

# **An AI-Assisted Study on the Vibrato of the French Flute School Based Upon Philippe Gaubert's 1919-1920 Recordings**

Dan GUO, Kyle FYR, and Sha YU

## **Abstract**

This study investigates the conception and application of vibrato within the French Flute School, specifically examining the pedagogical approaches detailed in the Taffanel-Gaubert Method (1923) in conjunction with Philippe Gaubert's historical recordings. After the death of Paul Taffanel, the founder of the French Flute School, Gaubert edited and co-authored the Taffanel-Gaubert Method, which remains popular and prevalently used even today. Through Gaubert's extensive recordings, performance practices of his era can now be accessed to illuminate the aesthetic principles. By juxtaposing Gaubert's recordings against recordings of flutists from the American and British Flute Schools, the authors focus on how vibrato is used as an expressive tool and how the method of the French Flute School has influenced their counterparts in US and UK. The analysis reveals that Gaubert did not oppose to the use of vibrato, but he was definitely against its misuse or its excess. Notably, the musical instruction "espressif" in the scores frequently correlates with sustained application of vibrato in Gaubert's performance. Furthermore, Gaubert's refined application of vibrato based on musical setting contributed to a distinctive personal style. Utilizing artificial intelligence tools, this study conducts quantitative analyses and visualizations of vibrato passages in Gaubert's diverse musical repertoire, thereby approximating the aesthetic underpinnings of his approach. These findings underscore that vibrato in the French Flute School transcends mere technical execution but embodies a fundamental aspect of artistic musical expression.

**Keywords:** French Flute School, vibrato, Philippe Gaubert, Paul Taffanel, early twentieth-century recordings

# 依據戈貝爾 1919 至 1920 年的錄音 以人工智慧輔助 研究法國長笛學派的抖音演奏

郭丹、凱爾·費樂、喻莎

## 摘 要

本文依據戈貝爾的歷史錄音檢驗《塔法內爾－戈貝爾教材》(1923)提供的教學方法,藉以研究法國長笛學派的抖音演奏。法國長笛學派創始人塔法內爾辭世後,戈貝爾擴充其遺稿編成《塔法內爾－戈貝爾教材》,該教材至今仍獲廣泛使用。戈貝爾留下的大量錄音,有效地增進了我們對該時代表演實踐與美學原則的理解。透過分析戈貝爾的錄音及來自美國和英國長笛學派的錄音,作者探究抖音作為表現工具的使用方式,並驗證法國長笛學派的抖音演奏如何對美國和英國的演奏家產生影響。分析顯示戈貝爾反對的不是抖音本身,而是其誤用與濫用。研究亦發現,每當樂譜上標註「富表現力」,戈貝爾就會以連續抖音來詮釋。此外,戈貝爾會依據特定音樂需求調整抖音的運用,藉此展現獨特的個人風格。本研究利用人工智慧工具對戈貝爾在不同音樂情境中的抖音使用進行量化分析和視覺化,藉以增強音樂分析的美學基礎。研究結果顯示,抖音不僅是技巧的展現,更是法國長笛學派音樂表現的核心要素。

**關鍵詞：**法國長笛學派、抖音、戈貝爾、塔法內爾、二十世紀早期錄音

# 1. The French Flute School and Vibrato

The mid-nineteenth century was a very important period for the French Flute School. It was during this period that Theobald Boehm (1794-1881) revolutionized the flute's key system and designed a new metal tube, the use of which soon spread to Paris.<sup>1</sup> During this period, chamber music for woodwind instruments was less prominent than chamber music for strings and piano.<sup>2</sup> For this reason, Paul Taffanel (1844-1908), the founder of the French Flute School,<sup>3</sup> founded the Société de Musique de Chambre pour Instruments à Vent (Chamber Music Society for Wind Instruments) in 1878, making the wind instrument works of eighteenth-century composers such as Bach, Mozart and Beethoven popular again.<sup>4</sup> From this point on, chamber music for woodwind instruments began to assume greater prominence in France.<sup>5</sup> The French Flute School included Taffanel and his successors, such as Georges Barrère (1876-1944), Adolphe Hennebains (1862-1914), Philippe Gaubert (1879-1941), Louis Fleury (1878-1926), Marcel Moyse (1889-1984), René Le Roy (1898-1985), and others.<sup>6</sup> The School represented a pedagogical and performance approach to the flute that emerged in the early twentieth century under the guidance of Taffanel and his disciples at the Paris Conservatory.<sup>7</sup>

After the end of the Franco-Prussian War in 1871, France attached increasing importance to developing cultural elements with distinct national characteristics.<sup>8</sup> In this historical context, in response to the rapid development of Parisian society and

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<sup>1</sup> Ardal Powell, *The Flute* (New Haven, CT: Yale University Press, 2002), 170-176.

<sup>2</sup> Edward Blakeman, *Taffanel: Genius of the Flute* (New York: Oxford University Press, 2005), 67.

<sup>3</sup> Claude Dorgeuille, *L'école française de flûte* (Paris: Éditions Actualité freudienne, 1994), 15.

<sup>4</sup> Blakeman, *Taffanel*, 67, 70.

<sup>5</sup> Blakeman, *Taffanel*, 94.

<sup>6</sup> Dorgeuille, *L'école française de flûte*, 17-45.

<sup>7</sup> Powell, *The Flute*, 208.

<sup>8</sup> Jessica Ann Raposo, "Defining the British Flute School: A Study of British Flute Performance Practice 1890-1940" (DMA diss., University of British Columbia, 2007), 8.

technology, Taffanel encouraged composers to write for the new metal flute.<sup>9</sup> This type of flute was first officially adopted in 1860 by Taffanel's mentor Louis Dorus (1812-1896) at the Paris Conservatory because of its advances in fingering, intonation, and pure light tone.<sup>10</sup> Since the time of Taffanel, the examination repertoire at the Paris Conservatory consisted predominantly of contemporary compositions by various French composers and was not limited to the flute professor's own works.<sup>11</sup> Notable composers who wrote music for the new flute included Taffanel, Gaubert, Gabriel Fauré (1845-1924), Cécile Chaminade (1857-1944), Louis Ganne (1862-1923), Henri Büsser (1872-1973), and Georges Enesco (1881-1955).<sup>12</sup> This sequence of events solidified the development of the new flute into the emblem of the French Flute School.

As a successor to Taffanel, Gaubert edited and published the influential *Méthode Complète de Flûte*.<sup>13</sup> This book, hereafter referred to as the "Taffanel-Gaubert Method", was based on the work of Taffanel, who entrusted his teaching materials to Gaubert a few weeks before his death in 1908.<sup>14</sup> Gaubert then adapted and published it in 1923.<sup>15</sup>

In addition to the Taffanel-Gaubert Method, historical recordings also provide important evidence for understanding the performance style of the French Flute School. Although there are no recordings of the founder of the school, Taffanel, it is

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<sup>9</sup> Raposo, "Defining the British Flute School," 8; Erinn E. Frechette, "The Pedagogy of Walfred Kujala: The American Flute School and Its Roots in the French Flute School of the Late Nineteenth Century" (DMA diss., University of Cincinnati, 2017), 27.

<sup>10</sup> Fabiana Magrinelli Rocha Dahmer, "The Influences of the French Flute School on Brazilian Flute Pedagogy" (DMA diss., University of Southern Mississippi, 2017), 6; Nancy Toff, *The Flute Book: A Complete Guide for Students and Performers*, 3rd ed. (New York: Oxford University Press, 2012), 101.

<sup>11</sup> Dorothy Glick, "Paul Taffanel and the Construction of the French Flute School" (master's thesis, University of Kansas, 2014), 75.

<sup>12</sup> Glick, "Paul Taffanel," 76.

<sup>13</sup> Paul Taffanel and Philippe Gaubert, *Méthode Complète de Flûte* (Paris: Alphonse Leduc, 1923).

<sup>14</sup> Penelope Ann Peterson Fischer, "Philippe Gaubert (1879-1941): His Life and Contributions as Flutist, Editor, Teacher, Conductor, and Composer" (DMA diss., University of Maryland, 1982), 116.

<sup>15</sup> Taffanel and Gaubert, Preface to *Méthode Complète de Flûte*, vii-viii.

possible to interpret the performance style of the French Flute School, especially in the use of vibrato, by analyzing recordings of Taffanel's disciples, such as Gaubert, who was considered to be Taffanel's direct successor in flute performance.<sup>16</sup> In France, at the dawn of the twentieth century, the integration of vibrato with sound quality became an important aspect of flute performance.<sup>17</sup> A primary purpose of vibrato is to enliven the tone.<sup>18</sup> Therefore, analyzing Gaubert's vibrato is a very useful way of illustrating the performance style of the French Flute School.

