique d'*Anthèmes 2* est analysé, en considérant comment il redéfinit le son du violon, de même que le rôle du violoniste. Cette section explique les difficultés d'exécution et les issues techniques du dispositif électronique joué en temps réel, dans *Anthèmes 2*, en plus d'offrir des solutions pour surmonter ces difficultés.

L'objectif principal de cet ouvrage est d'employer la méthodologie de Baillot dans l'apprentissage des *Anthèmes* de Boulez. Néanmoins, les parties trois, quatre, et cinq examinent des techniques violonistiques qui se retrouvent dans un large éventail de répertoire, et sont applicables lors de l'interprétation de nombreuses œuvres contemporaines. La méthode de Baillot foisonne en trésors musicaux et remarques pertinentes pour faciliter cet apprentissage.

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INTRODUCTION

When approaching a new piece of music performers often rely on repetition and practicing isolated excerpts of the unfamiliar score.[1] The current investigation proposes an alternative method for learning technically and emotionally challenging new repertoire, focusing specifically on Pierre Boulez's *Anthèmes 1 pour violon seul* (1991-1992) and *Anthèmes 2 pour violon et dispositif électronique* (1997). First, I illustrate how a practical method, Pierre Baillot's *L'art du violon* (1834), anchored in the Paris Conservatoire tradition, can overcome many of the technical challenges in Boulez's *Anthèmes 1*. Then I investigate how the live electronics part found in *Anthèmes 2* redefine the violin sound, as well as the violinist herself. The additional electronics create what Jonathan Goldman terms a hyper-violin,[2] that is a violin extended beyond its natural limits through the use of electronic processes.

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[1] Sohyun Eastham, "Part II: Guide to performance," in *The Role of the Violin in Expressing the Musical Ideas of the Romantic Period and the Development of Violin Techniques in the Nineteenth and Early Twentieth Centuries* (PhD diss., University of Newcastle, 2007), ix.

[2] Jonathan Goldman, *Understanding Pierre Boulez's Anthèmes [1991]: 'Creating a Labyrinth of Another Labyrinth'*(PhD diss., Université de Montréal, 2001); Jonathan Goldman, "Analyzing Pierre Boulez: Notes on *Anthèmes* for solo violin," in *Quêtes d'absolu*, ed. Jean-Jacques Nattiez (Montreal: Galerie Simon Blais, 2009), 21-22.

For a more detailed presentation of *Anthèmes 1* and *2*, see Jonathan Goldman, *The Musical Language of Pierre Boulez: Compositions and Writings* (Cambridge University Press, 2011).

1.1 Pierre Baillot's tradition

Pierre Baillot's *L'art du violon* is an excellent resource for modern violinists because he was not only the Father of modern violin pedagogy, but he was also a key figure in the development of the French violin tradition that is still very much alive today. As Zvi Zeitlin puts it, "Practically all good violinists can trace their origins back to one or more of the French Fathers."[3] In fact, the majority of recent research on the history of the violin pinpoints Pierre Baillot and his famous *L'art du violon* as the root of modern violin pedagogy.[4] To appreciate this bold statement, we need to consider the impact and subsequent reverberations of the nineteenth-century French School of Violin.

The concept of a "violin school" has been the source of much debate in recent literature.[5] The sceptical side of this argument is represented well by Joseph Wechsberg who writes, "Although much has been written about certain 'schools' of playing, the scope and influence of a school can never really be clearly defined... Often the 'school' is arbitrarily determined by time and place."[6] There is certainly truth to this idea, as each pedagogue develops a unique system of teaching representative of their own experiences and cultural context. Nevertheless, definitive bridges can be drawn between different

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[3] Pierre Baillot, *The Art of Violin*, trans. and ed. Louise Goldberg (Chicago: Northwestern University Press, 1991), x.

[4] These family trees include the American, Russian, Polish and Modern French Schools of Violin. See for example, Gwendolyn Masin, *Violin teaching in the new Millennium* (PhD diss., Trinity College in Dublin, 2012); Robin Stowell, "In principle Violin Pedagogy through the Ages," *Strad* (2007); Zdenko Silvela, *A New History of Violin Playing: The Vibrato and Lambert Massart's Revolutionary Discovery* (USA: Universal, 2001); Paul Stoeving, *The Violin: Its Famous Makers and Players* (Westport, CT: Greenwood, 1970); Paul G. Gelrude, *A Critical Study of the French Violin School: 1782-1882* (PhD diss., Cornel University, 1941).

[5] Including: David Milsom, *Theory and Practice in Late Nineteenth-century Violin Performance: An Examination of Style in Performance, 1850-1900* (Aldershot, Hampshire, England: Ashgate, 2003); Maciej Jablonski and Danuta Jasinska. *Henryk Wieniawski and the 19th century violin schools: techniques of performance, questions of sources and editorial issues* (Henryk Wieniawski Society, 2006); Mary (Masha) Lankovsky, *The pedagogy of Yuri Yankelevich and the Moscow violin school, including a translation of Yankelevich's article 'on the initial positioning of the violinist* (PhD diss., City University of New York, 2009).

[6] Joseph Wechsberg, *The Violin* (London: Calder and Boyars, 1973), 196.

places, times and violinists, contributing to the fascination associated with the study of violin "schools."

One of the most prominent violin schools arose in Paris, France in the early nineteenth century, a product of the newly founded Paris Conservatoire in 1795. The distinguished members of the violin faculty, violinists Rodolphe Kreutzer, Pierre Rode and Pierre Baillot,[7] all of whom were disciples of Giovanni Battista Viotti's,[8] marked the beginning of a new era for violin performance and teaching.[9]

This style of performance and teaching was codified by Kreutzer, Rode and Baillot, who were asked to write the official violin textbook for the Conservatoire, the *Méthode de violon* (1803).[10] This method established a uniform standard of virtuosity, technicality and musicality, and provided violinists with the fundamental methodology for teaching generations of violinist, a method that extends to the present day.[11]

Before considering the influence of this new methodology, it should be noted that in the fifty years preceding Baillot, Rode and Kreutzer's *Méthode de violon* (1803), several European "Méthodes" and treatises were in circulation and available to amateur violinists who wanted to improve their skills. These earlier treatises, by Francesco Geminiani,[12] Leopold Mozart[13] and Giuseppe Tartini,[14] reflected an older tradition

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[7] Lisa Sohn reports in *A study of the technical aspects of the French School of violin playing as exemplified in the works of Baillot, Kreutzer, and Rode* (DMA diss., University of Miami, 2003) that "Baillot, Kreutzer and Rode became the most representative violinists and teachers of the French violin school in the nineteenth century which laid the foundation of modern violin playing." Louise Goldberg expresses the same opinion in Baillot (1991), xxiii.

[8] "Viotti spent some ten years (1782-1792) in France performing and teaching a generation of French violinists who would bring the French Violin School into prominence." Sohn (2003), 2.

[9] The relationship between Viotti and his disciples is discussed in the following works: Bruce R. Schueneman, "The French Violin School: From Viotti to Beriot," *Project Muse* 60, no. 3 (March 2004): 757. ; Jonathan Ward Swartz, *Perspectives of Violin Pedagogy: A Study of the Treatises of Francesco Geminiani, Pierre Baillot, and Ivan Galamian, and a Working Manuel by Jonathan Swartz* (DMA diss., Rice University, 2003), 1-32; Masin (2012).

[10] See Judith L. Schwarz and Christena L. Schlundt, *French court music and dance music: A primary source writings 1643-1789* (Stuyvesant, NY: Pendragon Press), 432-433.

[11] Sohn (2003), 4.

[12] Francesco Geminiani, *A treatise of Good Taste in the Art of Musick.* (1749).

concerned with performance issues representative of Baroque violin playing. In France, most of the violin methods written prior to the *Méthode de violon*[15] endorsed the views of Mozart and Geminiani and were aimed at amateur musicians. The *Méthode de violon* differs from these previous works, incorporating mechanical training for more advanced players in the form of exercises and studies. The *Méthode de violon* represented a new pedagogical attitude, as violin education became institutionalized and standardized.

In 1834, Pierre Baillot, the original editor of the *Méthode de Violon*, decided to revise and update the work as *L'art du violon.* This second version of the treatise accounted for the new technological advancements of the time, mainly the use of a modern violin and a modern (Tourte) bow,[16] which distinguished his treatise from others in circulation at the time.[17] Baillot's *L'art du violon* was the single most important artefact of the French School of Violin, and as David Boyden has noted, it was "perhaps the most influential violin treatise of the nineteenth century."[18]

Baillot's treatise remains one of the most complete works of the genre even today.[19] The longevity and success of Baillot's treatise is due to the clear, and modern, organization. Baillot divides his treatise into two main parts: technique and musicality. In the first section, Baillot describes each technique associated with the right and left hands

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[13] Leopold Mozart, *A Treatise on the Fundamental Principles of Violin Playing* (1756) (Oxford: Oxford UP, 1985).

[14] Giuseppe Tartini, *Traité Des Agréments De La Musique* (1754) (Vergaelen, 1978).

[15] Including: L'abbé le fils, *Principes du violon pour apprendre le doigté de cet instrument et les différents agréments dont il est susceptible* (Paris, 1772); Antoine Bailleux, *Méthode raisonnée à apprendre le violon* (Paris, 1779); Michel Corette, *L'art de se perfectionner dans le violon* (Paris, 1782).

[16] For discussion on the modern violin and modern bow, see section 2.1-2.3 of this paper.

[17] Geminiani 1749; Tartini 1754; Mozart 1756; L'abbé le Fils 1772. ; Pierre Gavinies, *24 Études Caprices pour violon* (1794). ; Jean-Baptiste Cartier, *L'art du violon* (1800). ; Giuseppe Maria Cambini, *Nouvelle méthode théorique et pratique pour le violon* (1800).

[18] Baillot (1991), xxii.

[19] In her introduction to the English version of *L'art du violon*, Baillot scholar Louise Goldberg describes Baillot's violin method as follows: "*L'art du violon* is thus one of the earliest and most complete treatises for the modern violin and bow. Not only does it give a detailed and accurate picture of the technical side of violin playing in the first half of the 19th century in France but it goes beyond that." Baillot (1991), xxiii.

of a violin player. In the second section, Baillot focuses on the issues of style and interpretation. Unlike previous treatises, Baillot's true innovation is his plethora of musical examples, or etudes, which reinforces his description of techniques.[20] This seemingly intuitive format was revolutionary for treatises of the time, and planted the seed for future generation of violin methods in Europe, Russia, and eventually America.[21]

This wide-spread influence is exemplified well by Baillot's student Charles de Bériot, who became the father of the Franco-Belgian School of Violin,[22] and wrote the Conservatoire treatise, *Méthode de Violon* op.102 (1858).[23] De Bériot's treatise follows the same layout as Baillot's earlier work, beginning with technique coupled with etudes, and followed by a discussion of musicality. De Bériot also emphasizes the fundamental tenants of Baillot's method: tone production, technical accuracy and intelligence of execution. Robin Stowell notes how Baillot's method contributed directly to the development of the Franco-Belgian School of playing which produced such violinists as Henri Vieuxtemps and Eugène Ysaÿe. Furthermore, the lineage of teachers at the Franco-

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[20] The etudes prescribed by Baillot are still standard benchmark study material, as observed in Mary Frances Boyce, *The French School of Violin Playing in the Sphere of Viotti: Technique and Style* (PhD diss., North Carolina University, 1973), 10.

[21] For more on the influence of the French Violin School in Russia, see Dominic Gill, *The Book of the Violin* (New York: Rizzoli International Publications, 1984), 140-166. Bruce Schueneman also asses Rode and Baillot's travels and involvement in Russian education between 1804-1808. See Schueneman (2004), 757-770.

For more on the influence of the French Violin School in Europe, see for example Silvela 2001; Rut 2006; Boris Schwarz, "Beethoven and the French School," *The Musical Quarterly* XLIV, no. 4 (October 1958): 431-447; Jablonski (2006).

For more on the influence of the French Violin School in America, see for example Elizabeth H Green, *Miraculous Teacher: Ivan Galamian and the Meadowmount experience* (American String Teachers Association, 1993); Frederick Herman Martens, *Violin Mastery: Interviews with Heifetz, Auer, Kreisler and Others* (Mineola, NYC: Dover Publications, 2006); Barbara Lourie Sand, *Teaching Genius: Dorothy DeLay and the Making of a Musician* (Portland: Amadeus, 2000).

[22] Milsom (2003), 23.

[23] As noted by Stowell, the pedagogical material created by Kreutzer, Rode and more specifically Baillot directly contributed to the development of the Franco-Belgian School of playing which produced such violinists as Henri Vieuxtemps and Eugène Ysaÿe while starting a lineage of French teachers that, through Lucien Capet, can be traced to Ivan Galamian well in the twentieth century. See: Gill 1984, 140; Eric Wen, "The Twentieth Century," in *The Cambridge Companion to the Violin*, ed. Robin Stowell (Cambridge University Press, 1992), 89.

Belgian school can be traced from de Bériot all the way to Ivan Galamian well in the twentieth century.[24]

Galamian was the figurehead of the American School of Violin and taught at the Juilliard School, as well as the Curtis Institute of Music. His approach was highly influenced by the French School he encountered in his early twenties,[25] and also incorporated Russian ideals.[26] At the behest of his students, Galamian codified his pedagogy in the book *Principles of Violin: Playing & Teaching* (1962).[27] Central to this method are the familiar foundations of Baillot's method: tone production, technical mastery and musical intelligence. Galamian's systematical approach of describing the left and right hand techniques, followed immediately by examples for practice draws clearly on Baillot's pedagogy.[28] In fact, Galamian incorporates many of the same etudes prescribed by Baillot in *L'art du violon* into his own method book. Josef Gingold, one of Galamian's students, even remembers that for his professor, an etude was not just a piece of music to be learned, instead it became a vehicle for building a whole mass of pertinent techniques.[29]

Other notable examples of Baillot's influential method can be found in Lucien Capet's *Technique Supérieure de l'archet* (1916), Karl Courvoisier's *The Technique of violin playing: The Joachim Method* (1899), Leopold Auer's *Violin playing as I Teach It*

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[24] Christian Matthew-Baker, *Influence of the Violin Schools of Prominent Violinists/Teachers in the United States* (DMus diss., Florida State University, 2005), 45-50.

[25] He was a pupil of Lucien Capet, see Margaret Campbell, *The Great Violinists* (London: Robson Books, 2004), 214.

[26] Galamian himself said, about his treatise that "it is partly Russian, partly French, and a good deal of my own." Ivan Galamian, *Principles of Violin: Playing & Teaching* (Englewood Cliffs, NJ: Prentice-Hall, 1962), 123.

[27] The way Galamian divides his treatise is mirrors Baillot's. His fundamental concepts, including tone production, bowing technique and intonation can be directly linked to Baillot and the French School tradition. See Galamian 1962; Chui-In Park, *Comparison of Leopold Auer's and Ivan Galamian's violin teaching,* (PhD diss., Indiana University, 1995); Kim Heejung, *Violin Scale Books from late Nineteenth-century to the present – Focusing on Sevcik, Flesch, Galamian, and Sassmannshaus*, (DMA diss., University of Cincinnati, 2006).

[28] Baillot (1991), xxi.

[29] Green (1993).

(1921), and Carl Flesch's *The Art of Violin Playing* (1930).[30] Like Galamian, Carl Flesch includes many of the same etudes that Baillot used in his *L'art du violon*.[31] Not only are the methods of the violinists noted above still in use today, many of these violinists shaped the sound of the modern violin, recalling Zvi Zeitlin's statement that "Practically all good violinists can trace their origins back to one or more of the French Fathers." But the influence of the French School of Violin moves beyond the realm of pedagogy and into the concert hall as well. This latter form of influence is important for this study, because it is the context of the concert hall where Pierre Boulez would have encountered the sound world shaped by the French School of Violin. The next section briefly considers the influence of the French School of Violin as it pertains to the violin techniques found in Boulez's *Anthèmes*.

1.2 Connecting Pierre Baillot and Pierre Boulez

Pierre Boulez composed *Anthèmes 1* for the preliminary rounds of the Paris edition of the Yehudi Menuhin competition in 1991-1992. The work relies on a typically complex Boulezian compositional grammar, rooted in musical gestures, atonality, and abstract rhythms. Despite this modern sound, Boulez's work bears the mark of a French tradition of violin playing established by Baillot, Rode, Kreutzer and Viotti in the early nineteenth century. This tradition is manifest in the way that Boulez treats the violin—not in terms of the notes he writes, but in the techniques that he employs.

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[30] See Karl Courvoisier, *The Technique of violin playing: The Joachim Method* (London, 1899); Lucien Capet, *La technique supérieure de l'archet: pour violon* (Paris: Salabert, 1916); Leopold Auer, *Violin Playing as I Teach It* (New York: Frederick A.Stokes, 1921); Carl Flesch, *The Art of Violin Playing* (New York NY: C.Fischer, 1930).

[31] Including more obscure works such as J. Niedzielski, *The Theoretical – Practical School for Violin According to the Latest Violin Schools of Baillot, Spohr, Mazas and Others, Enriched by Remarks for Every Students* (Warszawa, Sennewald, 1841); WI. Gorski, *The Practical School for Violin, Collected from Various Excellent Authors, in five volumes, published and reprinted in Warsaw between 1880 and 1897* (Warszawa, 1897). where parts of Baillot's *L'art du violon* are translated and displayed in their entirety. See Magnalena Rut, "The influence of the Franco-Belgian Violin School of Violin Didactics in Poland from 19th to Mid-20th Century," *Revue belge de musicology* 60 (2006), http://www.jstor.org/stable/25486000.

The French tradition was defined by significant emphasis on virtuosity and the showpiece, a composition that highlighted the most challenging techniques possible on the violin.[32] Initially composed as concert pieces, the violin showpieces became the go-to repertoire for violin competitions and Conservatoire examinations.[33] To this day, most violin competitions include numerous showpieces written by Baillot's contemporaries and descendants, pieces that have come to represent the French tradition of violin playing. When Boulez attended the Paris Conservatoire in 1942 the majority of the imposed violin repertoire for practice and exams would have been pieces that Baillot included in his treatise.[34] Boulez's *Anthèmes 1* was composed within the context of this tradition.[35] Consequently, his work incorporates all those virtuosic techniques found in showpieces in this tradition, and, not coincidentally, techniques found in Baillot's *L'art du violon.* Baillot's treatise, in fact, accounts for every technique in Boulez's piece.

Having established the traditional elements of *Anthèmes 1*, it is easy to take the next step and consider why Baillot's *L'art du violon* is an excellent tool for learning Boulez's work. Baillot's method not only accounts for all of the techniques found in Boulez's work, but as the foundation for the majority of modern violin pedagogies, it still serves as an extremely valuable tool for the modern violinist. As will be shown in the following section, Baillot's thoughtful discussion of techniques and his prescriptions of

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[32] "The 19th century was the golden age of the virtuoso: the violinist or pianist who traveled from one provincial European town to the next, dazzling audiences with heroic displays of skill." See Sudip Bose, "A mastery of technique ought to be exalted, not disdained," *American Scholar* 74, no. 3 (Summer 2005), 115.

"This is especially true of Viotti's disciples (Kreutzer, Rode and Baillot) who have been known to be indefatigable travelers, carrying "the fame of the French school throughout Europe." Schwarz (1958), 432.

[33] Showpieces were such a big part of Conservatoire examinations that when Fauré occupied the position of the Paris Conservatoire director, he felt the need to balance both nineteenth-century French showpieces and works composed with several movements. For further discussion: Gail Hilson Woldu, " Gabriel Fauré, directeur du Conservatoire: les réformes de 1905," *Société française de musicologie* (1984): 199-228.

[34] For further discussion, see Anne-Marie Bongrain and Alain Poirier, *Le Conservatoire de Paris: deux cent ans de pédagogie (1795-1995)* (Paris: Buchet-Chastel, 1999).

[35] A similar, and much earlier, example of the French Violin Tradition's influence on composition is Beethoven's violin concerto. "It was Viotti's Parisian concertos (but also including nos. 22 and 23), as well as those of Rode and Kreutzer, which have conclusively been shown to have profoundly influenced Beethoven in his violin concerto of 1806." See Warwick Lister, *Amico: The Life of Giovanni Battista Viotti* (Oxford: Oxford University Press, 2009), 171.

etudes to practice these techniques can be mapped directly onto *Anthèmes 1*, providing instruction for any violinist approaching this, or many other modern compositions.

