THE CHINESE AND JAVANESE INFLUENCES IN WORKS THAT EXEMPLIFY EARLY TWENTIETH-CENTURY MUSICAL “EXOTICISM”

by

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THESIS ABSTRACT

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In Western music of the early twentieth century, pentatonic elements are particularly prominent when composers emulate Chinese music. Claude Debussy, for instance, drew upon Eastern musical styles in works such as "Pagodes" (from the collection *Estampes* of 1903). According to most scholars (E. Robert Schmitz 1950 and Sylvia Parker 2012), the historical record demonstrates that Debussy's inspiration for composing "Pagodes" was the sound of the Javanese Gamelan in the Exhibition Universelle in Paris in 1889. There is also a historical description about Debussy's writing to show his connection to Chinese music. Debussy himself expressed an awareness of Chinese musical practices: Roger Nichols has cited a newspaper article written by the composer published in February 1913 in which Debussy mentions that in the 1889 exhibition, the performance of the Annamite theater from the central Eastern region of Vietnam was influenced by Chinese practices. Debussy's awareness of Chinese—as well as Javanese—music will propel my discussion of how to use a mathematical method to determine the musical character of a region of the world, and more specifically, to demonstrate how an analytical method based on the *J* function may make the connection between "Pagodes" and the "Chinese" style in the early twentieth century. The conventional wisdom regarding "Pagodes" is that its inspiration is taken from Javanese gamelan. In the later parts of my thesis, I will show that the intersection between "Pagodes" and Javanese gamelan is mainly in the rhythmic and textural aspects.

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CHAPTER I

INTRODUCTION

In the early twentieth century, the relationship between Western and Eastern musical cultures became closer as Western composers attempted to imitate music from Japan, China, Indonesia, India, and other regions. Inspired by the sound of pentatonicism, composers such as Aaron Avshalomov, Claude Debussy, Lili Boulanger, and Maurice Ravel frequently incorporated pentatonic elements as a marker of "exoticism" in their music. Ralph P. Locke has offered an overview of the development of "exoticism" and the related concept of "Orientalism" in Europe from the eighteenth century to the early twentieth century. Based on his account, in the early eighteenth century, the Turkish style started to appear in French and German operas and also in instrumental works; furthermore, England was influenced by music from India, since India was one of its colonies.[1] Mary Hunter has also confirmed that there was a strong influence of Turkish military music on European music in the eighteenth century.[2] There is also a musical "Chinoiserie" in Europe in the nineteenth and twentieth centuries: music that addresses Chinese topics in a more superficial way than the pieces I will be discussing. Wendy Gan mentions that some less-well known late Victorian musical comedies on the London stage were influenced by China-based dramas *San Toy* and *A Chinese Honeymoon*.[3] Chinoiserie also influences French music in the nineteenth and twentieth centuries. For example, Debussy composed

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[1] Ralph P. Locke, *Musical Exoticism: Images and Reflections* (New York: Cambridge University Press, 2009), 108–9.
[2] Mary Hunter, "The Alla Turca Style in the late Eighteenth Century: Race and Gender in the Symphony and the Seraglio," in *The Exotic in Western Music*, ed. Jonathan Bellman (Boston: Northeastern University Press, 1998), 44–47.
[3] Wendy Gan, *Comic China: Representing Common Ground, 1890-1945* (Philadelphia: Temple University Press, 2018), 24-26.

Rondel Chinois for voice and piano in 1881. The lyric depicts a pastoral scene in China. Manuel de Falla is a Spanish composer. His piece "Chinoiserie" shows the influence from Chinese feminism, since the lyric depics a nostalgic Chinese landscape that represents the Chinese female. Debussy also commented on De Falla's "Chinoiserie" from *Trois Melodies* (1909).[4] Locke reinforces that in the nineteenth and early twentieth centuries, musical elements from the "Orient" (regions in East and South Asia) influenced European operas such as Giacomo Puccini's *Madama Butterfly* and *Turandot*.[5] The colonial expansion to sub-Saharan Africa and the establishment of treaty ports in more distant places such as China, reverberated in European music, especially French music, in the early twentieth century.[6] This long history of "exoticism" formed a peak during this period, with the influence of "Orientalism" often being manifested as pentatonicism in music.

There remains controversy regarding the concept and the term "Orientalism." Edward W. Said, in his classic work *Orientalism*, observed that in comparison with the attitude of North Americans towards the "Orient," Europeans have a long tradition of what he calls "Orientalism." From geographical and cultural perspectives, Europe has had a close relationship with the "Orient" through its colonialist practices. Said argues that "the Orient is an integral part of European material civilization and culture."[7] One controversy involving "Orientalism" concerns Said's claim that it involved a "high-handed executive attitude of nineteenth-century and early twentieth-century European colonialism."[8] Said claims that "Orientalism [was] a Western style

[4] Angela Kang, "Musical Chinoiserim," PhD diss., (University of Nottingham, 2011), 107–108.
[5] Locke, *Musical Exoticism*, 150–51.
[6] Locke, *Musical Exoticism*, 176–78.
[7] Edward W. Said, *Orientalism* (New York: Vintage Books, 1979), 2
[8] Said, *Orientalism*, 2

for dominating, restructuring, and having authority over the Orient."[9] He offers a more comprehensive and critical explanation of the term: it "represents a considerable dimension of modern political-intellectual culture, and as such has less to do with the Orient that it does with 'our' world."[10] Ibn Warraq has criticized Said's attribution of passivity and victimhood to the "Orient." One example that Warraq cites is Said's description of Egypt as a sorrowful victim. Warraq points out that in the conflicts between Egypt and France, there were cases in which the French military failed.[11] Moreover, Warraq locates contradictions among statements made by Said. On the one hand, Said seems to agree that some Orientalists acquired a genuine knowledge of "Oriental" history, culture, and languages. On the other hand, Warraq observes that Said later denies that Orientalists had acquired any objective knowledge at all.[12]

Returning to the influence of pentatonicism, pentatonic elements are particularly prominent when composers directly emulated Chinese music, and are a good example of European or Chinese composers demonstrating objective knowledge of Chinese musical culture. The Russian composer Aaron Avshalomov (1894–1965) lived in China from 1920 to 1947 and wrote a large amount of music based on Chinese subject matter. As a result, his music is stylistically similar to that of native Chinese composers in the early twentieth century such as He Luting (1903–1999). Around the same period, Debussy also emulated Eastern musical styles in works such as "Pagodes" (from the collection *Estampes* of 1903). The close connection between Javanese gamelan and Debussy's "Pagodes" is unambiguous. According to most scholars, the historical record demonstrates that Debussy's inspiration for composing

[9] Said, *Orientalism*, 3.
[10] Said, *Orientalism*, 12.
[11] Ibn Warraq, *Defending The West: A Critique of Edward Said's Orientalism* (New York: Prometheus Books, 2007), 34.
[12] Warraq, *Defending The West*, 24–25. For the passage in Said, see *Orientalism*, 122.

"Pagodes" was the sound of the Javanese Gamelan in the Exhibition Universelle in Paris in 1889.[13] Jeremy Day-O'Connell also claims that "Pagodes" was unmistakably influenced by Gamelan.[14] Helen Kasztelan describes the piece as depicting "Oriental Temples."[15] Day-O'Connell refers to its "Exotic Sound."[16] E. Robert Schmitz describes its subject matter as consecrated temples of the Orient.[17] These descriptions point to the connections we can sense between Javanese gamelan and "Pagodes." Are there other potential connections between "Pagodes" and the music of other regions such as China? Debussy himself expressed an awareness of Chinese musical practices: Roger Nichols has cited a newspaper article written by the composer published in February 1913 in which Debussy mentions that in the 1889 exhibition, the performance of the Annamite theater from the central Eastern region of Vietnam was influenced by Chinese practices.[18] The Annamite theater presented in 1889 was a form of traditional Vietnamese opera. There are some similarities between Chinese and Vietnamese traditional opera. For example, their costumes are similar, and most of the subjects of Vietnamese opera come from Chinese stories. Debussy's awareness of Chinese—as well as Javanese—music will propel my discussion of how to use a mathematical method to determine the musical character of a region of the world, and more specifically, to demonstrate how an analytical method based on the *J* function

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[13] Sylvia Parker, "Claude Debussy's Gamelan." *College Music Symposium* 52 (2012), n.p., and E. Robert Schmitz, *The Piano Works of Claude Debussy* (New York: Dover Publications, 1950), 82.

[14] Jeremy Day-O'Connell, "Debussy, Pentatonicism, and the Tonal Tradition," *Music Theory Spectrum* 31, no. 2 (September, 2009): 226.

[15] Helen Kasztelan, "Debussy's and the Javanese Ketawang Cycle, or Was Debussy the First Java Jive?" *A Journal of the Postgraduate Students of the University of Melbourne School of Music* 1, no. 1 (January 1991), 34.

[16] Day-O'Connell, "Debussy, Pentatonicism, and the Tonal Tradition," 226.

[17] Schmitz, *The Piano Works of Claude Debussy*, 82.

[18] Roger Nichols, *The Life of Debussy* (Cambridge: Cambridge University Press, 1998), 57–58. A detailed description of the Annamite theater appears in Annegret Fauser, *Musical Encounters At The 1889 Paris World's Fair* (Rochester: University of Rochester Press), 183.

may make the connection between "Pagodes" and the "Chinese" style in the early twentieth century. The conventional wisdom regarding "Pagodes" is that its inspiration is taken from Javanese gamelan. There is a similarity between "Pagodes" and Javanese gamelan, and I will show that Debussy truly emulates it in some aspects. In chapters 2–5, I will discuss the connection between Debussy's "Pagodes" and Chinese musical practice. I will first discuss the $J_{7,5}^{m}$ and $J_{12,7,5}^{m_1,m_2}$ functions based on the work of Clough, Douthett, Cuciurean, and Plotkin. An important point in my discussion is to demonstrate how to calculate $J_{7,5}^{m}$ and $J_{12,7,5}^{m_1,m_2}$ and explain the meaning of m_1 and m_2. I introduce the two main methods of decreasing *J* purity in works by Debussy and Boulanger ("Pagodes" and *Prelude in D-Flat Major*). The two methods introduce other subsets besides the ME sets (5-35 and 7-35). In this part, I propose the term "*J* function transformation." I then analyze Debussy's "Pagodes" based on $J_{12,7,5}^{m_1,m_2}$ to show the musical oscillation of the *J* function; here I introduce an analytical model of $J_{12,7,5}^{m_1,m_2}$ and the term "basic *J* purity." Next, I analyze two works in the "Chinese" style by Avshalomov and He (*Piano Concerto in G Major on Chinese Themes and Rhythms* and "The Cowherd's Flute"). In comparing music of Debussy, Avshalomov, and He, I introduce the term "deeper *J* purity." My first comparison is between the work of two Western composers (Avshalomov and Debussy) and that of He, which shows their different ways of creating stylistic variety. My second comparison considers the music of Avshalomov and He next to Debussy's "Pagodes"; I speculate that Debussy may have wanted to emulate a Chinese musical style in "Pagodes," because of the work's high *J* purity. In chapters 6–8, I will show the connection between "Pagodes" and Javanese gamelan. I will first introduce the Javanese and Balinese gamelan, and then I will compare the Javanese gamelan with

"Pagodes" and show that their similarity is mainly in rhythmic texture. Finally, I will compare Debussy's counterpoint with Javanese counterpoint.

Works by Debussy, Avshalomov and He in the early twentieth century contain a large concentration of the same musical collections (set classes 5-35 and 7-35) and are thus stylistically similar. The comparison of works by these composers raises the question: is there a specific way of combining maximally-even diatonic and pentatonic elements to make music sound more specifically "Chinese"? Which techniques generated a Chinese musical style when composers used the core pcsets (5-35 combined with 7-35), and how can we evaluate this musical style theoretically? These issues can be clarified by ME set *J* function theory[19]. The combination of maximally-even pentatonic and diatonic elements characterizes this function ($J^{m}_{7,5}$). I will introduce the notion of "purity" of the $J^{m}_{7,5}$ function as a new analytical application of the *J* function. The "7" means diatonic set and "5" means maximally-even pentatonic set. The $J^{m}_{7,5}$ shows that a pentatonic chord is distributed inside a diatonic set in a maximally-even way. My argument will be that the higher the purity of the $J^{m}_{7,5}$ function, the more "Chinese" the musical style will be.

The relative degree of purity of the $J^{m}_{7,5}$ function depends on how many other musical elements outside of 5-35 and 7-35 appear.[20] Within individual musical works, the purity of diatonic/pentatonic (subset/superset) relations may change over time, creating an oscillation between pure and impure *J* functions. Composers deviate from the pure *J* function mainly by transforming the maximally-even pentachords into

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[19] ME set here means the Maximally-even set. ME set *J* function theory is introduced and developed by John Clough, Jack Douthett, and John Cuciurean. In scale theory, a maximally even set is a scale that is either symmetrical or as close to symmetrical as possible.

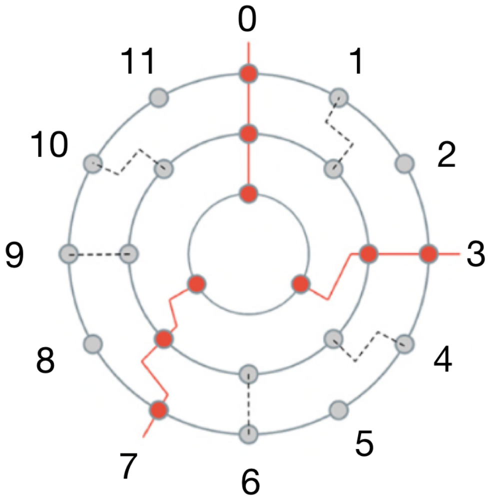
[20] "Purity" here is a quantitative concept, which is a way of evaluating the relative presence of 5-35 and 7-35 elements and the degree to which these elements suggest a kind of Chinese sound. It does not make a distinction between good and bad—that is, it does not mean that "pure" is good and that "impure" is bad.

members of other pentachord set classes, hexachords, and tetrachords that are not subsets of ME pentachords. Ambiguity between two maximally-even pentachords is another important method to decrease the *J* function.

In my argument concerning the *J* function, I will be drawing upon the pioneering work of John Clough and Jack Douthett, who together gave a comprehensive definition of the ME set *J* function.[21] Clough, Douthett, and John Cuciurean then extended the *J* function into the iterated maximally-even set.[22] Richard Plotkin later created a theoretical model of Filtered Point-Symmetry (FiPS) to show relationships between iterated maximally-even sets.[23] A brief overview of this later stage will help to introduce my analytical concerns in this essay. Plotkin's model of FiPS mainly demonstrates relationships among three musical elements (the iterated *J* function). Example 1 shows a FiPS illustration from Plotkin[24]; this is a 3-8-12 configuration that produces a C− triad (037). It illustrates the $J_{12,8,3}^{m_1,m_2}$ function (when $m_1 = 1\ and\ m_2 = 0$, the result is 037, that is, a C- triad). The "m" is a variable here. The m_1 determines different octatonic collections, while the m_2 controls the change of trichords. He called the most interior ring the beacon and all other rings filters. The beacon and middle ring can rotate to change the values of $m_1\ and\ m_2$ to produce different trichords. The values of m_1 and m_2 represent places within the superset where the subset begins.

[21] John Clough and Jack Douthett, "Maximally Even Sets," *Journal of Music Theory* 35, no. 1/2 (Spring-Autumn, 1991), 93–173.
[22] John Clough, John Cuciurean, and Jack Douthett, "Hyperscales and the Generalized Tetrachord," *Journal of Music Theory* 41, no. 1 (Spring, 1997), 67–100.
[23] Richard Plotkin, "Chord Proximity, Parsimony, and Analysis with Filtered Point-Symmetry," *Music Theory Online* 25, no. 2 (July, 2019). https://mtosmt.org/issues/mto.19.25.2/mto.19.25.2.plotkin.html.
[24] Plotkin, "Chord Proximity," [3.1.2].

Example 1: A 3→ 8 → 12 Configuration with a C- Result from Plotkin.



The *J* function of ME set theory originally demonstrated how the subsets are maximally distributed inside the outer cycle of supersets, a concept that Plotkin applied to create the FiPS theoretical model. My analysis is also based on ME set theory, particularly the iterated maximally-even set. However, I treat the subset (with maximally-even distribution) inside the superset as an internal and default property of the *J* function; this is the process through which the *J* function forms. Instead of focusing on this process itself, I treat the *J* function as a family of subsets that includes ME diatonic subsets of the chromatic scale as well as ME pentatonic subsets of the diatonic scale. Speaking of the relationships among the pentatonic, diatonic, and chromatic collections, I should mention that these relationships were first theorized in ancient Chinese sources as "均，宫，调" (*Yun*, *Gong*, *Diao*); this system was summarized by 黄翔鹏 (Huang Xiangpeng) in 1986.[25] As example 2a

[25] Huang Xiangpeng first presented this summary in his article "A Brief Discussion of the Foundations of Chinese Traditional Music Theory" ("中国传统乐学基本理论的若干简要提示"), published in *National Music* (民族民间音乐), 2 (1986). This material was republished in Huang's book *Tradition is a River* (传统是一条河流) (Beijing: People's Publishing House, 1990), 79–93.

illustrates, the Chinese tuning system is calculated by the *San-Fen-Sun-Yi* method, which will produce a circle-of-fifths relationship. The complete circle of fifths gives us all the twelve pitches in the chromatic universe. If we take the first seven notes of the circle of fifths, we obtain the structure of the diatonic collection, a process called *Yun*. This process shows how the diatonic collection can "be the subset of" or "come from" twelve pitches. Example 2b illustrates how we derive three pentatonic collections from the diatonic collection. This process generates three *Gong* modes. Each of the *Gong* modes has five different *Diao* (Tonalities) based on which note is the first in the scale. Taken together, then, the pentatonic, diatonic, and chromatic collections are understood as subsets of each other in traditional Chinese music theory. These concepts form a background to the argument of my paper, as I will focus on the subsets and supersets among the three collections and then track how closely a piece of music adheres to this family to measure how authentically "Chinese" it may sound. I have borrowed Plotkin's conception of multiple circles expressing the relationship of diatonic (7-35) and pentatonic (5-35) elements, although I do not strictly apply his FiPS model to my analysis.

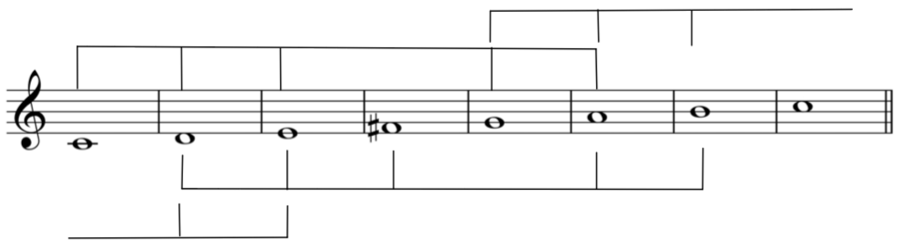
Example 2: 均, 宫，调 (*Yun, Gong, Diao*).

a. Diatonic Structure Derived from the First Seven Notes of the Circle of Fifths.

黄钟 *HuangZhong*	林钟 *LinZhong*	太簇 *TaiCu*	南吕 *NanLv*	姑洗 *GuXian*	应钟 *YingZhong*	蕤宾 *RuiBin*	大吕 *DaLv*	夷则 *YingZe*	夹钟 *JiaZhong*	无射 *WuShe*	中吕 *ZhongLv*
C	G	D	A	E	B	F♯	C♯	G♯	D♯	A♯	E♯

Letter name	C	D	E	F♯	G	A	B
Tunning name	黄钟 *HuangZhong*	太簇 *TaiCu*	姑洗 *GuXian*	蕤宾 *RuiBin*	林钟 *LinZhong*	南吕 *NanLv*	应钟 *YingZhong*
Scale-degree name	宫 *Gong*	商 *Shang*	角 *Jyue*	变徵 *Bian Zhi*	徵 *Zhi*	羽 *Yeu*	变宫 *Bian Gong*

b. Three Pentatonic Collections Generated from the Diatonic Collection.