The French Flute School also influences performance styles in the United States and the United Kingdom. In 1919, following Gaubert's appointment to the Paris Conservatory, Gaubert asked Moyse to be his assistant.<sup>19</sup> Similarly, Barrère started a flute career and disseminated the French Flute School performance style in the United States, becoming an important figure in shaping the direction of American flute performance.<sup>20</sup> His student, William Kincaid (1895-1967), is considered the father of the American Flute School.<sup>21</sup> Within the British School, there was a distinction between the traditional style that did not use vibrato and the style that developed under the influence of the French Flute School and incorporated vibrato.<sup>22</sup> The German School closely resembled to the British one,<sup>23</sup> and flute performance in Berlin, Vienna, and Milan before World War II lacked vibrato.<sup>24</sup> Therefore, understanding the American and British Schools, both of which embraced vibrato

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<sup>16</sup> Blakeman, *Taffanel*, 142.

<sup>17</sup> Maria Bania, "Sweetenings" and "Babylonish Gabble": *Flute Vibrato and Articulation of Fast Passages in the 18th and 19th Centuries* (Gothenburg: ArtMonitor, 2008), 115.

<sup>18</sup> Michel Debost, *The Simple Flute: From A to Z* (New York: Oxford University Press, 2002), 261.

<sup>19</sup> Sarah Kate Gearheart, "Exploring the French Flute School in North America: An Examination of the Pedagogical Materials of Georges Barrère, Marcel Moyse, and René Le Roy" (DMA diss., Louisiana State University, 2011), 18.

<sup>20</sup> Gearheart, "Exploring the French Flute School," 15.

<sup>21</sup> Frechette, "The Pedagogy of Walfrid Kujala," ii.

<sup>22</sup> Robert Philip, *Early Recordings and Musical Style: Changing Tastes in Instrumental Performance, 1900-1950* (Cambridge: Cambridge University Press, 1992), 116.

<sup>23</sup> Raposo, "Defining the British Flute School," 40.

<sup>24</sup> Philip, *Early Recordings and Musical Style*, 118.

after being influenced by the French one, is necessary to comprehend the uniqueness of the French Flute School.

The primary objective of this study is to elucidate the existing ambiguities in the application of vibrato as advocated by the Taffanel-Gaubert Method. This endeavor is undertaken to contextualize the French Flute School's approach to the use of vibrato in various types of compositions, based on Gaubert's recordings. We also employ artificial intelligence tools to analyze the use of vibrato in Gaubert's performance style. This analysis seeks to elucidate the French Flute School's approach to vibrato from a historical performance perspective. In addition, by comparing the characteristics of vibrato in Gaubert's works with those in selected recordings of the British and American Flute Schools, we explore the unique features of the French Flute School.

## 2. Methodology

This study first examines the discussions of vibrato in the Taffanel-Gaubert Method to clarify Taffanel and Gaubert's views on vibrato usage. Then, we analyze Gaubert's historical recordings to explore the influence of the French Flute School on the British and American Flute Schools, thereby highlighting the distinctive approach of the French Flute School. With the aid of artificial-intelligence-based signal processing and visualization methods, the style and characteristics of vibrato usage in the historical recordings were quantitatively measured and then graphically visualized. Specifically, this study employed the following two steps to achieve the quantitative analysis of the vibrato-usage percentage in each piece.

The first step involved using a machine-learning-based signal decomposition technique to extract the flute signal from the original recordings. Since no existing method could separate flute and piano signals effectively for this historical music study, an artificial-intelligence tool called Spleeter was employed,<sup>25</sup> which relies on typical machine-learning modules: training and inference. At the Spleeter training

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<sup>25</sup> "Spleeter," *Deezer*, GitHub, accessed January 20, 2024, <https://github.com/deezer/spleeter>.

module, flute and piano recordings were used to teach Spleeter to separate the flute/piano signals.<sup>26</sup> Specifically, three datasets were prepared: six hours each of piano solo,<sup>27</sup> flute solo,<sup>28</sup> and mixed piano-flute recordings. Through machine-learning training, Spleeter learns to transform mixed signals into single-instrument signals, mimicking the human ear's ability to hear multi-instrument sounds and simultaneously distinguish specific instrumental sounds. At the Spleeter inference module, Gaubert's recordings were fed into Spleeter to output separate flute signals.

In the second step, vibrato statistics from each flute signal were mathematically measured, and then visually analyzed using a wave visualization tool, Sonic Visualiser.<sup>29</sup> The tool in Sonic Visualiser enables precise temporal selection of vibrato cycles via spectrograms, displaying the exact duration of the selected segment.<sup>30</sup> Data such as vibrato cycles per second, minimum, maximum, and average vibrato statistics, can then be calculated. Since vibrato does not occur on every note, focusing on notes with vibrato is crucial when calculating an average vibrato. Given that only discrete vibrato metrics can be extracted from the recordings, converting these discrete points into a continuous waveform signal is

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<sup>26</sup> Romain Hennequin et al., "Spleeter: A Fast and Efficient Music Source Separation Tool with Pre-trained Models," *The Journal of Open Source Software* 5, no. 50 (2020): 2154, <https://doi.org/10.21105/joss.02154>.

<sup>27</sup> Wilhelm Kempff, pianist, *Beethoven: The 32 Piano Sonatas*, recorded 1964-1965, Deutsche Grammophon 00289 477 7958, 2008, 8 CDs.

<sup>28</sup> Claudio Ferrarini, flutist, *Friedrich Kuhlau: The Full Work for Solo Flute*, Arte Sonora, 2020, Digital Album; Hiroaki Kanda, flutist, *Giuseppe Gariboldi: Études Mignonnes Op.131*, B-Music BMCD-1030, 2016, CD; Motoaki Kato, flutist, *Ernesto Koehler: 35 Exercises for Flute Op.33*, Nami Records WWCC-7226/7, 1993, 2 CDs; Jean-Pierre Rampal, flutist, *Telemann: Twelve Fantasies for Flute Solo*, recorded 1972, Denon COCO-73082, 2010, CD; Marieke Schneemann, flutist, *Eugène Bozza: Complete Works for Solo Flute*, recorded 2016-2018, Brilliant Classics 95434, 2018, CD; Laura Trapani, flutist, *Saverio Mercadante: Music for Solo Flute*, recorded 2022, Brilliant Classics 96511, 2023, CD.

<sup>29</sup> Nicholas Cook and Daniel Leech-Wilkinson, "A Musicologist's Guide to Sonic Visualiser," Centre for the History and Analysis of Recorded Music, accessed January 20, 2024, [https://charm.rhul.ac.uk/analysing/p9\\_1.html](https://charm.rhul.ac.uk/analysing/p9_1.html).

<sup>30</sup> Frithjof Vollmer, "Preparing Spectrograms in Sonic Visualiser: Measuring Time-Sensitive and Frequency-Sensitive Performance Elements," in *Softwaregestützte Interpretationsforschung: Grundsätze, Desiderate und Grenzen*, ed. Julian Caskel, Frithjof Vollmer, and Thomas Wozonig (Würzburg: Königshausen & Neumann, 2023), 117.

essential. This transformation is achieved through curve fitting, a mathematical technique for signal processing,<sup>31</sup> which can be realized using the `curve_fit` function in the Python library SciPy.<sup>32</sup>

### 3. Vibrato Discussion

In the nineteenth century, almost all flutists employed vibrato.<sup>33</sup> The style of the French Flute School, which originated with Taffanel and introduced the new metal flute in the mid-nineteenth century, was also characterized by the use of vibrato.<sup>34</sup> In the twentieth century, the use of vibrato in flute performance became a prominent development.<sup>35</sup> Robert Philip asserts that the French Flute School progressively used an increasingly rapid vibrato, with vibrato in the early twentieth century treated as an embellishment or ornament, while vibrato in the late twentieth century became increasingly used as a way of enhancing tone.<sup>36</sup> The Taffanel-Gaubert Method features discussions of the use of vibrato; however, there is some controversy about their views on this point. In the compositions of Bach and other renowned classical composers, the Taffanel-Gaubert Method emphasized that vibrato should be avoided in order to preserve the simplicity and purity of the music, as vibrato or bleating would undermine the music and could quickly fatigue the ears of sensitive listeners.<sup>37</sup> Based on this information, many authors have suggested that

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<sup>31</sup> Paul Fearnhead, “Exact Bayesian Curve Fitting and Signal Segmentation,” *IEEE Transactions on Signal Processing* 53, no. 6 (June 2005): 2163, <https://doi.org/10.1109/TSP.2005.847844>.

<sup>32</sup> “`curve_fit`,” SciPy, accessed February 1, 2024, [https://docs.scipy.org/doc/scipy-1.13.0/reference/generated/scipy.optimize.curve\\_fit.html](https://docs.scipy.org/doc/scipy-1.13.0/reference/generated/scipy.optimize.curve_fit.html).

<sup>33</sup> Jochen Gärtner, *The Vibrato, with Particular Consideration Given to the Situation of the Flutist: Historical Development, New Physiological Discoveries, and Presentation of an Integrated Method of Instruction* (Regensburg: Gustav Bosse Verlag, 1981), 39.