One final question needs to be considered before continuing with the technical portion of this study: can we use Baillot's *L'art du violon* for Boulez's *Anthèmes* 2 for violin and live electronics? The answer is yes and no. To begin with, all the performance techniques found in *Anthèmes 1* are present in *Anthèmes 2*.[36] Therefore, Baillot's treatise provides excellent advice for *Anthèmes 2* in this regard. *Anthèmes 2* includes an element not found in *Anthèmes 1*, however—the live electronics. Needless to say, Baillot provides no advice on performing with electronics in his nineteenth-century treatise.[37] Therefore, in the final section of this paper I account for those aspects of *Anthèmes 2* that move beyond Baillot's treatise, mainly the score follower and the relationship between the violin and electronics which Jonathan Goldman has termed a "hyper-violin."[38] The discussion in this final section incorporates articles written by the engineers at IRCAM, Boulez's own words on the piece, and my experiences as a performer of the work.

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[36] *Anthèmes 2* is an expansion of *Anthèmes 1*. It uses as a base the musical material of the solo piece, while incorporating live electronics. For a complete discussion on *Anthèmes 2*, see section 5 of this paper.

[37] Nor do any contemporary violin methods, for that matter.

[38] See Goldman (2011).

Chapter 2

THE BOW AND THE VIOLIN:
The makings of modern instruments

Musical instruments constantly evolve to meet the needs of contemporary repertoire and provide state-of-the-art standards of expressivity.[39] In France, at the end of the eighteenth century the violin, and more outstandingly the bow, underwent fascinating transformations, leading the instrument to dominate the nineteenth-century concert halls, literature, and compositions. John Dilworth explains that "these developments made the sound of the violin much more penetrating and enabled soloists to compete with the larger orchestras of the period."[40] Baillot was attuned to these transformations, and accounted for them in *L'art du violon*, setting the treatise apart from previous works by describing and instructing violinists on how to play on modern instruments. The modern violin that Baillot accounted for is the very same instrument we play on today, which makes his treatise all the more valuable. The next section traces the evolution of the violin, which began in the eighteenth century and continued until the mid-nineteenth century, at which point the violin and the bow as we know them today were fully formed.

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[39] As described in Curt Sachs, "Romanticism (1750-1900)" in *The History of Musical Instruments* (Courier Dover Publications, 2012), 388-445. Two works stand out as tracing the evolution of the violin from its origins : David Boyden, *The History of Violin Playing from its Origins to 1761* (London: Clarendon Paperbacks ,1990); Robin Stowell, *Violin Technique and Performance Practice in the Late Eighteenth and Early Nineteenth Centuries* (Cambridgeshire: Cambridge UP, 1985).

[40] John Dilworth, "The violin and bow- origins and development," in *The Cambridge Companion to the Violin*, ed. Robin Stowell (Cambridge: Cambridge University Press, 1992), 11.

2.1 Discussion of the bow and its evolution

Early in the eighteenth century, national stylistic preferences dictated which bows were used by mainstream violinists.[41] In Italy, the trendy concerti and sonatas required a longer and straighter bow,[42] whereas in Germany, the polyphonic writing required a more convex bow.[43] Short and convex bows were used in France to perform its leading genre, dance music,[44] until François Tourte and his father, in the mid- to late-eighteenth century, transformed and standardized the 'modern' bow.[45]

Bow makers rarely wrote their names on their creations before 1750, thus it is often difficult to accurately associate bows to their makers.[46] However, early nineteenth-century violin treatises reveal clear and specific images of the predominant bows.[47] Baillot illustrates six varieties in *L'art du violon*: Corelli, Pugnani, two unnamed transitional bows, Viotti, and Tourte (Figure 2.1.1).

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[41] Stowell (1985), 11.

[42] "What has become known as the Corelli bow is slightly convex or straight, and is well-suited for Corelli's sonatas. A Stradivarius bow of 1704, somewhat lengthier, is only two inches shorter than a modern bow. The so-called Tartini bow was similar to that of Stradivarius, but somewhat lengthier and constructed of lighter wood. The Tartini bow was capable of a sonorous cantabile and facilitated a strong tone. Which made it ideal for soloists attempting to stand out against accompanying orchestras, as the concertos of Vivaldi." Roland Jackson, *Performance Practice: a dictionary-guide for musicians* (New York, NY: Routledge, 2005), 450.

[43] Richard Dallin Hansen, *The bouncing bow: a historical examination of "off-the-string" violin bowing, 1751-1834* (DMA diss., Arizona State University, 2009), 4.

[44] For more on French dance music, see Schwartz (1987).

[45] Clive Brown mentions that "In Paris in the 1780s François Tourte perfected a design of bow which gradually displaced earlier types and has remained standard up to the present day." See Clive Brown, "Bowing Styles, Vibrato and Portamento in the Nineteenth-Century Violin Playing," *Journal of the Royal Musical Association* 113, no. 1 (1998): 98.

[46] Stowell (1985), 14.

[47] Including: François Habeneck, *Méthode de violon* (1840); Delphin Alard, *École de violon* (1844); Charles de Bériot, *Méthode de violon* (1858)

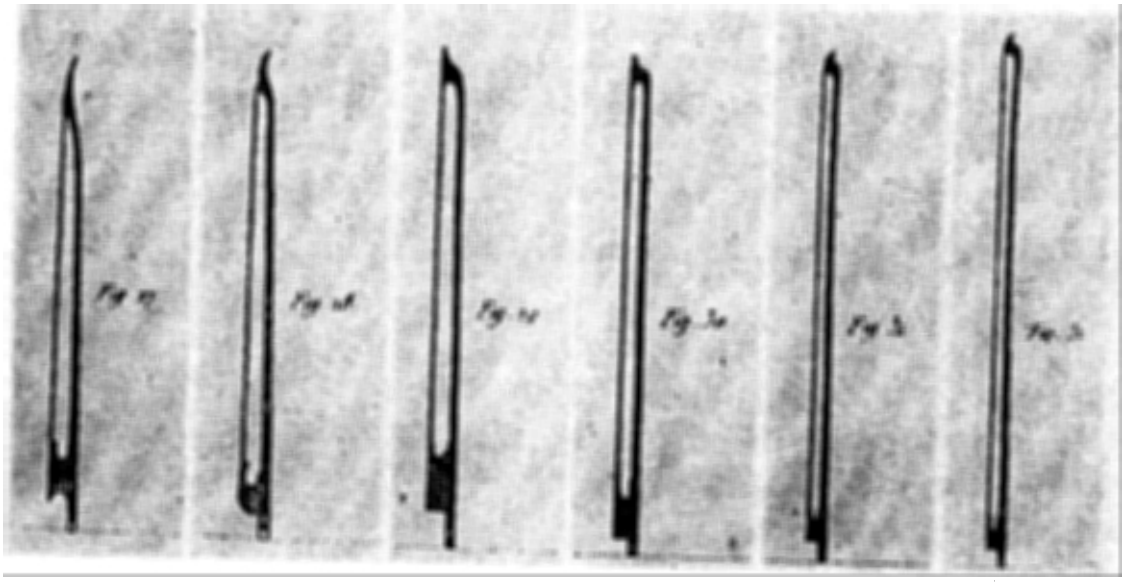

Figure 2.1.1: "Bows of different lengths and forms from Corelli to today" in *L'art du violon*

Of these bows, Baillot seems to prefer the longest, modern bow, which he illustrates in his example on how to hold the bow correctly. The violinist in this example (Figure 2.1.2) is playing with a Tourte-like bow.[48]

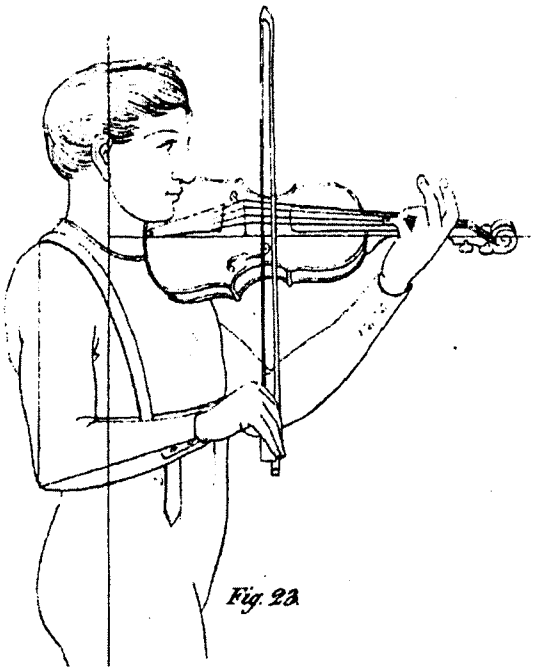

Figure 2.1.2: Correct positions for both hands, with the use of a Tourte-like bow

[48] See Brown (1998); Stowell (1984); Dilworth (1992); Hansen (2009).

Baillot's bow preference was likely dictated in part by his mentor and teacher, Viotti. Viotti's display of a grand style of violin playing[49] and his impassioned teaching to pupils such as Pierre Baillot, Rodolphe Kreutzer and Pierre Rode, instituted a long tradition of French violin playing. As a result, Viotti played an integral role in the evolution of the bow.[50] François-Joseph Fétis (1784-1871), a Belgian musicologist, stated that:

> Viotti came to Paris [in 1780]. Soon convinced of Tourte's superiority over other bow-makers, he asked him to look for a way of preventing the hair from becoming bunched, keeping it evenly spread at the frog.[51]

Tourte may or may not have considered Viotti's request, but his contribution to the evolution of the bow is unprecedented.[52]

Tourte's main contribution was the standardization of the length and weight of the bow.[53] These standardized measurements were the product of several other improvements. To begin with, instead of using snakewood, Tourte used expensive pernambuco wood (*Caesalphinia echinata*) which facilitated a pronounced concave *camber*.[54] This concave arc of the stick obliged Tourte to redesign the head of the bow,

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[49] "Each pedagogue shares an even more distant lineage with Viotti, the master of the grand style of playing, defined by a large, strong, full tone, penetrating legato and vast diversity of bowings." See Silvela (2001), 104. Quoting: *The Allgemeine musikalische Zeitung,* 3rd July 1811.

[50] Several authors share this opinion including Hansen who recalls Bruce R. Schueneman, The *French Violin School: Viotti, Rode Kreutzer, Baillot and their Contemporaries,* ed. William E. Studwell (Kingsville, Texas: The Lyre of Orpheus Press, 2002), 12. "Although the specifics of the Viotti-Tourte collaboration are unclear, we know Viotti was the first major musician to champion the new bow design."

[51] As reported by Stowell (1985), 18. Found originally in François Joseph Fétis, *Biographie universelle des musicians: Volume 7,* (Paris: Librairie Firmin Dodot Frères, Fils et cie., 1864), 246.

[52] Boyden (1990), 327-328.

[53] From the baroque bow weighing 47g. and measuring 70cm to 73.9cm, Tourte's bow weighed 56g. and measured 73.66cm to 74.94cm.

[54] "It is generally agreed that the evolution of the violin bow culminated in the work of the 19th century French bow maker François Tourte (1747-1835), who set the present standards for its dimensions and design, and the use of Brazilian hardwood named pernambuco (*Caesalpinia echinata*) for its construction." Anders Askenfelt, "Observations on the dynamic properties of violin bows," *KTH Computer Science and Communication: Quarterly Progress and Status Report* 33 (1992): 43.

making it higher and consequently heavier, preventing the hair from hitting the stick.[55] He restored the disrupted balance by adding metal inlays to the frog (nut), which allowed for a double ribbon of strong French horse hair.[56]

It is assumed that Tourte bows were in general use by 1830, fifty years after their creation, due to the impact of Parisian culture on the violin world of the early nineteenth century.[57] Tourte's bows provided nineteenth-century violinists with many advantages, including the possibility of a stronger and more even tone with smoother bow changes and a new diversity in bow strokes—vital components of France's virtuosic showpieces.[58] In the last decade or so after the advent of the Tourte bow, slurred bowings were increasingly exploited "as a means of emulating the qualities of the human voice."[59] While the cantabile character of the violin reached new heights with long slurred bowings, composers started to frequently prescribe a myriad of 'thrown' strokes such as *spiccato, sautillé,* and *ricochet* as well as strong *sforzandi* (*sfz*).[60]

These new compositional techniques appear in treatises of the time, including Rode et al.'s *Méthode de violon* and Baillot's *L'art du violon.* These authors account for the 'modern' Tourte bow in their conception of tone production, bow management and bow articulations. It is however in *L'art du violon* that Baillot applauds Tourte himself,

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[55] David D. Boyden "The Violin And Its Technique In The 18th Century" in *The Musical Quarterly* 36, no. 1 (January 1950): 14.

[56] Stowell (1985), 21.

[57] Colin Lawson and Robin Stowell recall that "since Paris was in the forefront of technical and instrumental developments in the early nineteenth century, it is probable that Tourte bows were in general use by 1830." Colin Lawson and Robin Stowell, *The Historical Performance of Music: An Introduction.* (UK: Cambridge, UP, 1999), 128.

[58] Pierre Baillot even advocates making bow changes without "the slightest jerk either at the hell or at the point," advocating "the same degree of intensity throughout the hole note." Robin Stowell, "Violin Bowing in Transition: A Survey of Technique as Related in Instruction Books c.1760-1830." *Early Music* 12 (August 1984): 320.

[59] Lawson (1999), 51.

[60] For the purpose of this study, it is interesting to observe Baillot's division of the *détaché* strokes into three categories: 1) on the string, 2) those produced with elasticity, and 3) sustained. See Baillot (1835), 85-106.

which confirms that his 1834 treatise is written for the modern bow. Baillot praises Tourte's reputation and states that his precious bows should serve as a model.[61]

2.2 Discussion of the violin instrument

Tourte's 'modern' bow met most late eighteenth-century demands for 'a strong, full and sonorous cantabile.'[62] It is, however, with the small adjustments to parts of the violin that, in the nineteenth century, the instrument attained its modern form. As with the bow, Paris and the French Violin School were highly influential regarding the development of the violin. Vincenzo Lancetti even remarked in 1823 that Italian makers such as Stradivarius were altering their art 'according to the fashion prevailing in Paris.'[63]

The fundamental shape of the violin, as well as the length of its body (c.35.6cm), have remained unaltered since the baroque era.[64] Violin makers found that by changing small parts of the violin they could drastically change of the sound and resonance to meet the demands of the time. One such demand concerned to tuning. By the nineteenth century the majority of violinists associated with the virtuosic French School tuned their violins sharper than in the past. This tuning created the "brilliant sound" for which the Paris School was famous.[65] A higher tuning meant greater stress on the bridge and

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[61] Baillot (1835), 246; Baillot is known to have owned himself three Tourte bows. See Hansen (2009), 37.

[62] Stowell (1985), 23.

[63] William Henry Hill, Arthur F. Hill & Alfred E. Hill, *Antonio Stradivari, His Life and Work: 1644-1737* (New York, NY: Dover Publications, 1963), 188.

[64] "Although golden-period Stradivari were acclaimed for their perfection of form, the increased projection of flatter archings on these and the violins of Giuseppe Guarneri ("del Gesù," 1698-1744) was not truly appreciated until the 19th century, when bigger sound and projection were required for larger concert halls and the new, demanding concerto literature. The 19th century firmly established the basic violin in use today." Don Michael Randel, *The Harvard Dictionary of Music* (Harvard University Press, 2003), 958. Similar ideas are presented by Elias Dann, "The second Revolution in the History of the Violin: A Twentieth-Century Phenomenon," *College Music Symposium* 17, no. 2 (Fall, 1977), 65. Dann states that "while the first revolution changed some of the internal and external fittings of the violin, the body of the instrument, as perfected by the great masters before 1750 remained unchanged." See also: Stowell (1985), 31; Boyden (1950), 11.

[65] Boyden (1950), 14.

fingerboard, however, prompting violin makers to raise the fingerboard and reduce the thickness of the bridge (Figure 2.2.1).

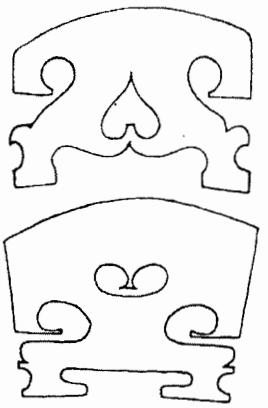

Figure 2.2.1: Image of a typical 'baroque' bridge (above) compared with the common nineteenth-century bridge

The changes to the fingerboard and bridge led to other issues, however. Mainly, the tension resulting from the higher string tuning necessitated a thicker bass bar, to distribute the pressure equally throughout the violin and achieve support from the belly of the instrument (Figure 2.2.2).[66] All of these advances required violinists to execute finger stopping with the upmost clarity, well-suited to a time where violin virtuosity was blooming.

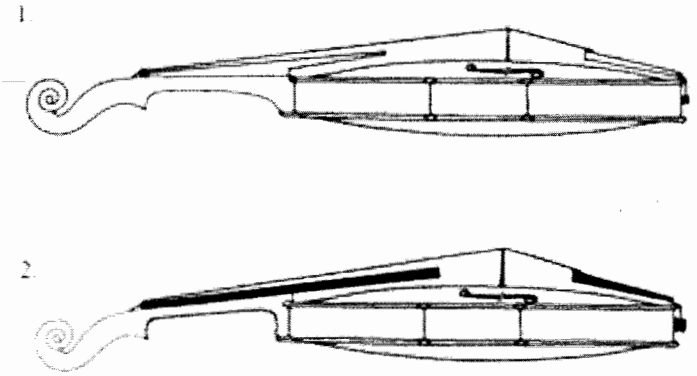

Figure 2.2.2: Image of a 'baroque' violin (above) and a 'modern' violin (below)

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[66] "The violin neck was lengthened and tilted back so that the fingerboard rose at a sharper angle, leading to a higher bridge and consequently greater tension of the string. As a result, the bass-bar had to be enlarged to help support the greater pressure on the belly of the instrument." Dann (1977), 64.

Baillot was aware of all the changes to the violin and discusses them in the introduction of *L'art du violon*:

> In 300 years, we did not change anything to the structure of the violin, but since the past century, some modifications notably the elevation of the bridge, the curve and the length of the fingerboard and the use of thicker strings were prompted by the development of a greater execution.[67]

One last addition to the violin is noteworthy: the invention of the chin rest. Invented in 1820 by prominent violinist Louis Spohr,[68] the nineteenth-century chin rest lays in the center of the instrument (Figure 2.2.3). Remarking on the need for frequent position shifts in new repertoire,[69] especially the virtuosic showpiece, Spohr writes "it is absolutely essential for the violin to be held firmly with the chin."[70] To account for position shifting and the resulting uneven bow strokes, he invented the chin rest:

> The chin rest completely rectifies all these evils and allows not only a firm and unconstrained hold of the violin but also has the advantage that one is not compelled to rest one's chin on the belly or the tailpiece, thereby checking the

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[67] "Depuis 300 ans, on n'a rien changé à l'ensemble de la Structure du Violon, mais ses proportions intérieures ont reçu, depuis le siècle dernier, quelques modifications qu'ont entraîné l'élévation du Diapasion, le renversement et la longueur du manche et l'augmentation de la grosseur des cordes, suites naturelles d'un plus grand développement dans l'exécution." Baillot 1835, 6. Baillot's mention of string thickness is intriguing. It is impossible to estimate with any accuracy the relative thickness of the strings employed during the eighteenth century due to the lack of agreement in scholarly articles (Stowell (1985), 28). It is interesting to note, however, that the common twenty-first-century preconception that violinists used exclusively gut strings is false. By the nineteenth century, metal strings (silver or brass wound—the addition of brass is attributed to Baillot) were available and often used on the lower strings, namely G and D for their long-lasting capacity to create a 'clearer sound'.

[68] Boyden (1950), 12.

[69] David Boyden also discusses the changes made to the violin and indicates that "the fittings were altered to approximately their present state to facilitate playing in the highest positions, to compensate for the increased tension of a higher pitch, and to give a more powerful and brilliant sound. Boyden (1950), 14. See also section 4.2.