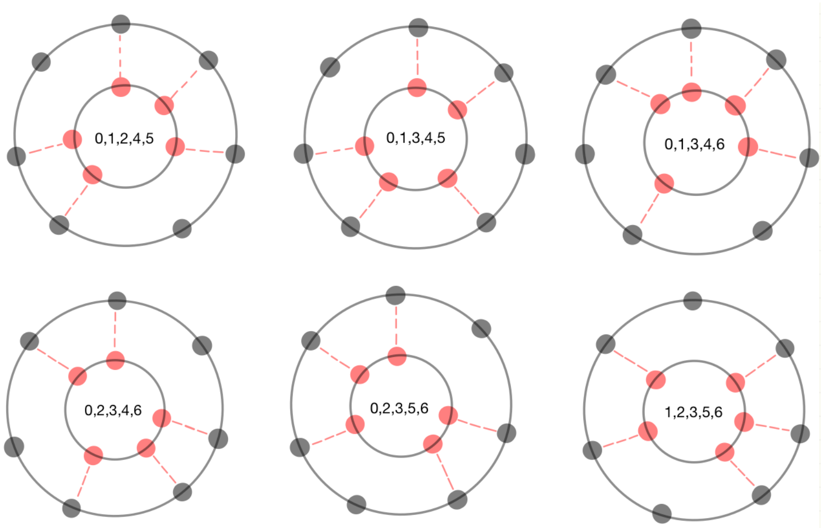
黄钟 *HuangZhong*	大吕 *DaLv*	太簇 *TaiCu*	夹钟 *JiaZhong*	姑洗 *GuXian*	中吕 *ZhongLv*	蕤宾 *RuiBin*	林钟 *LinZhong*	夷则 *YingZe*	南吕 *NanLv*	无射 *WuShe*	应钟 *YingZhong*
C	C♯	D	D♯	E	E♯	F♯	G	G♯	A	A♯	B
宫 ***Gong***		商 *Shang*		角 *Jyue*			徵 *Zhi*		羽 *Yeu*		
		徵 *Zhi*		羽 *Yeu*			宫 ***Gong***		商 *Shang*		角 *Jyue*
		宫 ***Gong***		商 *Shang*		角 *Jyue*			徵 *Zhi*		羽 *Yeu*

CHAPTER II

THE $J_{12,7,5}^{m_1,m_2}$ FUNCTION

In my discussion, I will use "pentatonic elements" to refer to the pentatonic maximally-even set (5-35). The combination of pentatonic elements with diatonic elements (the set 7-35) can be visualized as two tonal circles (example 3). The relation of these set classes (5-35 and 7-35) is a reflection of the *J* function. The theory and application of the *J* function has developed over time, and I would like to survey the most important points along this development, distinguishing between two principal stages.

Example 3: Two Tonal Circles.



In their first formulation of the theory, Clough and Douthett discussed the theory of maximally even (*ME*) sets from a mathematical viewpoint, which is expressed by the *J* function. They posit that if there is a subset of *d* pcs contained in the chromatic universe of *c* pcs, then we have a $D_{c,d} = \{D_0, D_1, D_2, \ldots, D_{d-1}\}$. $D_{c,d}$ is a diatonic set selected from the 12-pitch chromatic universe. Therefore, the $D_{c,\,d} = \{ D_0, D_1, D_2, \ldots, D_{d-1}\}$ is a subset of $\{C_0, C_1, C_2, \ldots, C_{c-1}\}$. The c and d are the cardinality of the two sets, and if there are maximally-even sets, then their relation can be expressed by

$$J_{c,d}^{m}(N) = \left\lfloor \frac{cN + m}{d} \right\rfloor \ (0 \leq m \leq c - 1, 0 \leq N < d \leq c).$$

Thus the J-set with these parameters (c, d, m) is:

$$J_{c,d}^{m} = \{J_{c,d}^{m}(0), J_{c,d}^{m}(1), \ldots, J_{c,d}^{m}(d-1)\}.$$

For example, if c=12, d=7, and m=0, then $J_{12,7}^{0}$= {0, 1, 3, 5, 6, 8, 10} (D^b major set).[26]

Therefore, in this preliminary version of J function theory, any maximally-even sets in the "c universe" can be calculated by means of the two equations above. However, there is one point worthy of note. If the "c universe" is 12 in the set {0, 1, 2, . . . ,11}, we will mod 12 when calculating $J_{12,d}^{m}$. In this case, all the results will be maximally-even sets. The point is that this "c universe" does not have to be 12; there are some cases in which we cannot mod 12 and thus, we cannot get results of maximally-even sets since the mod system has changed. For example, to express the relation of maximally-even diatonic and pentatonic sets with the J function, we let c= 7 and d= 5, resulting in $J_{7,5}^{m}$. In this case, if we calculate $J_{7,5}^{m}$, we will mod 7 instead of 12. We cannot obtain the result of pentatonic maximally-even sets since $J_{7,5}^{m}$ is in the context of mod 7 and the entire pitch class system is built on a 12-pitch chromatic universe. Changing the context back to mod 12, it is necessary to use the iterated ME set to illustrate the pentatonic and diatonic relationship ($J_{12,7,5}^{m_1,m_2}$). This consequence is why we must consider the second stage of ME set development.

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[26] Clough and Douthett, "Maximally Even Sets," 95–100.

In this second stage, Clough, Douthett, and John Cuciurean proposed an iterated ME property.[27] They examine the case of having multiple m such as m_1, m_2, m_3… m_n and multiple subscripts such as c, d_1, d_2, d_3. . . d_n. They present the supposition $c > d_1 > d_2 > \ldots > d_n$, $0 \leq m_n \leq c - 1$, and $0 \leq m_i + 1 \leq d_i - 1$ if $1 \leq i \leq n - 1$ and $0 \leq N \leq d_n - 1$. The result is:

$$J^{m_1,m_2,\ldots,m_n}_{c,d_1,d_2,\ldots,d_n}(Nm) = J^{m_1}_{c,d_1}\,(J^{m_2}_{d_1,d_2}(\,.\,.\,.\,J^{m_n}_{d_{n-1},d_n}(N).\,.\,.)).$$

Taking the parameters c, d_i and m_i from the above definition, leads to:

$$J^{m_1,m_2,\ldots,m_n}_{c,d_1,d_2,\ldots,d_n} = \left\{J^{m_1,m_2,\ldots,m_n}_{c,d_1,d_2,\ldots,d_n}(0),\ J^{m_1,m_2,\ldots,m_n}_{c,d_1,d_2,\ldots,d_n}(1),\ldots J^{m_1,m_2,\ldots,m_n}_{c,d_1,d_2,\ldots,d_n}(d-1)\right\}.$$

Plotkin offers a detailed explanation for calculating the iterated ME set.[28] Applying his method to my concerns here, to calculate $J^{m_1,m_2}_{12,7,5}$, we have to first calculate $J^{m_2}_{7,5}$ and then treat the results as N in $J^{m_1}_{12,7}$ to finally calculate the iterated value. We can let $m_1 = 5$ and $m_2 = 0$ in order to calculate $J^{5,0}_{12,7,5}$:

Step 1	Step 2
$J^{o}_{7,5}(0) = \lfloor\frac{7\times0+0}{5}\rfloor = 0$	$J^{5}_{12,7}(0) = \lfloor\frac{12\times0+5}{7}\rfloor = 0$
$J^{0}_{7,5}(1) = \lfloor\frac{7\times1+0}{5}\rfloor = 1$	$J^{5}_{12,7}(1) = \lfloor\frac{12\times1+5}{7}\rfloor = 2$
$J^{0}_{7,5}(2) = \lfloor\frac{7\times2+0}{5}\rfloor = 2$	$J^{5}_{12,7}(2) = \lfloor\frac{12\times2+5}{7}\rfloor = 4$
$J^{0}_{7,5}(3) = \lfloor\frac{7\times3+0}{5}\rfloor = 4$	$J^{5}_{12,7}(4) = \lfloor\frac{12\times4+5}{7}\rfloor = 7$
$J^{0}_{7,5}(4) = \lfloor\frac{7\times4+0}{5}\rfloor = 5$	$J^{5}_{12,7}(5) = \lfloor\frac{12\times5+5}{7}\rfloor = 9$

Therefore, $J^{5,0}_{12,7,5} = \{0, 2, 4, 7, 9\}$.

[27] Clough, Cuciurean, and Douthett, "Hyperscales and the Generalized Tetrachord," 89.
[28] Plotkin, "Chord Proximity," [2.3.4].

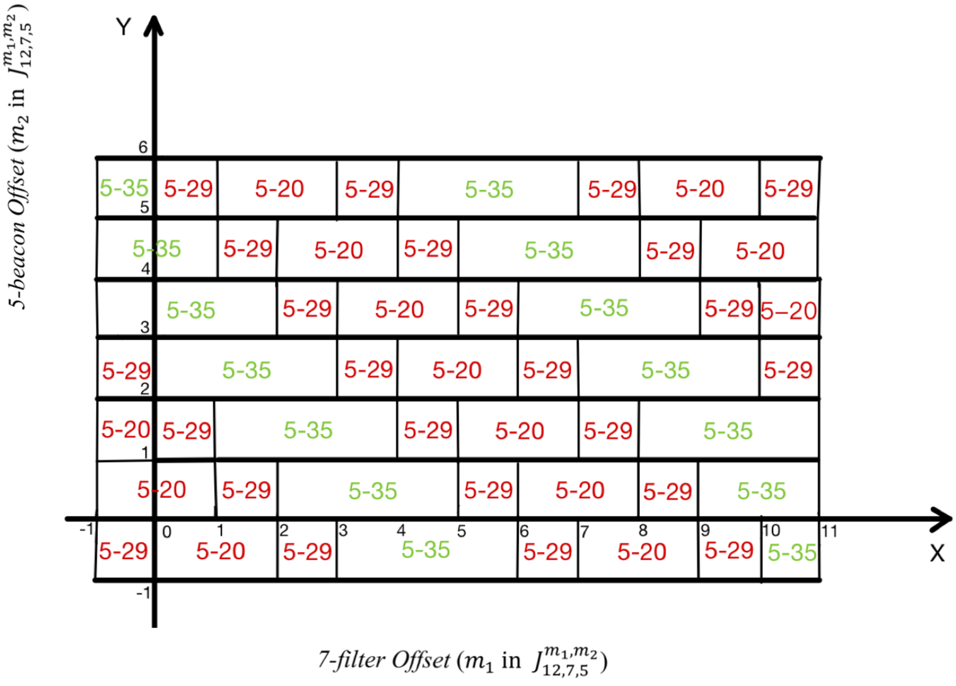
As I argued above, the normal $J_{7,5}^{m}$ cannot produce pentatonic maximally-even sets since c is 7, so we need to mod 7. The iterated ME set $J_{12,7,5}^{m_1,m_2}$ can produce the pentatonic maximally-even set (in prime form) and all of its 11 transpositions since we must mod 12. However, not all results of the iterated ME set ($J_{12,7,5}^{m_1,m_2}$) are maximally-even sets with respect to the c=12 collection. Aside from the 12 ME sets, the iterated ME set can also produce the pentachord sets 5-20 and 5-29. In example 4, the right-hand column lists all 12 pentachord ME sets in order from T_0 (prime form) to T_{11}; the left-hand column shows all other normal pentachord sets (5-20 and 5-29). When $J_{12,7,5}^{m_1,m_2}$ is expressed in a coordinate axis, it is more intuitive to see the pattern of alternating 5-20, 5-29, and 5-35 in $J_{12,7,5}^{m_1,m_2}$ (example 5). The x-axis indicates the variable m_1, and the y-axis indicates the variable m_2 in $J_{12,7,5}^{m_1,m_2}$ $(0 \leq m_1 \leq 11, 0 \leq m_2 \leq 6)$. For example, in the first 5-35 area from the left in the bottom line, the range of m_1 is the integer from $[3,6)$ and the range of m_2 is the integer from $[-1,0)$. The terms *7-filter Offset* and *5-beacon Offset* are first defined by Plotkin when he demonstrates $J_{12,8,3}^{m_1,m_2}$ by the method of Filtered Point-Symmetry (FiPS) and configuration space.[29]

[29] See Plotkin, "Chord Proximity," [3.1.6–3.1.8]. Plotkin introduces the iterated *J* function $J_{12,8,3}^{m_1,m_2}$ in FiPS, where he calls it the "3→ 8 → 12 configuration." Later he demonstrates $J_{12,8,3}^{m_1,m_2}$ by a coordinate axis, which he calls a "configuration space." In the illustration of this coordinate axis, he introduces the terms "8-*filter* Offset" and "3-*beacon* Offset" to indicate different triads produced by different m_1 and m_2 values in $J_{12,8,3}^{m_1,m_2}$.

Example 4: All Pentachord Sets Produced by $J^{m_1,m_2}_{12,7,5}$.

NORMAL PENTACHORD SETS		PENTACHORD ME SETS (5-35)
5-29:	5-20:	$J^{4,0}_{12,7,5}$: 02479 Prime form (T_0)
$J^{0,0}_{12,7,5}$: 01368	$J^{0,1}_{12,7,5}$: 01569	($J^{5,0}_{12,7,5}$: 02479) ($J^{6,0}_{12,7,5}$: 02479)
$J^{0,3}_{12,7,5}$: 0356T	$J^{0,2}_{12,7,5}$: 0156T	$J^{11,0}_{12,7,5}$: 1358T (T_1)
$J^{1,2}_{12,7,5}$: 0157T	$J^{1,0}_{12,7,5}$: 01378	($J^{0,5}_{12,7,5}$: 1358T) ($J^{1,5}_{12,7,5}$: 1358T)
$J^{1,6}_{12,7,5}$: 1378T	$J^{1,1}_{12,7,5}$: 01578	$J^{6,5}_{12,7,5}$: 2469E (T_2)
$J^{2,1}_{12,7,5}$: 02578	$J^{2,0}_{12,7,5}$: 02378	($J^{7,5}_{12,7,5}$: 2469E) ($J^{8,5}_{12,7,5}$: 2469E)
$J^{2,5}_{12,7,5}$: 2358T	$J^{2,6}_{12,7,5}$: 2378T	$J^{1,3}_{12,7,5}$: 0357T (T_3)
$J^{3,0}_{12,7,5}$: 02379	$J^{3,5}_{12,7,5}$: 2359T	($J^{2,3}_{12,7,5}$: 0357T) ($J^{3,3}_{12,7,5}$: 0357T)
$J^{3,4}_{12,7,5}$: 0359T	$J^{3,6}_{12,7,5}$: 2379T	$J^{8,3}_{12,7,5}$: 1468E (T_4)
$J^{4,3}_{12,7,5}$: 0457T	$J^{4,4}_{12,7,5}$: 0459T	($J^{9,3}_{12,7,5}$: 1468E) ($J^{10,3}_{12,7,5}$: 1468E)
$J^{4,6}_{12,7,5}$: 2479T	$J^{4,5}_{12,7,5}$: 2459T	$J^{3,1}_{12,7,5}$: 02579 (T_5)
$J^{5,2}_{12,7,5}$: 0257E	$J^{5,3}_{12,7,5}$: 0457E	($J^{4,1}_{12,7,5}$: 02579) ($J^{5,1}_{12,7,5}$: 02579)
$J^{5,5}_{12,7,5}$: 2459E	$J^{5,4}_{12,7,5}$: 0459E	$J^{0,6}_{12,7,5}$: 1368T (T_6)
$J^{6,1}_{12,7,5}$: 02679	$J^{6,2}_{12,7,5}$: 0267E	($J^{10,1}_{12,7,5}$: 1368T) ($J^{11,1}_{12,7,5}$: 1368T)
$J^{6,4}_{12,7,5}$: 0469E	$J^{6,3}_{12,7,5}$: 0467E	$J^{5,6}_{12,7,5}$: 2479E (T_7)
$J^{7,0}_{12,7,5}$: 12479	$J^{7,1}_{12,7,5}$: 12679	($J^{6,6}_{12,7,5}$: 2479E) ($J^{7,6}_{12,7,5}$: 2479E)
$J^{7,3}_{12,7,5}$: 1467E	$J^{7,2}_{12,7,5}$: 1267E	$J^{0,4}_{12,7,5}$: 0358T (T_8)
$J^{8,2}_{12,7,5}$: 1268E	$J^{8,0}_{12,7,5}$: 12489	($J^{1,4}_{12,7,5}$: 0358T) ($J^{2,4}_{12,7,5}$: 0358T)
$J^{8,6}_{12,7,5}$: 2489E	$J^{8,1}_{12,7,5}$: 12689	$J^{7,4}_{12,7,5}$: 1469E (T_9)
$J^{9,1}_{12,7,5}$: 13689	$J^{9,0}_{12,7,5}$: 13489	($J^{8,4}_{12,7,5}$: 1469E) ($J^{9,4}_{12,7,5}$: 1469E)
$J^{9,5}_{12,7,5}$: 3469E	$J^{9,6}_{12,7,5}$: 3489E	$J^{2,2}_{12,7,5}$: 0257T (T_{10})
$J^{10,0}_{12,7,5}$: 1348T	$J^{10,5}_{12,7,5}$: 346TE	($J^{3,2}_{12,7,5}$: 0257T) ($J^{4,2}_{12,7,5}$: 0257T)
$J^{10,4}_{12,7,5}$: 146TE	$J^{10,6}_{12,7,5}$: 348TE	$J^{9,2}_{12,7,5}$: 1368E (T_{11})
$J^{11,3}_{12,7,5}$: 1568E	$J^{11,4}_{12,7,5}$: 156TE	($J^{10,2}_{12,7,5}$: 1368E) ($J^{11,2}_{12,7,5}$: 1368E)
$J^{11,6}_{12,7,5}$: 358TE	$J^{11,5}_{12,7,5}$: 356TE	

Example 5: $J_{12,7,5}^{m_1,m_2}$ Coordinate Axis.



In the iterated ME set (in this case $J_{12,7,5}^{m_1,m_2}$), m_1 and m_2 have a special meaning, although Clough and Douthett do not illustrate this point in their article "Maximally Even Sets" (1991). As example 6 demonstrates, the values of m_1 represent different starting notes in the diatonic scale within a chromatic scale. When *m* is 0, the starting note is pitch class 1 (initiating a D♭ major scale). Aside from this case (*m* = 0), all of the starting notes may be calculated by "$m + 7$ (mod 12)" since each starting note is separated by a *clen* 7 (a fifth relation).[30] For instance, when *m* is 3, the starting note is 10 (3+7), which leads to a B♭major scale. As example 7 illustrates, the values of m_2 represent different starting notes in the maximally-even pentatonic scale within a diatonic scale. Since we are exploring $J_{7,5}^{m}$, the superset has changed from the

[30] The term "*clen*" is explained by Clough and Douthett as a chromatic length in $D_{c,d}$, which here points to $J_{12,7}^{m}$. Although Clough and Douthett explain the "7" relation and the circle of fifths relation of each diatonic set calculated by a different *m* of $J_{12,7}^{m}$, they do not extend this to illustrate a specific meaning of *m* in an ME set. See Clough and Douthett, "Maximally Even Sets," 95 and 100.

chromatic scale to the diatonic scale; we would then need to mod 7 (see example 7a). We can then notate the first note of the pentatonic scale with the number under the mod 7 system (see example 7b). When m is 0, the starting note of the pentatonic scale is 0. Except for this case, the starting note is "$m + 2 \cdot m$ (mod 7)." For example, when m equals 4, the starting note of the pentatonic scale is 5 ($4+2 \cdot 4$, mod 7), which leads to a pentatonic scale starting on A.

Example 6: The m in $J_{12,7}^{m}$ (m_1 in Iterated ME Set $J_{12,7,5}^{m_1,m_2}$).