<sup>34</sup> Glick, “Paul Taffanel,” iii.

<sup>35</sup> Rachel Lynn Waddell, “Marcel Moyse Between Two Centuries: Examining Early Twentieth-Century French Flute Performance Practice Through Recordings” (DMA diss., University of Nebraska–Lincoln, 2002), 108.

<sup>36</sup> Philip, *Early Recordings and Musical Style*, 103.

<sup>37</sup> Paul Taffanel and Philippe Gaubert, “De la façon d’interpréter: L’adagio de la 1<sup>re</sup> sonate



Taffanel and Gaubert held a strict and negative attitude toward the use of vibrato.<sup>38</sup> However, such a conclusion overlooks some important contextual limitations.

A crucial observation emerges when closely examining the original text of the Taffanel-Gaubert Method, specifically in the section addressing the interpretation of the Adagio of Bach's Flute Sonata in B minor, BWV 1030. It becomes apparent from the original text that the Taffanel-Gaubert Method's restriction on vibrato is subject to specific conditions:

With Bach, as with all the great classical masters, the performer must observe the most rigorous simplicity. Therefore, there should be absolutely no vibrato or quavering, an artifice that should left to mediocre instrumentalists, to inferior musicians.<sup>39</sup>

This perspective was articulated in the context of interpreting Bach's compositions, and it should not therefore be concluded that Taffanel and Gaubert totally forbid vibrato.

According to Fleury, a student of Taffanel, French flutists tended to use vibrato in a relatively vague and less rigorous manner, rather than pursuing a highly precise and explicit vibrato technique.<sup>40</sup> This type of vibrato was light and almost imperceptible, as stated by Taffanel.<sup>41</sup> Also, Taffanel openly discussed the use of vibrato as a means of expression with his students.<sup>42</sup> Regarding the practice of vibrato, Fleury posited that the vibrato ought to be acquired with aesthetic

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(en si mineur) de J. S. Bach," in *Méthode Complète de Flûte*, 177.

<sup>38</sup> Deborah R. Ribelin, "An Overview of Pedagogical Techniques of Vibrato for the Flute" (master's thesis, Columbus College, 1987), 74; Demetra Baferos Fair, "Flutists' Family Tree: In Search of the American Flute School" (DMA diss., Ohio State University, 2003), 26; Gärtner, *The Vibrato*, 39; Glick, "Paul Taffanel," 82; Philip, *Early Recordings and Musical Style*, 111; Raposo, "Defining the British Flute School," 71; Toff, *The Flute Book*, 113.

<sup>39</sup> Taffanel and Gaubert, "De la façon d'interpréter," 177. The English translation from the French is by the authors.

<sup>40</sup> Gärtner, *The Vibrato*, 40.

<sup>41</sup> Toff, *The Flute Book*, 113.

<sup>42</sup> Eloise Kendall, "An Exploration of Tone and Vibrato on the Flute in Relation to the French Flute School of the Early Twentieth Century" (master's thesis, University of Gothenburg, 2017), 7.

discernment and the intelligent collection of experience rather than precise rules.<sup>43</sup> René Le Roy also posited that the acquisition of an effective vibrato depended on first having a perfectly stable tone without vibrato.<sup>44</sup> Believing it to be an inherent and instinctive technique, Taffanel, Gaubert and Barrère held the view that vibrato should be acquired naturally rather than formally studied.<sup>45</sup>

Rather than saying that Taffanel and Gaubert opposed the use of vibrato, it would seem more appropriate to say that they were against the abuse of vibrato. This view is further supported by the fact that their disciple Moyse approached vibrato in two distinct manners. On the one hand, Moyse pointed out that vibrato was overused at the time<sup>46</sup> and likened its impact to that of severe diseases such as cholera.<sup>47</sup> On the other hand, Moyse advocated a more positive perspective, a subtle, natural vibrato technique that served to enhance rather than dominate the sound of the flute, thereby bringing out its most melodious qualities.<sup>48</sup> Moyse's widely divergent views show that he is not directly opposed to vibrato itself, but to its improper use.

Although Taffanel and Gaubert did not delve into the precise definition of vibrato in the Method, they used three musical terms to describe the sound oscillations: "tremblement", "vibrato", and "chevrotement".<sup>49</sup> According to Johann Joachim Quantz (1697-1773), tremblement includes chevrottement, a very rapid shake with little effect, similar to a slow shake that appeared in French singing.<sup>50</sup> According to Toff, vibrato is a naturally occurring shake, and chevrottement is a taught vibrato.<sup>51</sup>

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<sup>43</sup> Gärtner, *The Vibrato*, 40.

<sup>44</sup> Dorgeuille, *L'école française de flûte*, 123.

<sup>45</sup> Toff, *The Flute Book*, 109.

<sup>46</sup> Toff, *The Flute Book*, 114.

<sup>47</sup> Trevor Wye, *Marcel Moyse: Un homme extraordinaire* (Paris: Alphonse Leduc, 1993), 26.

<sup>48</sup> Wye, *Marcel Moyse*, 26.

<sup>49</sup> Taffanel and Gaubert, "De la façon d'interpréter," 177.

<sup>50</sup> Johann Joachim Quantz, *Versuch einer Anweisung die Flöte traversiere zu spielen* (Berlin: Johann Friedrich Voß, 1752), trans. Edward R. Reilly as *On Playing the Flute* (London: Faber & Faber, 2011), 101.

<sup>51</sup> Toff, *The Flute Book*, 110.

In the annotated score of Bach's sonata, it is clear from the text descriptions of Taffanel and Gaubert that the term "tremblement" on the score corresponds to the term "vibrato" or "chevrotement" (bleating sound caused by tense larynx) in the body text (see Example 1). When encountering the phrase "sans aucun tremblement" (without any shake), particularly at the beginning of a descending scale,<sup>52</sup> the authors want to use it as an instruction to let the sound descend naturally without introducing any additional nuances.

**Example 1.** Taffanel and Gaubert, "De la façon d'interpréter," 177, bars 15-16 and first three lines of the body text.

The image shows a musical score snippet in G major, starting with a forte (f) dynamic and a piano (p) dynamic. The score includes the instruction "Elargir le son, diminuer à la fin de la mesure" and "Laisser tomber le son - finir sans nuances et sans aucun tremblement dans le son - avec une grande simplicité." The text below the score explains that in Bach's music, the performer should observe the simplest approach, avoiding vibrato or chevrotement, which are considered artifices for inferior musicians. The text states: "Chez Bach, comme chez tous les grands maîtres classiques, l'exécutant doit observer la plus rigoureuse simplicité. On s'y interdira donc absolument le vibrato ou chevrotement, artifice qu'il faut laisser aux instrumentistes médiocres, aux musiciens inférieurs. La sonorité est la cause évocatrice de l'émotion musicale, ou, si l'on veut, l'agent".

Within the œuvre of Georges Hüe, Taffanel and Gaubert emphasized the necessity for breath support by annotating "sans tremblement" (without shake) in the lower register towards the ending phrase, accompanied by a long phrase within a pianissimo dynamic passage (Example 2). However, Taffanel and Gaubert annotated "très expressif" (very expressive) at bars 16 and 62, contrasting with the subsequent marking of "sans tremblement", despite the composer already marked "espressivo" three times in the score, at bars 46, 62, and 120.<sup>53</sup> Furthermore, Taffanel seemed to consider "expression" as a slight vibration in the tone for shaping the phrase.<sup>54</sup> These annotations indirectly support the idea that "expression" and "vibrato" can be interchangeable within French-style flutists.<sup>55</sup>

<sup>52</sup> Taffanel and Gaubert, "De la façon d'interpréter," 177.

<sup>53</sup> Paul Taffanel and Philippe Gaubert, "Nocturne (pour Flûte et Orchestre) de Georges Hüe," in *Méthode Complète de Flûte*, 186-187.

<sup>54</sup> Raposo, "Defining the British Flute School," 88.

<sup>55</sup> Raposo, "Defining the British Flute School," 70. This argument will also be identified in the next section, "4. Recording Analysis".

**Example 2.** Taffanel and Gaubert, “Nocturne,” 187, bars 132-137.



Moreover, the vibrato of the French Flute School developed into distinct forms in the United States and the United Kingdom. Among the flutists in American recordings in the 1920s and 1930s, Kincaid, the father of the American Flute School, was known for the fastest continuous vibrato, even faster than his teacher Barrère.<sup>56</sup> His concept of vibrato, as mentioned by his student Walfrid Kujala (1925-2024) in his teaching, was that vibrato should not be used on running notes.<sup>57</sup> Michel Debost (born 1934), a student of Moyse, who taught at the Paris Conservatory and the Oberlin Conservatory of Music, believed that vibrato should always be employed. He suggested that long notes should not begin and end without vibrato and employed vibrato to connect passing notes in Bach’s compositions. However, he believed that in forte passages, vibrato should be more controlled to prevent the pitch from becoming sharp.<sup>58</sup>

The opportunity for vibrato to develop in the UK from the 1920s to the 1940s was not only due to the performances of the French Flute School in the UK, but also because the vibrato-free performances of the traditional British School were generally unacceptable to the Gramophone Company at the time.<sup>59</sup> The British School thus developed a vibrato that was slower and more subtle than that of the French School. Even when playing on the wooden flute, which represents traditional performance, British flutists like Gareth Morris (1920-2007) would incorporate discreet vibrato in their playing.<sup>60</sup> However, there were also flutists who adhered to the traditional British School style, such as John Amadio (1883-1964).<sup>61</sup>

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<sup>56</sup> Philip, *Early Recordings and Musical Style*, 113.