[70] Louis Spohr, *Violinschule* (Vienna 1832), trans. John Bishop as *Louis Spohr's Celebrated Violin School.* (London, 1834), 8-9.

vibration of these parts, to the detriment of the quality and volume of tone of the instrument.[71]

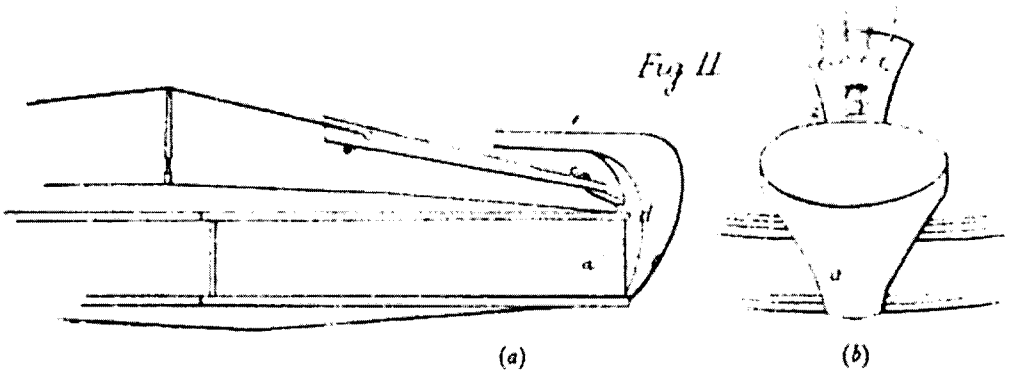

Figure 2.2.3: Spohr's chin rest

In addition to accounting for the new chin rest, Baillot advised the violinist to put a cloth on the left shoulder, under the violin.[72]

Today's violin is not only modelled on the nineteenth-century advances examined above, but is, in fact, the very same instrument. Not only does Baillot mention these changes in his treatise, but his pedagogy is conceived for the same violin that we play today, and the same violin that *Anthèmes 1* is played on. Consequently, as we shall see in the next section, Baillot's treatise is an excellent resource for a contemporary violinist approaching Boulez' *Anthèmes*.

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[71] Spohr (1834), 8-9

[72] "Nota. Les enfants ou les jeunes gens dont les épaules n'ont pas encore assez de largeur pour soutenir le Violon, et les dames qui jouent de cet instrument et qui n'ont rien dans leur ajustement pour les aider à le tenir avec facilité et penché du côté droit, peuvent remplir le vide existant entre l'épaule gauche et le Violon en y plaçant un mouchoir épais ou une espère de cousin: l'expérience nous a prouvé que ce moyen offert de grands avantages, qu'il est sans inconvénient et que le mouchoir étant place en dedans du vêtement sur l'épaule, il ne doit pas même être aperçu." Baillot (1835), 19.

Chapter 3

RIGHT HAND TECHNIQUE

Boulez's *Anthèmes 1* displays a wide range of violin techniques, including sharp contrasts in timbre, vivid ornamentation, and a great range of dynamics and tempi.[73] All of these techniques rely on one of the most fundamental elements of violin playing—tone production — an aspect of violin performance that received a great deal of emphasis in the nineteenth century.[74] The changes made to the violin, and more specifically to the bow, increased the sonorous power of the instrument.[75] So much so, in fact, that in

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[73] In his very descriptive review of the piece, musicologist Robert Adlington states that "the five short sections of contrasting material which make up the work's first half take on a preparatory role in the context of the work as a whole. In their diversity and speedy succession, they give dramatic point to the more spacious treatment of the older music, where a number of well-articulated gestures intermingle and, through repetition, undergo gradual evolution." See Robert Adlington, "Boulez: *Anthèmes* for Solo Violin," *The Musical Times* 135, no. 1822 (December, 1994): 764.

[74] This very well might have been due to Baillot's mentor, Viotti, who's playing was described as follows: "The most influential figure in the development of an expressive performing style during the period was undoubtedly Giovanni Battista Viotti, whose virile tone, powerful singing legato, brilliant passage-work and mastery of a diversity of bowings had far-reaching consequences in the history of violin playing." See Stowell 1984, 316. For descriptions with the same or similar words, see: Peter Walls, "Mozart and the Violin," *Early Music* 20, no. 1 (February, 1992), 23; Brown (1988), 102-3; Kelley Marie Johnson, *Lucien Capet: comparisons and connections to contemporary violin bowing technique* (PhD diss., University of Iowa, 2000), 85.

[75] "The advent of the Tourte bow meant that the emphasis was shifted away from the articulated strokes, subtle nuances and delayed attack of most mid-eighteenth century models to a more sonorous, smoother cantabile style promoted by Viotti and his school (...)." See Eastham (2007), 182.

"Developments in bow making during the second half of the eighteenth century radically affected the bow's capabilities, and the subsequent changes in bowing techniques undoubtedly had a profound effect on the sound of the instrument and on the style of performance." See Brown (1988), 99.

French pedagogy the bow was often referred to as the "soul of the violin."[76] Baillot presents this very description in his *L'art du violon*,[77] which included the most detailed survey of bowing techniques of the time.[78] In fact, Baillot canonized this 'nouvel art de l'archet' by accounting for the modern bow and the diversity of timbres it could generate.[79]

This section will present bowing issues or techniques found in Boulez's *Anthèmes 1*. A similar approach to Baillot's three-step method will be used, by 1) defining the issues, 2) understanding the mechanics, and 3) applying the latter in the chosen repertoire, in this case, *Anthèmes 1*.[80]

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[76] The bow was referred to as the 'soul of the instrument' as early as in 1772. Like many writers, L'abbé le fils calls the bow "the soul of the instrument it touches, as it is used to give expression to the sounds, sustain them, swell and diminish them." See L'abbé le fils (1772), 1. For more references, see: Brown (1988), 198; Boyden (1950), 29.

[77] Baillot (1835), 4.

[78] See: Stowell (1984), 320. Not only did *L'art du violon* showcased the most complete survey for bowings, it was considered one of the most valuable treatises by violinists and teachers. Edmund Van der Straeten points out that *L'art du violon* "lays stress on the ability and elegance of bowing combined with power and beauty of tone." See his *The Romance of the Fiddle: The Origin of the Modern Virtuoso and the Adventures of his ancestor* (London: Rebman, 1911), 257.

[79] At the very beginning of the nineteenth century, Baillot was already recognized for the wide diversity of bowings he used. After giving a concert in Vienna, in 1809, a critic wrote that Baillot used an "excessive variety of bowings leading to exaggeration." Allgemeine musikalische Zeitung, 10 (1808-09) 603, quoted in Brown (2004), 278. It is then no surprise that his treatise was the most complete and accurate compilation of the time.

[80] Baillot (1835), 11-12.

3.1 Important bow concepts

3.1.1 Bow division and bow changes

The most fundamental concept related to bowing is the necessity to keep the bow perfectly parallel to the bridge (Figure 3.1.1). Striking the strings at a 90-degree angle, as Baillot explains, maximizes the vibrations, resulting in the purest sound.[81]

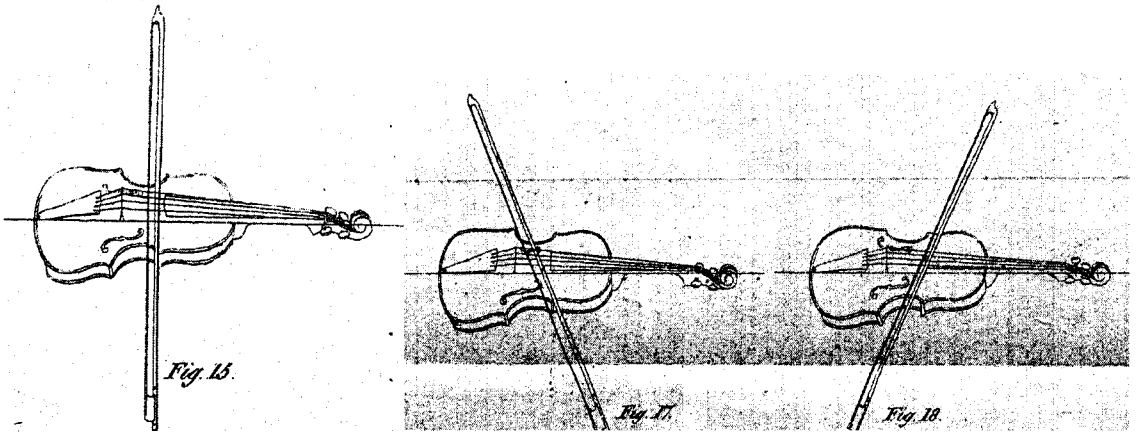

Figure 3.1.1: As illustrated by Baillot, the correct bow angles (on the left) and incorrect bow angles (in the middle and on the right)

Baillot divides the length of the bow in three strategic parts: the heel, the point (tip) and the middle (Figure 3.1.2).

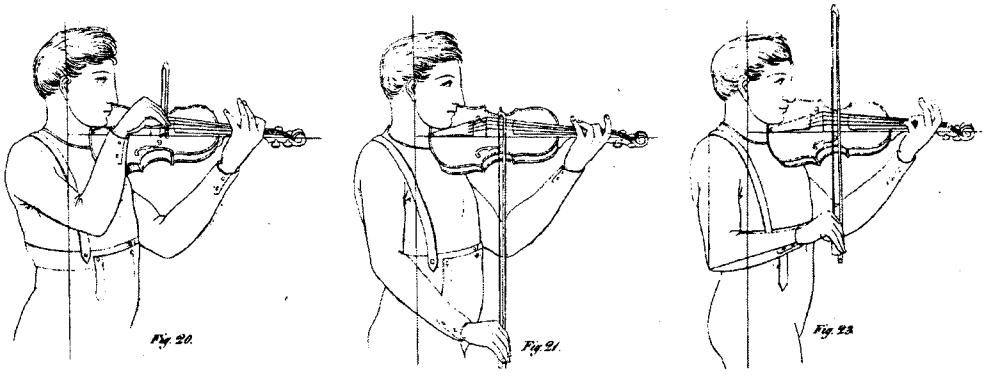

Figure 3.1.2: Baillot's images of the correct position when the bow is at the heel, at the tip, and in the middle

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[81] "L'archet doit être tire ou poussé en ligne parallèle au chevalet, toujours place sur la corde de manière à la couper en angle droit, loi invariable pour que la corde soit bien mise en vibration et pour que le son soit pur." Baillot (1835), 15. See also Baillot (1835), 124.

Baillot focuses on the understanding of the different qualities of each section of the bow in order to successfully achieve all the bow strokes and effects prescribed in the repertoire of the time.[82] The heel is the stronger part of the bow and offers exceptional control; the middle provides balance; the point, finally, creates a weaker sound than the rest of the bow. Baillot insists that the violinist should be able to feel the distribution of weight on the bow.[83] Going from the heel to the point (down bow) or from the point to the heel (up bow) requires an adjustment of the right hand in order to produce the desired sound. These adjustments can be divided in three categories: bow speed, bow pressure and different points of contact.

3.1.2 Bow speed

Baillot's discussion of bow speed revolves around "Roundness of tone." "Roundness of tone, that is to say the manner of making the string vibrate as evenly as possible, is the principle that is called *breadth* in playing. This breadth consists in grading the duration of the sounds and the length of the bow in proportion to the value of the notes and the grandeur of the style."[84] Baillot illustrates two types: fast bow strokes and slow bow strokes. The Tourte bow is a true asset in achieving these different speeds of bow stroke due to its length.[85]

3.1.3 Bow pressure

Whereas bow speed relates to "roundness of tone," the next category, bow pressure, is associated with dynamics and tone production. Tone production can be soft or loud.

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[82] For further information on the growing prescriptive notation by the composers in the eighteenth century, see: Per Dalh, "The rise and fall of literacy in classical music: an essay on musical notation," *Fontes Artis Musicae* 56, no. 1 (January-March, 2009): 66-76.

[83] Baillot is very precise with his recommendation on utilizing each section when he describes bow changes: "Avoid making the change of bow audible or making the slightest jerk either at the heel or at the point; to this end, press the thumb against the stick when the heel approaches the bridge, in order to present [the stick] from being too heavy on the string. When the change of bow is executed at the point, lighten the hand quickly so that the beginning of the up-bow is not audible. Increase the finger pressure against the stick as the bow comes towards the point; you will then obtain a sound that will have exactly the same degree of intensity throughout the whole note." Reported in Stowell (1984), 322.

[84] As reported in Stowell (1985), 138.

[85] See Stowell (1984), 325.

Experimenting with bow pressure allows a violinist to build a strong range of dynamics. Dynamic range is a critical element of Boulez's modern musical language,[86] and in *Anthèmes 2*, Boulez relies on dynamic contrasts to trigger musical exchanges between the violin and the electronics.[87] Dynamic contrasts were an important part of the music in Baillot's day as well, and he provides excellent advice on mastering this technique.

Baillot suggests practicing sustained notes with swelling by either increasing or decreasing the sound produced by a full bow.[88] He also insists on practicing these swells contrary to the natural curve of the bow, thereby overcoming a reliance on the bow itself. In other words, a violinist should develop the capacity to 'correct' the natural inclination of the bow (even the modern, Tourte bow) by adding or removing pressure with the right hand.[89] For example, a down bow motion from the heel to the tip will naturally create a decrescendo. Baillot suggests practicing a down bow with a crescendo, forcing the violinist to release pressure at the heel and gradually increase the pressure toward the tip (Figure 3.1.3.1).

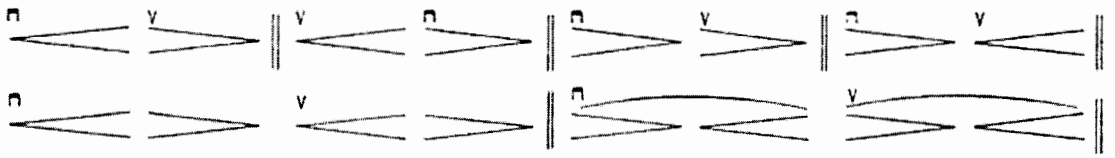

Figure 3.1.3.1: Dynamics exercises prescribed by Baillot

Two examples (Example 3.1.3.2 and Example 3.1.3.3) from Boulez's *Anthèmes 1* demonstrate the difficulty of sustaining a prolonged sound that requires "unnatural dynamics," played with a slow *Adagio*, *sostenuto* tempo and character. In each case, a violinist needs to rely on unusual bow pressures and a masterful control of the bow speed to achieve Boulez's vision. Understanding the mechanics of bow pressure, as presented

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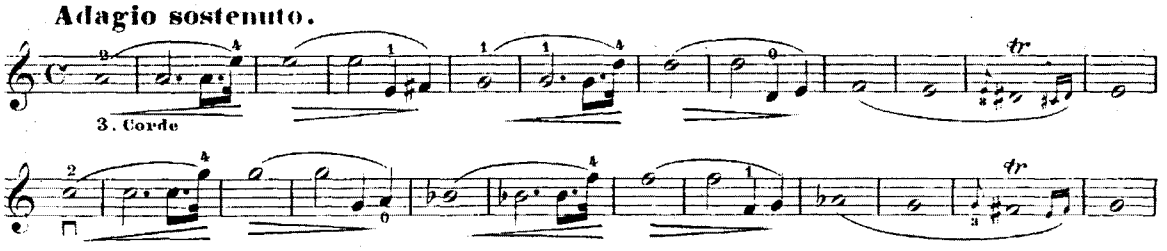
[86] For a complete theoretical analysis of Boulez's musical language in *Anthèmes*, see Goldman (2001).

[87] See Elizabeth McNutt, "Performing electroacoustic music: a wider view of interactivity," *Organised Sound* 8, no. 3 (2003): 297-304

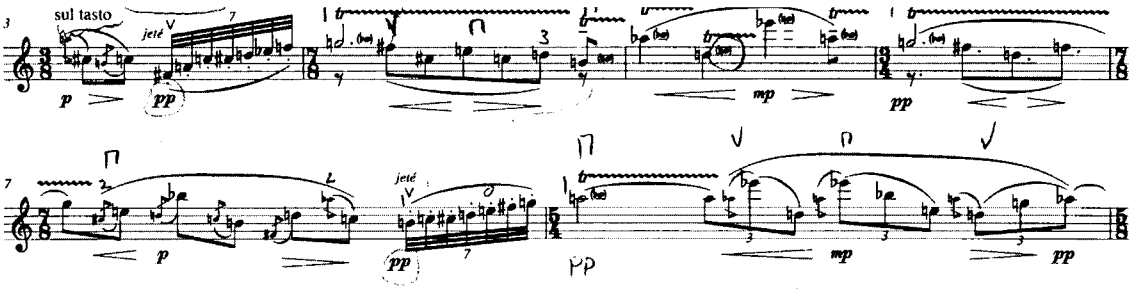
[88] See Baillot (1835), 124-128

[89] See Stowell (1984), 319; Baillot (1835), 124-128.

by Baillot, enables a violinist to execute the multitude of bowings found in Boulez's *Anthèmes 1*, as well as other modern works that incorporate similar musical ideas.



Example 3.1.3.2: Kreutzer, Caprice No.1, 1-24



Example 3.1.3.3: Boulez's *Anthèmes 1*, mm. 3-8

3.1.4 Point of contact

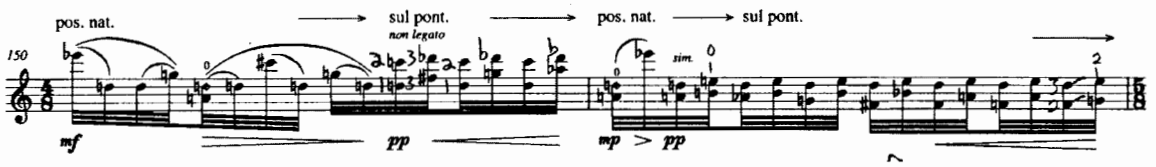
Baillot's third and final category of bow technique, the point of contact, refers to the position of the bow between the fingerboard and the bridge. As a basic rule, Baillot states that the violinist should "place the hair of the bow between the curve of the f-holes of the violin and the fingerboard, a little nearer to the f-holes than to the fingerboard."[90] This placement assures a beautiful tone, but fails to capture the infinite expressiveness that the instrument is capable of delivering. Thus, Baillot continues by noting that the bow can be placed closer to the bridge for a louder melody or away from the bridge for a softer one. This technique amounts to two contrasting special effects: *sul ponticello* and *sulla tastiera (sul tasto).* Indications of these effects commonly appear in nineteenth-century repertoire, and continued to appear right up to today. Baillot is extremely precise

[90] "Poser le crin de l'archet entre le rond des ouïes du Violon et la touche, un peu plus près des ouïes que de la touche." Baillot (1835), 15.

regarding these techniques and the desired outcome. Concerning *sul ponticello* he writes, "To play *sul ponticello*, place the bow against the bridge and apply a minimum pressure on the bow. The resulting hissing and nasal sound is acceptable for certain contrasts."[91] The example he gives is taken from Boccherini's 7th Quintet (Example 3.1.4.1).

Example 3.1.4.1: Excerpt from Boccherini's 7th Quintet

Two hundred years later, Boulez also uses this unusual sound quality in his *Anthèmes 1*. Baillot's technique for executing a *sul ponticello* is perfect for realizing Boulez's *Anthèmes 1*, and helps a violinist expand her sound palette to enrich the musical landscape of Boulez's work, as seen in Example 3.1.4.2.



Example 3.1.4.2: Boulez's *Anthèmes 1*, mm. 150-151

The opposite of *sul ponticello* involves a movement away from the bridge, and closer to the fingerboard. In the nineteenth century, this technique was called *flautato, flûté* or *traîné,* as well as the more common term, *sul tasto.*[92] To create this "flute-like" effect Baillot advises the violinist to place the bow as far as one inch from the end of the fingerboard.[93] He remarks, however, that on the G and E strings—the lowest and highest strings—the body of the violin gets in the way of achieving this dramatic effect. To account for this, a violinist should remain in the proper position over the fingerboard as long as possible, and rely on bow speed and weight to create the effect when the bow position can no longer be maintained. Occurrences of *sul tasto* are found throughout the

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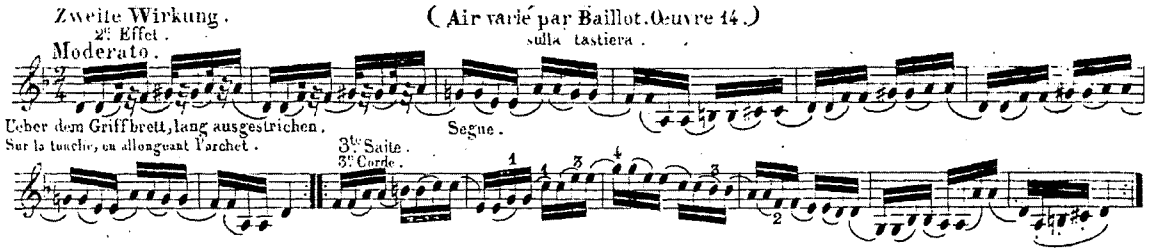
[91] "*Sul ponticello,* tout contre le chevalet; en n'appuyant presque point l'archet, le son est sifflant et nasillard, il convient pour de certains contrastes." Baillot (1835), 15.