$J_{12,7}^{m}$	Starting Note (mod 12)	The Value of m	C 0	C♯ 1	D 2	D♯ 3	E 4	F 5	F♯ 6	G 7	G♯ 8	A 9	A♯ 10	B 11
$J_{12,7}^{0} = \{0, \boxed{1}, 3, 5, 6, 8, 10\}$ (intervals: 1 2 2 1 2 2 2)	1 ($D^\flat$)	0	•	•		•		•	•		•		•	
$J_{12,7}^{1} = \{0, 1, 3, 5, 7, \boxed{8}, 10\}$ (intervals: 1 2 2 2 1 2 2)	clen 7 → 8 ($A^\flat$)	1	•	•		•		•		•	•		•	
$J_{12,7}^{2} = \{0, 2, \boxed{3}, 5, 7, 8, 10\}$ (intervals: 2 1 2 2 1 2 2)	clen 7 → 3 ($E^\flat$)	2	•		•	•		•		•	•		•	
$J_{12,7}^{3} = \{0, 2, 3, 5, 7, 9, \boxed{10}\}$ (intervals: 2 1 2 2 2 1 2)	clen 7 → 10 ($B^\flat$)	3	•		•	•		•		•		•	•	
⋮														
$J_{12,7}^{11} = \{1, 3, 5, \boxed{6}, 8, 10, 11\}$ (intervals: 2 2 1 2 2 1 2)	clen 7 → 6 ($F^\sharp$)	11		•		•		•	•		•		•	•

(The Circle Of Fifths)

Example 7: The m *in* $J_{7,5}^{m}$ (m_2 in Iterated ME Set $J_{12,7,5}^{m_1,m_2}$).

a. Mod 7 and Mod 12 System Exchange in a Diatonic Scale.

	C	**D**	**E**	**F**	**G**	**A**	**B**
Mod 7	0	1	2	3	4	5	6
Mod 12	0	2	4	5	7	9	11

b. The m in $J^m_{7,5}$ (m_2 in Iterated ME Set $J^{m_1,m_2}_{12,7,5}$) Based on the Mod 7 System.

$J^m_{7,5}$	Starting Note (mod 7)	The Value of m	C 0	D 1	E 2	F 3	G 4	A 5	B 6
$J^0_{7,5} = \{0, 1, 2, 4, 5\}$ (1, 1, 2, 1, 2)	0 (C) clen “3”	0	•	•	•		•	•	
$J^1_{7,5} = \{0, 1, 3, 4, 5\}$ (1, 2, 1, 1, 2)	3 (5, F) clen “3”	1	•	•		•	•	•	
$J^2_{7,5} = \{0, 1, 3, 4, 6\}$ (1, 2, 1, 2, 1)	6 (11, B) clen “3”	2	•	•	•	•			•
$J^3_{7,5} = \{0, 2, 3, 4, 6\}$ (2, 1, 1, 2, 1)	2 (4, E) clen “3”	3	•		•	•	•		•
$J^4_{7,5} = \{0, 2, 3, 5, 6\}$ (2, 1, 2, 1, 1)	5 (9, A) clen “3”	4	•		•	•		•	•
$J^5_{7,5} = \{1, 2, 3, 5, 6\}$ (1, 1, 2, 1, 2)	1 (2, D) clen “3”	5		•	•	•		•	•
$J^6_{7,5} = \{1, 2, 4, 5, 6\}$ (1, 2, 1, 1, 2)	6 (11, B)	6		•	•		•	•	•

CHAPTER III

TWO TECHNIQUES OF DECREASING THE *J* FUNCTION

As I mentioned above, there are two ways of decreasing the *J* function. The principal way is to transform the maximally-even pentachords into either members of other pentachord set classes (outside of 5-35) or into a hexachord or a tetrachord that is not a superset or subset of the ME pentachord. There are four methods of chordal transformation within this technique that are characteristic of music by composers such as Debussy and Boulanger. The second technique of decreasing the *J* function, less commonly used in the music literature, is to create ambiguity between two maximally-even pentachords.

Chordal Transformation

Chordal transformation plays an important role in certain early twentieth-century works such as Debussy's "Pagodes" and Boulanger's *Prelude in D-Flat Major*. These composers utilized techniques of chordal transformation with the result of flexibly transforming maximally-even pentatonic elements into tetrachord, hexachord, or other pentatonic pcsets (outside of set classes 5-35 and 7-35). These techniques decrease the purity of $J_{12,7,5}^{m_1,m_2}$.[31] Four main approaches to chordal transformation can be identified in their works: Transformation 1) through sustained notes; 2) through *minimal offset voice leading*; 3) from maximally-even pentachords to whole-tone sets, and 4) between two maximally-even pentachords (two 5-35s). This final technique, which appears in Debussy's music, is closely connected with the *J* function. I will call this the "*J* function transformation."

[31] I will define *J* purity as a measure determining how many sets in a measure adhere to the $J_{12,7,5}^{m_1,m_2}$ function, on pp. 32–35 of this paper.

(1) *Sustained-Note Transformation*

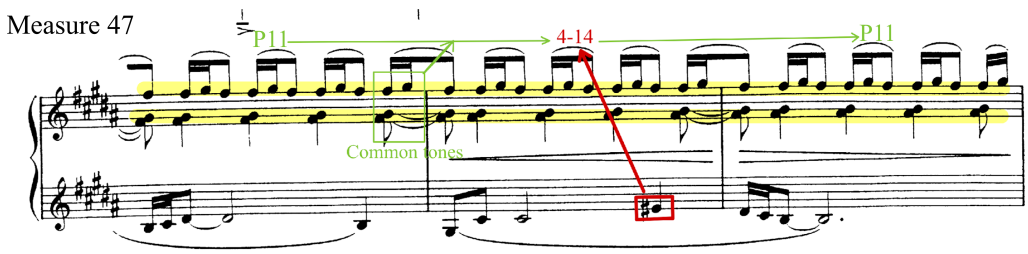
Sustained notes in Debussy's music often help build pivot chords or parsimoniously transform maximally-even pentachords into other collections outside of 5-35 and 7-35. The function of the sustained notes is to connect a series of musical elements and render the parsimonious transformation fluent.

In the same way that David Lewin argued for the musical significance of parallel voice-leading, I would argue that sustained notes are not a simple phenomenon in Debussy's music.[32] The reason that sustained notes can support parsimonious transformation is that they can function as common tones between two pcsets. (This does not mean that they are all common tones.) As examples 8a and 8b illustrate, two sustained notes ($F^\sharp$ and $G^\sharp$) are treated as common tones to help transform P_{11} into set class 4-14 and then back to P_{11} ($\{1, 3, 6, 8, 11\}$). Here, "P" represents the transposition of the maximally-even pentatonic collections indicated in examples 4 and 11; P_{11} is equivalent to T_{11} of the prime form of the maximally-even pentachord (02479). In the process of transforming P_{11} into 4-14, Debussy keeps three common tones and moves another voice up a half step. Since the upper voice of measures 47–49 retains the $F^\sharp$ and $G^\sharp$, what strikes our ears is the $E^\sharp$ in the lower voice. This $E^\sharp$ (marked in this example with red) changes the P_{11} into 4-14; resulting in a symmetrical progression P_{11} – 4-14 – P_{11} (see example 8b).

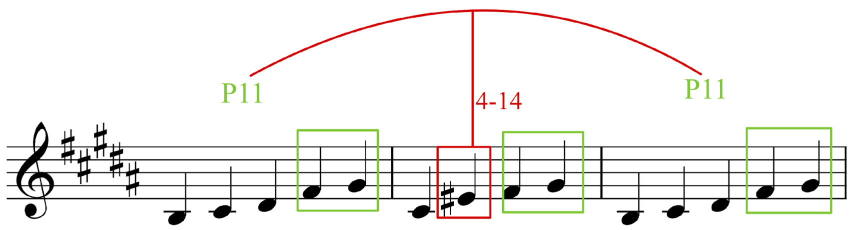
32 David Lewin, "Some Instances of Parallel Voice-Leading in Debussy," *19th-Century Music* 11, no. 1 (Summer, 1987), 61–62.

Example 8: Common-Tone Transformation.

a. Common-Tone Transformation in mm. 47–49 of Debussy's "Pagodes."



b. Structural Reduction of the Common-Tone Transformation in mm. 47–49.



(2) *Transformation by Minimal Offset Voice Leading*

Transformation by *minimal offset voice leading* (either maximally uniform or maximally balanced) is one kind of parsimonious transformation discussed in detail by Joseph N. Straus in his article "Voice Leading in Set-Class Space."[33] Example 9 presents Straus's illustration of parsimonious transformation with *minimal offset voice leading* through "fuzzy transposition" and "fuzzy inversion." The notation T_0^p indicates a transpositon between two identical chords, which we can also describe as strict transformation (Example 9, 1a). If a transformation deviates in a measurable way from this strict transposition, we call it "fuzzy" transposition.[34] Therefore, the notation $\underset{(1)}{{}^{*}T_0^p}$ in Example 9, 1b indicates that the chord Y_2 ($G^{\#}$, A, E) deviates from X

[33] Joseph N. Straus, "Voice Leading in Set-Class Space," *Journal of Music Theory* 49, no. 1 (Spring, 2005), 45–108.
[34] Straus, "Voice Leading in Set-Class Space," 45–47.

(G, A, E) by a semitone (one offset). The notation I^{A5}_{E3} refers to the case in which two chords (X and Z_1) are a strict inversion of each other, and the notation $\overset{*}{}I^{A5}_{E3}\underset{(1)}{}$ indicates that Z_2 relates to X through a fuzzy inversional relationship, which means that the voice leading from G to F disrupts the balance by one semitone. The first staff contains the transformational voice leading via transposition (X–Y_1) and its fuzzy transpositions (X–Y_2/Y_3/Y_4, called "maximally uniform") as pitch and pitch-class sets. The second staff contains the transformational voice leading via inversion (X–Z_1) and its fuzzy inversions (X–Z_2/Z_3/Z_4, called "maximally balanced") as pitch and pitch-class sets. In this example, the voice leading deviates one semitone (one degree of offset) from "strict T and I," so that X–Y_2/Y_3/Y_4 and X–Z_2/Z_3/Z_4 are respectively interpreted as maximally uniform and maximally balanced. If a member of one set class maps onto every member of another set class with maximally uniform or maximally balanced transformation, then these two set classes are related by *minimal offset voice leading* (with the offset of 1).[35]

Furthermore, Straus has proposed a theoretical model of parsimonious voice-leading space based on offset relationships for dyad, trichord, tetrachord, pentachord, and hexachord set classes, or two of these adjacent classes.[36] I will identify the offset number of the transformation between two set classes based on Straus's model (parsimonious voice-leading space) to demonstrate that Debussy's works contain many parsimonious transformations by *minimal offset voice leading*. As example 10a illustrates, there are ten transformations in measures 16–18 of "Pagodes"; six of them are parsimonious transformations by *minimal offset voice leading* (highlighted in yellow).

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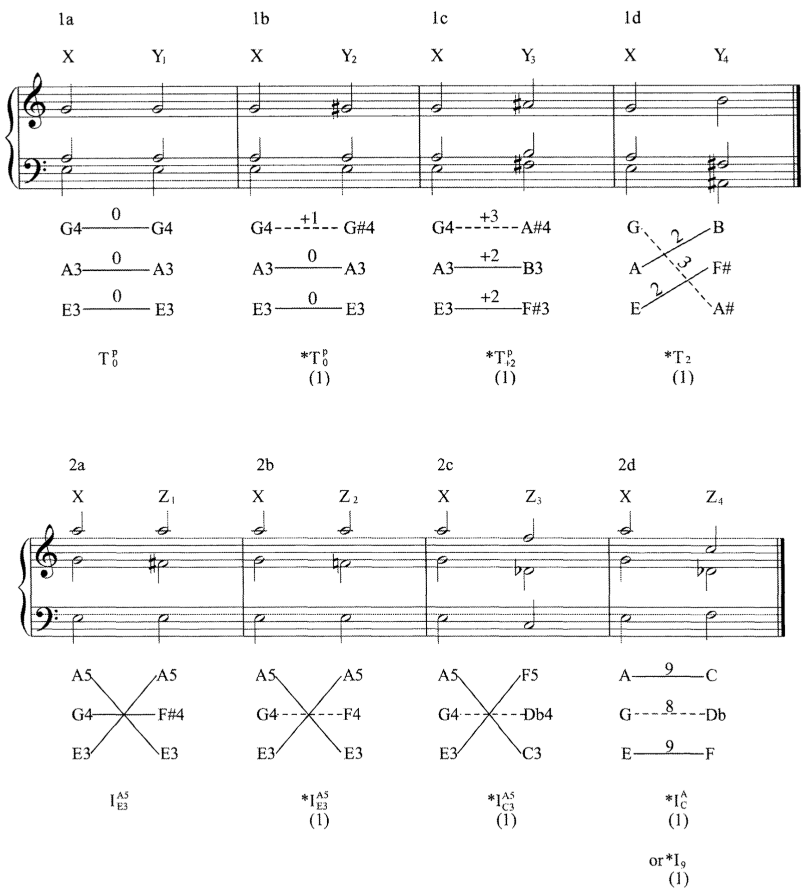
[35] Straus, "Voice Leading in Set–Class Space," 49.
[36] Straus, "Voice Leading in Set–Class Space," 51–67.

Example 10b offers a detailed explanation of the offset numbers in the chart in example 10a. As b1 illustrates, the prime form of the set class 4-23 relates to the prime form of 4-27 by parsimonious transformation through both fuzzy transposition and fuzzy inversion (with *minimal offset*). The transformation between 4-27 and 5-23 in b2 includes two transformations: transformation by fuzzy transposition with *minimal offset* and transformation by "split."[37] I will count this transformation between 4-27 and 5-23 as two offset numbers.[38] The transformations in b3, b4, and b5 should be considered in the same way.

[37] For a detailed explanation of the terms "split" and "fuse," see Straus, "Voice Leading in Set-Class Space," 100.

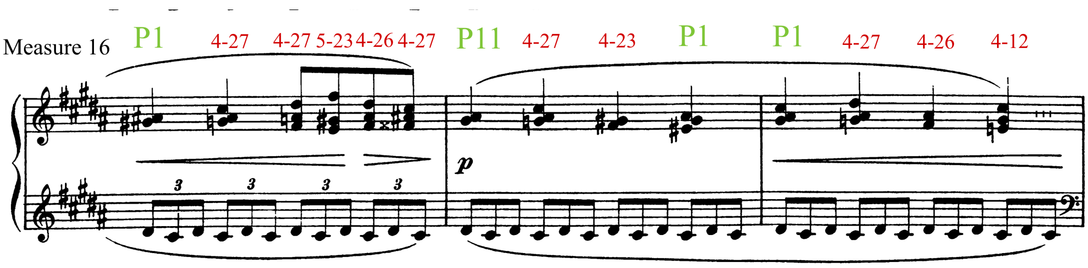
[38] Theoretically, the offset number is only defined in terms of a transformation by fuzzy transposition or inversion. For example, if there is a fuzzy transposition, there should then be an offset number to indicate how far it is away from strict transposition. However, there is one more step in addition to the fuzzy transposition in b2, which is the "split" transformation. To show the real distance between two pcsets, I also count one offset number for the "split" transformation. In his "voice-leading space figures" that include only one chordal type, Straus argues that the line connecting two nodes indicates one offset (*minimal offset number*). However, in the voice-leading spaces that contain two or more different chordal types (for example, when one voice-leading space contains both a dyad and trichord), Straus does not clarify what the line between the two nodes means. I would explain this as follows: Since the voice-leading spaces that contain transformational relationships of two or more different chordal types involve two different transformations (fuzzy transformation and "split and fuse" transformation), the connecting line could indicate that two set classes relate to each other by fuzzy transformation or "split and fuse" transformation. While the voice-leading spaces that contain transformational relationships of one chordal type only involve fuzzy transformation, the connecting line only indicates that two set classes relate to each other by a fuzzy transformation with a *minimal offset*. In this case, the line connecting the two nodes indicates one offset number.

Example 9: Fuzzy Transposition and Fuzzy Inversion in Straus (2005).



Example 10: Parsimonious Transformation by *Minimal Offset Voice Leading.*

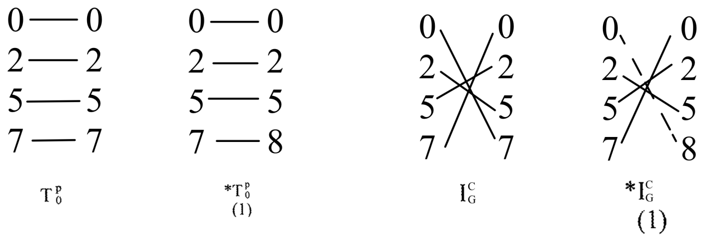
a. Parsimonious Transformation by *Minimal Offset Voice Leading* in mm. 16–18 in “Pagodes.”



	Measure 16	Measure 17	Measure 18
	(4-23) P1 4-27 5-23 4-26 4-27	(4-16) (4-21) P11 4-27 4-23 P1	(4-23) P1 4-27 4-26 4-12
Offset	1 2 2 1	2 1 2	1 1 3

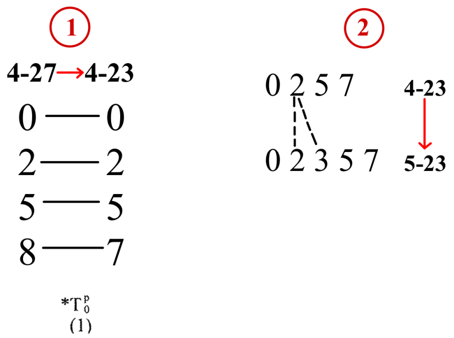
b. The Explanation of the Offset Number in the Chart of Example 10a.

1. Offset 1 of the transformation between 4-23 and 4-27.

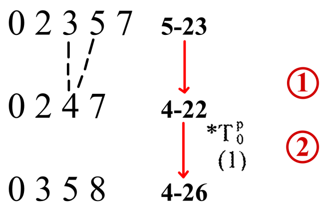


Fuzzy transformation from 4-23 to 4-27 Fuzzy inversion from 4-23 to 4-27

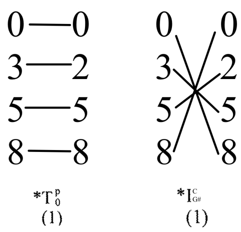
2. Offset 2 of the transformation between 4-27 and 5-23.



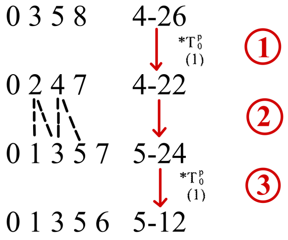
3. Offset 2 of the transformation between 5-23 and 4-26.



4. Offset 1of the transformation between 4-26 and 4-27.



5. Offset 3 of the transformation between 4-26 and 5-12.



(3) *Transformation from Set Class 5-35 to 6-35*

Another transformation that is common in early twentieth-century French music is the transformation from the maximally-even pentachord into the whole-tone scale (6-35). Richard Taruskin, for instance, has pointed to an example of the transformation from a whole-tone collection to a maximally-even pentatonic collection in Debussy's "Voiles" (*Préludes*, Book I, mm. 41–48).[39] In this kind of transformation, three common tones are retained, while two other voices move by semitone. To illustrate this kind of transformation, example 11 presents the two possible whole-tone scales (W_0 and W_1) and all twelve possible maximally-even pentachords to show their relationships. Here, six pentachords keep three common tones with W_0, and another six pentachords keep three common tones with W_1. Composers may treat the three common tones as pivot tones to transform a pentachord into a whole-tone scale or to transform a whole-tone scale into a pentachord. Lili Boulanger used this type of transformation in her *Prelude in D-Flat Major*: there is a transformation from P_1 to W_1 in measures 10–11 (example 12). P_1 and W_1 keep three common tones (1, 3, 5), while 8 moves down by semitone to 7 and 10 splits to 9 and 11.