<sup>57</sup> Frechette, “The Pedagogy of Walfrid Kujala,” 64.

<sup>58</sup> Debost, *The Simple Flute*, 262.

<sup>59</sup> Raposo, “Defining the British Flute School,” 57.

<sup>60</sup> Philip, *Early Recordings and Musical Style*, 116.

<sup>61</sup> Raposo, “Defining the British Flute School,” 51.

## 4. Recording Analysis

This section quantitatively analyzes and visualizes Gaubert's vibrato usage in six recordings from 1919 to 1920. Based on these six recordings, we employed five analytical approaches to explore Gaubert's understanding of vibrato:

1. Examine two pieces composed and performed by Gaubert himself.
2. Use two pieces of similar style by Debussy to compare the recordings of Gaubert and Kincaid, the father of the American Flute School.
3. Compare Gaubert's performance of the same piece with that of the British School flutist Amadio.
4. Compare Gaubert's performance of the same piece with that of the British School flutist Morris.
5. Compare Gaubert's performance of the same piece with that of the later French flutist Debost, who exhibits characteristics of the American School.

The analysis of each piece is presented in a table, a vibrato wave graph, and examples. The table lists the minimum, maximum, and average number of vibrato cycles per second, as well as the percentage of notes using vibrato. In vibrato wave graphs, the values marked as dots on the graph represent the actual vibrato values. The frequency wave is generated based on data that has been smoothed and is intended to intuitively present the continuity of vibrato usage. Specifically, when Gaubert uses continuous vibrato, the vibrato value is aligned with the frequency peaks on the wave graph. When vibrato is used discontinuously, the vibrato value does not overlap with the peaks, and the larger the interval between vibrato usage, the farther the vibrato value is from the frequency peaks. In the recording analysis of this section, the boxes in musical examples indicate the locations of vibrato usage.

### (1) Analysis of Two Pieces Composed and Performed by Gaubert

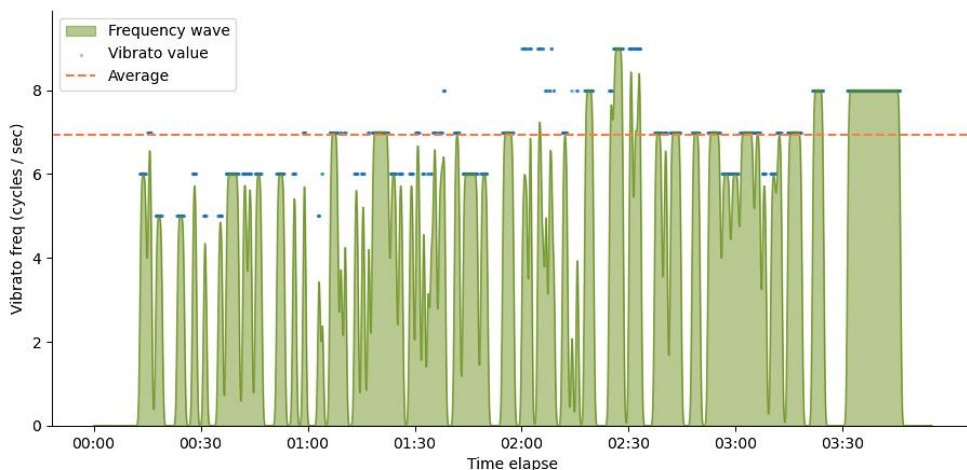
The two pieces analyzed here, *Madrigal* and *Soir sur la Plaine*, were both composed and performed by Gaubert and were recorded in 1919.<sup>62</sup> Figures 1 and 2

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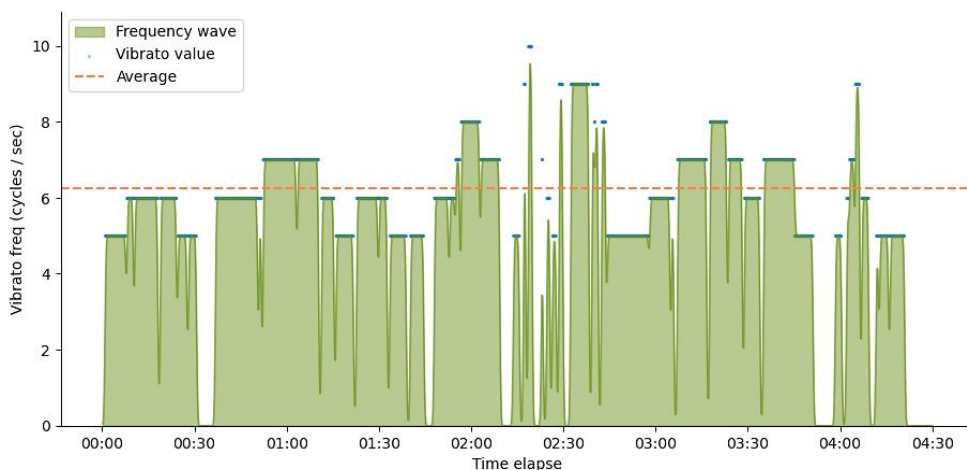
<sup>62</sup> Philippe Gaubert, "Madrigal," recorded 1919, track 10 on Gaubert, flutist, *Les Chants de*

show the analysis for *Madrigal* and *Soir sur la Plaine*, respectively. Table 1 provides an analytical comparison of two pieces.

**Figure 1.** Gaubert’s vibrato usage in *Madrigal*.



**Figure 2.** Gaubert’s vibrato usage in *Soir sur la Plaine*.




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*la Mer*, Alpha Classics ALPHA801, 2006, CD; Gaubert, “Soir sur la Plaine,” recorded 1919, track 9 on Gaubert, flutist, *Les Chant de la Mer*.

**Table 1.** Summary of vibrato usage in *Madrigal* and *Soir sur la Plaine*

Compositions	Minimum	Maximum	Average	Vibrato Usage
<i>Madrigal</i>	5	9	6.9	45.2%
<i>Soir sur la Plaine</i>	5	10	6.5	71.9%

As can be seen from Table 1, in *Madrigal*, Gaubert's vibrato frequency ranged from 5 to 9 cycles per second, with an average value of 6.9. The percentage of notes using vibrato is 45.2%. In *Soir sur la Plaine*, the maximum value exceeds that of *Madrigal*, yet its average value of 6.5 is lower than that of *Madrigal*. However, the percentage of vibrato usage in *Soir sur la Plaine* is significantly higher, reaching 71.9%.

The graph in Figure 1 provides insight into how continuous Gaubert's use of vibrato is in this piece. For example, between 2:00 and 2:15 in the graph (corresponding to bars 39 to 44 in the score), the vibrato values are significantly separated from the frequency wave, indicating intervals between vibrato usage (see Example 3). After 3:30 (corresponding to bars 69 to 73), however, the vibrato value overlaps with the frequency wave, indicating a more continuous use of vibrato (see Example 4).

**Example 3.** Gaubert's vibrato usage in *Madrigal*, bars 39-44.



**Example 4.** Gaubert's vibrato usage in *Madrigal*, bars 69-73.



In this recording, Gaubert applied vibrato on all longer notes, such as quarter notes and dotted quarter notes. He also used vibrato on the first note of eighth-note groups, but not all eighth notes. Based on the use of vibrato in the opening passage of the piece, it can be observed that Gaubert only used vibrato on eighth notes when he was slowing down. For example, Gaubert employed vibrato at the high point of the phrase and on the downbeat of bar 7 (see Example 5).

**Example 5.** Gaubert's vibrato usage in *Madrigal*, bars 5-7.



Gaubert changed his approach in the second section. In this “un peu plus vite” section, as the eighth notes became sort of “marking points” within faster rhythmic passages, Gaubert used vibrato on the eighth notes more frequently. For example, he employed vibrato on an eighth note as he decelerated toward the end of a phrase at bar 25 (see Example 6).

**Example 6.** Gaubert's vibrato usage in *Madrigal*, bar 25.



The only instance Gaubert used vibrato on sixteenth notes in the entire piece was on the last note of the short cadenza. Gaubert gradually slowed down in the final phrase of the cadenza, and the last note seamlessly transitioned into the recapitulation of the theme, creating a connection with the opening phrase (Example 7).