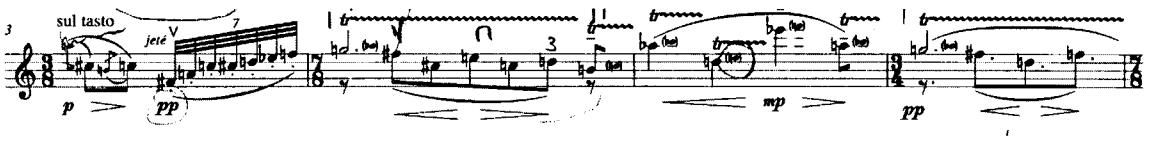
[92] See Boyden (1950), 28.

[93] See Baillot (1835), 15-16.

nineteenth- (Example 3.1.4.3) and twentieth-century repertoire, including multiple appearances in Boulez's *Anthèmes 1* (Example 3.1.4.4).



Example 3.1.4.3: Baillot, *Air Varié, no. 14*



Example 3.1.4.4: Boulez, *Anthèmes 1*, mm. 3-6

When playing Boulez's work, Baillot's advice regarding the placement of the bow and understanding the limits of the effect allows the performer to maximize the expressive power of the violin,[94] and capture, to the best of his or her ability, the musical world of the work.

3.2 Thrown bowings: emphasis on the ricochet and *spiccato*

"Off-the-strings" strokes were not discussed in treatises until the 1830s, nearly 50 years after the appearance of the Tourte bow.[95] Baillot accounts for these bouncing strokes in *L'art du violon*, and refers to them as "elastic" bowings.[96] As a general rule, he states that the four elastic bow strokes (the *détaché léger*, the *perlé*, the *sautillé,* and the *staccato à ricochet*) must be played with more elasticity than the legato (on the string) strokes. In other words, a performer must allow the bow to bounce enough to leave the

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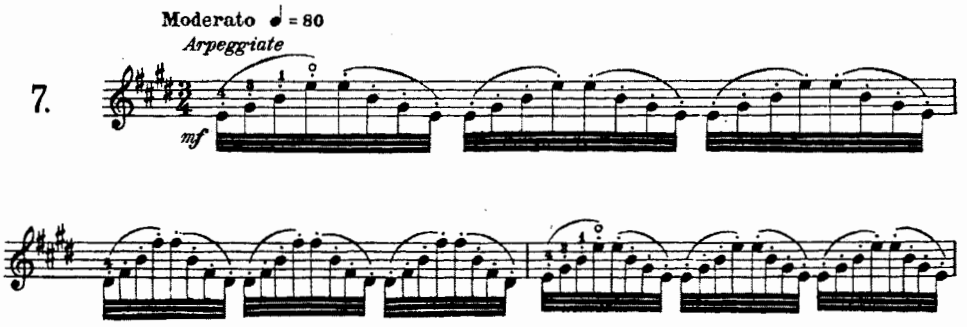
[94] See Stowell (1984), 317; Pepina Dell'Olio, *Violin Bow Construction and its Influence on Bowing Technique in the Eighteenth and Nineteenth Centuries* (DMus diss., Florida State University, 2009), 22.

[95] See Hansen (2009).

[96] See Baillot (1835), 101.

string a little.[97] Boulez's *Anthèmes 1* incorporates countless instances of both *staccato à ricochet* (hereafter, *ricochet*) bowings and *sautillé* bowings. These will be discussed in succession, beginning with the *ricochet.*

Baillot attributes the first performances of *ricochet* bowing to Paganini,[98] but earlier evidence has shown that virtuosi such as Locatelli already employed the technique in the eighteenth century (Example 3.2.1).



Example 3.2.1: Locatelli, Capr*ice No. 7*, mm. 1-3

The *ricochet* bow stroke can be executed up bow or down bow and results from throwing the bow on the string from a distance of about one to two inches, according to Baillot.[99] This movement allows the bow to bounce on the string and strike several notes in a row. Baillot observes that for a greater quantity of notes to be played in one throw, "one simply needs to drop the bow from a slightly greater height on the to the string."[100] This advice is directly applicable to the execution of Boulez's demanding ricochets, two of which are illustrated below, in Example 3.2.2 and Example 3.2.3.

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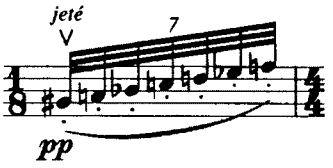
[97] See Baillot (1835), 101-103

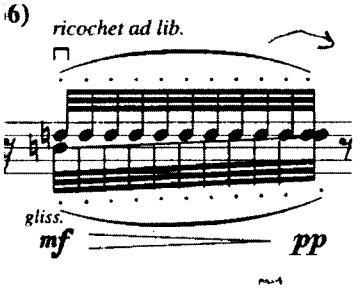
[98] Johnson (2010), 85.

[99] See Baillot (1835), 100.

[100] Stowell (1985), 188-189

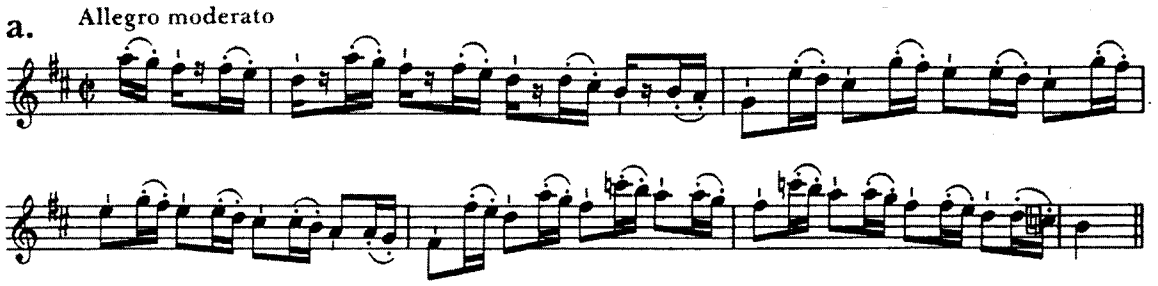


Example 3.2.2: Example of up-bow ricochet in Boulez's *Anthèmes 1*, mm. 10



Example 3.2.3: Example of down-bow ricochet in Boulez's *Anthèmes 1*, mm. 1

Both examples of Boulez's *ricochet* require the violinist to find the perfect contact point on the string in order to project a bouncing sound, and also to consider where to drop the bow. Baillot suggests dropping the bow so that it contacts the string at the very tip of the middle part of the bow, which works perfectly for each of the *ricochet* examples above.[101] To master this challenging technique, Baillot prescribes several etudes, such as fragments from Kreutzer's 10th concerto, and recommends experimenting with both down bows and up bows (Example 3.2.4).

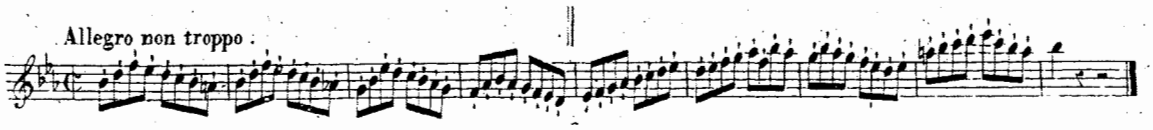


Example 3.2.4: Kreutzer's *Concerto No.10*

Anthèmes 1 includes countless *ricochet* bowings, but also uses another thrown bowing: the *détaché sautillé*, a stroke usually used in fast passages. Baillot advises violinists to execute this *sautillé* in the middle of the bow, forcing the bow to bounce

[101] See Baillot (1835), 100.

lightly in the same place while only slightly leaving the string.[102] François Habeneck, an important student of Baillot, is more precise in his instruction on the stroke, mentioning the need for a flexible right wrist. Habeneck's advice is mandatory for clear sound production.[103] The following example, Example 3.2.5, reproduces Baillot's exercise for *sautillé* bowing, which provides excellent practice for Boulez's *sautillé* bowings.



Example 3.2.5: Example of *détaché sautillé* as illustrated in Baillot,(1835), 101.

Some of Boulez's *sautillé* bowings require a specific color, and are demarcated *col legno*. *Col legno*, from the expression "*col legno battuto*"[104] is a percussive sound the violinist makes by striking the strings of the violin with the wood of the bow, rather than with the hair. *Col legno* is described by Baillot in *L'art* and also by Hector Berlioz in his orchestration treatise.[105] The combination of the two effects— *sautillé* and *col legno*— only appears in Michel Woldemar's treatise from the time, however: *Grande méthode ou étude élémentaire pour le violon* (c. 1800). Woldemar recommends that violinists "let the bow stick bounce"[106] for the execution of a specific musical passage, such as Example 3.2.6.

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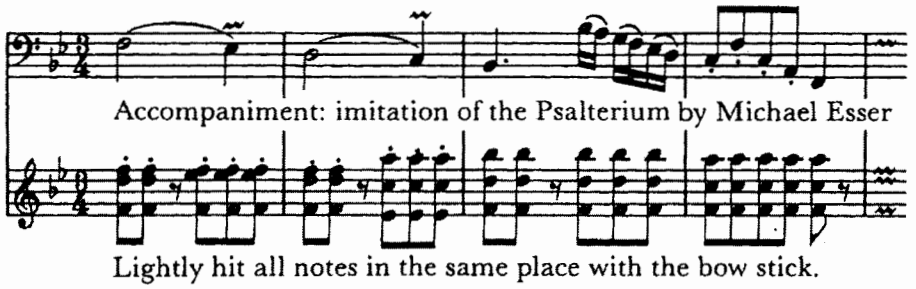
[102] See Baillot (1835), 101.

[103] See Robin Stowell, *The Early Violin and Viola: a practical guide.* (Cambridge: Cambridge University Press, 2001), 71-74.

[104] Italian for "Hit with the wood"

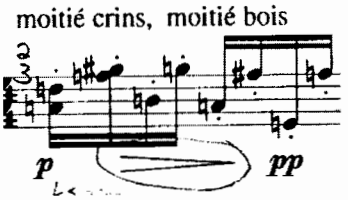
[105] Hector Berlioz, *A treatise on modern instrumentation* (Paris, 1843), trans. Clarke (London, 1858), 12.

[106] Michel Woldemar, *Grande méthode ou étude élémentaire pour violon.* (Paris, 1801), 48.



Example 3.2.6: Woldemar's illustration of a *sautillé col legno*

The *sautillé-col legno* bowings in Boulez's *Anthèmes 1* also present the difficulty of multiple stopping, just like Woldemar's example above. Understanding Baillot's instructions for *détaché sautillé* as well as practicing Woldemar's *col legno* exercise help a violinist achieve similar passages in Boulez's *Anthèmes 1*, such as Example 3.2.7.



Example 3.2.7: Boulez, *Anthèmes 1*, mm. 103

3.3 On the *saccade* and the execution of accents

Another type of bowing that is found in Boulez's *Anthèmes 1* is the *saccade*. Baillot describes this technique in *L'art du violon* as a "rough and sudden jerk of the bow given to notes, generally in twos, threes etc., and sometimes irregularly, that is to say without symmetry."[107] Baillot adds that "in a violin solo, its [the *saccade*'s] function is to break the monotony, to lighten the passage and give it energy."[108] The idea of breaking up a passage and giving it energy foreshadows Boulez's own use of the technique. In *Anthèmes 1*, the *saccade* is used to create stark contrasts between *p* or *pp* to *f* or *ff*. This

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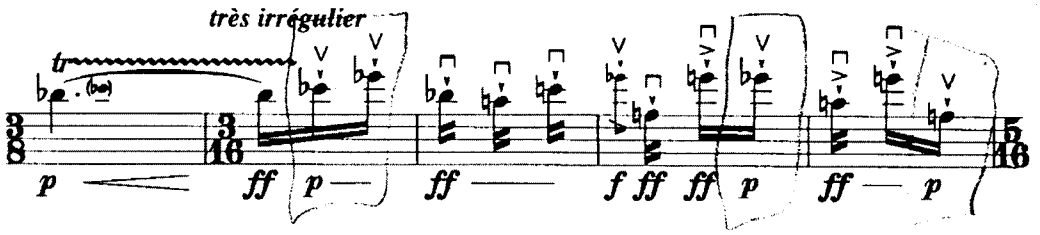
[107] "La saccade est une secousse d'archet rude et prompte que l'on donne aux notes (...)" Baillot (1835), 119-120.

[108] "Dans le Violon solo, elle est destinée à rompre la monotonie, à relever le trait, à lui donner de l'énergie." Baillot (1835), 119-120.

technique is made more challenging because it appears in the context of very difficult bowing changes. Boulez prescribes these dynamics and bowings with precision, as seen in Example 3.2.1.



Example 3.3.1: Saccade bowings in Boulez's *Anthèmes 1*, mm. 60-64

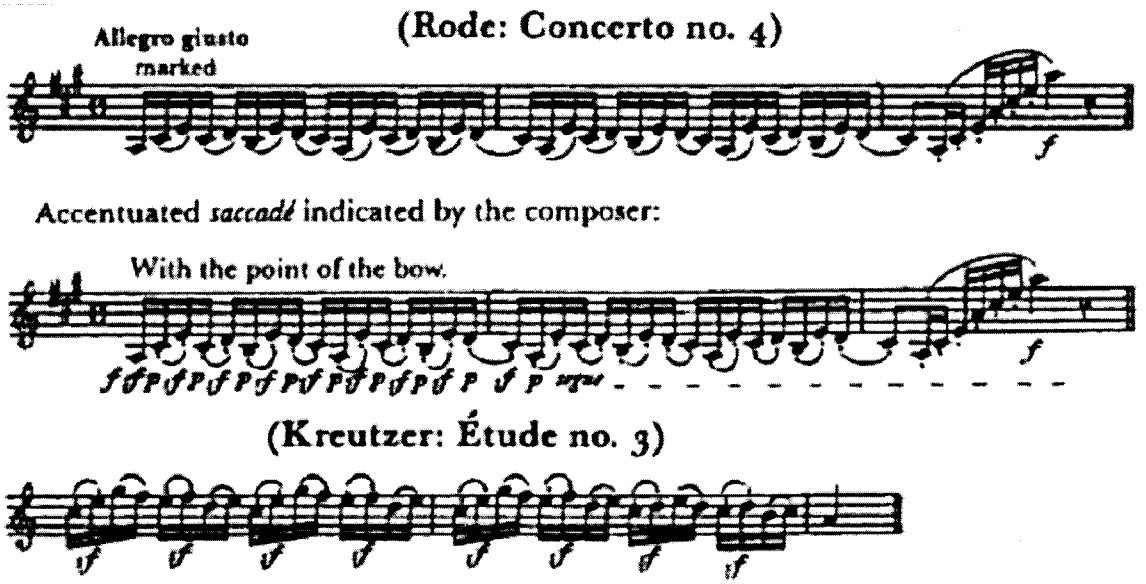
When approaching a passage of this nature, Baillot's advice is extremely valuable. He writes:

> One must take care to correct its [the *saccade*'s] normal harshness . . . because the sudden contrast requires a brisk, decisive movement of the bow which would easily make the playing dry and hard if one did not attempt to blend the *saccade* into the other notes of the passage.[109]

Baillot reinforces his advice with examples taken from works by his colleagues, Rode and Kreutzer (Example 3.2.2).

---

[109] "Il faut s'attacher d'autant plus alors à corriger sa dureté naturelle que sa brusque opposition exige dans le coup d'archet un mouvement vif et tranchant qui rendrait bientôt le jeu sec et heurté si l'on ne cherchait à fondre la saccade avec les autres notes du trait." Baillot (1835), 119.



Example 3.3.2: Example of a passage where the character requires a saccade (above), with the correct way to perform it (middle) and an example of exercise that would be helpful (below). Baillot (1835), 119-120.

Boulez often pairs the *saccade* with accents in *Anthèmes 1* and notates the speed and dynamics of the accents in the score (Figure 3.3.3).

*les valeurs *ff* plus longues, les valeurs *p* plus courtes

Figure 3.3.3: Example of the prescriptive indications of Boulez in regards to the length of some of the accented notes

Unfortunately, Baillot's advice regarding accents leaves something to be desired: "*Attack* the note and then draw it out a little for the rest of its value, very softly."[110] Nevertheless, comparing his examples of *saccade* with Boulez, and following his advice regarding harshness and the movement of the bow, results in a more refined execution of the Boulez example. Furthermore, a violinist benefits greatly from moving back and forth between Baillot's examples for practice and Boulez's own example. This back and forth helps clarify the tone of Boulez's complicated *saccade*, which has a tendency to move towards harshness and thinness of tone.

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[110] Stowell (1985), 194-195.

3.4 Pizzicato

Before shifting our attention to left-hand techniques, we should account for a final technique that straddles the boundary between left and right hands: *pizzicato*. *Pizzicato* appears countless times in Boulez's *Anthèmes 1* and *2*. Baillot describes this technique as "accomplished by plucking the string with one finger of the right or the left hand."[111] Baillot prefers *pizzicato* played with the right hand, as he believes this results in a fuller tone than with the left-hand. He goes on to remark that:

> It is very useful to practice executing them well with the right hand; they are susceptible of many nuances which one may not be able to add if one does not possess the technique.[112]

Baillot's advice captures well the dynamic shadings that Boulez incorporates into *Anthèmes 1*. Boulez takes the virtuosity one step further by writing extremely fast *pizzicato* sections which require two-, three- and four-note chords to be played *pizzicato* in alternation with bowed notes (Example 3.4.1).

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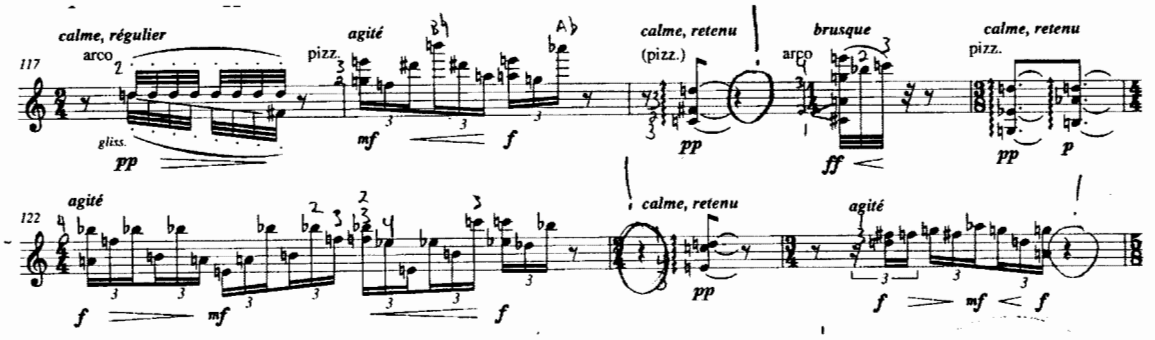
[111] "Le Pizzicato se fait en pinçant la corde avec un doigt de la main droite ou de la main gauche." Baillot (1835), 218.

In the nineteenth century, the traveling virtuosic soloists arose at the forefront of the musical scene. Of those, Nicolo Paganini was the most prominent violinist. Paganini was often viewed with disdain at the time by violinists such as Spohr who wrote that "In composition and in his style there is a strange mixture of consummate genius, childishness and lack of taste that alternately charms and repels." Louis Spohr, *Autobiography, Vol. 11* (London: Longman, Green, Longman, Roberts and Green, 1865): 168. In contrasts, Baillot writes of Paganini, "Avant tout: il est magique! Quand le violon est entre ses mains, il devient incroyable." Baillot (1835), 5-6. This opinion that Baillot holds of Paganini and his virtuosity certainly explains why he discusses the left-hand pizzicato (See Baillot (1835), 219.) and refers the violinists to the work of Mr.Gurh for the complete range of exercises (Carl Gurh wrote the official "Paganini treatise"). Yet again, by referring students to Mr.Guhr's work, Baillot reinforces the idea of exercises as a means of obtaining strong techniques. Other treatises omitted the mention of the left-hand pizzicato (to the exception of Michel Woldemar's *Grande Méthode* (1801) and Bartolomeo Campagnoli's *Nouvelle Méthode de la mécanique du violon (1824)*) although present in the violin literature of the time.