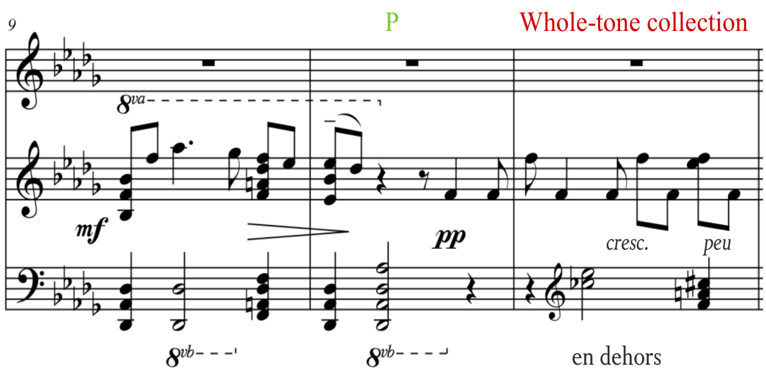
[39] Richard Taruskin, *Music in the Early Twentieth Century* (Oxford and New York: Oxford University Press, 2010), 75.

Example 11: The Relationship of Maximally-Even Pentachords and Whole-Tone Scales.

Whole-tone Collections	**W_0 0 2 4 6 8 10**	**W_1 1 3 5 7 9 11**
Maximally-Even Pentachord Pitch Class Sets	0 2 4 6 8 10	1 3 5 7 9 11
	0 2 4 7 9 P_0	1 3 5 8 10 P_1
	2 4 6 9 11 P_2	0 3 5 7 10 P_3
	1 4 6 8 11 P_4	0 2 5 7 9 P_5
	1 3 6 8 10 P_6	2 4 7 9 11 P_7
	0 3 5 8 10 P_8	1 4 6 9 11 P_9
	0 2 5 7 10 P_{10}	1 3 6 8 11 P_{11}
Uncommon Tones	1357911------W_1	0246810 ------ W_0
Common Tones	0246810 ------ W_0	1357911 ------ W_1

Example 12: Transformation from a Pentatonic Collection to a Whole-Tone Collection.

a. Transformation from a Pentatonic Collection to a Whole-Tone Collection in mm. 10–11 in *Prelude in D-Flat Major* by Boulanger.



b. Reduction of the Transformation from P_1 to W_0.

(4) *J Function Transformation*

The final method of chordal transformation is the transformation between two maximally-even pentachords, which is what I describe as the "*J* function transformation." This transformation is different from the other transformations I have discussed (transformations between 5-35 and 7-35, and pcsets outside of set classes 5-35 and 7-35); it does not decrease the *J* purity, because it is a transformation between two maximally-even pentachords. The *J* function transformation means that these pentachords are connected through $J_{12,7,5}^{m_1,m_2}$ —in other words, two 5-35 subsets of the same diatonic scale like two *Gong* modes within the same *Jun*. The two maximally-even pentachords do not have to be different, in fact. The rule is that if we keep m_1, in order to change m_2 we will transform the pentachord into a different pentachord. If we keep m_2 and change m_1, the pentachord itself remains the same, yet it will now appear within a different diatonic context and assume a different function. The *J* function transformation in example 13 belongs to the first type.

I discuss this transformation here to draw attention to a significant connection between the *J* function and chordal transformation; this transformation proves the musical function of the $J_{12,7,5}^{m_1,m_2}$ working as a potential link between two different maximally-even pentachords. As example 13a illustrates, P_6 ($\{1, 3, 6, 8, 10\}$) in m. 44 is transformed into P_{11} ($\{1, 3, 6, 8, 11\}$) through the pivot D_5 ($\{1, 3, 5, 6, 8, 10, 11\}$).[40] P_6 is connected with D_5 through $J_{12,7,5}^{11,1}$ $(m_1 = 11\ and\ m_2 = 1)$, and P_{11} is connected with D_5 through $J_{12,7,5}^{11,2}$ $(m_1 = 11\ and\ m_2 = 2)$. The principle is that in this $J_{12,7,5}^{m_1,m_2}$ transformation, two different maximally-even pentatonic pcsets retain the same m_1

[40] The principle guiding the notation "D" (diatonic collection) is the same as that for "P" (pentatonic collection). D_0 equals T_0, which is the prime form of the maximally-even diatonic collection, and D_5 is the T_5 of the maximally-even diatonic collection.

(11) and change m_2 from 1 to 2, preserving the same diatonic scale, with two 5-35 subsets. More specifically, in the base of the first pentachord ($m_1 = 11$ *and* $m_2 = 1$), m_2 changes from 1 to 2 to produce another pentachord, and these two different maximally-even pentachords are connected by the same m_1 (the same diatonic collection D_5). I have marked the path of this transformation in a matrix graph (see example 13b).

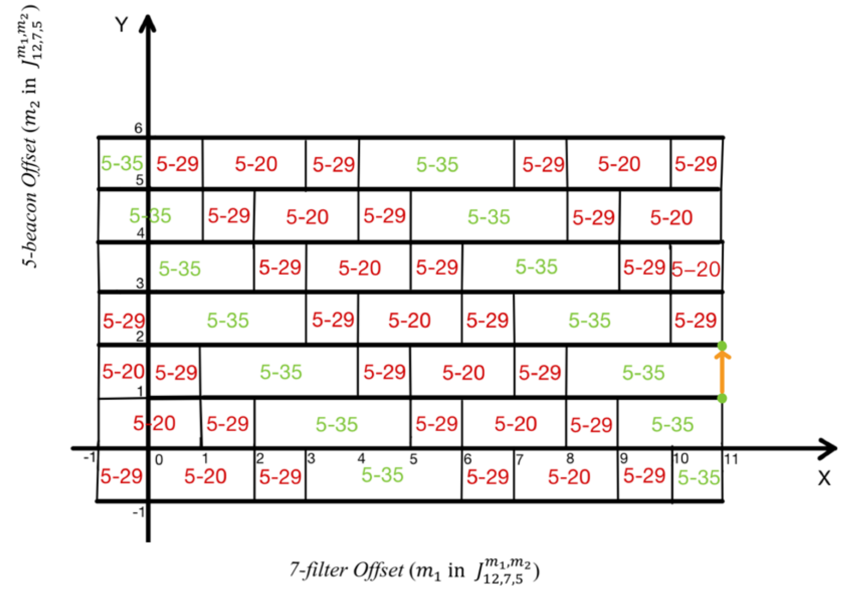
Example 13: *J* Function Transformation.

a. The *J* Function Transformation in mm. 44–47 in "Pagodes."

P6 D5 P11

1 3 6 8 T⟶1 3 5 6 8 T E⟶1 3 6 8 E

b. The Path of the Transformation of Two Maximally-Even Pentachords in $J_{12,7,5}^{m_1,m_2}$ along a Coordinate Axis.

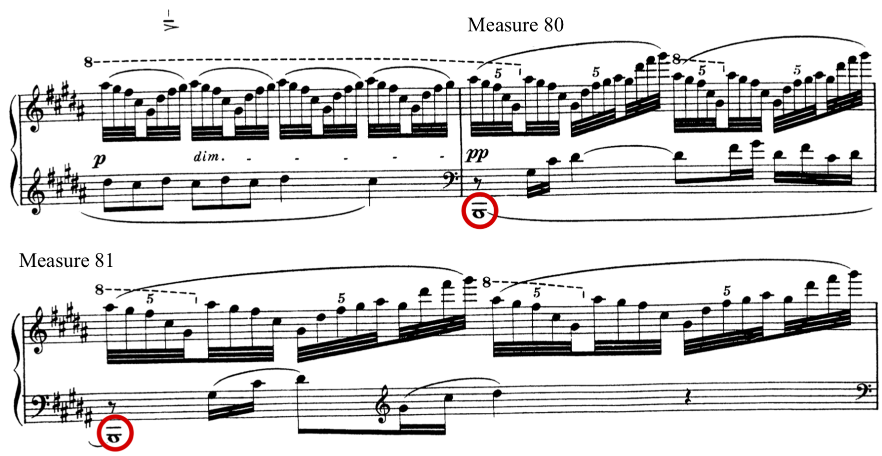


The Ambiguity of Two Maximally-Even Pentachords

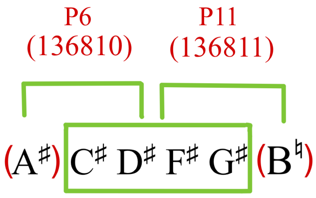
The technique of parsimonious transformation can be used to create ambiguity involving two maximally-even pentachords. This does not mean transforming the maximally-even pentachords into a hexachord or tetrachord, although six different notes are present instead of five different notes. Instead, ambiguity is created between two maximally-even pentachords, and it is difficult to identify which pentachord it is since the two pentachords share four common tones. For example, in measures 80–81 of "Pagodes," each measure contains two ambiguous maximally-even pentachords. In measure 80, if we ignore the long-sustained B in the bass, there are five different pitch classes ($\{1, 3, 6, 8, 10\}$) that belong to 5-35; this constitutes P_6, following my definition of the different maximally-even pentachords (examples 14a and 14b). However, the bass note B disrupts this perfect maximally-even pentachord. This B and the four other notes in the left hand ($C^\sharp$, $D^\sharp$, $F^\sharp$ and $G^\sharp$) constitute a different maximally-even pentachord: P_{11} ($\{1, 3, 6, 8, 11\}$). Measure 81 contains the same ambiguity as measure 80. The ambiguity between P_{11} and P_6 therefore forms a six-note group in these measures, which ruptures the stability of the *J* function.

Example 14: The Ambiguity of Two Maximally-Even Pentachords.

a. The Ambiguity of Two Maximally-Even Pentachords in mm. 80–81 of "Pagodes."



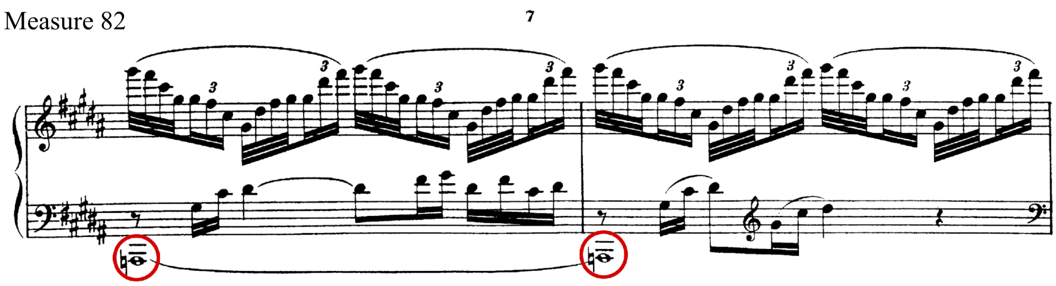
b. The Structure of Two Maximally-Even Pentachords in mm. 80–81 of “Pagodes.”



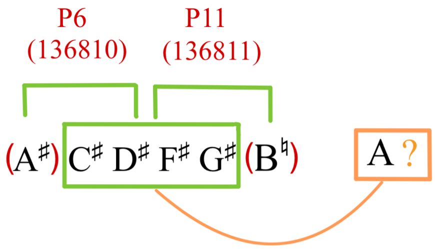
Another way of forming ambiguity is by lowering the purity of the *J* function even more than in the first case described above. Based on the ambiguity of P_0 and P_2, this way adds a note outside of these two maximally-even pentachords. For instance, in measure 82 (examples 15a and 15b), if we ignore the long sustained A, we have four notes (C♯, D♯, F♯, and G♯), which are the common tones of P_{11} and P_6. One difference between this second case and the first case is that there is no A♯ and B♯, but there is still ambiguity in the second group of notes between P_6 and P_{11}, since these four notes can belong to P_{11} (by adding a B♮) or P_6 (by adding an A♯). Within this ambiguity, the long-sustained note A♮ breaks the stability of maximally-even pentachords and makes the *J* function weaker than in the first case.

Example 15: The Ambiguity of Two Maximally-Even Pentachords with the Disruptive Pitch.

a. The Ambiguity of Two Maximally-Even Pentachords with the Disruptive Pitch “A” in mm. 82–83 of “Pagodes.”



b. The Structure of Ambiguity with a Strange Note.



CHAPTER IV

THE OSCILLATION AND PURITY OF THE *J* FUNCTION

Having summarized the development of *J* function theory and discussed the significance of $J_{12,7,5}^{m_1,m_2}$ in particular, I will now extend this theory to examine the combination of maximally-even diatonic and pentatonic elements in Debussy's "Pagodes." The reason I apply $J_{12,7,5}^{m_1,m_2}$ to explain the relation of 7 and 5 is that all of the results are pentachords. How, then, can the result of 5 notes (a pentachord) express the relationship between the diatonic (7-35) and pentatonic (5-35) sets? First, the precondition of the validity of $J_{12,7,5}^{m_1,m_2}$ is that the *c*, d_1, and d_2 are all maximally-even sets. Take $J_{12,7,5}^{m_1,m_2}$ as an example: *c*, being 12, is assuredly a maximally-even set; that d_1 is 7 means that it is diatonic (it could be {0, 1, 3, 5, 7, 9, 10}); finally, d_2 is 5, which means that it is a maximally-even pentatonic set (for example, {0, 2, 4, 7, 9}). In this case, the diatonic pcset contains all the cardinality of the maximally-even pentatonic pcset. Therefore, from the essence of $J_{12,7,5}^{m_1,m_2}$, a relation of maximally-even diatonic and pentatonic sets has been established.

If we want to calculate the purity of $J_{12,7,5}^{m_1,m_2}$ in a musical work or passage, we should first clarify what constitutes a completely pure $J_{12,7,5}^{m_1,m_2}$ function. All of the maximally-even pentachords are results of $J_{12,7,5}^{m_1,m_2}$. All diatonic sets can be produced in the second step when counting $J_{12,7,5}^{m_1,m_2}$, since we read $J_{12,7,5}^{m_1,m_2}$ *as* $J_{7,5}^{m_2}$ and $J_{12,7}^{m_1}$. To calculate $J_{12,7,5}^{m_1,m_2}$, we need first to calculate $J_{7,5}^{m_2}$ and then $J_{12,7}^{m_1}$. All of the diatonic pcsets are results of $J_{12,7}^{m_1}$. Therefore, if one measure or one section in a musical work consists only of pentatonic (5-35) elements or contains both diatonic and pentatonic

(5-35) elements, then the purity of the *J* function ($J_{12,7,5}^{m_1,m_2}$) in this measure or section is 100%.

In understanding the function of chordal types in set class 5-35, my viewpoint differs from that of Arnold Schoenberg, who described Debussy's harmony as being "non-functional."[41] "Function" here means that the harmonies, such as some chordal types of the set class 5-35, might not have any function in common-practice tonality. However, these chords do have a function in the Chinese modal system, since Chinese music is heavily based on the pentachord and Chinese theorists have offered a detailed classification of these chords. Example 16 lists all of the possible chordal types in set class 5-35 classified by Chinese music theorists such as Sang Tong and Fan Zuyin[42]; I have translated the original Chinese names of these chords into English. Any chord from this chart that appears in a musical passage indicates the presence of a maximally-even pentatonic set as superset. The presence of other pcsets (except for 5-35 and 7-35) decreases the purity of the *J* function. If $J_{12,7,5}^{m_1,m_2}$ is not pure, the ECG line will be unstable, and we will hear an oscillation within it.

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41 Arnold Schoenberg, *Style and Idea* (New York: Philosophical Library, 1950), 104.

42 Sang Tong [桑桐], *Wushengzonghexing hesheng jiegoudetaolun* (五声纵合性结构的讨论) (*The Discussion of Pentatonic Vertical Harmony*) *Art of Musi-Journal of the Shanghai Conservatory of Music* 1 (1980): 23–24.
Fan Zuyin [樊祖荫], *Zhongguo wushengdiaoshiheshengde lilunyufangfa* (中国五声调式和声的理论与方法) (*The Theory and Method of Chinese Pentatonic Tonal Harmony*) (Shanghai: Shanghai Music Publishing House, 2003): 103–107.

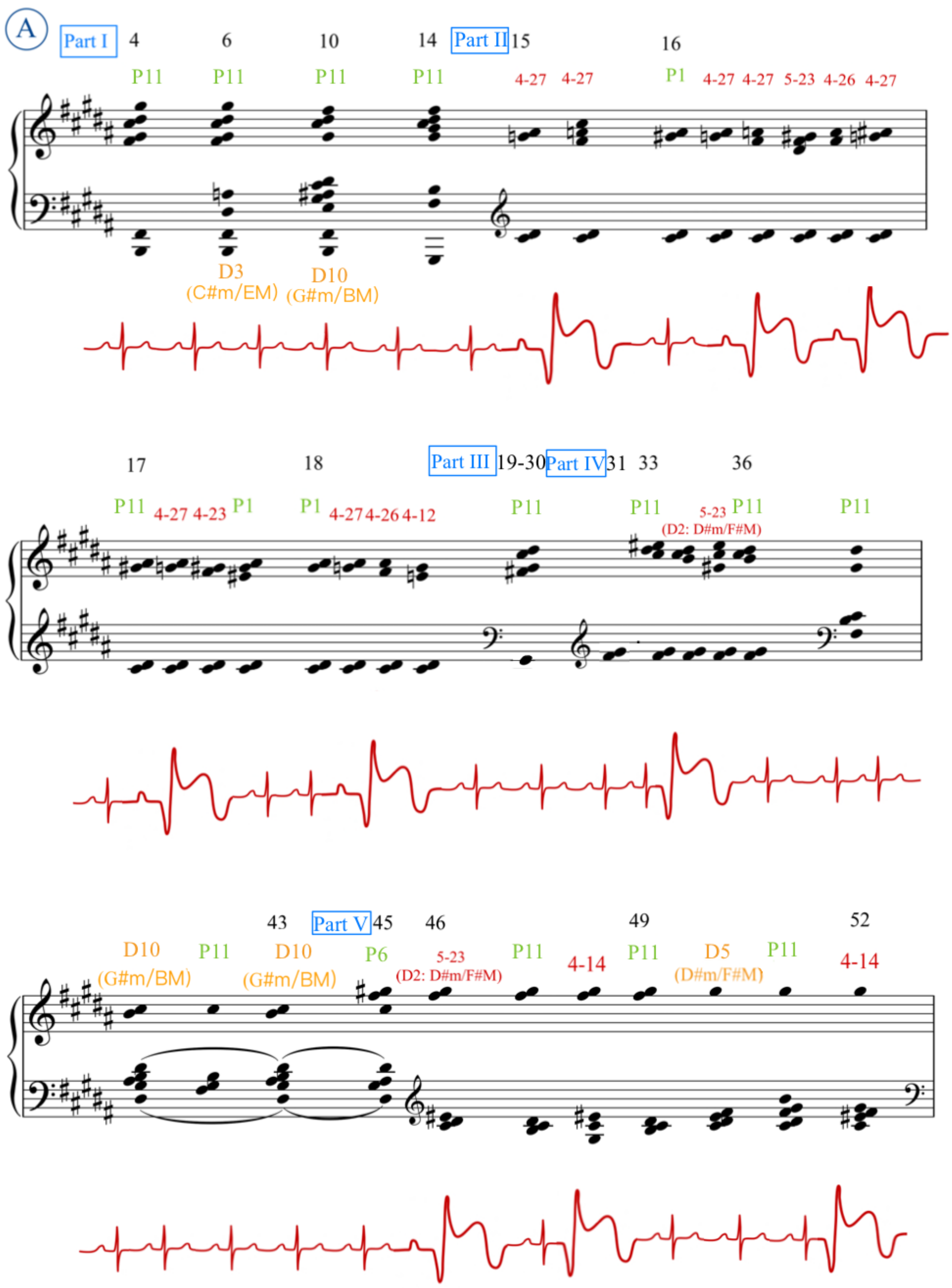
Example 16: All Chordal Types in the Subsets of Set Class 5-35.