**Example 7.** Gaubert's vibrato usage in *Madrigal*, bars 52-53.





Gaubert's treatment of the long note that ends the piece was notable as well. In the preceding parts of the recording, when vibrato was applied, it always filled the entire duration of the note. However, for the final long note of the piece, Gaubert used vibrato on the first two beats, dampened it on the third, and omitted it on the last three beats, allowing the music to end in a tranquil atmosphere, as he explained in the Taffanel-Gaubert Method.

The graph in Figure 2 demonstrates that Gaubert used almost continuous vibrato throughout *Soir sur la Plaine*. By comparing the recording and the score, it can be observed that the peak points between 2:00 and 2:30 were located on the note a<sup>2</sup> of bar 28 (see Example 8). These bars marked the points within the piece at which vibrato frequency was at its highest (see Figure 2). Furthermore, between bars 27 and 31, which correspond to the dynamic peaks of the piece, it can therefore be discerned that the frequency of Gaubert's vibrato increased with the intensification of dynamic levels. The same relationship between dynamics and vibrato is also found at the high point after 4:00, on the last note of bar 51, indicating that the highest vibrato frequency corresponds to the peak of the crescendo (see Example 9).

**Example 8.** Gaubert's vibrato usage in *Soir sur la Plaine*, bars 27-31.



**Example 9.** Gaubert's vibrato usage in *Soir sur la Plaine*, bars 50-51.



In addition to the overall slower tempo than the *Madrigal*, the higher percentage of vibrato usage in *Soir sur la Plaine* is primarily attributed to the composer's

marking of “espressif”. Under this marking, Gaubert employed vibrato on all possible notes. In contrast, in *Madrigal*, hence the absence of the “espressif” marking, Gaubert did not utilize vibrato on every possible note. At the very least, through the comparative analysis of these two pieces and their recordings by Gaubert, it can be found that in his performance practice, the marking of “espressif” is nearly synonymous with the application of continuous vibrato.

In *Soir sur la Plaine*, vibrato was employed discreetly and consistently on all notes except the thirty-second notes and the notes marked as tenuto. In order to maintain a balanced quantity of vibrato use throughout the piece, Gaubert was very careful when applying vibrato to long notes.

To prevent auditory fatigue, Gaubert employed a specific approach for handling long notes. Similar to his treatment of the final long note in *Madrigal*, he divided the note’s duration into two halves here. The first half contained vibrato, while the second half did not. At the end of the phrases and the end of the piece, Gaubert also frequently introduced vibrato at the beginning of notes, and then let the music gradually return to a calm state.

As in Example 8, however, when a long note was in the middle of a phrase, especially when it was preceded by a descending scale followed by an ascending scale (such as the g-sharp<sup>1</sup> at bar 30 in this example), Gaubert did not use vibrato at first but gradually added it in. This type of vibrato usage smoothly accentuated the transition from the gentle beginning to the powerful phrase ending at bar 30.

Gaubert employed vibrato not only for expressiveness but also for contrast. This was particularly evident in the recapitulation, which echoed the opening of the piece. When the recurring triplet motive first appeared, the vibrato propelled the music forward and helped it develop at bar 1 (see Example 10). However, in the recapitulation, this motive reappeared at bar 50 with a slight vibrato in the long notes and no vibrato in the triplets, which contrasted with the opening and helped to foreshadow the imminent tranquil ending of the piece (see Example 9).

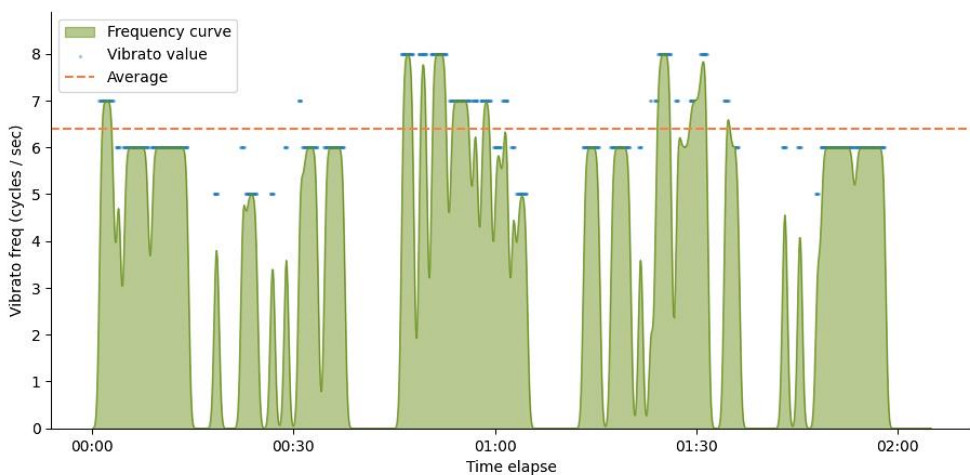
**Example 10.** Gaubert’s vibrato usage in *Soir sur la Plaine*, bars 1-3.



## (2) Analyzing the Performances of Gaubert and Kincaid Based on Two Similar-Style Pieces by Debussy

“The Little Shepherd” is the fifth movement of Debussy’s *Children’s Corner*, a six-movement piano suite published in 1908. The version adapted and recorded by Gaubert in 1920 is for flute and piano, with the main melody played by the flute.<sup>63</sup> We chose to compare this recording by Gaubert with the opening phrase of Debussy’s *Prélude à l’Après-midi d’un faune* recorded by Kincaid,<sup>64</sup> because the two share common stylistic features. Figures 3 and 4 show the analysis of Gaubert’s and Kincaid’s performances, respectively. Table 2 compares vibrato usage in two pieces of similar style.

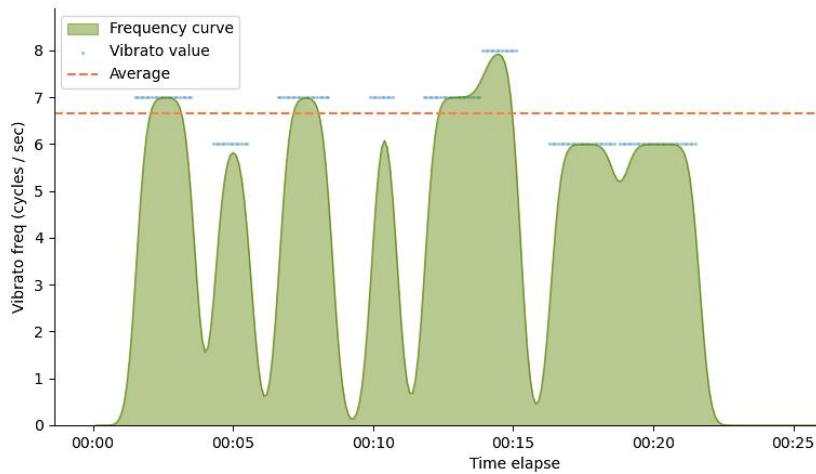
**Figure 3.** Gaubert’s vibrato usage in “The Little Shepherd”.



<sup>63</sup> Claude Debussy, “Le Petit Berger,” side 1, track 1 on Gaubert, flutist, *Le Petit Berger* (Debussy), *Variations du Ballet d’Ascanio* (Saint-Saëns), and *Fantasie Pastorale* (F. Doppler), recorded 1920, Disque pour Gramophone W 380, 1920, 78 rpm. “Le Petit Berger” is the French translation of “The Little Shepherd”. Debussy deliberately titled the work and its movements in English.

<sup>64</sup> William Kincaid, flutist, “Prélude à l’Après-midi d’un faune,” by Claude Debussy, recorded with the Philadelphia Orchestra, conducted by Eugene Ormandy, 1959, side 3, track 1 on *The Debussy Album*, Columbia MG 30950, 1971, 2 33<sup>1</sup>/<sub>3</sub> rpm records.

**Figure 4.** Kincaid’s vibrato usage in the opening phrase of *Prélude à l’Après-midi d’un faune*.



**Table 2.** Summary of vibrato usage in “The Little Shepherd” performed by Gaubert and the opening phrase of *Prélude à l’Après-midi d’un faune* performed by Kincaid

Compositions	Flutists	Minimum	Maximum	Average	Vibrato Usage
“The Little Shepherd”	Philippe Gaubert	5	8	6.4	44.8%
<i>Prélude à l’Après-midi d’un faune</i> (opening phrase)	William Kincaid	6	8	6.8	78%

Table 2 shows that in Gaubert’s recording of “The Little Shepherd”, the vibrato frequency ranged from 5 to 8 cycles per second, with an average value of 6.4. The percentage of notes using vibrato is 44.8%. In contrast, Kincaid’s performance has a higher average value of vibrato, with vibrato applied on 78% of the notes.