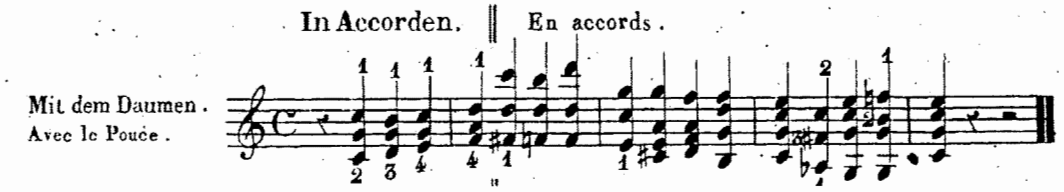
For further discussion on attitude toward virtuosity and technique, see Bose (2005), 113-116.

[112] "Il est très utile de s'exercer à les bien faire de la main droite; ils sont susceptibles de beaucoup de nuances que l'on ne peut y mettre si l'on n'en possède le mécanisme." Baillot (1835), 220.



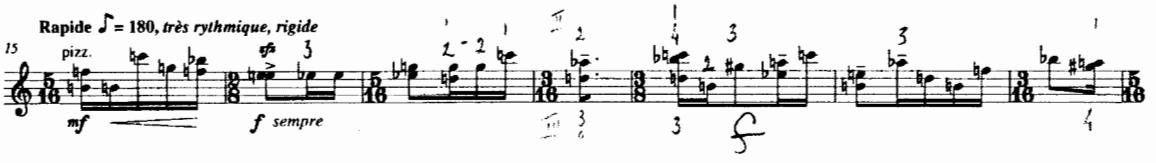
Example 3.4.1: Boulez, *Anthèmes 1*, mm. 117-124

Baillot suggests that such dynamic shading can be accomplished by using various fingers on your right hand.[113] For example, to account for Boulez's *pianissimo* three-note chords, Baillot would use his thumb and place it near the middle of the fingerboard (Example 3.4.2).



Example 3.4.2: Exercise of chords pizzicato played with the thumb as illustrated by Baillot.

In contrast, using the index finger of the right hand allows a performer to achieve a louder, faster *pizzicato* (Example 3.4.3). Baillot's advice is especially valuable when approaching a later section of *Anthèmes 1*, which directly juxtaposes two- and three-note *pizzicato* chords with faster, single-note *pizzicato*. Not only does alternating index finger and thumb help mediate the virtuosity of these juxtapositions, but this alternation also creates a tasteful juxtaposition of dynamic shadings.



Example 3.4.3: Boulez, *Anthèmes 1*, mm. 15-21

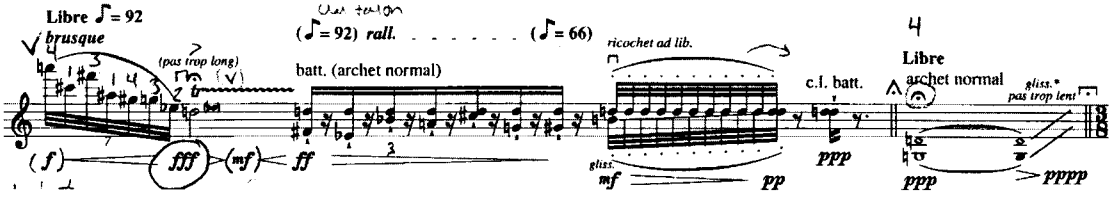
[113] See Baillot (1835), 218-220.

This passage of extreme virtuosity ends our exploration of right-hand violin techniques in Boulez's *Anthèmes 1* and Baillot's *L'art du violon*. The next section of the study examines left-hand techniques. As with right-hand techniques, Boulez constantly challenges the modern violinist, but once again we can turn to Baillot to help us with our struggle.

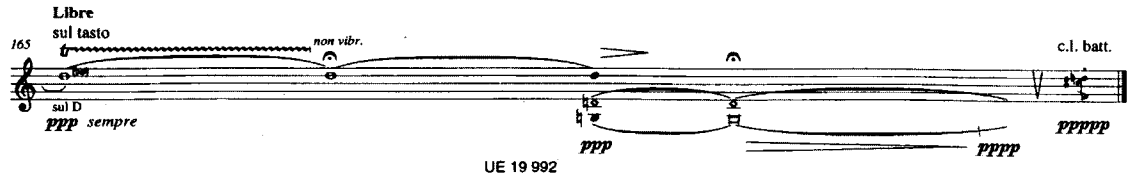
Chapter 4

LEFT HAND TECHNIQUE

While the bow drags the sound out of the violin, the notes themselves are executed with the left-hand. The plethora of notes in *Anthèmes 1* requires a masterful knowledge of the fingerboard. Baillot's *L'art du violon* becomes a strong asset to the violinist in this regard, as his pedagogy sets the standard for scale studies, position shifting, ease of execution, and etudes which reinforce these techniques. Baillot's relaxed and natural violin hold remains in use today;[114] but what is interesting for this study are his detailed instructions on the complete range of left-hand techniques found in Boulez's work. A sample of these techniques are illustrated below in Example 4.0.1 and Example 4.0.2.



Example 4.0.1: The opening musical gesture of Boulez's *Anthèmes 1*, mm. 1-2



Example 4.0.2: The closing musical gesture of Boulez's *Anthèmes 1*, mm. 165

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[114] How to hold the violin has been at the forefront of many treatises throughout the eighteenth century. Leopold Mozart, in his *Violinschule,* was adamant of looking relaxed or comfortable by holding the violin with the chest while others, such as L'Abbé le fils, were offering a more modern way to grip the instrument, with the chin. Nevertheless, every pedagogue, in their own treatises, indicated clear instruction on what they considered to be the proper way to hold the violin, including Baillot. He added to the discussion offered in *Méthode de violon* several clear images of the proper violin hold.

These examples present the first and last musical gestures of *Anthèmes 1*, and encapsulate the entirety of the left-hand techniques elaborated later in the piece. These techniques are related to intonation, fingerings, undulating ornaments, harmonics and double and multiple stops, all of which are characteristic elements of the nineteenth-century French showpiece. Not surprisingly, Baillot accounts for each of these techniques, and we begin with his discussion of scales and intonation.

4.1 Intonation and the importance of practicing scales

Baillot wanted all musicians to agree on a standard and uniform pitch.[115] He describes the standardized tuning fork, which was adopted by the Paris Conservatoire in 1821, as a way to solve problems of intonation.[116] He urged scientists and musicians to collaborate[117] and join forces to find a solution to the lack of uniformity, which was problematic in the emerging nineteenth-century commercialisation of concert-giving.[118]

Baillot's discussion of standardized pitched is indicative of his larger focus on good intonation. As he puts it, "Whatever instrument one plays, tuning is the starting

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[115] In his insightful and thorough *History of Performance Pitch*, Bruce Haynes defines a pitch as a combination of "two separate coordinates: not only a frequency value (such as 440Hz, for instance), but also the name of a note, such as A. A-440Hz is a pitch (...) pitches become standard when they are placed in a musical context." See Bruce Haynes, *History of a Performance Pitch: The Story of "A"* (Scarecrow, 1992), xxxiv.

[116] See Baillot (1835), 188.

[117] The desire for music and science to collaborate is shared by other French institutes, including Pierre Boulez's IRCAM (Institut de Recherche et Coordination Acoustique/Musique). See: Laurent Bayle and Peter Szendi, *Lire L'IRCAM* (Paris: Éditions IRCAM – Centre Georges-Pompidou, 1996). ; Célestin Deliège and Irène Deliège, "L'IRCAM (I)" in *Cinquante ans de modernité musicale: de Darmstadt à l'IRCAM*, ed. Célestin Deliège and Irène Deliège (Liège: Mardaga, 2003), 470-476. ; Peter O'Hagan, "Pierre Boulez and the Foundation of IRCAM" in *French Music Since Berlioz,* ed. Richard Langham Smith and Caroline Potter (England: Ashgate, 2006), 303-331.

[118] For more information on the nineteenth-century commercialization of concerts, see: Wiliam Weber, "Mass Culture and the Reshaping of European Musical Taste, 1770-1870," *International Review of the Aesthetics and Sociology of Music* 25, no. 1/2 (June-December, 1994): 175-190.

point for good intonation, without which everything sounds wrong."[119] To solidify a violinist's intonation, he prescribes a system of scales that he considers as the "yardstick of our musical system."[120] He insists that scales provide:

> a noble and symmetrical melodic line, capable of much expression and variety; it lends itself to all the movements of harmony, it can accompany any melody, and when one reflects on its limits, one can hardly believe that five tones and two semitones can provide so many combinations and offer so many resources.[121]

Baillot's scale exercises are presented below (Figure 4.1). For Baillot, the type of scale exercise is less important than the way the exercise is practiced. For example, he states, "experience has shown that scales are harder when performed slowly."[122] It is then imperative to practice them, according to Baillot, slowly, with space between the notes in order to focus on intonation—a skill well-suited to the complex scalar passages in Boulez's *Anthèmes 1*.

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[119] "Quel que soit l'instrument dont on joue, l'accord est le point de départ de la justesse sans laquelle tout est mauvais." Baillot (1835), 248.

[120] Stowell (1985), 251.

[121] "La gamme est l'échelle de notre système musical; elle offre, telle qu'elle est, un chant noble et symétrique, susceptible de beaucoup d'expression et de variété; elle se prête à tous les mouvements de l'harmonie, elle accompagne toutes les mélodies, et lorsque l'on réfléchit sur ses limites, on a peine à comprendre comment cinq tons et deux demi-tons peuvent fournir autant de combinaisons et présenter autant de ressources." Baillot (1835), 43.

[122] "L'expérience prouve que les gammes sont plus difficiles à faire justes quand on les fait lentement." Baillot (1835), 24.

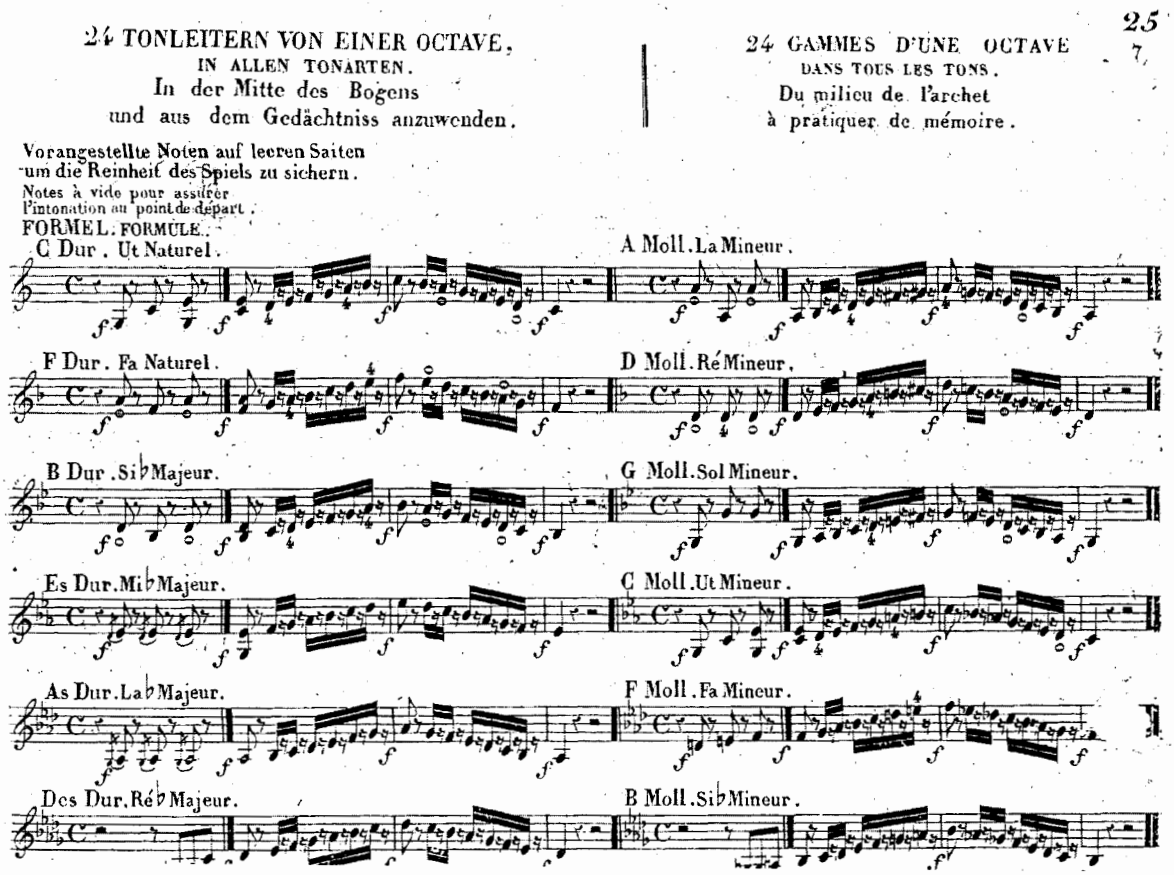

Figure 4.1: One of many scales exercises in Baillot's *L'art du violon*

Baillot differs from other treatises as he not only illustrates major and minor scales, but integrates a distinct melody or bass line into each example. These melodious segments reinforce a harmonic understand of each key and help violinists develop a strong sense of intonation in the context of real music. Baillot takes his scale studies one step further, by also integrating other concepts, such as fingerings, position shifting, interval tuning, and complex, right-hand bowings. From my experience, this multifaceted system of scale exercises is valuable for any repertoire, from Baillot to Boulez and beyond.

4.2 Fingerings

By the turn of the nineteenth century, the fingerboard achieved its modern length.[123] Consequently, Baillot's principles of fingerings and shifting from one position to the next remain valid today. In fact, the terminology for "positions" was solidified in the first decades of the 1800, in the French school of violin playing, notably with the Paris Conservatoire treatises. Baillot offers a complete set of exercises to master every position from first to seventh—the most common positions (Figure 4.2).[124]

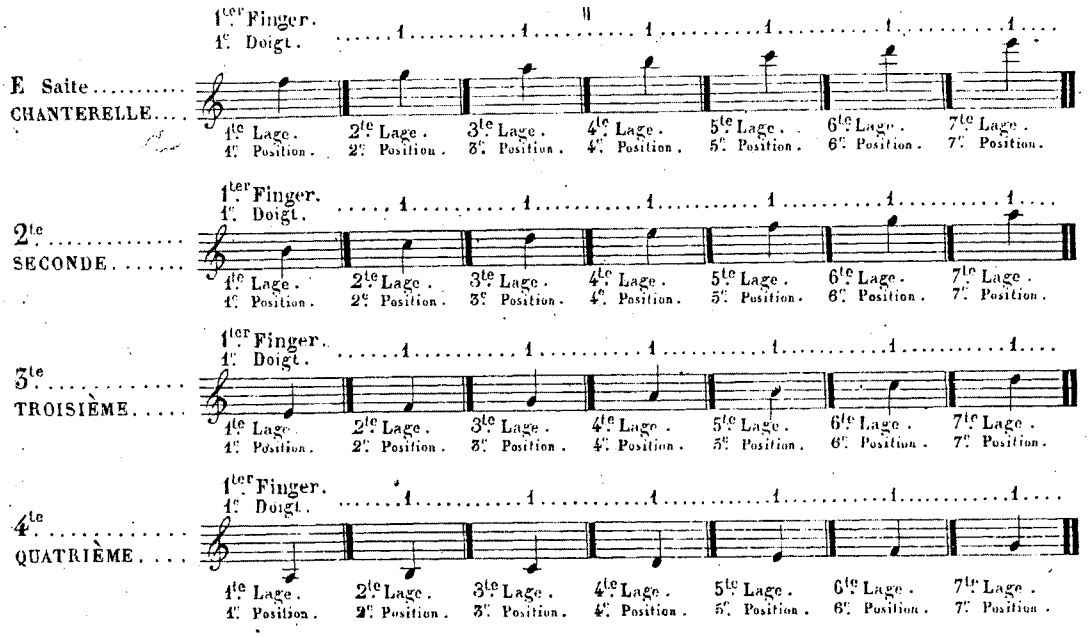

Figure 4.2: Demonstration of the positions by Baillot in his *L'art du violon*

A thorough knowledge of the fingerboard, as gained from practicing Baillot's scales system and exercises, allows a violinist to make informed decisions on fingering, a skill that is particularly relevant for Boulez's *Anthèmes 1*—a score nearly devoid of

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[123] "An important distinction between Baroque and modern fingerboards is the difference in their lengths. The modern violin fingerboard is about 270mm long, whereas Satradivari's patterns and original fingerboards are between 190 and 213 mm long." Stewart Pollens, *Stradivari* (Cambridge: Cambridge University Press, 2010), 113.

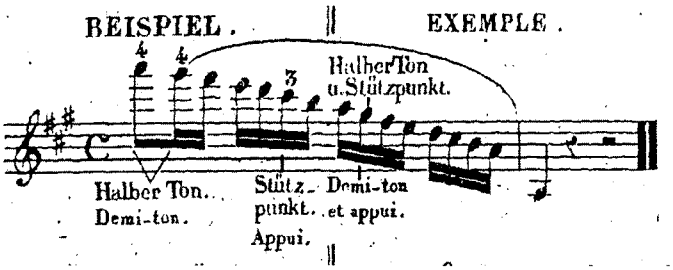
[124] Baillot offers exercises and advices on the three types of fingerings he categorizes: 1) the surest fingering, which should be used in general; 2) the easiest fingering for small hands; 3) the expressive fingering or composer's fingerings. For the complete survey and advice, see Baillot (1835), 143-153.

prescriptive fingerings.[125] Decisions on fingerings, according to Baillot, should be based on 3 criteria or goals: (1) the comfort of the left hand, (2) to colour and shape a phrase and (3) to add expressivity to a passage of music.[126]

4.2.1 Positions and Shifting

Baillot's basic principle is that if the fingering is not indicated by the composer himself, "it will be necessary to choose the one which offers the most security of intonation."[127] To do so, he suggests that the violinist should try out "a passage several times in different ways,"[128] varying fingerings to find the best way to play the music. Baillot offers the following guidelines.[129]

First, he insists on shifting upwards and downwards (from one position to the next) by means of semitones (Example 4.2.1.1).[130]



Example 4.2.1.1: Baillot's example of shifting by means of semi-tone from the upper D to the upper C sharp

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[125] In *Anthèmes 1*, Boulez specifies at only one occasion a specific color, which is to play a specific note on the D string (mm.165). For further information regarding modern fingerings, see Paul Zukofsky "Aspects of contemporary technique" in The *Cambridge Companion to the Violin*, ed. Robin Stowell (Cambridge: Cambridge University Press, 1992), 1-5.

[126] See Baillot (1835), 143-149.

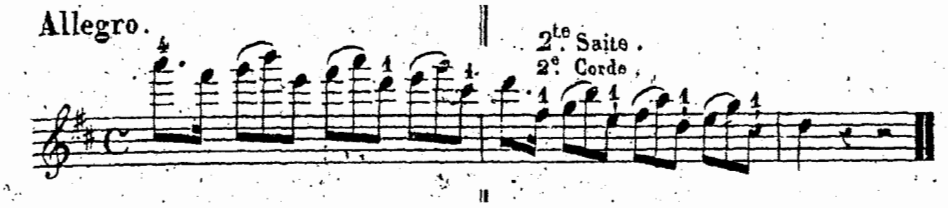
[127] "Mais si le doigté n'est pas indiqué, il faudra choisir celui qui offre le plus de sûreté pour l'intonation." Baillot (1835), 143.

[128] "En essayant un passage plusieurs fois de différentes manières (...)" Baillot (1835), 143.

[129] Baillot's indications on the mechanics of shifting reflects a nineteenth-century pedagogical attitude. "Guidelines for deciding when to shift are not uncommon, but no 18th- century treatise gives a description of the mechanics of shifting. Tartini avoids the question altogether, saying only that 'as regards changing position, it is impossible to give any hard and fast rules.'" See Peter Walls, "Fingering in the 18th Century," *Early Music* 12, no. 3, String Issue (August, 1984): 305.

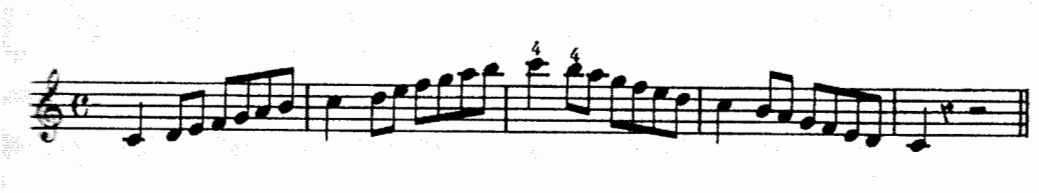
[130] See Baillot (1835), 143.