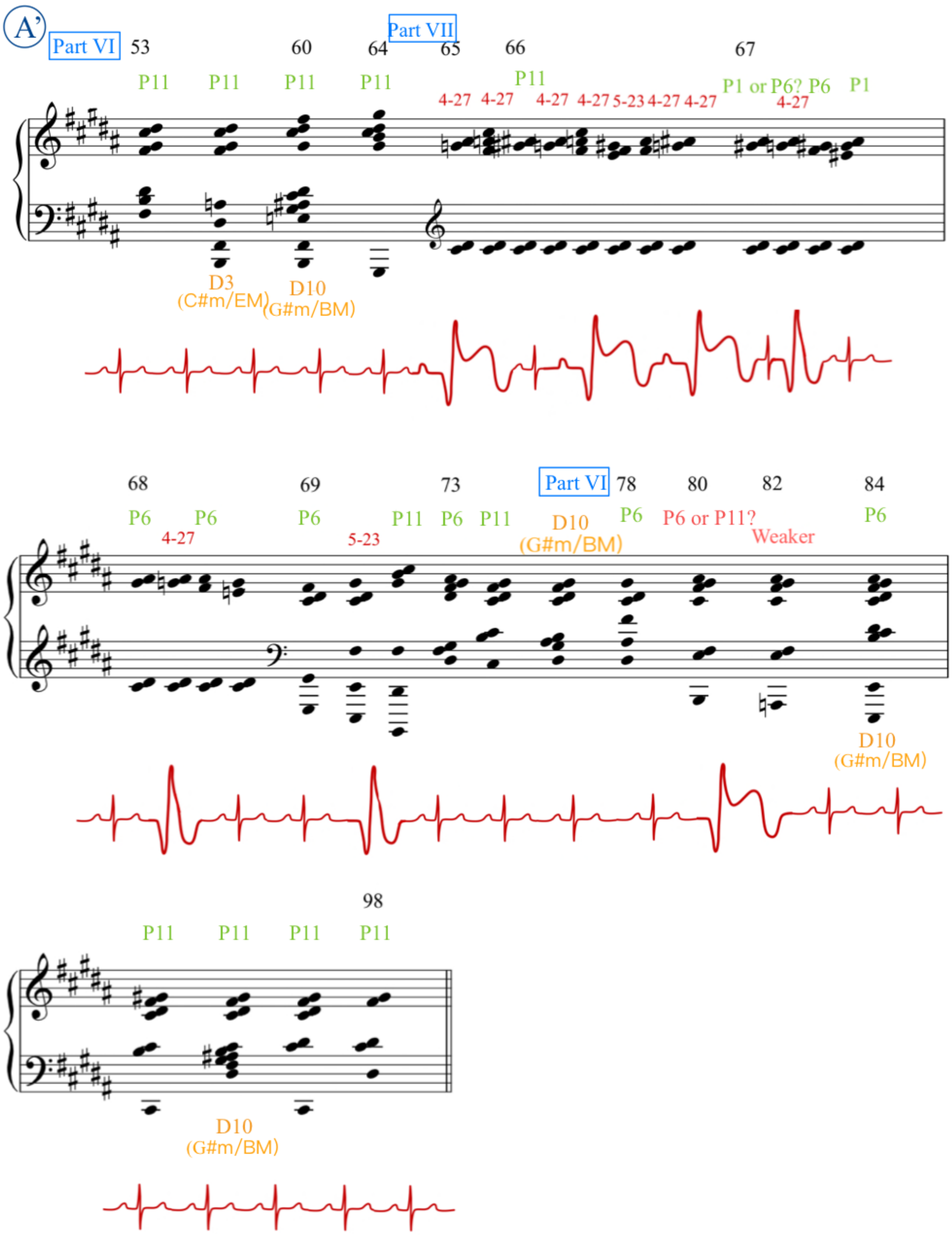
Chord name	Example	Set Class	Pentatonic/Diatonic Exclusive
Trichords with a major third	CDE	3-6 [024]	no (WT/ HARM/AC))
Trichords with a fourth	DEG	3-7 [025]	yes
	GAC		
	EGA		
	ACD		
Trichords with a fifth	DGA	3-9 [027]	yes
	GCD		
	ADE		
Tertian triads	CEG	3-11 [037]	yes
	ACE		
Major triad tetrachord	CDEG	4-22 [0247]	yes
Minor triad tetrachord	ACDE	4-22 [0247]	yes
Tetrachord with a fifth	DEGA	4-23 [0257]	yes
Tertian seventh chord	ACEG	4-26 [0358]	yes
Chinese pentachord	CDEGA	5-35 [02479]	yes

DIA= diatonic scale, AC=acoustic scale, HARM=both harmonic minor and harmonic major (7-32)

There are two ways of showing the relationship of maximally-even diatonic and pentatonic elements based on the properties of $J_{12,7,5}^{m_1,m_2}$. First, the appearance of maximally-even pentatonic elements itself shows this relationship, since all the pentatonic collections can be calculated by $J_{12,7,5}^{m_1,m_2}$. The second way is more obvious, when the upper voice is the pentatonic element (5-35) and the lower voice is the diatonic element; sometimes the position of these two will be exchanged. Identifying these two kinds of relationship provides us with a criterion for evaluating the various musical elements (different pcsets belonging to different set classes) and then distinguishing those area(s) with 100% purity of the *J* function. Adapting the *J* function offers a means of analyzing Debussy's "Pagodes." My analysis will clearly show a distribution and confrontation of two forces in this piece: one consists of set classes 5-35 and 7-35, and the other comprises pcsets outside of these two set classes. Example 17 offers a sketch of this analysis. There are three letters with the subtitles P_{11}, P_1, and P_6. As I mentioned briefly in the last section, "P" refers to the maximally-even pentatonic elements, and the numbers 11, 1, and 6 indicate the transposition of the prime form of the maximally-even pentatonic set (P_{11}: $\{1, 3, 6, 8, 11\}$, P_1: $\{1, 3, 5, 8, 10\}$, and P_6: $\{1, 3, 6, 8, 10\}$). "D" indicates the diatonic elements, while the numbers 3, 10, and 5 indicate the transposition of the prime form of the maximally-even diatonic set (D_3:$\{1, 3, 4, 6, 8, 9, 11\}$, D_{10}: $\{1, 3, 4, 6, 8, 10, 11\}$, and D_5: $\{1, 3, 5, 6, 8, 10, 11\}$). The pcsets marked with red interrupt the *J* function. In any given passage or section, the more red elements appear, the more unstable the *J* function is. To help visualize the status of the $J_{12,7,5}^{m_1,m_2}$ function, I have adapted an electrocardiograph (ECG) line. As this example illustrates, if the section consists only of P and D elements, the ECG oscillation is in a normal status, which means that the *J* function is stable—in other words, it possesses a high level of purity. However, if some red elements appear, the ECG line indicates this anomaly, which means that the *J* function is unstable, or of a low level of purity. Viewed as a whole, the ECG line of this piece vividly represents the oscillation of various levels of purity and impurity of $J_{12,7,5}^{m_1,m_2}$. This function begins with 100% purity (or stability), and as the music develops, this purity decreases, and the function becomes unstable. In the final section of the piece, the purity of $J_{12,7,5}^{m_1,m_2}$ increases and eventually returns to 100%, and the *J* function therefore recovers its "normal" status. In this sketch I have also indicated the large-scale formal division into two sections (A and A') with eight subsections distinguished by their textures.

Example 17: *J* Function Oscillation Sketch of “Pagodes.”




A'
Part VI
53
60
64
Part VII
65
66
67
P11
P11
P11
P11
P11
4-27
4-27
4-27
4-27
5-23
4-27
4-27
P1 or P6?
P6
P1
4-27
D3
(C#m/EM)
D10
(G#m/BM)
68
69
73
Part VI
78
80
82
84
P6
P6
4-27
P6
5-23
P11
P6
P11
D10
(G#m/BM)
P6
P6 or P11?
Weaker
P6
D10
(G#m/BM)
98
P11
P11
P11
P11
D10
(G#m/BM)

Having offered this overview of the *J* function in the entire piece, I would like now to consider the specific values of this function within each of the eight subsections. To calculate these values, let the maximally-even pentatonic and diatonic elements in the first voice of one measure be *x* and these elements in the second voice also be *x*; the ideal full pentatonic and diatonic elements in one measure should then be 2*x*. Let the $J_{12,7,5}^{m_1,m_2}$ purity be *y*, the measure numbers be *n*, the total beats within a measure be *r*, and the beats of maximally-even pentatonic and diatonic harmony in one measure be *z*. We then have:

$$y = \frac{\left(\frac{z_1}{r_1}+\frac{z_2}{r_2}+\dots\frac{z_n}{r_n}\right)\cdot 2x}{2\cdot x\cdot n}\cdot 100\%.$$

I will call the *J* purity calculated by this equation the "basic *J* purity." An example of one measure having 100% basic *J* purity is measure 63 of "Pagodes" (example 18a):

$$y = \frac{2x}{2x}\cdot 100\% = 100\%.$$

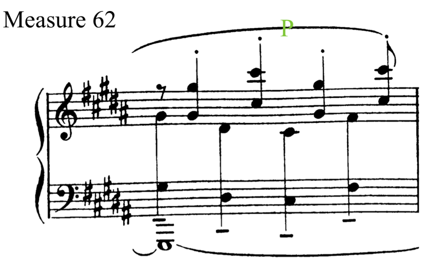
An example that illustrates a different degree of basic *J* purity is measures 67–68 (example 18b). The basic *J* purity of this passage is 62.5%:

$$y = \frac{\left(\frac{3}{4}+\frac{2}{4}\right)\cdot 2x}{2\cdot x\cdot 2}\cdot 100\% = 62.5\%.$$

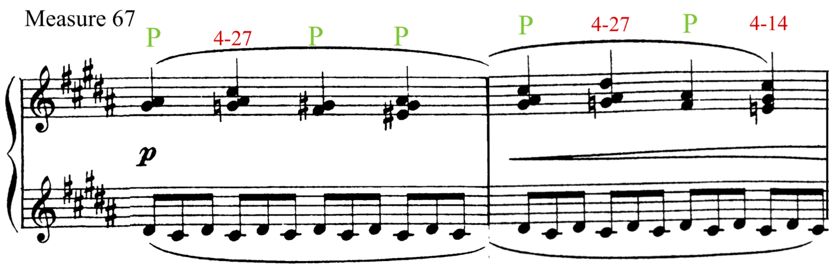
Example 18c illustrates the calculations of the purity of $J_{12,7,5}^{m_1,m_2}$ in all eight parts. In the A section, the *J* function descends from 100% to the lowest point at 25% and then bounces back to 100%. In the second half of the A section, the *J* function decreases to 83.3% and again bounces back to 100% at the beginning of the second section (A'). The A' section (and the piece as a whole) ends with a relatively high level of purity (90.5%).

Example 18: *J* Purity in Harmony and Calculation.

a. 100% *J* purity in m. 62 of "Pagodes."



b. Harmonic Description of mm. 67–68 of "Pagodes."

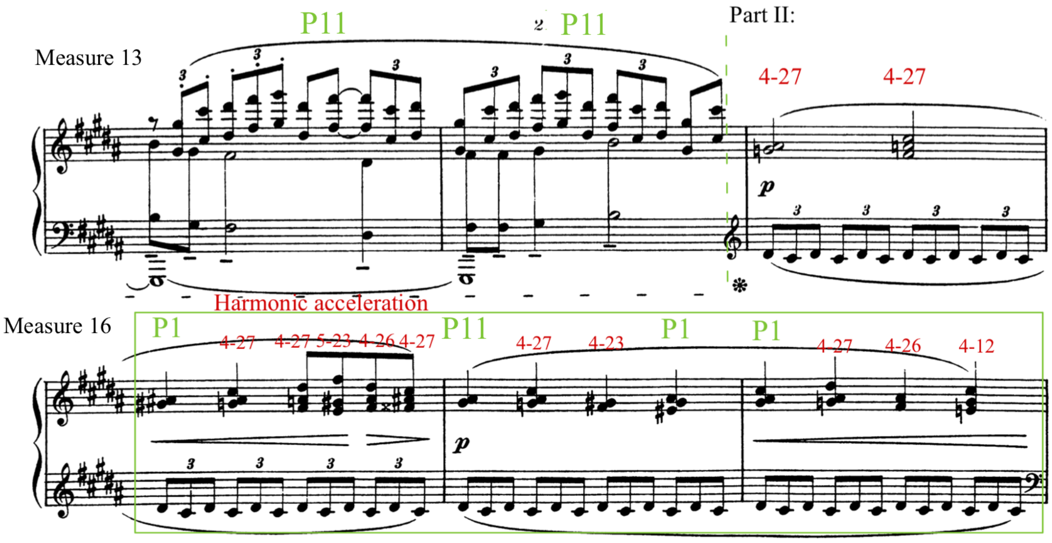


c. The Purity of $J_{12,7,5}^{m_1,m_2}$ (*J* function) of "Pagodes."

		Calculating process	The purity of $J_{12,7,5}^{m_1,m_2}$
A	**Part I**: Mm. 1–14	$y = \frac{2 \cdot x \cdot 14}{2 \cdot x \cdot 14}$	100%
	Part II: Mm. 15–18	$y = \frac{\frac{x}{2}+\frac{x}{2}+x}{2 \cdot x \cdot 4}$	25%
	Part III: Mm. 19–30	$y = \frac{2 \cdot x \cdot 12}{2 \cdot x \cdot 12}$	100%
	Part IV: Mm. 31–44	$y = \frac{27x}{2 \cdot x \cdot 14}$	96.4%
	Part V: Mm. 45–52	$y = \frac{15x}{2 \cdot x \cdot 9}$	83.3%
A'	**Part VI**: Mm. 53–64	$y = \frac{2 \cdot x \cdot 12}{2 \cdot x \cdot 12}$	100%
	Part VII: Mm. 65–77	$y = \frac{19x}{2 \cdot x \cdot 13}$	73.1%
	Part VIII: Mm. 78–98	$y = \frac{38x}{2 \cdot x \cdot 21}$	90.5%

My analysis of the relationship of these two set classes (5-35 and 7-35) in "Pagodes" is based on a calculation of the detailed values of *J* purity within individual parts. Can listeners hear the changes in value of the *J* purity in example 18c (or the ECG oscillation of the *J* function in example 17) be heard by listeners? I can hear some obvious signals that point to the striking drop of *J* purity from 100% to 25% from Part I to Part II). These signals are the acceleration in harmonic rhythm and changes of texture. Listeners might not be sensitive to changes of pcsets as well as changes in the purity of $J_{12,7,5}^{m_1,m_2}$. The harmonic acceleration and change of texture coincide with the change in *J* purity, so they provide listeners with clear signals of this change. In example 19, there is one chord per measure in part I (P_{11}), yet there are four harmonic changes from the second measure of part II to the end (measure 18). The texture also has a clear distinction between the material before measure 15 and the material in and after measure 15. The texture at the end of part I consists of triplets with arpeggiation in the right hand and octaves in each hand over a low pedal tone. The texture in part II consists of triplets alternating between two pitches in the left hand that accompany a more active melodic line in chordal voicing in the right hand. What Debussy is doing here is using surface elements to support more fundamental changes in basic harmonic materials and characteristics.

Example 19: Juncture between Part I and Part II of "Pagodes."



The acceleration of harmonic rhythm and the transformation by minimal offset voice leading illustrated in example 10 coincide with the decrease of the *J* function to 25% purity. In this case, we can demonstrate a characteristic of the low *J* function: an area having a low *J* function has an acceleration of harmonic rhythm based on transformation by *minimal offset voice leading*. Therefore, the harmonic rhythm and the degree of transformation by *minimal offset voice leading* may influence the purity of the *J* function. This suggests a further calculation of the *J* function level.

I have established the concept of basic *J* purity and introduced a mathematical method to calculate it. However, another situation points to an additional way of exploring *J* purity. Looking at my analytical representation of harmonic content, note that when two measures or sections have the same amount or percentage of red elements (the same basic *J* purity), we can further assess a "deeper *J* purity" based on which specific red collections this area includes as well as their different characteristics. Before I introduce the method of calculating this deeper *J* purity, there is a precondition that must be met: if we have two sections that have the same basic *J* purity, we have to calculate each measure's deeper *J* purity and then add each measure's deeper *J* purity to determine a section's total deeper *J* purity. Briefly, the equation I will introduce is suitable for calculating deeper *J* purity in a unit of one measure. If we want to know a section's deeper *J* purity, we need to calculate the total purity value of this section by adding each measure's value. Expressed formally, let "harmonic acceleration level of red elements," which is the number of different consecutive harmonies (outside of set classes 5-35 and 7-35) in a measure, be *x*. Let the offset of two adjacent set classes within a measure be *r*, and let *n* be the total number of harmonies this measure contains. Within a measure, "the degree of the transformation by *minimal offset voice leading*" shows the distance between the P and D collections (marked in red). Their relationship corresponds to the degree of transformation: the more intimate this relationship is, the smaller the value of the degree of transformation by *minimal offset voice leading* will be.

There will then be two cases:

(1) If a measure contains maximally-even pentatonic harmonies (P_0, P_1 or P_2 in "Pagodes"), the degree of transformation by *minimal offset voice leading* of this measure will be $r_1 + r_2 + \ldots r_{n-1}$. Letting the deeper *J* purity be *y*, in this case, we have:

$$y = x + \frac{1}{r_1 + r_2 + \ldots r_{n-1}}.$$

(2) If a measure does not contain a P collection, we need to take two steps. The first step is to find the closest P element preceding the first element outside of the 5-35 and 7-35 collections (marked in red) in this measure. The closest P element might be in the previous measure or several measures before this measure. In this case, the degree of the transformation by *minimal offset voice leading* is $r_1 + r_2 + \ldots r_n$, since we need to add the closest P element as an additional harmony outside of this measure. The second step is to calculate the deeper *J* purity using the adapted equation from the first situation:

$$y = x + \frac{1}{r_1 + r_2 + \ldots r_n}.$$

J purity includes both the basic *J* purity and the deeper *J* purity; if we calculate the basic *J* purity of several sections or measures and we find that they have the same basic *J* purity, then we must calculate the deeper *J* purity to be able to compare them. For an example that illustrates how to compare the *J* purity when several measures or sections contain the same basic *J* purity, we can consider Part II of “Pagodes.” The lowest basic *J* purity of the piece occurs in this part. Examining the *J* function of three measures of this part (mm. 16–18) will show how to compare different *J* purity values. As example 20 illustrates, measure 17 has both the highest basic *J* purity and therefore the highest *J* purity among these three measures (mm. 16 and 18 have the same basic *J* purity). The next step is to compare the deeper *J* purity of measures 16 and 18. Since there are P elements inside each measure, we will use the following equation to calculate their deeper *J* purity:

$$y = x + \frac{1}{r_1 + r_2 + \ldots r_{n-1}}.$$

Let $y_{16}$and y_{18} represent the deeper *J* purity of measures 16 and 18. We then add the results:

$$y_{16} = 4 + \frac{1}{1+2+2+1} \approx 4.2.$$

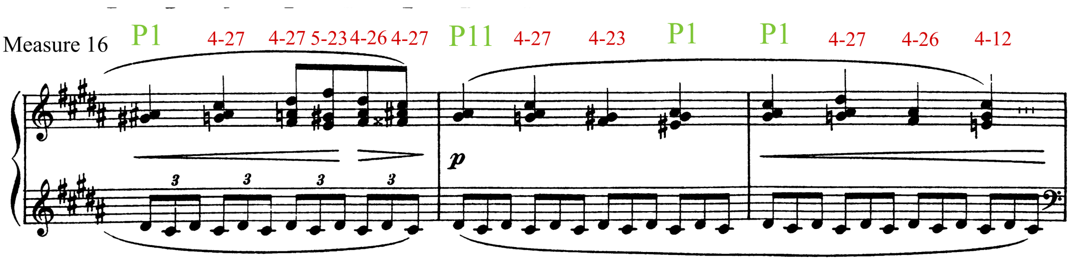
$$y_{18} = 3 + \frac{1}{1+1+3} = 3.2.$$

The deeper *J* purity of measure 16 is therefore higher than that of measure 18. Finally, the final *J* purity comparison of these three measures is:

Measure 17 > Measure 16 > Measure 18

Example 20: *J* Purity in mm. 16–18.

a. Harmonic Description of mm. 16–18 of "Pagodes."



b. *J* Purity Comparison of mm. 16–18 of "Pagodes."