Analysis of Figure 3 reveals that Gaubert utilized both continuous and discontinuous vibrato techniques. Continuous vibrato aligns with the peaks of the frequency waves. Notably, higher vibrato frequency clusters are observed just before

1:00 and around 1:30 in the recording. The highest continuous vibrato points before 1:00 correspond to bars 12-13, marking the first entry into the highest register of the piece (see Example 11). The second peak around 1:30 coincides with Gaubert's application of vibrato on the first note of the crescendo and accelerando at bars 21-22 (see Example 12). Thus, Gaubert's vibrato intensity increased with the rise in register and with significant crescendo and accelerando passages.

**Example 11.** Gaubert's vibrato usage in "The Little Shepherd", bars 12-13.



**Example 12.** Gaubert's vibrato usage in "The Little Shepherd", bars 21-23.



In response to the slow tempo and the composer's marking of "espressif", Gaubert applied vibrato to appropriate notes and incorporated it into running notes on the first beat of certain bars, defining the beginning of the phrases and driving the music forward (Example 13). This suggests that Gaubert linked "espressif" with vibrato, even in compositions composed by others.

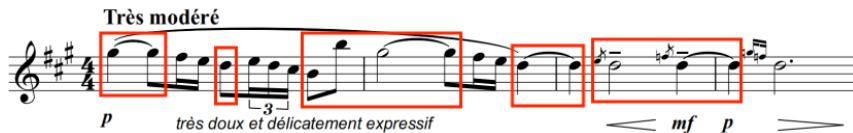
**Example 13.** Gaubert's vibrato usage in "The Little Shepherd", bars 5-6.



In the opening phrase, Gaubert applied vibrato on eighth notes and longer, but omitted it on the final dotted half note to achieve a calm fade-out and a contrast in timbre before the piano joins in (Example 14). This phrase is based on the Dorian

mode starting on B (B – C-sharp – D – E – F-sharp – G-sharp – A – B) and features a raised sixth degree (G-sharp), which is distinct from the major and natural minor scales. Gaubert’s vibrato on the g-sharp<sup>2</sup> effectively highlights the modal color.

**Example 14.** Gaubert’s vibrato usage in “The Little Shepherd”, bars 1-4.



In this piece, Gaubert used three vibrato approaches on notes lasting two beats or longer. He applied vibrato throughout the long notes in the crescendo phrases; at the end of the phrases, he first used vibrato and then transitioned to non-vibrato for the second half of the note; and in the diminuendo phrases, he used vibrato on the first half of the note (like the note b<sup>1</sup> in Example 15). At the end of the piece, the first e<sup>1</sup> had discreet vibrato, while the last e<sup>1</sup> had no vibrato (Example 16). This variation in the use of vibrato, especially at the end, avoids auditory fatigue and creates a tranquil ending.

**Example 15.** Gaubert’s vibrato usage in “The Little Shepherd”, bars 8-9.



**Example 16.** Gaubert’s vibrato usage in “The Little Shepherd”, bars 29-31.



The opening phrase of *Prélude à l’Après-midi d’un faune* played by the flute outlines a tritone. Kincaid used vibrato, but as his student Kujala pointed out, he avoided using it on running notes (see Example 17). Thus, Kincaid refrained from

applying vibrato on the passing notes and the g-sharp<sup>1</sup> at bar 3, yet on the notes where vibrato was utilized, it was present consistently throughout. In contrast, Gaubert allowed the vibrato to dissipate gradually at the end of the opening phrase of “The Little Shepherd”. Kincaid’s vibrato of the opening phrase ranged between 6 and 8 cycles per second (see Figure 4 and Table 2), faster than Gaubert’s. Gaubert’s recording of the opening phrase of “The Little Shepherd” featured vibrato between 5 and 6 cycles per second, with a smaller overall vibrato amplitude than Kincaid’s, exhibiting more discreet vibrato.

**Example 17.** Kincaid’s vibrato usage in *Prélude à l’Après-midi d’un faune*, bars 1-4.



### (3) Comparison of Gaubert and Amadio’s Performances of the Same Piece

Franz Doppler (1821-1883) was a prominent nineteenth-century flutist and composer. His composition, *Fantaisie Pastorale Hongroise*, Op. 26, was originally written for flute and orchestra. Gaubert and Amadio left recordings of this piece respectively, allowing us to compare the use of vibrato in the French and British Flute Schools.<sup>65</sup>

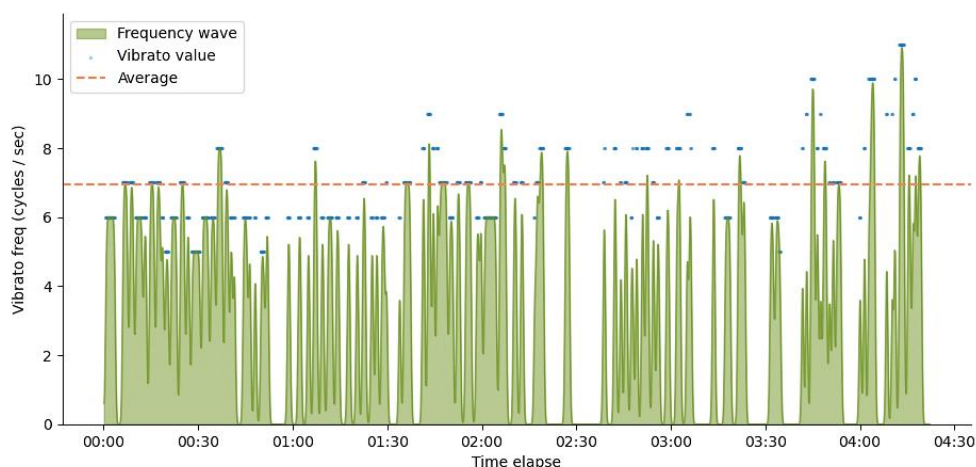
Before 1925, the record length limit was about four minutes, and it was not until the advent of electrical recording techniques in 1925 that musicians were able to make longer recordings.<sup>66</sup> Due to the record length limit, Gaubert’s 1920 recording includes only six of the thirteen sections of this piece. The analysis is conducted in

<sup>65</sup> Franz Doppler, “Fantaisie Pastorale,” side 2 on Gaubert, flutist, *Le Petit Berger*; John Amadio, flutist, *Fantaisie Pastorale Hongroise*, by Franz Doppler, recorded with orchestra conducted by George Byng, 1929, His Master’s Voice C1788, 1930, 78 rpm.

<sup>66</sup> Philip, *Early Recordings and Musical Style*, 35.

the following four-part order: “Molto Andante” and “Poco animato”, “Allegro” and “Piu lento”, “Moderato”, and “Allegro”. The analysis of Amadio’s 1929 recording follows the same order. Figure 5 shows the analysis of Gaubert’s performance. Table 3 compares Gaubert’s and Amadio’s vibrato usage.

**Figure 5.** Gaubert’s vibrato usage in *Fantaisie Pastorale Hongroise*.



**Table 3.** Summary of Gaubert’s and Amadio’s vibrato usage in *Fantaisie Pastorale Hongroise*

Flutists	Minimum	Maximum	Average	Vibrato Usage
Philippe Gaubert	5	11	6.9	31.4%
John Amadio	0	0	0	0%

As shown in Table 3, the vibrato frequency in Gaubert’s 1920 recording ranged from 5 to 11 cycles per second, with an average value of 6.9. The percentage of notes using vibrato is 31.4%. In sharp contrast, Amadio’s recording adopted the traditional British School performance style and did not employ vibrato at all. Although Amadio did not use vibrato, his recording offers an interesting comparison with Gaubert’s recording in terms of other relevant musical characteristics.



The graph in Figure 5 reveals that Gaubert employed both continuous and discontinuous vibrato in this piece. The frequency of the vibrato peaked near the end of the piece, which is also the fastest part of the piece. In this recording, the vibrato frequencies of the notes in the middle and low registers were always below average. This characteristic reflects the relationship between vibrato and registers in Gaubert's performance: the vibrato frequency in the high register is often higher than that in the low register.

Amadio did not employ vibrato, his tone in the middle and low registers was thick and dark. Although he could transit to a brighter timbre in the higher register, it lacked the lightness and brightness that Gaubert achieved in the high register. Gaubert also presented a dark tone in the middle and low registers, but the incorporation of vibrato made his tone mellower than Amadio's.

The Molto Andante and Poco animato sections are rich in melodic lines and scales, with the accompaniment following the flute's slow, free-flowing melody. Gaubert applied vibrato on long and structural melodic notes, with the final long note of the Molto Andante being the only exception (see Example 18). Amadio created musical contrast by providing a full tone in the middle and low registers while employing a soft touch in the high register.

**Example 18.** Gaubert's vibrato usage in *Fantaisie Pastorale Hongroise*, bar 16.



In the faster Poco animato section,<sup>67</sup> aside from employing vibrato at the climax, Gaubert employed vibrato only on the starting notes of the melodic patterns (see Example 19). Before the cadenza, on the d<sup>1</sup> and on the c-sharp<sup>1</sup> with a fermata, Gaubert released tension by gradually slowing down and applying vibrato on these notes to help launch the cadenza at bar 27 (see Example 20). In the cadenza, Gaubert

<sup>67</sup> Amadio did not include this section in his recording.

applied a slight vibrato on the  $e^3$  with a fermata (Example 20) and a noticeable vibrato on the  $b^3$  at the climax (Example 21), but refrained from using vibrato before the climax, instead creating tension through acceleration. After the climax, Gaubert slowed down and employed vibrato to release tension (Example 21).