Second, to assure smoothness of action, he suggests changing positions regularly on the same finger to create repetitive motions that straighten the hand (Example 4.2.1.2).[131]

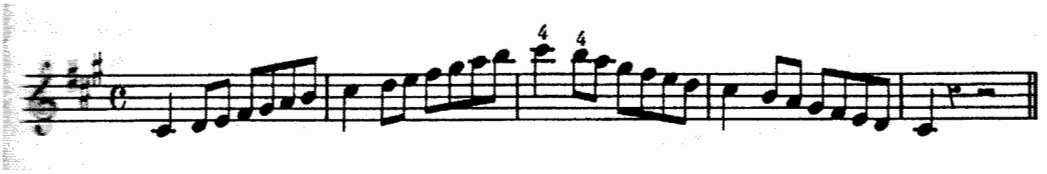


Example 4.2.1.2: Baillot's example of shifting with the same fingers

Finally, he insists that it is better to stay in the same position when possible,[132] and to use *extensions* (Example 4.2.1.3 and Example 4.2.1.3). An extension means that a finger extends beyond its regular reach within a single left hand position on the fingerboard. Thus, an awkward or unneeded shift is avoided altogether.



Example 4.2.1.3: Extension of a tone



Example 4.2.1.4: Extension of a semi-tone

Extensions of this nature are extremely valuable when approaching *Anthèmes 1*, which requires either the fourth finger extending upward or the first finger extending downwards. Examples 4.2.1.5 and Example 4.2.1.6 show passages from Boulez's *Anthèmes 1* that benefit from this technique.

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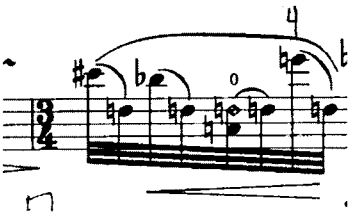
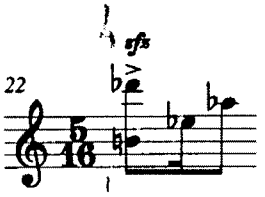
[131] Ibid.

[132] See Baillot (1835), 146.



Example 4.2.1.5: An example of an upward extension fingering in Boulez's *Anthèmes 1*, mm. 100



Example 4.2.1.6: An example of a downward extension fingering in Boulez's *Anthèmes 1*, mm. 22

Limiting left-hand position shifts help the violinist achieve Boulez's very fast tempi, while maintaining Baillot's ideal natural position free of unnecessary movements.[133]

4.2.2 Portamento (port-de-voix/glissando)

In contrast to using fingerings to limit movement on the fingerboard, a violinist may choose to purposefully change position and remain on the same string to add expressivity to her playing. This technique, known as *portamento*,[134] arose between the mid-eighteenth to mid-nineteenth centuries.[135] The *portamento* combines the use of a right-hand non articulated bow with a left hand that shifts from one position to another with the same finger, resulting in an audible slide. Baillot recommends the use of an anticipatory

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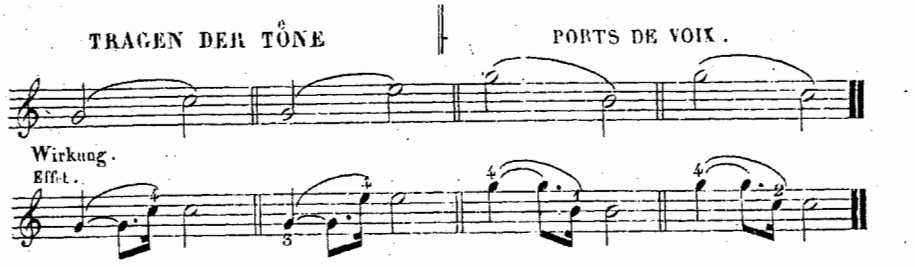
[133] "A natural position is obtained by doing only the necessary movements." Baillot 1835, 189.

[134] "The term 'portamento' or portamento di voce, (or its usual synonyms in other languages: in French 'port de voix,' in English 'glide' or 'slur,' and in German 'tragen der Töne'" Brown 2004, 558. For further information see also Brown 2004, 558-588.

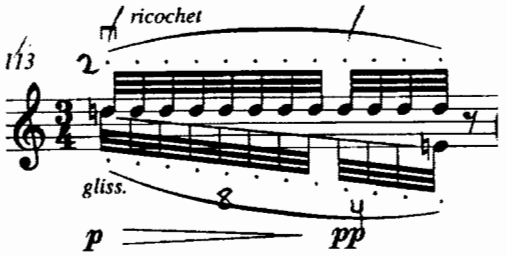
[135] In the nineteenth century, the *portamento* was not welcomed by all, but favoured by some important figures of the French School, including Rode and Baillot. Unlike Viotti who had a tendency to remain in the same position as often as possible, Rode enjoyed changing position to stay on the same string, which often produced a *portamento* sound. In his own Caprices, the fingerings he proposes are a testament to that practice. For examples, see Baillot 1835, 146-147

note to solidify the slide.[136] He advised the player to slide a stopped finger forwards or backwards in order to skilfully substitute another finger for it; the written-out anticipatory notes were not to be sounded.[137]



Example 4.2.2.1: Baillot's example of the correct execution of the *portamento* (*ports de voix*)

Baillot's *portamento* exercises (Example 4.2.2.1), and his advice regarding the technique, are very helpful when preparing Boulez's *Anthèmes 1*. Boulez uses a prescribed *portamento* device several times in the work, and combines it with *ricochet*, the technique of dropping the bow onto the strings, discussed in the previous section of this study. In the following example, Boulez combines a ricochet gesture with a left-hand slide backwards from a **D** to **E** (Example 4.2.2.2).



Example 4.2.2.2: Boulez, *Anthèmes 1*, mm. 113

The expression of this combined gesture implies a twentieth-century musical language, but its technicality is rooted in the nineteenth century. It requires the violinist to master the right hand *ricochet,* as well as the sliding motion of the left. Even then, Boulez pushes these techniques to their limit, also specifying dynamics and the speed of each

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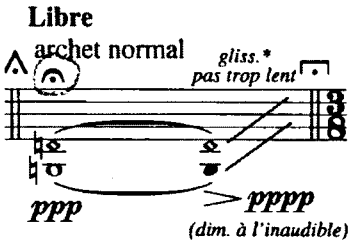
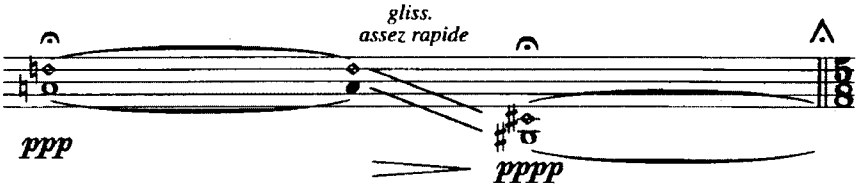
[136] See Baillot (1835), 70-72.

[137] See Stowell (1985), 98.

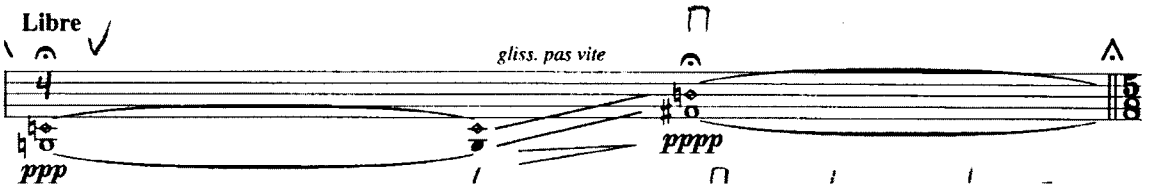
portamento: "*gliss. Pas trop lent*," "*gliss. Assez rapide*," or "*gliss. Pas vite*" (Example 4.2.2.3, Example 4.2.2.4 and Example 4.2.2.5).



Example 4.2.2.3: Boulez, *Anthèmes 1*, mm. 2 : "gliss. Pas trop lent"



Example 4.2.2.4: Boulez, *Anthèmes 1*, mm. 89: "gliss. Assez rapide"



Example 4.2.2.5: Boulez, *Anthèmes 1*, mm. 66: "gliss. Pas vite"

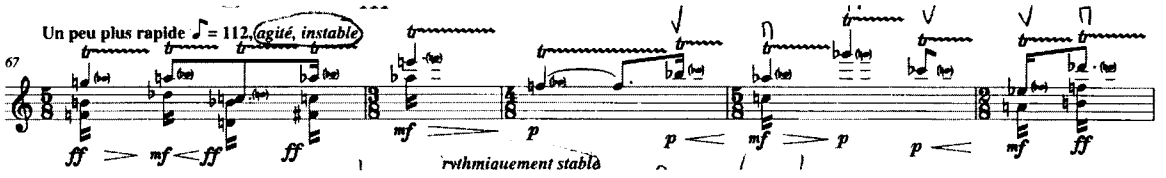
4.3 Undulating Ornament and Effect: Trills and Vibrato

The musical language of *Anthèmes 1* is highly gestural, composed of a series of musical characters or gestures that interact in different ways throughout.[138] One of the most important gestures in *Anthèmes 1* is the trill. Boulez uses it to color melodies, divide larger gestures or sections and to create striking instability. To account for this plethora of sound shapes we can yet again turn to Baillot. Baillot states that "the trill consists of a

[138] For more information regarding Boulez's gestural style of composition, see Chapter 9 of Goldman (2011), who deals specifically with both *Anthèmes*.

pulsating oscillation between two notes which must always be a tone or a semitone apart."[139]

Faithful to his remarkable instructions, Baillot recommends that the oscillating fingers press lightly with the stopped finger, and that any kind of stiffness or force should be avoided at all cost to avoid a quavering sound.[140] Once again, he emphasizes the importance of a beautiful tone, denigrating bleating sounds. He is also adamant that the speed of oscillation remain constant throughout the trilled note.[141]



Example 4.3.1: Boulez, *Anthèmes 1*, mm. 67-71

This notion of a constant trill is pushed to the limit in Boulez's work, as he writes entire melodies coloured by trills (Example 4.3.1). To achieve the seamless changes of notes from one trilled note to the next, Baillot would advise using different fingers for successive trills.[142] In addition, a violinist must consider the height at which they raise their finger from the string when trilling. Baillot recommends to raise it high so that the tip of the finger falls with some impact on the string, creating a brilliant effect.[143]

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[139] "Le trille consiste dans les battements alternatifs de deux notes qui doivent toujours être à un ton ou à un demi-ton d'intervalle." Baillot (1835), 72. To avoid all confusion whether the trilled notes should be played with a tone or semi-tone, Boulez notates his desire effect for every trill in *Anthèmes 1*. Example 4.3.1. presents an example of how he includes the desire effect, that is with the appropriate trilled note in parenthesis next to the main pitch.

[140] See Baillot (1835), 73.

[141] According to Baillot, the trill will be brilliant if the finger falls on the string continuously at the same speed, and with elasticity. See Baillot (1835), 73.

[142] See Baillot (1835), 73.

[143] Ibid.

Another form of left-hand oscillation is the vibrato.[144] The vibrato was a topic of much debate in the eighteenth and nineteenth century,[145] and was omitted altogether from Rode *et al*'s *Méthode du violon*. Baillot attempted to remedy the conservative stance of the *Méthode de violon* and incorporated it *L'art du violon*. He refers to the vibrato as "*sons ondulés*." Like Corette (1782) and Bailleux (1779),[146] Baillot views the vibrato as a powerful means of expression. Nevertheless, he warns that this type of embellishment should be used with caution, as its overuse could "make the melody unnatural . . . depriving the style of that precious naivety which is the greatest charm of art and recalls it to its primitive simplicity."[147] Yet Baillot also represents an important step towards reinstating the vibrato as a technique used for expressive means. He insists that the vibrato gives a tender and sometimes pathetic expression, yet reiterates the importance of maintaining good intonation.[148]

Whereas vibrato can be a strong expressive device, not using vibrato can be just as effective. Boulez's requests a "non vib." note in the very last measure of *Anthèmes 1* to illustrate a dramatic effect—a final "primitive simplicity" hinting at a musical world come and gone. Indeed, Boulez asks the violinist to transfer from an undulating sound, a trill, to a note emptied of undulation, a "non vib." note (Example 4.3.2). One can only image the debate that would have arisen in nineteenth-century Paris regarding Boulez's dramatic final gesture—I like to imagine that Baillot would have been thrilled.

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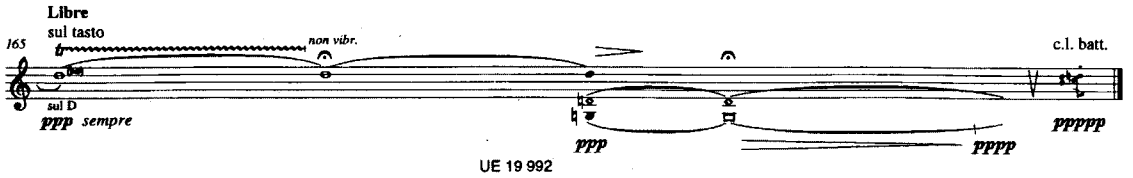
[144] Baillot notes that the vibrato can be done with the right hand, which he comes from a wavering motion of the bow caused by variation of the pressure on the bow stick. This technique isn't present in Boulez's.

[145] In the eighteenth century, views on vibrato were quite divergent. Geminiani shocked the musical world with his progressive views on violin technique, including his stance of vibrato, which he suggested be used as often as possible. He writes, "When [the vibrato, which he calls 'tremolo' or 'close shake'] is made on short notes, it only contributes to make their sound more agreeable, and for this reason, it should be made use of as often as possible." Francesco Geminiani, *A treatise of good taste in the art of Musick* (1749). In contrast, some other treatises, including Leopold Mozart's, disdained the use of a constant vibrato. "Performers here are who tremble constantly on each note as if they had palsy." Mozart (1756), 203.

[146] "The *Flatté* is a kind of shakering that is done on a final or sustained note. To produce the effect, one must firmly press the finger on the string and do small movements with the hand." Bailleux (1779), 11. See also: See Corette (1782).

[147] See Baillot (1835), 133.

[148] Ibid.



Example 4.3.2: Example of a trilled note (undulating sound) that morphs into "non vib." (a note without vibrato, or undulation). Boulez, *Anthèmes 1*, mm. 165

4.4 Harmonics

A common trend in violin treatises since Giuseppe Tartini's, "*Traité des agréments de la musique*" (1754), is a scientific approach to violin harmonics.[149] In his *L'art du violon*,[150] Baillot himself relies on the words of Mr.Savard,[151] whose scientific discourse focuses on vibrations that arise in the belly of the violin, as well as an elaboration of the divisions of the strings caused by harmonics.[152] Baillot quotes M. Savart who explains how to play harmonics on the violin, instructing violinists to simply play a note where it would be usually played, but without applying a full pressure on the string.[153] Following M. Savart's instructions, Baillot offers exercises on each string to practice harmonics. He indicates on which string the harmonic should be played, with which finger, and illustrates the resulting harmonic pitch, shown with black notes in Example 4.4.1.

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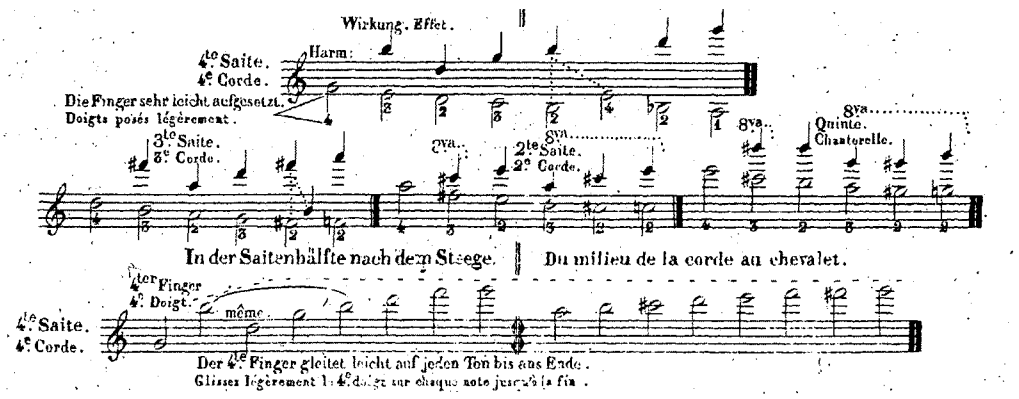
[149] For scientific approaches, see: John Ewan McLennan, *The violin music acoustics from Baroque to Romantic* (PhD diss., The University of New South Wales, Syndey, Australia, 2008); Paul Zukofsky, "On Violin Harmonics," *Perspectives of New Music* 6, no. 2 (Spring-Summer, 1968): 174-181.

[150] In the *Méthode de violon*, the use and techniques of harmonics were omitted altogether. With the rise of Paganini, it is not surprising that Baillot, who acknowledged him in his treatise, would include the famous techniques used by the virtuoso. Paganini was known to perform and composed melodies entirely written in harmonics, both artificial and natural, as well as in double-stops (to the disdain of some of his contemporaries, including Spohr). See: Edgar Istel and Theodore Baker, "The Secret of Paganini's Technique," *The Musical Quarterly* 16, no. 1 (January, 1930): 101-116.

[151] French distinguished natural philosopher who investigated the sources of sound. See "How to make a cheap violin," *Magazine of sciences and school of arts*, edited by G.Francis, F.L.S 5 (London, 1844): 277-278.

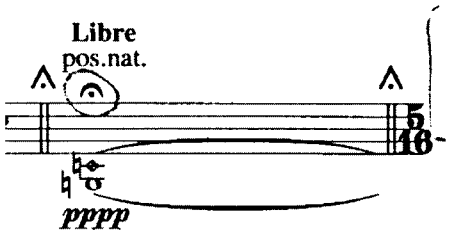
[152] See Baillot (1835), 212-213.

[153] See Baillot (1835), 212.



Example 4.4.1: Exercise in Baillot's *L'art du violon*

The harmonics shown above, played with open strings,[154] are referred to as *natural harmonics*. Boulez incorporates multiple natural harmonics into *Anthèmes 1* (Example 4.4.2). Unlike the other techniques described so far, Boulez's natural harmonics serve a formal, rather than virtuosic function, indicating the division between sections.[155]



Example 4.4.2: Example of a natural harmonic; Boulez, *Anthèmes 1*, mm. 14

Another type of harmonics, *artificial harmonics*, is used in Boulez's *Anthèmes 1* as well. Baillot describes these as follows:

> Place, at predetermined intervals, two fingers at the same time on the same string, one pressing strongly and the other very lightly, and you will obtain artificial harmonics.[156]

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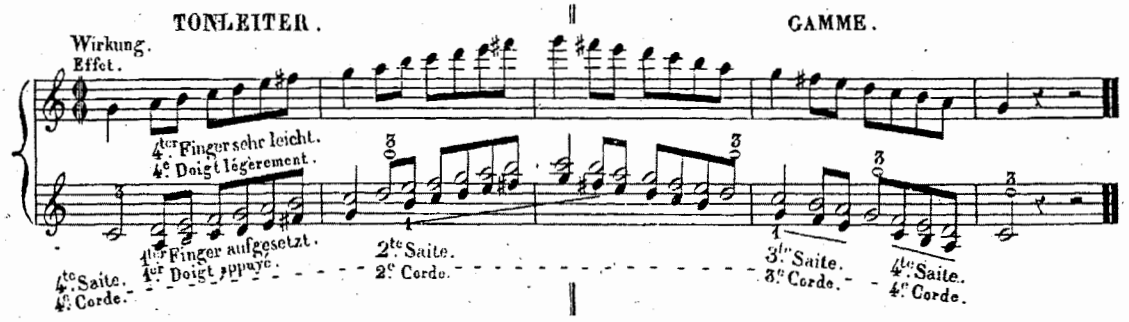
[154] The open strings of the violin are g-d-a-e.

[155] In *Anthèmes 2*, Boulez even uses the harmonics to "signal" a new section to the score follower. More discussion of Boulez's use of harmonics and thematic division, see Goldman (2001), 69-84.

[156] "Placez, à des intervalles déterminés, deux doigts en même temps sur la même corde, l'un, fortement appuyé et l'autre, posé très légèrement, vous obtiendrez par ce moyen des sons harmoniques artificiels." Baillot (1835), 214.