	Measure 16 (4-23) P1 4-27 5-23 4-26 4-27	Measure 17 P11 4-27 4-23 P1	Measure 18 (4-23) P1 4-27 4-26 4-12
Basic J purity	25%	50%	25%
Offset	1 2 2 1		1 1 3

CHAPTER V

DEBUSSY'S "PAGODES," THE CHINESE STYLE, AND "*J* DIVERSITY"

As I mentioned in my initial historical overview, Debussy emulated an Eastern musical style in "Pagodes". How do we consider and define this "Eastern" style? There might not be a definite answer, given that so many regions and nations are included in the concept of the "East." The *J* function model I have proposed offers support for intuitions we might have about a specifically "Chinese" style within an "exotic" or "Eastern" style. To explore this possibility, I will compare works by Avashalomov and He with "Pagodes" to demonstrate their similarity and to further show that "Pagodes" has a strong Chinese musical style. In my analysis of He's "The Cowherd's Flute," I will introduce the term "*J* diversity," which is based on the technique of "*J* functional transformation."

Avshalomov's Piano Concerto in G Major on Chinese Themes and Rhythms

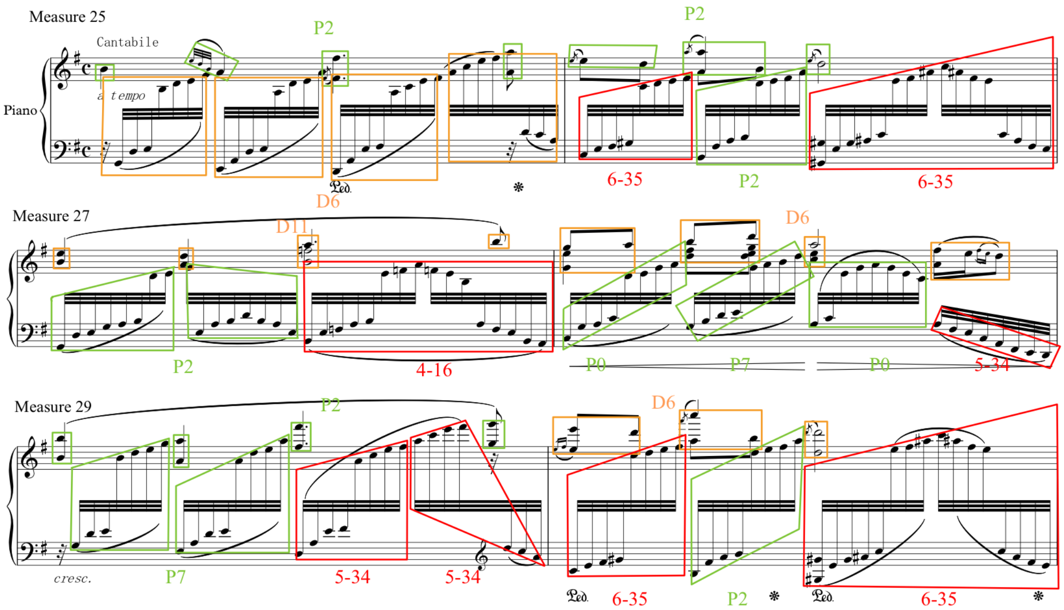
Aaron Avshalomov was a Russian-born Jewish composer who resided in China from 1920 to 1947. He composed a large amount of music on Chinese themes during this time, including a sequence of orchestral works. One of his major works is his *Piano Concerto in G Major on Chinese Themes and Rhythms*, composed in 1935. The work's title clearly points to the presence of a Chinese musical style. My analysis of the work illustrates a *J* function that expresses the relationship between pentatonic and diatonic elements (example 21a). In my structural sketch (example 21b), we can even see a more obvious juxtaposition of P and D elements compared to Debussy's "Pagodes."[43] Example 21c presents the calculations of the basic purity of the *J*

[43] In example 21a, the principle for notating "P_2, P_7, P_0, D_6, D_{11}" is the same as that used in

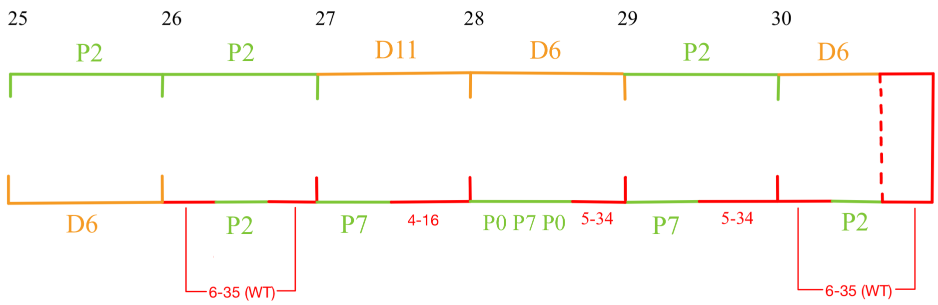
function within each measure and demonstrates that this purity oscillates in this section.

Example 21: Analysis of the *J* Function in mm. 25–30 of *Avshalomov, Piano Concerto in G Major on Chinese Themes and Rhythms*, first movement.

a. Solo Piano Part (Transcribed from Original Edition of the Score) with Annotations.



b. Structural Sketch.



my analysis of "Pagodes." The numbers "2, 7, 0, 6, 11" indicate different transpositions of the prime form of maximally-even pentachords or diatonic collections. Here, P_2 is {2, 4, 6, 9, 11}, P_7 is {2, 4, 7, 9, 11}, and P_0 is {0, 2, 4, 7, 9}; D_6 is {0, 2, 4, 6, 7, 9, 11}, and D_{11} is {0, 2, 4, 5, 7, 9, 11}.

c. *J* Purity Values.

Measure Numbers	The Purity of $J_{12,7,5}^{m_1,m_2}$
25	100%
26	66.7%
27	75%
28	87.5%
29	75%
30	50%

He Luting's "The Cowherd's Flute" and "J Diversity"

He Luting was a Chinese composer active in the early twentieth century. He composed a large amount of film, choral, and orchestral music. In September of 1949, he was appointed president of the Shanghai Conservatory of Music, a position he held until 1984. His solo piano work "The Cowherd's Flute" ("Mu Tong Duan Di," 牧童短笛, 1934) is one of the earliest Chinese compositions that combines a distinct Chinese style with Western compositional techniques. It won the first prize in a competition held in Shanghai in 1934 that sought the best piano piece with Chinese characteristics. The competition was organized by the Russian composer Alexander Tcherepnin, with whom He studied composition. The work was subsequently performed by Tcherepnin in Europe and published in Japan in 1935.

The piece includes three sections (A, B, A) that maintain 100% *J* purity throughout—that is, the whole piece is defined by 100% *J* purity. It therefore demonstrates an important utilization of the *J* function (here, $J_{12,7,5}^{m_1,m_2}$): the formal division of the piece is based on different m_1 and m_2 values of $J_{12,7,5}^{m_1,m_2}$. The *J* function thus has a close relationship with the musical form. The A section stays in $J_{12,7,5}^{5,0}$, since it contains the relation of D_{11} ({0,2,4,5,7,9,11}, calculated by $J^{5}_{12,7}$, m_1=5) and P_0 ({0,2,4,7,9}, calculated by $J^{5,0}_{12,7,5}$, m_2=0). By contrast, the B section involves various m_1 and m_2 changes in $J^{m_1,m_2}_{12,7,5}$, which creates distinct *J* functions different from the A section.

All of the changes of the $J^{m_1,m_2}_{12,7,5}$ in the B section are listed in example 22a. The B section itself is divided into two parts (Part I and Part II), with the second part repeating the first part with some variation. The B section has various instances of $J^{m_1,m_2}_{12,7,5}$ with different m_1 or m_2 values. I describe these changes in the *J* function with the term "*J* diversity," which is created by the method of *J* function transformation discussed previously.[44] The theoretical concept of *J* diversity describes an important technique used by early twentieth-century Chinese composers to increase the tonal diversity of their music; a similar technique was used by Western composers such as Debussy but with much lower frequency (one instance is found in example 13). In example 22a, the sections marked in red form a *J* function symmetry centered on $J^{8,4}_{12,7,5}$ (mm. 32–36 in part I and mm. 44–48 in part II). This symmetry may also be observed in examples 22b and 22c; for instance, in example 22c, the peak of the m_1 and m_2 lines (in mm. 34 and 46) is the position of the $J^{8,4}_{12,7,5}$. The sections marked in black, by contrast, do not involve this type of symmetry.

I use a curve diagram to represent the *J* diversity (the change of $J^{m_1,m_2}_{12,7,5}$) in the B section in example 22c. There are three variables in this diagram: *x*, m_1, and m_2. *X* refers to the measure numbers shown in the x-axis ($x \in [25, 52]$), and the values of m_1 and m_2 are shown in the y-axis. To calculate the changes in *J* diversity, let (x, m_1,

[44] The *J* function transformation would involve keeping m_1 and changing m_2 to transform one maximally even pentachord into a different pentachord, or keeping m_2 and changing m_1 to preserve the same pentachord while including a different diatonic collection.

m_2) represent the values of m_1 and m_2 in a measure number x. The functional expression "$f(x) = (m_1, m_2)$" then indicates that the change of x leads to the change of the values of m_1 and m_2. The period (T) is 12. Thus, the T of this $f(x)$ can be expressed as:

$$f(x) = f(x+12).\ x \in [25, 40].$$

For example, if we want to calculate the measure in which a period starting in measure 25 ends, we calculate:

$$f(25) = f(25+12) = f(37) = (6{,}6).$$

Therefore, the section from measure 25 ($J^{6,6}_{12,7,5}$) to measure 37 ($J^{6,6}_{12,7,5}$) forms a period, and the section from measure 37 to measure 49 ($J^{6,6}_{12,7,5}$) forms another period. In example 22c, measures 25, 37, and 49 are the places in which the two lines (m_1 and m_2) overlap, which means that the J function in these measures is $J^{6,6}_{12,7,5}$. Consequently, this diagram illustrates the pattern of changes of $J^{m_1,m_2}_{12,7,5}$ in the B section. The J function starts with $J^{6,6}_{12,7,5}$ (measure 25) and then multiple, different instances of $J^{m_1,m_2}_{12,7,5}$ appear through the changes of m_1 and m_2; it returns to $J^{6,6}_{12,7,5}$ in measure 37, and it starts to change again and then finally returns to $J^{6,6}_{12,7,5}$ in measure 49.

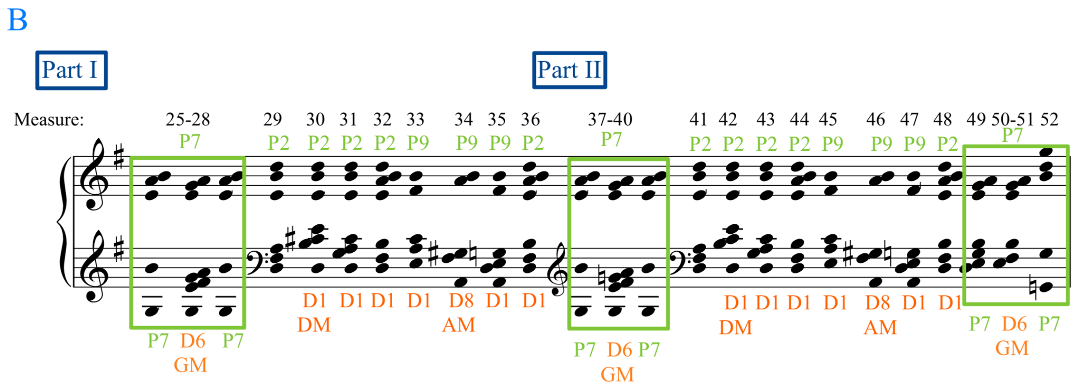
Example 22: *J* Diversity in the B Section of "The Cowherd's Flute."

a. *J* Diversity in Each Measure.

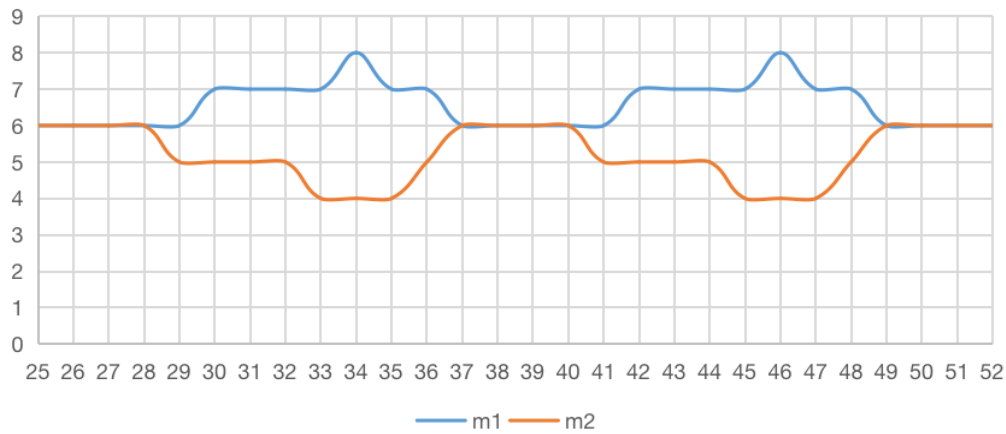
	Measure Number	Diatonic Collection (m_1)	Maximally-Even Pentatonic Collection (m_2)	$J_{12,7,5}^{m_1,m_2}$
Part I	25–28	D_6: {0,2,4,6,7,9,11}	P_7: {2,4,7,9,11}	$J_{12,7,5}^{6,6}$
	29	(D_6: {0,2,4,6,7,9,11}) *	P_2: {2,4,6,9,11}	$J_{12,7,5}^{6,5}$
	30–31	D_1: {1,2,4,6,7,9,11}	P_2: {2,4,6,9,11}	$J_{12,7,5}^{7,5}$
	32	D_1: {1,2,4,6,7,9,11}	P_2: {2,4,6,9,11}	$J_{12,7,5}^{7,5}$
	33	(D_1: {1,2,4,6,7,9,11})	P_9: {1,4,6,9,11}	$J_{12,7,5}^{7,4}$
	34	D_8: {1,2,4,6,8,9,11}	P_9: {1,4,6,9,11}	$J_{12,7,5}^{8,4}$
	35	D_1: {1,2,4,6,7,9,11}	P_9: {1,4,6,9,11}	$J_{12,7,5}^{7,4}$
	36	(D_1: {1,2,4,6,7,9,11})	P_2: {2,4,6,9,11}	$J_{12,7,5}^{7,5}$
Part II	37–40	D_6: {0,2,4,6,7,9,11}	P_7: {2,4,7,9,11}	$J_{12,7,5}^{6,6}$
	41	D_6: {0,2,4,6,7,9,11}	P_2: {2,4,6,9,11}	$J_{12,7,5}^{6,5}$
	42–43	D_1: {1,2,4,6,7,9,11}	P_2: {2,4,6,9,11}	$J_{12,7,5}^{7,5}$
	44	D_1: {1,2,4,6,7,9,11}	P_2: {2,4,6,9,11}	$J_{12,7,5}^{7,5}$
	45	D_1: {1,2,4,6,7,9,11}	P_9: {1,4,6,9,11}	$J_{12,7,5}^{7,4}$
	46	D_8: {1,2,4,6,8,9,11}	P_9: {1,4,6,9,11}	$J_{12,7,5}^{8,4}$
	47	D_1: {1,2,4,6,7,9,11}	P_9: {1,4,6,9,11}	$J_{12,7,5}^{7,4}$
	48	D_1: {1,2,4,6,7,9,11}	P_2: {2,4,6,9,11}	$J_{12,7,5}^{7,5}$
	49–52	D_6: {0,2,4,6,7,9,11}	P_7: {2,4,7,9,11}	$J_{12,7,5}^{6,6}$

* This and subsequent D collections in the list that are placed within parentheses indicate that there are no actual pitches from the diatonic collection in the score and that the two voices are all from the same pentatonic collection.

b. Notational Reduction.



c. Curve Diagram Illustrating Changes of $J_{12,7,5}^{m_1,m_2}$.

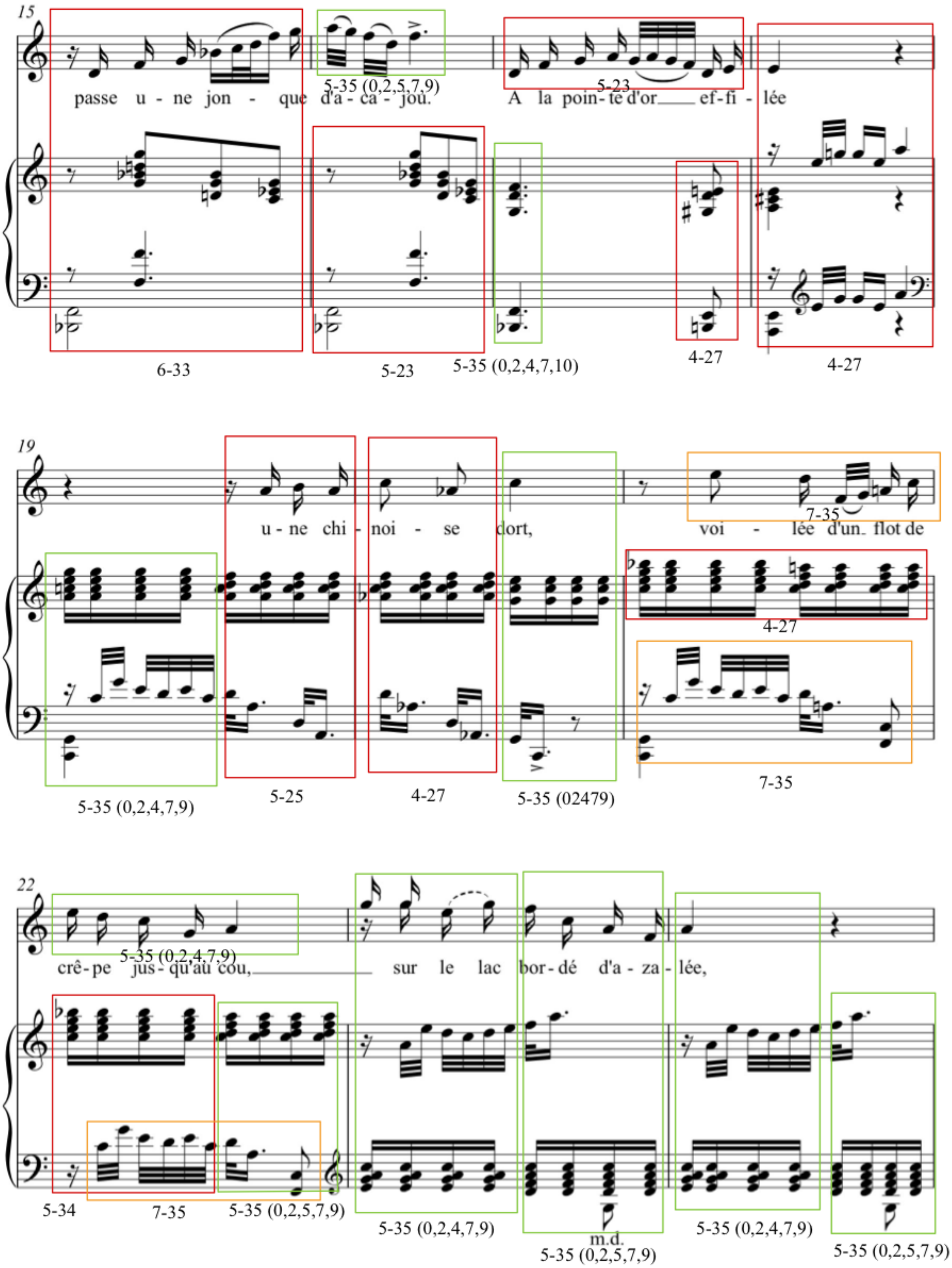


We found with Debussy's "Pagodes" and Avshalomov's Piano Concerto that if composers wish to create variety, they may incorporate other musical collections outside of 5-35 and 7-35 to disturb the stability of the *J* function, resulting in an oscillation of *J* purity. Chinese works such as "The Cowherd's Flute," however, contain 100% *J* purity throughout the whole piece. Accordingly, the way a composer like He may add diversity to his music is to create various instances of $J_{12,7,5}^{m_1,m_2}$ by frequently changing the m_1 and m_2 values.