**Example 19.** Gaubert's vibrato usage in *Fantaisie Pastorale Hongroise*, bars 17-18.



**Example 20.** Gaubert's vibrato usage in *Fantaisie Pastorale Hongroise*, bars 26-27.



**Example 21.** Gaubert's vibrato usage in *Fantaisie Pastorale Hongroise*, bar 28.



In the middle Allegro section, Amadio maintained a steady tempo, while Gaubert gradually increased the pace from the slower introduction to the main theme. Gaubert's vibrato was concentrated on quarter notes and syncopation, primarily to push the music forward (see Example 22). In the Piu lento section, his vibrato was then restrained, appearing only on the highest note with a fermata (see Example 23). At bar 81, Gaubert deferred the molto rallentando until the last two sixteenth notes

of bar 82 and instead applied vibrato on the peak note to enhance the tension built up by the previous fast tempo.

**Example 22.** Gaubert's vibrato usage in *Fantaisie Pastorale Hongroise*, bars 45-51.

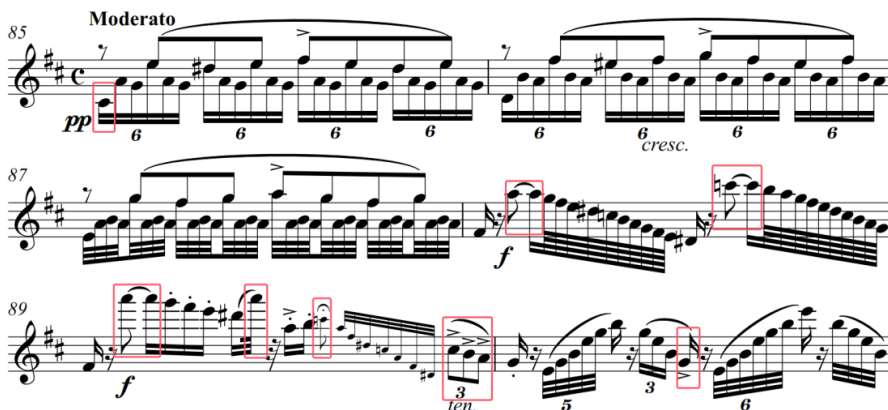


**Example 23.** Gaubert's vibrato usage in *Fantaisie Pastorale Hongroise*, bars 81-83.



The Moderato section features an emphasis on melodic notes within patterns of running notes.<sup>68</sup> Unlike the Molto Andante section, Gaubert used vibrato sparingly here, reserving it only on the starting note of running-note patterns, on ascending melodic notes, and on notes marked with fermatas, accents and tenuto (Example 24).

**Example 24.** Gaubert's vibrato usage in *Fantaisie Pastorale Hongroise*, bars 85-90.



<sup>68</sup> Amadio also omitted this section in his recording.

In the final Allegro section, Gaubert selectively applied vibrato as the tempo reaches its peak. In addition to employing vibrato on eighth notes or longer to build up tension, Gaubert avoided using vibrato on accented notes in order to accumulate the intensity of the tension through accelerando (see Example 25). In contrast, Amadio maintained a steady tempo without the pronounced accelerando that characterizes Gaubert's performance.

**Example 25.** Gaubert's vibrato usage in *Fantaisie Pastorale Hongroise*, bars 100-104.



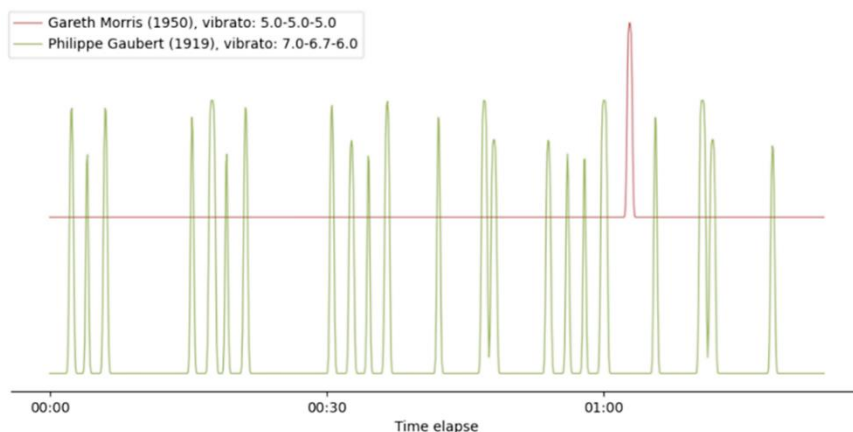
#### (4) Comparison of Gaubert and Morris' Performances of the Same Piece

"Badinerie" is the seventh movement of Bach's Orchestral Suite No. 2 in B minor, BWV 1067, a piece that exemplifies Bach's virtuosic style of writing. Gaubert and Morris left recordings of this piece respectively, allowing us to compare their use of vibrato.<sup>69</sup> Figure 6 and Table 4 show comparisons of Gaubert's and Morris' vibrato usage. We can see in Figure 6 that Morris used vibrato only once. As a result, the minimum, maximum, and average values of Morris' vibrato are all 5. The three values of Gaubert's are 6, 7, and 6.7, respectively, and the percentage of notes using vibrato is 12.2%, significantly higher than Morris' 0.6% (see Table 4).

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<sup>69</sup> Johann Sebastian Bach, "Badinerie," recorded 1919, track 8 on Gaubert, flutist, *Les Chants de la Mer*; Gareth Morris, flutist, "No. 7: Badinerie (Allegro)," by Johann Sebastian Bach, recorded with George Malcolm (harpsichord) and the London Chamber Orchestra, conducted by Anthony Bernard, side 6, track 2 on *Suite No. 2 in B minor (Bach)*, His Master's Voice C4032-4034, 1950, 3 78 rpm records.

**Figure 6.** Visualization comparison of Gaubert's and Morris' vibrato usage in “Badinerie”.



**Table 4.** Summary of Gaubert's and Morris' vibrato usage in “Badinerie”

Flutists	Minimum	Maximum	Average	Vibrato Usage
Philippe Gaubert	6	7	6.7	12.2%
Gareth Morris	5	5	5	0.6%

While the theoretical stance of the Taffanel-Gaubert Method might suggest a prohibition against vibrato in Bach's music, it can be observed that in practice Gaubert utilized vibrato in specific contexts when performing this piece by Bach, specifically on notes that are equal to or longer than a quarter note. Additionally, he selectively applied vibrato to eighth notes where increased tension was needed, particularly at the end of phrases that were on the brink of resolution. This indicates a more nuanced and contextualized approach to the use of vibrato in Bach's music, wherein its application was tailored to enhance the musical expression at pivotal moments within the phrase structure (see Examples 26 and 27). Morris employed vibrato only slightly on the note a<sup>1</sup> in the second repetition of the second section; all other notes were played with a full, straight, vibrato-free tone (see Example 28).

**Example 26.** Gaubert's vibrato usage in "Badinerie", bars 1-4.



**Example 27.** Gaubert's vibrato usage in "Badinerie", bars 16-22.



**Example 28.** Morris' vibrato usage in "Badinerie", bars 16-22.



By examining Gaubert's use of vibrato in his performance of Bach's music, we can clearly see that Gaubert's position was not one of outright prohibition of vibrato, but rather a stance against the misuse or overuse of vibrato, as this could potentially compromise the aesthetic effect of the performance. In comparison, although Morris treated vibrato as an inherent component of sound, his performance practice was more cautious in its use than Gaubert's. He believed that vibrato should serve the music, rather than playing for the sake of vibrato.<sup>70</sup> In this piece, Gaubert also demonstrated a cautious approach to vibrato, yet his strategic use of vibrato on long notes and structural notes in phrases functioned as embellishment, propelling the music forward while preserving its intrinsic simplicity.

## **(5) Comparison of Gaubert and Debost's Performances of the Same Piece**

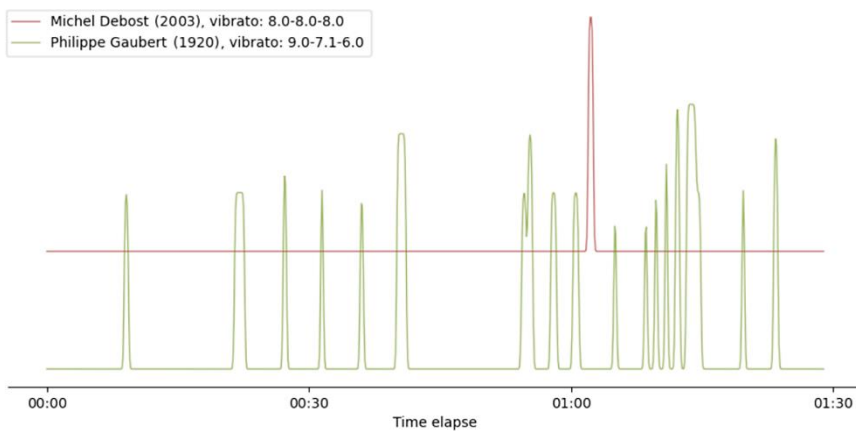
*Ascanio* (1890) is a "grand opéra" in five acts by Camille Saint-Saëns (1835-1921). The second half of Act III of *Ascanio* consists of 12 ballet pieces, of which

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<sup>70</sup> Raposo, "Defining the British Flute School," 72.