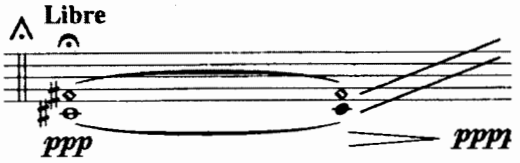
The predetermined interval could be a third, a fourth or a fifth.

Baillot suggests practicing scales with artificial harmonics, which not only solidifies a violinist's tone production as she plays harmonics, but also positions shifting and intonation (Example 4.4.3).



Example 4.4.3: Scale in harmonics as prescribed by Baillot

This exercise is very useful for playing Boulez's *Anthèmes 1.* Boulez uses artificial harmonics and pairs them with a *portamento* gesture, which is equivalent to sliding through Baillot's exercise above, instead of clearly dividing the notes (Example 4.4.4). Needless to say, intonation is the true challenge here, and Baillot's exercise is an excellent way to practice this technique.



Example 4.4.4: Artificial harmonic *portamento* in Boulez's *Anthèmes 1*, mm. 89

4.5 Double and Multiple Stopping

Double and multiple stopping refers to the action of playing two or more notes simultaneously,[157] a common occurrence in Boulez's *Anthèmes 1.* Baillot's discussion of multiple stopping consists of a few important rules paired with a wide range of exercises.

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[157] See David Froom, *New Grove Dictionary of Music*, ed. Stanley Sadie, Vol. 17 (2001): 384.

The issues he assesses relate to intonation, shifting, independence of the fingers, the necessity for extensions, and understanding bow concepts such as bow division and bow pressure.[158]

Baillot insists on practicing double and multiple stops with all intervals in all tonalities—using exercises reminiscent of his scale system—before performing repertoire that requires the technique. In his instructions, he presents concepts discussed in very few treatises, such as: a clear explanation for the diminished-fifth intervals and fingered octaves.[159] Traditional octave fingerings on the violin involve applying the first and fourth finger (1-4) onto the fingerboard, whereas Baillot's fingered octaves are octaves that require an alternation of "1-3" and "2-4" fingerings (Example 4.5.1).

Example 4.5.1: Example of an octave with a "fingered" fingering, played with 2 and 4, 4 using an extension prescribed by Baillot.

Such fingerings are common in twentieth century music and Boulez's music is no exception. Mastering these fingerings increases the dexterity of the left hand. Furthermore, mastering this technique fulfills Baillot's ideal of a "pure sound"; for example, in the case of fingered octaves, the violinist will not have to slide the first and fourth fingers from one octave to the next, avoiding undesired glissandi and bad intonation. I employ these fingerings in the final section of Boulez's *Anthèmes 1*, where

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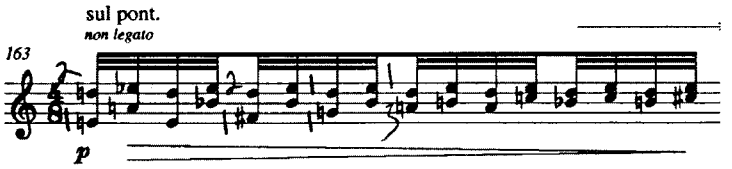
[158] In his previous *Méthode de violon*, Baillot already assessed issues of double stopping, but in the *L'art du violon*, he incorporated exercises with a strong emphasis on the importance of practicing the device in all intervals and contexts. See Baillot (1835), 79-82.

[159] By the time Baillot wrote his treatise, 70 years have passed since the first instruction on the performance of diminished fifths. It was still however absent from the majority of treatises. "In 1761, L'abbé published his method, *Les Principes du Violon*. It was the first known source to discuss the half position. Coupled with this concept was l'Abbé's discussion of diminished fifths, in which he stated that diminished fifths should be played not only with the same finger, but with adjacent fingers." Peter T. Myers, *Guidelines for violin fingerings based on editions of Ivan Galamian and Carl Flesch* (DMA diss., University of Oklahoma, 2011), 9.

any kind of slides would perturb the *sul ponticello non legato* oscillating notes (Example 3.4.2).



Example 4.5.2: Unusual fingerings demonstrating an extended fingering and a diminished fingering, in Boulez, *Anthèmes 1*, mm.163

When approaching passages of this difficulty using Baillot's methodology, it is easy to see why his method has enjoyed such prolonged success. In fact, all of the techniques surveyed in this section are made less intimidating through Baillot's clear instruction and intuitive examples for practice. The most intuitive aspect of Baillot's entire treatise, however, is his simple three-step approach to practicing music: defining the concept, practicing it with different exercises and formulations, and finally, applying it to the music itself.[160] Baillot makes the final step easier because many of his practice examples are derived from the core violin repertoire of his time and ours. Boulez's *Anthèmes 1* is a true successor to this tradition, and it bears all the technical marks to prove it. With *Anthèmes 2 pour violon et dispositif électronique*, however, Boulez finds a way to stand apart—both in terms of the musical language and the unique demands placed on the performer. These new and exciting challenges are the focus of the final section of the paper.

[160] See Baillot (1835), 11-12.

Chapter 5

ANTHÈMES 2:

Moving forward with Boulez's hyper-violin

Boulez's *Anthèmes 2*, which is an extended version of *Anthèmes 1*, utilizes contemporary technology that, obviously, was not available in Baillot's time. On the one hand, our comparison of Boulez and Baillot has come to an end. Yet, there is an interesting analogy between Baillot's reworking of *Methode de violon* as *L'art du violon*—inspired by new technological breakthroughs—and Boulez's reworking of *Anthèmes 1* as *Anthèmes 2,* also inspired by technological advances.[161] Although not applicable to the performance of *Anthèmes 2*, this analogy does highlight Baillot and Boulez's shared values—mainly, music is an evolving art, constantly shaped by the culture that envelops it. As a cultural product it is inevitable that music will embrace these changes. In Baillot and Boulez's case they were among first in their respective fields to account for evolutions in their lifetime—musical, cultural and technological. Nevertheless, we must now move away

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[161] At the time of the premiere, and even for many years afterwards, the live electronics of *Anthèmes 2* represented the latest and most developed technology in the field. Hugues Vinet reported that "Standard synthesis and processing features have been offered, as well as original developments such as the *Spatialisateur* library, phase-aligned formant synthesis objects, and various modules that perform pitch following and score recognition. The latest developments related to pitch following and score recognition were done for Philippe Manoury's *En Écho* for solo soprano and electronics (1993) and Pierre Boulez's *Anthèmes 2* for solo violin and live electronics (1997)." See Hugues Vinet, "Recent Research and Development at IRCAM," *Computer Music Journal*, 23, no. 3, Recent Research at IRCAM (Autumn 1999): 13. See also: Jean-Marc Jot, "Efficient Models for Distance and Reverberation Rendering in Computer Music and Virtual Audio Reality," *Proceedings of the International Computer Music Conference* (San Francisco: ICMA, 1997); Miller Puckette, "Formant-Based Audio Synthesis Using Nonlinear Distortion," *Journal of the Audio Engineering Society* 43 (1/2), 1995.

from parallels between Baillot and Boulez, and focus our attention on *Anthèmes 2*. This section deals with two fundamental issues of performance: the unique difficulties posed by the live electronics in *Anthèmes 2*, and the specific *violinistic* issues created by the live electronics. We begin, however, with a brief glimpse at the background of *Anthèmes 2* and Boulez's work at IRCAM, the Institut de Recherche et de Coordination Acoustique/Musique.

5.1 *Répons*: Boulez's first IRCAM work for instruments and live electronics

As director of IRCAM, Boulez constantly strove for a singular musical vision—the union of science and music. He hoped that this would create "a taste, a climate for contemporary music."[162] Determined to see his vision through, Boulez himself made multiple contributions to this contemporary musical literature. His first contribution to this genre was *Répons*,[163] a work composed for large chamber orchestra, six soloists and live electronics. The work featured the newly invented 4X, the fourth generation in a series of real-time digital signal processors used and developed at IRCAM between 1979 and 1984.[164] Boulez's discussion of the work captures the IRCAM mentality:

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[162] Jonathan Harvey, "IRCAM," in *Pierre Boulez: A Symposium*, ed. William Glock (London: Eulenburg, 1986), 240.

[163] *Répons* was commissioned by the Sudwestfun Baden-Baden (a German radiophonic organization) and created for the Donaueschigen Festitival in 1981, and was subsequently expanded until the achievement of its final version, in 1984. Critiques qualified the work as Boulez's first "creative demonstration of his commitment to electronic research at IRCAM and only his second exploration of live electronics at all." Paul Driver, "Boulez's 'Répons,'" *Tempo*, New Series, no. 140 (March 1982): 27. In 1995 (two years before *Anthèmes 2*, Georgina Born analyzes what she considers to be a twentieth century music crisis through examples of IRCAM. She divulges the same critique: "[*Répons* is Boulez's] Boulez's "only major contribution to involving computer music technology." See Georgina Born, *Rationalizing Culture: IRCAM, Boulez and the Institutionalization of the Musical Avant-Garde.* (Berkeley: University of California, 1995), 84.

[164] "IRCAM has been a pioneer in designing real-time systems for live interaction between performers and computers. Its main related achievements are the 4X and IRCAM Musical Workstation." See Vinet (1999), 13. In 1981, Giuseppe di Giugno creates the 4X, which "can no longer be considered as a synthesizer, but also control elements in real-time, that is to say during the performance." Jean Kott et Jean-Baptiste Barrière, "Le processeur numéque de sons 4X," *Porte ouverte à l'IRCAM: colloque "Le concept de recherché en musique"* (Paris: Centre Georges Pompidou, 1983): 25.

> What then is the most enticing prospect? To bring, I repeat for the last time, the two sound universes [acoustics and electronics] face to face within multi-dimensional constructions, an experiment that would doubtless lead us, nay drag us, to the edge of fertile land...[165]

By combining two sources of sound, the acoustic and the electronic, *Répons* exemplifies and exploits IRCAM's resources, such as the 4X processor. Another resource that was at Boulez's disposal was a system of sound "spatialization."[166] Boulez uses this technique to create a unique sound world for *Répons*, including a dramatic entrance of six soloists near the beginning of the piece (Figure 5.1.1). The sounds produced by these soloists are transformed in real-time—via the 4X processor—through six speakers that surround the audience. Consequently, the acoustic and the synthetic combine and drag us to the "edge of fertile land."

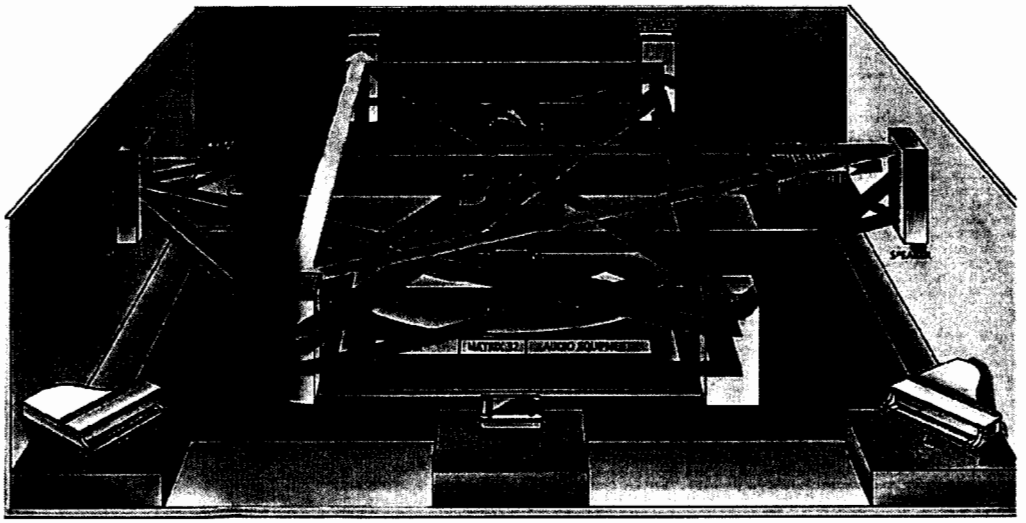

Figure 5.1.1: Spatialization for Boulez's *Répons* as illustrated by Andrew Gerzso

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[165] O'hagan (2006), 326.

[166] Andrew Gerzso, the *assistant musical* of Pierre Boulez, explains "'Spatialization' of the sounds produced by six instrumental soloists at their simultaneous entrance in *Répons* involves circulating each sound among four speakers in a pattern shown by an arrow of a color corresponding to that of the soloist's instrument. The speed with which a sound moves around the performance hall depends directly on the loudness of the sound. Because the sounds of the instruments die out at different rates, the sounds slow down at different rates. Several technicians seated at a panel just behind the orchestral ensemble control the various electronic and audio devices that make such an effect possible." Pierre Boulez and Andrew Gerzso. "Computer in Music." *Scientific American* 258, no. 4 (April 1988): 2.

Although differing in terms of technology and composition,[167] *Répons* and *Anthèmes 2* share several commonalities, including real-time signal processing, spatialization, and the interaction between acoustic and electronic realms. [168]

5.2 Defining the live electronics of *Anthèmes 2*

The role of live electronics[169] in the expansion of *Anthèmes 1* into *Anthèmes 2*[170] was to 'thicken the sound' of the piece.[171] Boulez chose Andrew Gerzso, his technological collaborator for *Répons*, to realize the electronic part.[172] This time Gerzso was faced with a new challenge: rather than having technicians operate the live transformations, like in *Répons*, the electronics would be triggered by a *score follower*. The 'score-follower' is a computer program that acts as the technician by 'listening' to the music in real-time and

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[167] There are several ways to make a live electronics performance possible. In *Répons*, an operator was hired to follow the score and the conductor and start the electronic part at the right moment, whilst the 'score follower' *Anthèmes 2*.

[168] Another interesting connection is that *Anthèmes 2*, just like *Répons*, was written for the Donaueschigen Festival, in 1997.

[169] "A 'live' electronic system, developed at IRCAM, captures the live sound of the violin and transforms it in a multitude of ways, controlling its diffusion through a series of loudspeakers placed around the hall" in the way envisioned by Boulez himself. See Goldman (2001), 160.

[170] By 1995, *Anthèmes 1* already established itself as part of the canonic twentieth-century solo violin repertoire, even presented side by side with Cage's Exercises in the common repertoire of violinists such as Irvine Arditti. See Deliège, Célestin, and Irène Deliège. "Pierre Boulez, initiateur de technologies, Professeur au collège de France." In *Cinquante Ans de Modernité Musicale: De Darmstadt*, edited by Célestin Deliège and Irène Deliège, 470-476. (Liège:Mardaga, 2003.), 726.

[171] The idea of wanting to 'thicken the sound' of an instrument by using live electronics is shared by many collaborators at IRCAM, including Philippe Leroux who talks about a *meta-instrument* when he states that: "First of all, the use of electronics gave me the possibility of creating new sounds... then as an extension of instrumental or orchestra timbre, an extension of possibilities of instruments or voices or instrumental gestures, or even of treating the sound. Also, as a fusion of instrumental and electronic timbre, they gave birth to hybrid instruments or meta-instruments (...)" See Yiorgos Vassilandonakis, and Philippe Leroux. "An Interview with Philippe Leroux." *Computer Music Journal* 32, no. 3, Synthesis, Spatialization, transcription, transformation (Fall, 2008): 21.

[172] Pierre Boulez and Andrew Gerzso are long time collaborators. They share the same vision of 'tape music,' which they declared irrelevant in 1988. They disliked that tape music limited the "give and take" a musician can desire with tempi. They also felt that tape music was ultimately disappointing audiences, whose preference was always to see a skilled musician actually play their instruments on stage. Consequently, they both invested time and resources in the development of live electronics. See Boulez (1988), 1-8.

comparing what the violin plays with the score stored in its memory. At the appropriate moments, the score follower triggers the electronic parts.

To create *Anthèmes 2*, Boulez and Gerzso conducted a series of experiments in order to establish which musical parameters (pitch, dynamic, time, etc.) could be altered. The effectiveness of certain effects inspired Boulez to expand certain sections of *Anthèmes 1* into *Anthèmes 2* to showcase both the violin virtuosity and the advanced technology. In Gerzso's words, the electronics fulfill three roles: to modify and extend the structure of the violin's sound, to modify and extend the rhythmical structure, and to create a spatial element that enables the musical material to be projected in space.[173]

5.2.1. Modifying and extending the structure of the violin's sound

Boulez's goal in *Anthèmes 2* was to push the violin beyond its human capacity—to explore, as Boulez puts it, both its "nakedness" and its extra-human possibilities, pushing the instrument beyond the limits of possible fingerings and bowings.[174] Jonathan Goldman, a prominent Boulez scholar, refers to this instrument—forged from the union of acoustics and electronics—as a "hyper-violin." From a compositional perspective, Boulez creates this hyper-violin by pairing specific violin techniques with certain electronic effects, the most prominent of which are: a *harmonizer* and a *frequency shifter.*[175]

The harmonizer enriches the sound spectrum of the violin by shifting the pitches produced by the violin up or down. The resultant pitches are then played in harmony with the original violin pitches. This process happens in real time, so there is virtually no delay between the violin and the harmonizer. [176] The harmonizer is effective when paired with

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[173] *Anthèmes 2*, Technical Manual, 10. See also: Goldman (2001), 120-125.

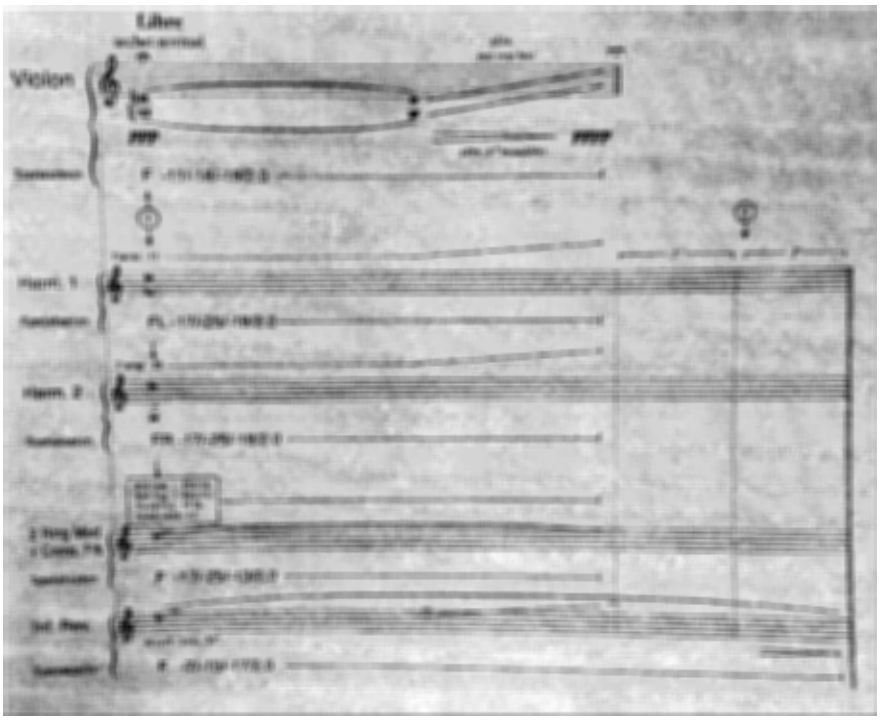
[174] See Goldman (2001), 125-126.

[175] See Goldman (2001), 120-121.

[176] Boulez compares the harmonizer to the petals of the violin chrysanthemum. See Goldman (2001), 120.

violin harmonics. Boulez exploits this relationship and uses sustained harmonics to divide sections of *Anthèmes 2*.[177]

The harmonizer creates two musical effects in *Anthèmes 2*: *heterophony* and *sound mass*.[178] Each effect is created by adding a certain number of notes at fixed intervals to the notes of the violin. Below, in Example 5.2.1.1, is an example of the notation of the harmonizer, as presented in Boulez's technical score.



Example 5.2.1.1: Boulez, *Anthèmes 2*, mm. 4

The *frequency shifter* differs from the harmonizer, relying on a mathematical formula instead of simple intervallic calculations. In his own description of the technique, Boulez states that "there is nothing overly scientific about this, it is just substituting one

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[177] Aside from clarifying the structure of the piece, these chant-like gestures convey a profound relationship with the nature of the piece itself, grounding its roots in old "anthems."

[178] See Giomi, Franceco, Damiano Meacci and Kilian Schwoon. "Live electronics in Luciano Berio's Music." *Computer Music Journal* 27, no. 2 (Summer, 2003), 34.

value for another."[179] In other words, it creates pitches that harmonize with the violin's part, like the harmonizer, but using a process based on frequencies (in Hertz) rather than intervals.[180] Due the nature of the process that the frequency shifter employs, the lower the violin plays, the greater the distant between the violin's pitch and the resulting frequency-shifted pitch. Boulez always pairs this process with pizzicato pitches in *Anthèmes 2*. He also modifies the pizzicato sections in terms of the rhythm, which refers to Gerzso's second category of electronic modifications.