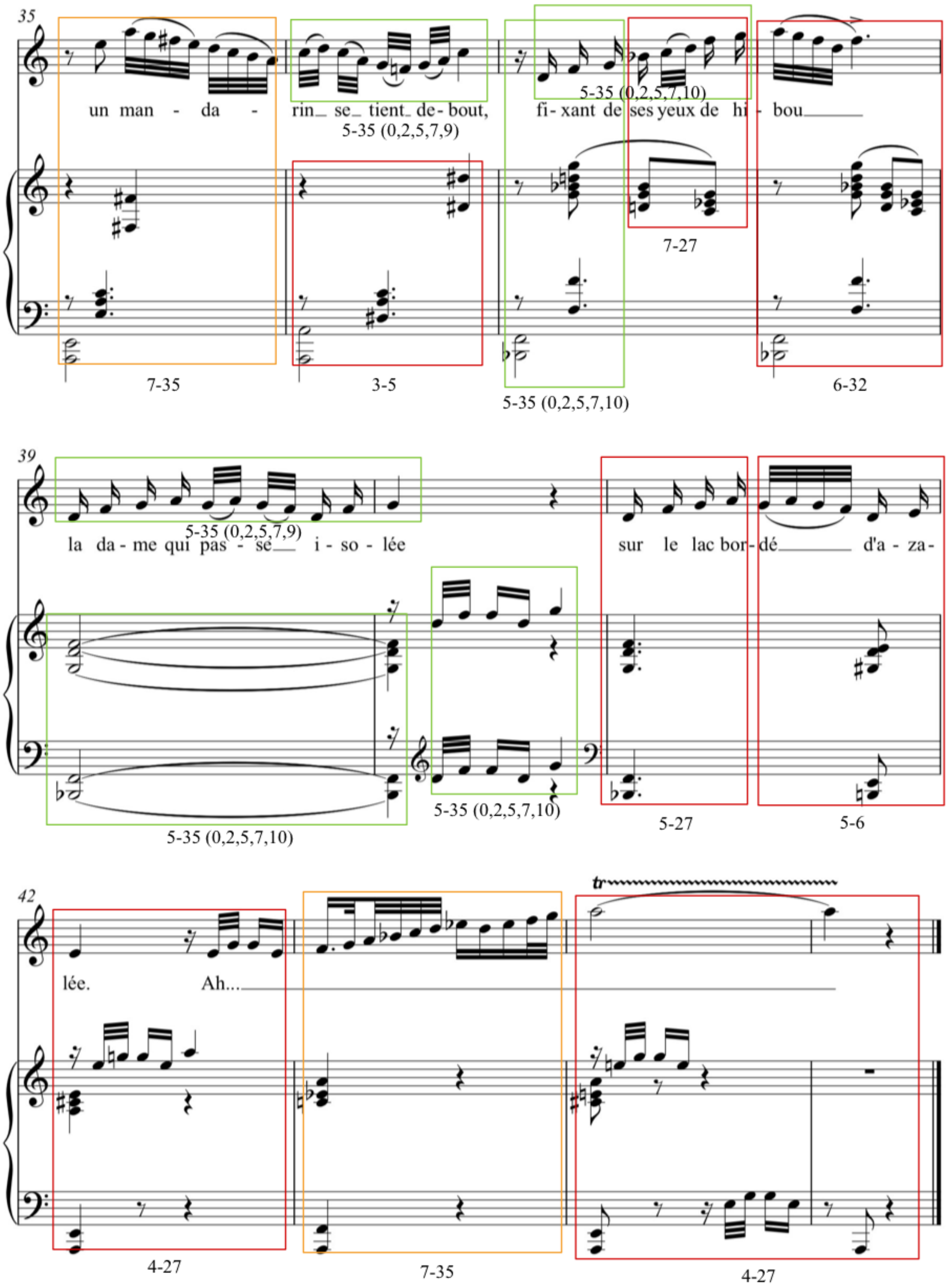
If we consider the two works with a certain Chinese style (*Piano Concerto in G Major on Chinese Themes and Rhythms* and "The Cowherd's Flute"), we find that both pieces have a high *J* purity. This indicates that "high *J* purity" is a characteristic of the Chinese musical style in the early twentieth century. The higher the purity of the *J* function (in the above cases, $J_{12,7,5}^{m_1,m_2}$), the more “Chinese” the music will sound. Returning to Debussy’s “Pagodes,” as I mentioned in the introduction, the historical record and the accounts of most scholars have identified the work as exemplifying a “Javanese” style. The *J* function model I have proposed offers the possibility that the style is “Chinese” to the extent that it includes a high density of maximally-even pentatonic collections combined with diatonic collections. As example 18c shows, all parts in the piece have a 70%-100% *J* purity value except for a four-measure part that has a 25% value. The high *J* purity of the whole piece accords with this *J* characteristic of the Chinese musical style. Recall that Debussy, in a newspaper article of February 1913, observed that the connection between Debussy and Chinese music style. Although it is not precisely clear if the Eastern style Debussy is emulating is Chinese, the high *J* purity of the piece suggests that “Pagodes” is referencing a Chinese musical style. This raises a series of questions: when the identification of a musical style is supported by a theoretical model yet conflicts with scholarly consensus and the historical record, how should we evaluate it? Does this reveal a historical blind spot? These questions may open up a discussion of the relationship between music theory and music history. Furthermore, it may inspire music theorists to contemplate how the study of “music theory” may have significance in helping to define and resolve ambiguities in music history.

If we want to determine the characteristics of Chinese musical practice from examples we discussed above in the early twentieth century, the most important one is the appearance of the relationship between diatonic superset and maximally-even pentatonic subset in musical pieces, which we defined from *Yun*, *Gong*, *Diao* from Chinese music theory. However, could only the appearance of a large quantity of diatonic and ME pentatonic sets in music prove a Chinese style? I would say no. There are some deeper requirements for the combination and distribution of diatonic and ME pentatonic collections in Chinese-style pieces. For example, Debussy's *Rondel Chinois* is a song on a Chinese topic written in 1881. The title and lyrics obviously show a Chinese topic. The piece does include diatonic and ME pentatonic sets, but it is hard to determine *Rondel Chinois* as a Chinese style piece from the musical perspective since the diatonic and ME pentatonic collections combine and distribute themselves in a completely different way from "Pagodes" and the pieces we discussed by Avshalomov and He. In example 23, I use different colors to mark different pcsets. The green color marks ME pentatonic sets; the orange color marks the diatonic sets; the red color marks the pcsets outside of 7-35 and 5-35. Firstly, although this piece includes diatonic sets and ME pentatonic sets, they appear in sequence with much "red" musical material in between, so that their subset/superset relationships are less audible: for example, measures 6–8 and 11–13. Diatonic and ME pentatonic sets appearing close together show their relationship of superset and subset more strongly than those appearing at a distance. Second, a large quantity of elements of set classes outside of 7-35 and 5-35 disrupt the balance between ME pentatonic sets and diatonic sets and reduce the *J* purity. For example, after two measures of diatonic sets in measures 7–8, an interruption containing another two measures of "red sets" leads to a sequence of diatonic set and ME pentatonic set in the voice with the interference of "red sets" in the piano accompaniment. Third, there is a small number of diatonic sets in the whole piece, which does not match the quantity of ME pentatonic sets. The percentage of diatonic sets is much less than the "red elements." In measures 25–34, there is only one measure of diatonic sets and seven measures of "red elements." In this case, it is hard to define this piece as a "Chiense style" piece from the musical perspective.

Example 23: Debussy's *Rondel Chinois* with Annotations.


15
passe u - ne jon - que d'a - ca - jou.
A la poin - te d'or ef - fi - lée
5-35 (0,2,5,7,9)
5-23
6-33
5-23
5-35 (0,2,4,7,10)
4-27
4-27
19
u - ne chi - noi - se dort,
voi - lée d'un flot de
7-35
4-27
5-35 (0,2,4,7,9)
5-25
4-27
5-35 (02479)
7-35
22
crê - pe jus - qu'au cou,
sur le lac bor - dé d'a - za - lée,
5-35 (0,2,4,7,9)
5-34
7-35
5-35 (0,2,5,7,9)
5-35 (0,2,4,7,9)
m.d.
5-35 (0,2,5,7,9)
5-35 (0,2,4,7,9)
5-35 (0,2,5,7,9)


25
de né - nu - phar et de bam - bou.
Ah...
5-35 (0,2,4,7,9)
5-35 (0,2,5,7,9)
5-35 (0,2,4,7,9)
12-tone
28
ah...
ah...
ah...
12-tone
12-tone
12-tone
31
tr
ah...
Sous sa vé - ran - dah den-te-lée
5-35 (0,2,5,7,9)
4-27
5-z38
5-35 (2,4,6,8,11)
5-35 (0,2,4,7,9)
3-5
3-5


35
un man - da - rin se tient de - bout, fi - xant de ses yeux de hi - bou
5-35 (0,2,5,7,9)
5-35 (0,2,5,7,10)
7-27
7-35
3-5
5-35 (0,2,5,7,10)
6-32
39
la da - me qui pas - se i - so - lée sur le lac bor - dé d'a - za -
5-35 (0,2,5,7,9)
5-35 (0,2,5,7,10)
5-35 (0,2,5,7,10)
5-27
5-6
42
lée. Ah...
tr
4-27
7-35
4-27

CHAPTER VI

THE INFLUENCE OF JAVANESE MUSIC ON DEBUSSY

> But my poor friend! Do you remember the Javanese music, able to express every shade of meaning, even unmentionable shades … which make our tonic and dominant seem like ghosts, for use by naughty little children?[45]
>
> The Javanese music obeys laws of counterpoint which make Palestrina seem like child's play. And if one listens to it without being prejudiced by one's European ears, one will find a percussive charm that forces one to admit that our own music is not much more than a barbarous kind of noise more fit for a traveling circus. [46]
>
> Debussy

As I discussed in the introduction, based on the historical record, Debussy's inspiration for composing "Pagodes" was the sound of the Javanese gamelan at the Exhibition Universelle in Paris in 1889. In the last several chapters, I discussed the possible Chinese influence on "Pagodes," keeping in mind the fact that Debussy was also aware of Chinese music at that time. In my analysis above, it seemed that the connection between Chinese music and Debussy's music mainly involved pitch material. What, then, is the connection between Javanese music and "Pagodes," and furthermore, might there also be similarities between "Pagodes" and Balinese music? Most historical descriptions of eastern influences on Debussy's music are about Javanese gamelan and there is barely any description which connects Debussy's music with Balinese music. However, Bali is close to Java on the geographical map

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[45] *Correspondance de Claude Debussy et Pierre Louÿs* (1893-1904), ed. Henri Borgeaud (Paris: Libraire Jose Corti, 1945), 41; trans. In Edward Lockspeiser, *Debussy: His Life and Mind* (New York: Macmillan, 1962), 1:115.

[46] Claude Debussy, *Debussy on Music: The Critical Writings of the Great French Composer Claude Debussy*, ed. Francois Lesure, trans. Richard Langham Smith (New York: Knopf, 1977), 278

and their music is similar in many aspects. It will be worth it to compare them and find their similarities and differences.

In the quotation from Debussy's own writings above, we can see Debussy's admiration for Javanese music and his belief that *stile antico* counterpoint is overshadowed by Javanese music. In this chapter, I will first compare the Javanese and Balinese practices of gamelan. Second, I will compare Javanese and Balinese music with "Pagodes" to demonstrate that the link between them mainly centers on rhythmic texture.

Javanese Gamelan

Javanese gamelan was the original form, from which Balinese gamelan was a later development. Javanese and Balinese gamelan are similar in that each contains several strata with different rhythmic textures; however, they are different in instrumentation and rhythm, with Javanese gamelan including rhythmic elaborations such as syncopations, and Balinese gamelan featuring a deeper hierarchy of rhythmic levels that line up with each other. Javanese and Balinese gamelan both stress the presence of different parts with distinctive functions that work together, and both emphasize how the parts combine to create a seamless melody. Javanese gamelan has a clear division of the instruments consisting of three parts: *balungan* instruments, punctuating instruments, and elaborating instruments. *Balungan* refers to the melodic part of the texture; the punctuating instruments mark the time cycle (colotomic structure); the elaborating instruments embellish the melody by subdividing the beat and repeating the notes. Example 24 illustrates a simple Javanese gamelan piece, showing the different strata with different rhythmic densities. Tamagawa describes this structure as "multiplicity of rhythms."[47] The *slenthem* (metallophone instrument) plays the *balungan* that forms the "skeleton" of the piece. Other parts fill in and elaborate this skeleton. Benjamin Brinner has observed that beat subdivision and note repetition are the two main types of elaboration in Javanese gamelan.[48] The *peking* (another, higher pitched metallophone) elaborates the *slenthem* part (*balungan*). In example 24, the *peking* plays two notes for every note in the *slenthem*.

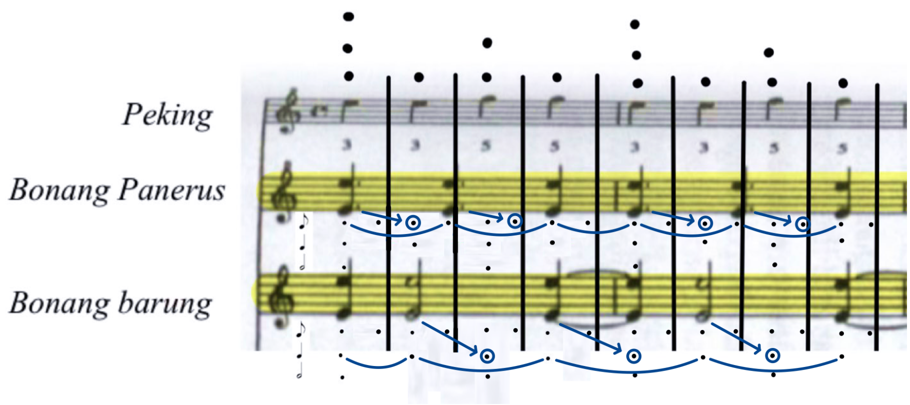
Example 24: "Lancaran Singa Nebah Sléndro" Transcribed by Brinner (2008), 65.

There is more complicated rhythmic elaboration in the other parts. There are two *bonang* parts (*bonang panerus* and *bonang barung*, small gongs), which add rhythmic variety and variation. The *bonang panerus* part plays in octaves and creates a syncopated rhythmic pattern. Musical time is measured with various levels of pulsation, and in example 25 I apply the method of metrical hierarchy to show this rhythmic structure. The dotted quarter note in the *bonang panerus* anticipates the beat

[47] Kiyoshi Tamagawa, *Echoes from the East: The Javanese Gamelan and Its Influence on the Music of Claude Debussy* (Lanham: Lexington, 2020), 53.
[48] Benjamin Brinner, *Music in Central Java: Expeiencing Music, Experessing Culture* (Oxford: Oxford University Press, 2008), 66–67.

circled and marked with an arrow. In the *bonang barung*, the half note anticipates the beat circled; there is even syncopation across the bar line. The *peking* part holds the rhythmic pattern, which is four beats per measure in the transcription. However, the syncopation in both *bonang* parts breaks this pattern. I use slurs to mark the rhythmic pattern in the *bonang* parts. The pattern in the *bonang panerus* is 3+3+2 (counted in all eighth note values); in the *bonang barung,* the pattern is 1+2+2 (counted in all quarter notes). The *bonang* parts enrich the rhythmic structure of the piece through this type of complex rhythmic elaboration.

Example 25: Rhythmic elaboration in "Lancaran Singa Nebah Sléndro."



Another characteristic of Javanese music is its seamlessness. When we think of seamlessness, we might immediately think of Richard Wagner's music. The main method for Wagner to produce "endless melody" is to avoid cadences. Because Javanese music is not in the tonic-dominant system like Western tonality and uses a colotomic texture, it creates its seamless quality in another way. In Javanese gamelan, some notes work as the goals in the musical texture. Those notes are called *sèlèh*. However, these notes do not function like the tonal goals in the Western tonal system.

Although there is a tonic in a specific *pathet* (mode), the piece does not end with it.[49] In example 25, we can also see how the rhythmic organization makes the texture seamless. The two quarter notes slurred across the barline in the *bonang barung* part and the syncopation in the *bonang panerus* connect two measures and blur the boundary of regular rhythmic patterns and musical pulses.

Balinese Gamelan

A well-known musical composition in Balinese gamelan is *Oleg Tumulilingan* (abbreviated *Oleg*). Michael Tenzer has identified several characteristics of *Oleg*: (1) it includes different strata with different rhythmic densities; (2) it is seamless both horizontally and vertically; (3) each stratum is rhythmically aligned with the others; (4) the notes in the lower stratum support and reinforce the notes in the upper strata.[50] Example 26 is an excerpt from *Oleg* transcribed by Tenzer that shows how each layer has its own specific rhythmic activity. Stratum 1 has the most dense rhythm, and each stratum below it reduces its density proportionally. In stratum 1.1, two musicians play the stem-down notes and another two play the stem-up notes, so the overall melodic line is horizontally seamless. Stratum 2 is called *neliti*, progressing once per beat with ornamentation. When the player of stratum 1 stops, the players of stratum 2 play the ornaments. In this case, the melodic line is also seamless vertically. The beats in each stratum align with each other, and the nodal points are always unisons or octaves. Stratum 3 is the "root," called *pokok*.

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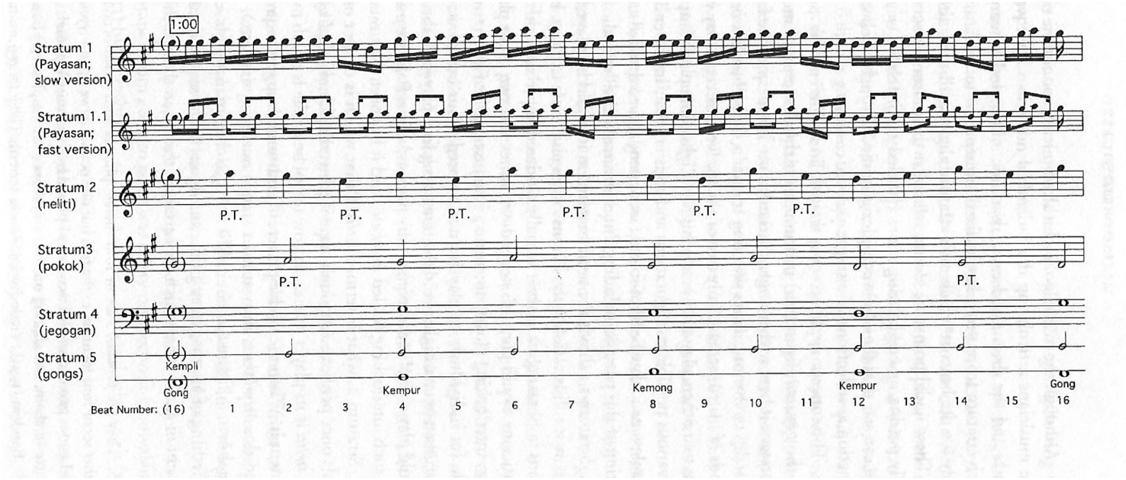
[49] Brinner, *Music in Central Java*, 60–61.

[50] Michael Tenzer, "Oleg Tumulilingan: Layers of Time and Melody in Balinese Music," in *Analytical Studies in World Music,* ed. Michael Tenzer (Oxford: Oxford University Press, 2006), 205–36.

Example 26: *Oleg*: Melodic Strata and Gongs in cycle 8.