No. 7, “L’Amour fait apparaître Psyché”, and No. 9, “Variation de l’Amour”, feature flute solos. Taffanel then adapted these two ballet pieces into a two-section piece for flute and piano, titled *Airs de Ballet d’Ascanio: Adagio et Variation*. Here we compare Gaubert’s recording of the second section of the Taffanel’s adaption with Debost’s recording of “Variation de l’Amour” from Act III of *Ascanio*.<sup>71</sup> “Variation de l’Amour” is dedicated to showcasing the tonguing techniques of flute playing, with a particular emphasis on double and triple tongues. Figure 7 and Table 5 show comparisons of Gaubert’s and Debost’s vibrato usage.

**Figure 7.** Visualization comparison of Gaubert’s and Debost’s vibrato usage.



**Table 5.** Summary of Gaubert’s and Debost’s vibrato usage

Flutists	Minimum	Maximum	Average	Vibrato Usage
Philippe Gaubert	6	9	7.1	5%
Michel Debost	8	8	8	1%

<sup>71</sup> Camille Saint-Saëns, “Variations du Ballet d’Ascanio,” side 1, track 2 on Gaubert, flutist, *Le Petit Berger*; Michel Debost, flutist, “Extraits du ballet Ascanio: Variation de l’Amour,” by Camille Saint-Saëns, recorded with Miskolc Symphony Orchestra, conducted by François-Xavier Roth, 2003, track 8 on *Panorama*, Skarbo DSK 3042, 2004, CD.

As shown in Figure 7, Debost used vibrato only once. As a result, the minimum, maximum, and average values of Debost's vibrato are all 8, in stark contrast to Gaubert's performance, where vibrato values are 6, 9, and 7.1, respectively (see Table 5). Due to the piece consisting primarily of rapid tonguing, Gaubert used only 5% of the notes in his performance with vibrato, but this is still higher than Debost's performance, which used only 1% of the notes with vibrato. This disparity exemplifies one of the trajectories of the French Flute School in the same composition, spanning from the early twentieth century to the turn of the twenty-first century.

Gaubert's distinctive approach in this piece involved adding a slight rubato at the end of each brief passage, which facilitated the application of vibrato to the final staccato, effectively signaling the end of each passage (see Example 29). Gaubert's rubato in this piece was characterized by subtlety, aligning with Debussy's perspective that rubato pertained to nuance and expression rather than alterations of time or bar.<sup>72</sup>

**Example 29.** Gaubert's vibrato usage in the Variation from *Airs du Ballet d'Ascanio*, bars 8-11.



Another situation where Gaubert employed vibrato was on the highest note of the climax: here the vibrato frequency reached its maximum value of 9. Gaubert intentionally lingered on this highest note, employing vibrato to intensify the tension. Later, on the last note of the descending scale, vibrato was applied again to impart a sense of relaxation to offset the tension in the first half of the phrase (see Example

<sup>72</sup> Philip, *Early Recordings and Musical Style*, 44.



30). Considering that Gaubert did not employ vibrato much in this performance, these contrasts created a powerful and dramatic effect.

**Example 30.** Gaubert's vibrato usage in the Variation from *Airs du Ballet d'Ascanio*, bars 24-25.



This analysis illustrates a subtle development in the French Flute School's approach to vibrato. While Gaubert at times added rubato in addition to vibrato to emphasize certain notes in the piece, the recording of the later French flutist Debost rigorously adhered to a uniform tempo. Debost's overall slower tempo allowed for more room for the application of vibrato than Gaubert's. However, even at bars 24-25 (see Example 30), when the high note of the climax was accented and the final note of the descending scale was marked with tenuto, Debost maintained a consistent tempo and did not use any vibrato. In the entire piece, Debost's recording shows only one instance of vibrato, applied to the note e<sup>3</sup>, with an accent (see Example 31).

**Example 31.** Debost's vibrato usage in "Variation de l'Amour", bars 32-33.



Debost's approach to performance is therefore closer to the American Flute School's treatment by not applying vibrato to running notes.<sup>73</sup> He employed a relatively fast vibrato frequency, yet prioritized maintaining a strict tempo, thus not altering the tempo to incorporate vibrato on running notes. Therefore, Gaubert and

<sup>73</sup> Frechette, "The Pedagogy of Walfrid Kujala," 64.

Debost's recordings reflect the evolution of vibrato in the French Flute School from its early to later stages, while also exhibiting the fusion characteristics of different schools' influences.

## 5. Conclusion

This study explores the unique characteristics of the French Flute School, with a particular focus on the Taffanel-Gaubert Method and Gaubert's historical recordings, supplemented by comparative analysis of recordings from the British and American Flute Schools. Combining primary sources, audio analysis, and artificial intelligence data visualization, this study uses quantitative methods to strengthen the aesthetic foundations of music analysis.

One finding of this study reveals that Gaubert was not against vibrato itself, but rather opposed its misuse and overuse. Another finding is that the term "espressif" indicated on the score can be equated with the continuous vibrato in Gaubert's performance. In addition, Gaubert demonstrates a selective approach to vibrato, adjusting the use of vibrato according to specific musical requirements. Gaubert's approach to vibrato reflects his understanding of vibrato as an expressive tool that can enhance phrasing without compromising the clarity or purity of the sound.

Concerning the distinctions between the three schools, the British Flute School is characterized by its slow, discontinuous vibrato, or non-vibrato use, which contrasts sharply with the continuous and faster vibrato typically employed in the French and American Schools. The French School, exemplified by Gaubert, selectively applies vibrato in running or long notes to reflect the emotional content of the music, allowing vibrato to complement rather than dominate the phrase. In addition, Gaubert selectively alters the tempo on running notes to incorporate vibrato. He also applies vibrato selectively in long notes, with three distinct methods: 1) continuous vibrato throughout; 2) no vibrato at the beginning; 3) no vibrato at the end. The American Flute School, by contrast, employs a full vibrato throughout long notes and typically avoids vibrato in running passages.

Despite these differences, it is important to recognize that the boundaries between these schools are not rigid. For instance, Debost does not alter the tempo to apply vibrato in running notes. Although Debost is traditionally associated with the French Flute School, his treatment of vibrato significantly departs from Gaubert's and instead reflects the characteristics of the American Flute School. This integration of techniques reflects the increasingly fluid nature of flute pedagogy and performance practices, where elements from different schools are blended to create a more individualized approach to playing.

The analyses presented in this article indicate that the French Flute School's approach to vibrato has acted as a foundation, upon which other related flute schools have developed their own vibrato characteristics. This study underscores the importance of understanding vibrato in the French Flute School, not only as a technical skill but also as an essential component of musical expression and a cornerstone in the development of modern flute performance.

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Dan GUO is a DMA candidate in Music Performance and Pedagogy at the College of Music, Mahidol University, Thailand, and a flute instructor at the College of Music, Guizhou University, China. She holds a master’s degree in performance from the Royal Conservatory of Brussels, Belgium, and completed a course in Digital Signal Processing at Oxford University. Her main research fields are flute performance and pedagogy, AI music, and digital signal processing.

郭丹，現為泰國瑪希隆大學音樂學院博士候選人，中國貴州大學音樂學院長笛教師。比利時布魯塞爾皇家音樂學院演奏碩士，完成牛津大學數位訊號處理課程。主要研究領域為長笛演奏和教學、人工智慧音樂、數位訊號處理。

Kyle FYR is an Assistant Professor of Musicology at the College of Music, Mahidol University, Thailand. His main research interests are music performance and music analysis. He has published articles in *Music Theory Online*, *Music Theory and Analysis*, the *Journal of Music History Pedagogy*, and *Notes*.

凱爾·費樂，泰國瑪希隆大學音樂學院助理教授，現任音樂學系主任和音樂學系博士班主任。主要研究方向為演奏與音樂分析，經常在學術期刊發表文章。

Sha YU is an Associate Professor at the School of Computer Science and Technology, Guizhou University, China. Her research focuses on deep learning and music signal processing. She has published papers in *IEEE TIP*, *ACM MM*, and *IEEE VCIP*.

喻莎，貴州大學計算機科學與技術學院副教授。主要研究深度學習和音樂訊號處理，經常在學術期刊發表文章。