5.2.2. Modifying and extending the rhythmical structure

Anthèmes 2's hyper-violin allows Boulez to write music that is physically impossible for a violinist in the world of acoustic music. In terms of the pizzicato section, this involves samples of pizzicato that are triggered by the score follower. The samples create an effect that is impossible for a single violinist to achieve—it is both louder and faster than a violinist can play. Mixed with the sound of the violin, however, the samples become a part of the violin itself. In this way, Boulez achieves his goal of pushing the violin beyond its usual range, and blurring the boundary between the electronic and the acoustic sound sources.[181] Here is an example of one of those sections (Example 5.2.2.1).

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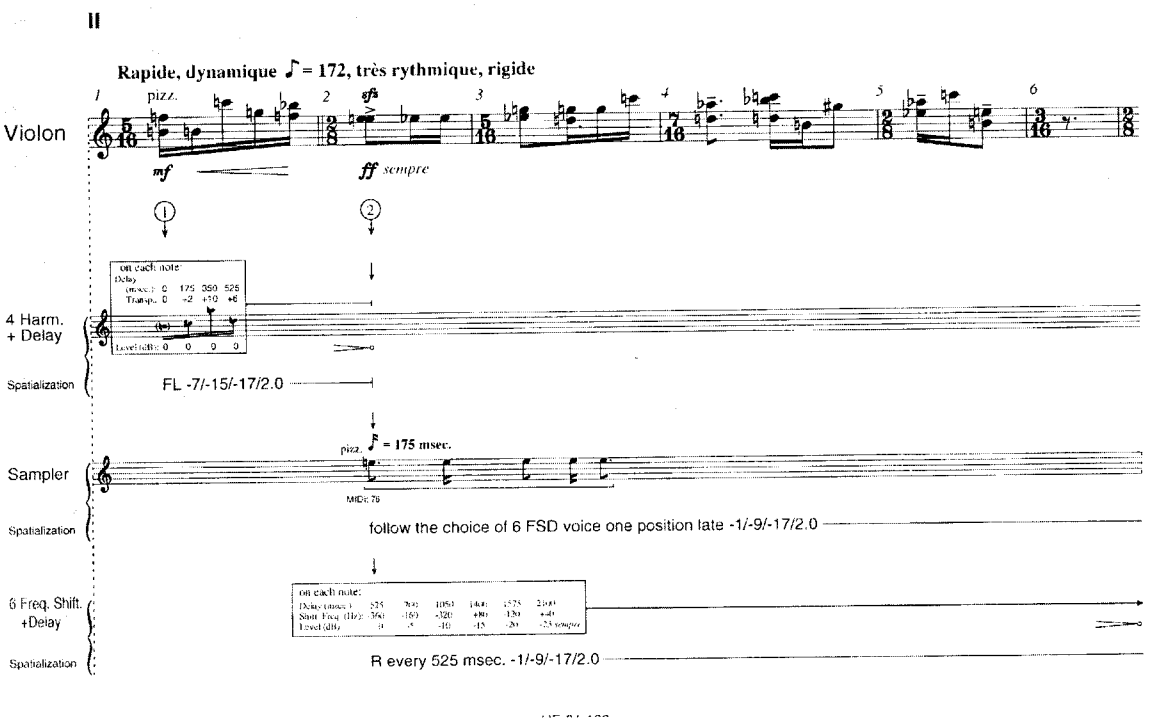
[179] Goldman (2001), 109.

[180] For more information, see Goldman (2001); Goldman (2011).

[181] Also interesting from a compositional perspective is the change the form of the pizzicato section underwent. Originally, in *Anthèmes 1*, the pizzicato section was build as a canon, depicting the idea of shifting a musical structure over time, in Boulez's very precise way. The addition of the transposition modules, combined with the delay modules, blur the original music line and create a new form of canon. For further discussion see Goldman (2001); Goldman (2011).



Example 5.2.2.1: Boulez, *Anthèmes 2*, section 2, mm. 1-6

5.2.3. Creating a spatial element

The final electronic process in *Anthèmes 2* is spatialization. Gerzso employed a new system for the piece based on a perceptual approach to spatial hearing.[182] He specified three parameters that could be affected by the spatialization. First, the direction of the source, that is to say where the sound is perceived to be coming from; second, the presence of the source, or whether the sound is perceived to be 'near' or 'far'; and lastly, the sense of the virtual room in which the source is projected. The spatialization is the last transformation the violin's sound undertakes, via the score-follower, before reaching

[182] In his previous works for instruments and live electronics, Boulez used "space" to articulate, outline and clarify the musical structure. In *Dialogue*, it articulated the musical phrase; in *Répons* it outlined a chord; and in ... *explosante-fixe*... it clarified a musical process. But throughout these manipulations of the sound, the audience could always hear the specific sound from the exact speaker it was projected from. *Anthèmes 2*'s new system allows a listener to hear the effect independently of where he sits or the amount of speakers used. For further discussion see Gerzso, 10.

an audience. This spatialization provides the hyper-violin with a distinct location, quantity, and quality.[183]

5.3 Playing the hyper-violin: performance issues for violinists

The electronic processes discussed above provide the performer with a unique sound world—the hyper-violin—but also create unique challenges. In particular, the live electronics result in three performance issues regarding tempo, bowings, and dynamics. Each of these issues relates to the score follower, the computerized technician responsible for triggering the different electronic processes. In many ways, the score follower feels like a musical partner that the performer learns to interact with,[184] much like a fellow member of a chamber ensemble. As with a fellow musician, a violinist performing *Anthèmes 2* must learn how to cue the score follower, so that it knows when to enter (i.e. initiate the different electronics). In the context of *Anthèmes 2*, this cueing is done with great accuracy in relationship to Boulez's score.

The first performance issue relates to tempo and the score follower. Boulez modified several tempo markings of *Anthèmes 1* to compose *Anthèmes 2*.[185] These tempo markings are vital for the interaction between the violinist and the score follower. For example, Boulez's tempo markings in section VI.2 must be respected in order to successfully cue the score follower, which triggers a duet. This exactitude limits a performer's rhythmic freedom and challenges a performer to develop a perfect and consistent sense of tempo. In other words, for this particular section of the work,

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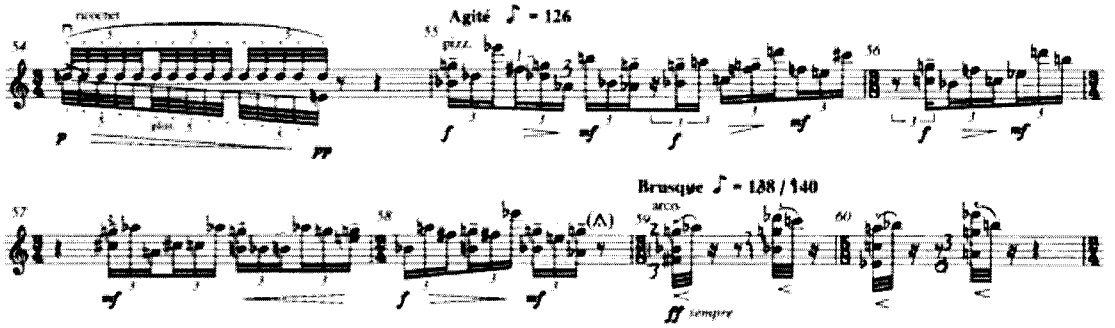
[183] *Anthèmes 2*, Technical Manual, 3.

[184] For the majority of electroacoustic composers, 'interactivity' refers to technology, which responds to input for a performer. However, performers usually described the 'interactivity' quite differently. They 'interact' with their instruments, with the composers and audiences, with the score, with prosthetic devices (microphones, loudspeakers, etc.) and with the score follower. See McNutt (2003), 297-304.

[185] Interestingly, from *Anthèmes 1* to *Anthèmes 2*, Boulez modified the metronome marking of these pizzicato sections. For example, in the pizzicato section (Section II), the tempo was reduced from 180=♩ to 172=♩. This diminution of tempo may be due to the fact the velocity desired is no longer obtained exclusively from the violinist, but rather from the combination of the violinist pizzicato and the electronics samples.

practicing with a metronome and developing an exact sense of tempo is vital to cue the score follower.

Boulez attempts to free a performer somewhat from these constraints by incorporating waiting times between the entries of the electronics, which are indicated with the sign: (Δ)* (Example 5.3.1).[186] Therefore, if a performer is slightly fast or slow, they can wait for the electronics to finish before initiating the next part of the duet.



Example 5.3.1: Boulez, *Anthèmes 2*, mm. 54-60

The second performance issue relates to bowings. Researchers at IRCAM have conducted experiments with wind instruments, such as the flute, which found that the score follower was 99% accurate. The score follower recognizes specific fingerings trigger certain keys or holes on wind instruments, and understands when to play its part. This type of consistency is not possible on the violin, because there is no finger position triggered by keys or holes as is the case with the clarinet or the flute. [187] Nevertheless, I have found a solution to help the score follower detect the input signal from the violin—the use of the original bowings and articulation prescribed by Boulez. These seem to affect the score follower, which was programmed to interact with the original performance at IRCAM. For instance, Example 5.3.2. shows a slower section where a violinist may be tempted to divide the long bowing into several bows to facilitate tone production.

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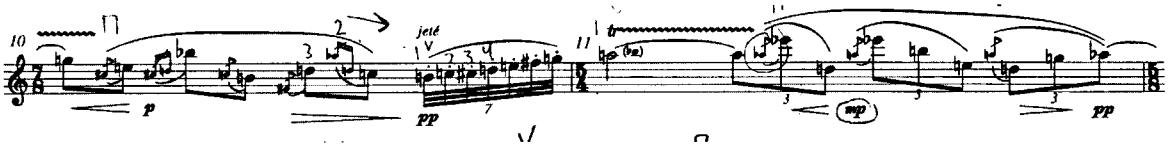
[186] "attendre avant de continuer, que les dérivations électroniques soient inies, mais enchaîner imédiatement après" Boulez, *Anthèmes 2*, 10.

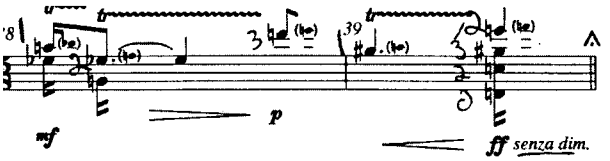
[187] Elizabeth McNutt studied interactivity between the score follower and the performer through flute repertoire. See McNutt (2003), 297-304.



Example 5.3.2: Boulez, *Anthèmes 2*, mm.10-11

Such a liberty is dangerous with the score follower, however, which relies on a cue from the performer. The score follower senses the impetus of bow changes, which are often imperceptible to the human ear.[188] Consequently, changing Boulez's original bowings might prevent the electronics from triggering the right effect at the right moment. Thus, a performer must balance the musical and the technical. In this case, this means performing Boulez's indicated groupings to convey the desired musical effect while technically utilizing the correct bowings to trigger the electronics.

The final performance issue regarding the score follower relates to dynamics. To put it simply, the score follower reacts to large dynamic contrasts. It seems Boulez was aware of this technological parameter and composed *Anthèmes 2* with a range of dynamics easily recognized by the score follower. Therefore, as a performer, it is important to capture Boulez's indicated range of dynamics, which take on a dual role, as both an element of the composition itself and a means of communication with the electronics part (Example 5.3.3).



Example 5.3.3 Example of important dynamics that trigger the electronics, Boulez, *Anthèmes 2* mm. 38-39

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[188] A few years after *Anthèmes 2* was composed, researches on the "hyperbow" were conducted. Aware that violin repertoire and technique required extremely subtle and sophisticated coordination of gestures, scientists tried to offer performers a new way to enable violinists to view, inspect, and exploit the subtlety of their bowing. For further information on the hyperbow controller, see: Diana Young, "The Hyperbow Controller: Real-Time Dynamics Measurement of Violin Performance,1" *Conference on New Instruments for Musical Expression* (NIME-02), Dublin, Ireland (May 24-26, 2002): 1-6. A more recent series of experimentations, led by Mari Kimura, a violinist, had to main purpose to demystify all kinds of signals of dynamics bowings in order to increase the score follower sensitivity. The team of researchers also wanted to make the system more "user-friendly." Kimura says that "with other systems, you have to modify your playing to accommodate the hardware, but this system honors the violin." For more information, see: Greg Olwell, "Making Computers More Interactive for 21st-century String Players," *Strings* (October 2011): 62.

Aside from the performance issues that arise from electronics, they also take on an organic role in the composition. In fact, they grow directly out of Boulez's vision for *Anthèmes 1*. To get a sense of this growth and this organic relationship, we can refer to the chart below (Figure 5.3.4), which illustrates the electronic effects paired with different violin techniques. Each of these techniques appears in *Anthèmes 1* and *Anthèmes 2* as a musical gesture, distinct from other gestures in the work, and tied to the musical language of the works. By expanding the core sections *Anthèmes 1* for *Anthèmes 2*, Boulez gives extra meaning to each of these musical gestures.[189]

Type of Material	Sound Processing
Jeté septuplets	Frequency shifting
Trill groups	Harmonizer
Long notes in harmonics	Ring modulation, harmonizer, infinite reverb
Pizzicato notes	Spatializer
Passages marked 'irrégulier'; nervous bowings	Randomly triggered samples
Triple stops surmounted by trills	Infinite reverb
Trills preceded by letago appoggiatura	Sampled violin sounds in antiphony

Figure 5.3.4: Types of Material and their respective sound processing as found in Boulez's *Anthèmes 2*

This pairing expands the musical world of *Anthèmes 1* and extends it into the realm of the hyper-violin. From a performance standpoint, a violinist learns to expect the united sound of acoustics and electronics. In some sense, the violinist *becomes* the hyper-violin, entering the blurred world of acoustics and electronics that Boulez hoped to achieve. For example, in the section VI.2 (see Figure 5.3.1), the four gestures of *Anthèmes 1* are depicted: the *calme et régulier* ricochet, the *agité* pizzicato, the *brusque* arco chords and the *calme et retenu* arpegiated pizzicato. These four gestures contrast with one another, both in dynamics and electronic effect. The electronics enhance these

[189] Goldman (2011), 170.

contrasting characters and shape the form of the section. As a performer, you learn to hear and understand these gestures as the product of the hyper-violin. So much so, that practicing the piece without the electronics feels like practicing a sonata without your fellow musician.

Boulez's *Anthèmes 2* is a unique work in many ways—it pushes the boundaries of live electronic performance, it exemplifies Boulez's late musical style, and it presents a performer with distinctive challenges. For all its originality, however, I am tempted to call on Baillot one last time and offer my advice for approaching this type of repertoire. Recall that Baillot's methodology involves a simple, three-step mode of practice: understand the technique, practice the technique, and finally, apply it to a piece of music. This simple method still works today and is perfect for Boulez's *Anthèmes 2*. In the spirit of Baillot, I viewed the electronic issues discussed above as new violin techniques that I must first understand. I developed exercises, and even drew from some of Baillot's etudes, to practice these techniques until they were mastered. Finally, I applied these techniques to my performance of *Anthèmes 2* on Boulez's very own hyper-violin.

Conclusion

I penned this study with the goal of reassessing Baillot's *L'art du violon* by demonstrating how the French tradition of violin playing that was developed at the Paris Conservatoire has become an integral part of how and what we play today. Baillot's method is unique in this sense, crossing culture, time and place. Consequently, his discussions, examples and etudes are still relevant for modern violinists striving to better their technique and understand the mechanism of violin playing. Indeed, it is my belief that modern violinists can gain immensely from the study of Baillot's treatise, and will continue to do so for years to come.

In the specific case of Boulez, this study has contextualized his work in terms of the French Tradition. *Anthèmes 1* and *2* set the violin within a dense Boulezian language,[190] and place the works firmly in the twentieth century. As a performer, however, I was interested in the practical aspect of the performance and mechanics of the pieces: in *Anthèmes 1*, I considered the technical issues of his violin writing, while in *Anthèmes 2*, I considered how to assess, understand and solve technological issues that lack clear solutions in terms of Baillot's *L'art du violon.*

From this research grew two fruitful avenues for continued exploration: expressivity and technology. The first of these was an important issue in Baillot's day as well. In the second half of *L'art du violon*, Baillot presents guidelines for violin playing

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[190] At the premiere of *Anthèmes 2*, Boulez said that "Il y a quelque chose de théâtral aussi dans cette pièce, non pas au sens où la violoniste va faire des pieds et des mains ou jouera sur la tête, mais au sens où il y a ici une dramatisation de la pièce, surtout dans le rapport qu'elle a avec quelque chose sur lequel elle n'a aucun contrôle." Goldman (2001), 118.

in terms of expressivity. He explains that the mechanism of violin playing can be altered through time, especially with the advancement of the violin's construction, but that expression's goal—to render with exactitude what has been composed in a given system—remains the same through time.[191] He codifies six elements of expression, all relating to the realization of a composer's vision: sound quality, movement, style, taste, precision and genius of execution.[192]

Dealing with musical expression through language and writing is difficult even today, and Baillot's notions of expression pose more questions than answers. To begin with, what do Baillot's ideas of expression sound like? Due to a lack of recordings from the time, we will never have a concrete point of reference for Baillot's descriptions, which poses many challenges for a contemporary reader. Another question arises as well: how do we contextualize Baillot's discussion of expression today? Should it be placed in the realm of historical performance, or as Baillot put it, does expression remain the same through time? These are difficult questions, and there are multiple ways to answer them. To begin with, one might assess Baillot's notions of expression based on the few recordings we have from the end of the nineteenth century by comparing these recordings with his poetic descriptions. Another approach might be to examine other literature from his time that deals with musical expression, such as Mathis Lussy's, *Traité de l'expression musicale: Accents, nuances et mouvements dans la musique vocale et instrumentale* (1874). This comparative approach might shed light on specific aspects of Baillot's description of expression, or clarify areas of his discussion that are difficult to parse.

What I find intriguing is how Baillot's notions of expression might relate to his methodology and technique. Did Baillot approach violin technique with the ultimate goal of achieving his desired expressive effect? Or was expression an extra step, one that could sometimes interfere with or even trump technique? In what ways did this

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[191] "Le temps peut apporter des changements à quelques parties du mécanisme et peut offrir des moyens de le simplifier ou de l'enrichir mais l'expression a pour but de rendre avec justesse ce qui a été composé dans un système donné (...)." Baillot (1835), 268.

[192] See Baillot (1835), 268-276.

relationship between technique and expression affect his teaching? Certainly, there must have been some variance between his written methodology and the way he taught in person, but how much? All of these questions are fraught with difficulty, but they would serve as excellent starting points for future research.

Another avenue for further study is technology, specifically the score-follower. Technicians at IRCAM continue to strive to make the program easier to use and more accurate, but limited availability of recordings and statistics present difficulties.[193] From a performer's perspective, we prefer to limit extra elements, such as technology, that might inhibit the effectiveness of practice and rehearsals.[194] From a composer's perspective, there is a constant desire to create works that can be easily repeated. Composers do not normally want to add unnecessary technological components to a set-up that is already not easily portable.

All of these considerations add constraints to ongoing research into technology such as the score-follower. To overcome these challenges, IRCAM and similar institutions may need to find a better balance between composer, technician, and performer. This *trichotomy* has been somewhat neglected, with the majority of focus placed on the relationship between composers and technicians. It was with this spirit that I approached part five of the current study, but future work in this field from the performer's standpoint will continue to benefit the constantly evolving field of music and technology.

From Baillot to Boulez, we have covered 200 years and yet in many ways remained in the same place. This is not due to a lack of innovation, or a stale musical environment, but rather the strength of Baillot's method—a method written not as a violin technician, but as a musician. Even for those violinists who have never heard his name, Baillot guides their bows everyday, both on and off the stage.

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[193] Even in 2014, only two recordings of *Anthèmes 2*, both by Hae-Sun Kang, who premiered the work, are available. See *Boulez- Sur Incises & Anthèmes II* on Deutsche Grammophon, 2000; a live performance by Hae-Sun Kang is also available on *Donaueschinger Musiktage 1997*, Col Legno, 1999.

[194] See Arshia Cont, *Improvement of Observation Modeling for Score Following* (PhD diss., Université Pierre et Marie Curie, 2004): 42-49.

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