My comparison above shows that Javanese and Balinese gamelan both have elaborating parts but handle these parts in different ways. In Javanese gamelan, the beat of every stratum is not aligned with the others, since there is rhythmic elaboration. In Balinese gamelan, by contrast, the pitch elaboration is more intricate than in Javanese gamelan. For example, comparing both of the top two voices of examples 25 and 26, the notes are denser and the pitch contour is more disjunct in Balinese music. One similarity is that Balinese gamelan creates a seamless texture similar to Javanese gamelan because of pitch and rhythmic interlocking between the players of the *payasan* part (stratum 1 and 1.1). This analysis of Javanese and Balinese gamelan will provide a model for a comparison between gamelan and "Pagodes" in the next chapter.

CHAPTER VII

"PAGODES" COMPARED WITH JAVANESE AND BALINESE GAMELAN

Example 26 illustrates the rhythmic texture of "Pagodes." From the perspective of rhythmic structure, we can see obvious similarities between the rhythmic texture of "Pagodes" and both Javanese and Balinese gamelan. I have marked the four voices of "Pagodes" from top to bottom as strata I–IV. Note, first, that the rhythmic density reduces from stratum I in the top register to stratum IV in the bass. Stratum IV identifies with Stratum 3 (*pokok*) in *Oleg* and the *Slenthem* in Javanese gamelan, which works as the "root." The root here is not the traditional understanding of root in a triad or seventh chord since the chordal structure in "Pagodes" has broken the frame of triads and seventh chords. I think that Stratum IV identifies with the role of "root" because of its long duration and slow-moving layer, which supports the other layers.

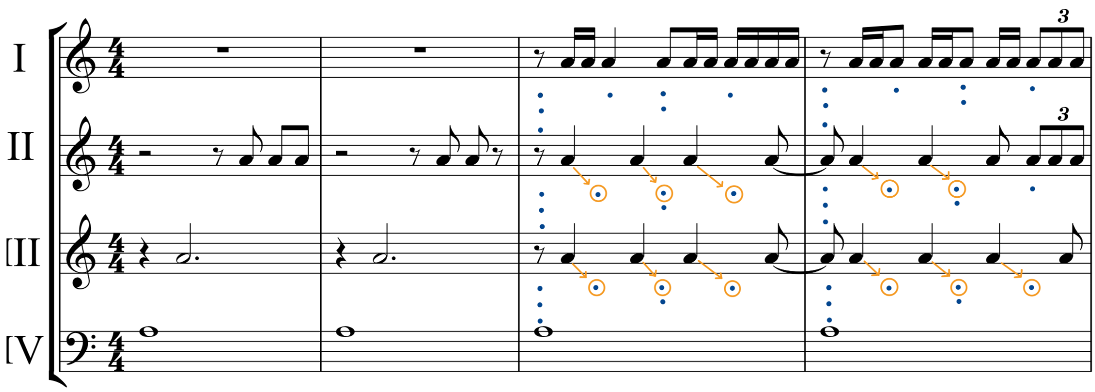
Seamlessness is also shown to be one of the important characteristics in "Pagodes." Each time one stratum has a rest, another voice plays. As example 27 illustrates, in measure 1, the first beat of Stratum III has a quarter rest while Stratum IV plays the half note. The first beat and half of the second beat in Stratum II rests as Strata III and IV play. Measures 3–4 continue the seamless texture; they are connected by the slur in Strata II and III, which blurs the boundary of these two measures, and there are many other similar cases in this piece. From the observations above, we might see the influence of Javanese and Balinese gamelan on Debussy's texture.

Example 27: The Rhythmic Texture in mm. 1–26 of “Pagodes.”


11
15
18
21
24

However, in addition to the seamlessness that Debussy might have borrowed from Javanese music, another obvious characteristic in “Pagodes” is rhythmic misalignment. The rhythmic structure of “Pagodes” is illustrated in example 28, with dots showing the metrical hierarchy. As shown in this example, there is a syncopated pattern in stratums II and III. In other words, not all the beats in each stratum align with each other, similar to rhythmic elaboration found in Javanese music. In “Pagodes,” Debussy used this rhythmic elaboration in the middle two voices. Similarly, as shown in Example 25, Javanese music also enriched rhythmic elaboration through syncopation in the middle *bonang* part. It seems like the middle part in both pieces functions to elaborate and enrich the rhythm.

Example 28: The Rhythmic Texture with Beats’ Levels illustration in mm. 1–4 of “Pagodes.”



Even though there is no historical record of Debussy's exposure to Balinese gamelan, it is noteworthy that he incorporated rhythmic characteristics of both Balinese style and Javanese style into his work. Debussy used the rhythmic structure of Javanese and Balinese gamelan to inform the basic structure of "Pagodes" and drew the inspiration of seamlessness and rhythmic elaboration from both types of gamelan. However, Debussy did not replicate these characteristics from gamelan exactly, but expanded on them and created variations. For example, he introduced a sectional change of rhythmic structure in "Pagodes," where the rhythmic and pitch densities do not always reduce from top to bottom. As example 29 illustrates, the different textural structure and register divides measures 1–26 into four sections. Measures 1–14 has the most similar structure to Javanese and Balinese music. In measures 15–18, the rhythmic texture is thinner since the upper three voices are in the same rhythm. A more striking point is that the rhythmic density reduces from the bottom to the top, which is the opposite of Javanese and Balinese music. In measures 19–22, the middle two voices are the same, and the rhythmic texture is reorganized again, since this time the middle two parts become the most dense part. In measures 23–26, the top voices are all resting. The rhythm of the middle voice is denser than the bass voice (Javanese and Balinese music texture).

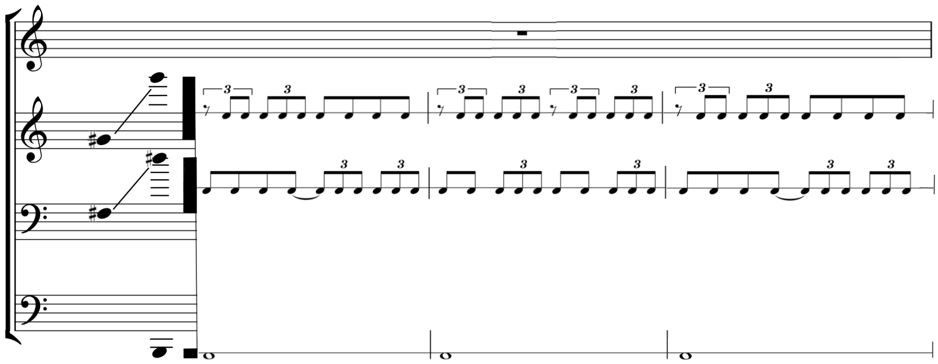
Example 29: The Rhythmic Structure with Registral Indication.

mm. 1–14

mm. 15–18

mm. 19-22

mm. 23-26



CHAPTER VIII

DEBUSSY'S COUNTERPOINT COMPARED WITH JAVANESE COUNTERPOINT

The connection between Debussy and counterpoint is mentioned by different scholars such as Kiyoshi Tamagawa and Matthew Brown.[51] Debussy himself compares Javanese counterpoint and Western counterpoint in his writings. Tamagawa has summarized the main principles in Debussy's comparison between western counterpoint and Javanese counterpoint: "formal freedom that excludes 'confinement within a traditional form'; 'percussive charm'; freedom from conventional notions of harmony; and, finally, 'counterpoint that makes Palestrina seem like child's play.' "[52]

Debussy had a strict contrapuntal educational background (but we do not know whether Palestrina was used as a model in his classes), and we can see a "potential harmony" in his piano pieces. As example 27 illustrates, it seems like there are four voices arranged in a contrapuntal way in "Pagodes". This style is different from the learned-style counterpoint of the Renaissance, and one could also interpret this piece from a traditional piano perspective, which includes two voices instead of four voices. Strata I and II belong to one voice and strata III and IV belong to another voice. However, there are two reasons for proving that this piece should be interpreted as four voices in an idiomatic contrapuntal way. Gerry Farrell explained that in Western common-practice music, musical exoticism and Orientalism can mainly be found in piano pieces, songs and romances, symphonic poems, operas, and operettas.[53] When

[51] Tamagawa, *Echoes from the East*, 45–54; Matthew Brown, 'Follow the leader: Debussy's Countrapuntal Games', in *Debussy's Resonance*, ed. François de Médicis and Steven Huebner (Rochester: University of Rochester Press, 2018), 395–418.
[52] Tamagawa, *Echoes from the* East, 46.
[53] Fauser, *Musical Encounters*, 140.

Western composers emulate another nation or region’s music, they usually will adapt the exotic elements to their familiar instrument. In the 19th and 20th centuries, western composers had limited opportunities to learn about other nations’ instrumentation. In this case, it is hard for them to compose for an unfamiliar instrument. As for Debussy, he adapted what he heard of Javanese gamelan in 1889’s exhibition in his piano work “Pagodes” and imitated the multiple parts of the gamelan on a single instrument.

Louis Laloy and Matthew Brown indicate multiple ways that Debussy “combined lines so as to create a ‘kind of unobtrusive idiomatic counterpoint’,” which included creating parallel chords, countermelodies, chains of parallel six-three chords, rhthymic augmentation, sequences, and so on.[54] One obvious difference between “Pagodes” and Renaissance counterpoint is that Debussy’s harmony is not guided by traditional tonal and functional harmony, and it is not in a frame of triads and seventh chords. The chords are stacked with dissonant intervals to produce special sonorities. Speaking of counterpoint, Javanese counterpoint has it own characteristics that form a contrast with Western Renaissance counterpoint. The main reason that I put the Javanese and Renaissance counterpoint to a comparison is that they all include the cantus firmus (ostinato).[55] The cantus firmus in Western counterpoint is usually located in the tenor voice. The cantus firmus in Javanese music is the *Balungan*, which means the melody. As example 30 illustrates, *Balungan* exists in the middle register among other voices. Debussy emulates this point in the “Pagodes” by putting the cantus firmus in the middle voice (example 31). Patricia Harpole also tells us that Debussy places the melody in the middle register above the prolonged bass pedal

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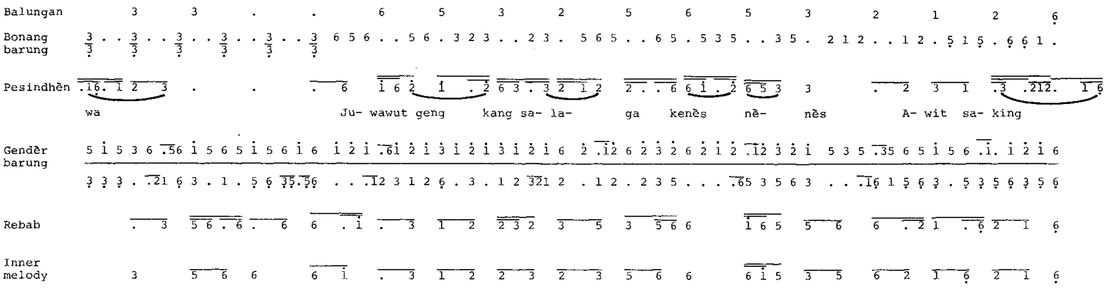
[54] Matthew Brown, ‘Follow the leader: Debussy’s Contrapuntal Games’, in *Debussy’s Resonance*, 397–399; Louis Laloy, “La musique de l’avenir,” *Le mercure de France* (December 1, 1908): 419–34.

[55] Although not all *cantus firmi* are laid down as ostinati and not all contrapuntal works include a cantus firmus in western music, I would like to mention it as one of the traditional methods that composers use to write a contrapuntal piece.

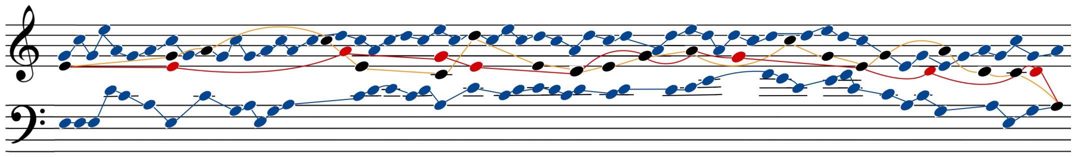
point with the faster ornamentation in the top voices.[56] It seems that Debussy tried to emulate the Javanese gamelan structure texturally.

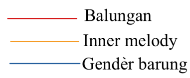
Example 30: Javanese Gamelan Illustration with its Linear Structure.

a. A Javanese short excerpt transcribed by Sumarsam (1975), 265.

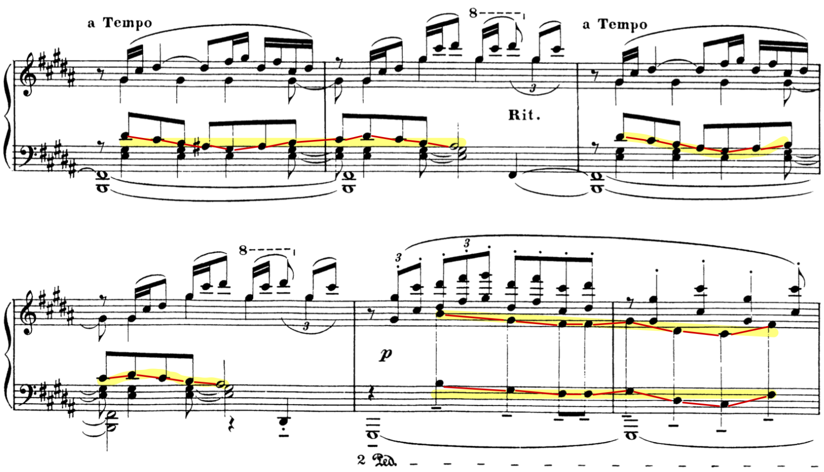


b. The Linear Structure.





Example 31: Measures 7–12 of "Pagodes."



[56] Tamagawa, *Echoes from the East*, 53.

Sumarsam is the first scholar to introduce the concept of inner melody in Javanese gamelan. A Javanese gamelan composition is called *gendhing*. [57] The *blungan* is the skeleton and the melody of the *gendhing*. Marc Perlman and Sumarsam observe that most scholars treat the *balungan* as the guiding voice of the *gendhing*. [58] Sumarsam indicates that it is wrong to equate the *balungan* with the melody played on the *saron*; there is a more important "inner melody" in the musician's mind, which works as the soul and the real melody of the *gendhing*. This inner melody is hummed by the musicians and directs the melodic motion. The *rebab* (two-string bowed lute) is the best-suited gamelan instrument to play this melody since it most closely resembles the texture of a vocal melody. In this case, the *rebab* has an important position in presenting the inner melody. [59] Example 30 illustrates a inner melody in a Javanese gamelan excerpt. The inner melody is similar to the *rebab* melody except for some rhythmic changes. This concept of "inner melody" and the "potential counterpoint" in Debussy's music both convey an idea of obscurity, invisibility, and potential expression.

If we consider the differences between Renaissance counterpoint and Javanese counterpoint, aside from the obvious difference in instrumentation, a significant difference lies in the harmonic aspect. Javanese counterpoint is not written in the Western tonal system, and tonal harmony therefore does not guide the composition. Compared to the strict limitations on using dissonance in Renaissance counterpoint, there are more possibilities for dissonance in Javanese counterpoint. Another

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[57] Noriko Ishida, "The Textures of Central Javanese Gamelan Music: Pre-notation and its discontents," *Bijdragen tot de Taal-, Land- en Volkenkunde* 164, no. 4 (2008), 475.
[58] Marc Perlman, *Unplayed Melodies: Javanese Gamelan and the Genesis of Music Theory* (Berkeley and Los Angeles: University of California Press, 2004), 87–91; Sumarsam, "Inner Melody in Javaneses Gamelan," in *Karawitan*, ed. Judith Becker and Alan H. Feinstein (Michigan: University of Michigan Press, 1984), 249–250.
[59] Sumarsam, "Inner Melody in Javaneses Gamelan," 250–264.

important difference is that in Renaissance counterpoint the score reflects most of the content of the music, while in Javanese gamelan, not all the elaborations are shown in the score; the musicians improvise and also sing the invisible “inner melody” in their minds. Apart from these differences, there is also an important similarity. Javanese and Renaissance counterpoint may both contain a cantus firmus (functioning like an ostinato) appearing in any voices.

As we have seen, the rhythmic and textural differences between Javanese and Balinese counterpoint on the one hand and Renaissance counterpoint on the other are many. Not only that, but Javanese and Balinese practices both have their own unique rhythmic profiles. In the rhythm and texture of “Pagodes,” Debussy mixes features of Javanese and Balinese counterpoint freely, together with his own distinctive approach to harmony.

CONCLUSION

In the first half of the thesis, I discussed the *J* function and how it might explain the potential Chinese influence on Debussy's "Pagodes." I would like to highlight two significant results of this discussion. First, I have proposed a new use of the *J* function to analyze music of the early twentieth century that engages with "exotic" tonal materials. This theoretical model, however, is not limited to the early twentieth century, since the $J_{12,7,5}^{m_1,m_2}$ function can be applied to music of any period, as long as the music features maximally-even pentatonic and diatonic relationships. Indeed, it would be worthwhile to conduct further research to determine what music outside of France, Russia, and China shows this $J_{12,7,5}^{m_1,m_2}$ function. The second result is that my theoretical model of *J* purity may help to evaluate the musical style of pieces when the use of "exotic" materials is ambiguous. In this way, we can establish a line of communication between music theory and music history.

Furthermore, the analytical model and the new concepts I have proposed may prompt us to consider whether we can extend $J_{12,7,5}^{m_1,m_2}$ to $J_{12,7,4}^{m_1,m_2}$ and $J_{12,7,3}^{m_1,m_2}$ to analyze music outside of the "Chinese" style and the early twentieth century. The high *J* purity of $J_{12,7,5}^{m_1,m_2}$ reflects a characteristic of music by French, Chinese, and Russian composers dealing with Chinese themes in the early twentieth century. What if there are some works that contain around a 50% purity of $J_{12,7,5}^{m_1,m_2}$ and around 50% of $J_{12,7,4}^{m_1,m_2}$? How should we evaluate the style of these works through the *J* function characteristic? These possible extensions of $J_{12,7,5}^{m_1,m_2}$ suggest the versatility of the *J* function in music analysis.

In the second half of the thesis, I mainly focused on the Javanese influence on Debussy's "Pagodes" from rhythmic and textural perspectives. I first examined the characteristics of Javanese and Balinese music and then compared them with "Pagodes," particularly considering that work's similarities with the rhythm and texture of Javanese gamelan. I did not include a comparison with Debussy's other works, yet it would not be difficult to find these types of similarities in other works by Debussy. In the final chapter, my discussion of the relationship between Debussy and Renaissance counterpoint further suggested that Debussy focused on elements of Javanese and Balinese counterpoint rather than 16th-century counterpoint and combined them with his unique harmonic materials in a new and innovative way.

My discussion demonstrates that "Pagodes " is an effective example of how Debussy was able to draw together a variety of different styles, including aspects of Chinese and Javanese music. Although there was no Chinese performance at the Exhibition Universelle in Paris in 1889, based on the historical description of Debussy's awareness of Chinese music, we should not ignore the strong similarities between Chinese musical style and "Pagodes." My application of *J* function theory proves this similarity.

There are some aspects of these issues that call for more research in the future. Perhaps some scholars might think it is controversial to claim that Debussy emulated Chinese music, because this seems to contradict what Debussy would have heard at the Exhibition Universelle. This skepticism might come from the idea that historical determination should control the process of analysis. The intersection between musicology and music theory is often understood to involve the following: when presented with a specific historical fact relating to a problem, the only thing theorists can do is to prove this fact through analyzing music. From my perspective, however, music theorists can also add something that was found through the analysis of the score to acknowledged facts. No one can read a composer's mind, nor can anyone guarantee the complete accuracy of the historical record, since scholars continue to search and correct aspects of this record. In this case, there is a possibility for understanding the Chinese influence on "Pagodes." Debussy was aware of Chinese music before the exhibition, which is why the performance of Vietnamese theater reminded him of Chinese music. It would be fascinating if a historical source could be uncovered in the future to reinforce the idea that Debussy's music was indeed influenced by the Chinese style, as my theoretical work has demonstrated.

APPENDIX

The Score of the B Section of He's "The Cowherd's Flute."

B

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