Transpositional Combination and Aggregate Formation in Debussy

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The most conspicuous moments of chromaticism in Debussy's works are found in passages unified by sequential motion featuring semitonal transposition. This topic has been termed transpositional combination (TC) by Cohn, and it relates naturally to Debussy's method of aggregate formation. Such passages appear throughout Debussy's output, and serve a variety of functions. Debussy expanded his method of aggregate formation in his final works beyond TC to include inversive symmetry as well. The "mystery" behind the similarity in a chord progression common to works by both Debussy and Berg is found in a trait both works share: aggregate formation via TC.

Although the total chromatic, or aggregate, has been a subject traditionally associated with the Second Viennese School and later serial composers, aggregate formation in works of the Classical era has been the subject of several recent studies. James Baker argues that music of this era provides an ideal environment in which to study the structural functions of chromaticism since there is frequently a strong contrast between diatonic and chromatic material. This distinction was significantly blurred in the 19th century, and thus the rhetorical power obtained through aggregate formation in the Classical style was lost. This, as Baker notes, was "a sacrifice Romantic composers were more than willing to make." While Baker's observation is certainly true, it brings up an important question: is it possible for Romantic or even early 20th-century composers to employ aggregate formation in a meaningful way, or was their harmonic language inherently too chromatic for such an event to be perceived? I explore this question through the analysis of works by a composer rarely, if ever, associated with the chromatic aggregate: Claude Debussy.

Baker shows that unordered aggregate formation in the works of Mozart often unfolds over the course of a phrase or period. Burnett and O'Donnell limit themselves to the ordered formation of the aggregate, and therefore the time span of its presentation is greatly expanded. Indeed, the ordered aggregate they find in a Haydn Divertimento unfolds over nearly the entire sonata-form movement, albeit a short one. This study follows Baker's model for unordered aggregate formation, while at the same time remaining sensitive to the interval cycles that play a large role in Burnett and

1 See Baker 1992 and 1993; Burnett and O'Donnell 1996; and Burnett 1998.
3 Another distinction between the methodology of these scholars lies in their treatment of chromatic pitches: Baker always counts the first appearance of each chromatic pitch class, while Burnett and O'Donnell sometimes only count salient appearances—which may not be the initial appearance—of the chromatic pitch classes.
O'Donnell's work. The following analysis of a passage from Chopin not only demonstrates the methodology to be used in this study, but also reveals a conspicuous method of aggregate formation within the context of chromatic harmony.

Example 1 contains the final eight measures of Chopin's Nocturne, op. 9 no. 3. The first five measures of this passage employ a generally stepwise bass line that connects two dominant seventh chords. This passage is unremarkable in terms of its chromatic harmony: two applied dominants are heard; one resolves deceptively. Nevertheless, these applied dominants add three pitch classes (Fx, E#, and D?) to the B-major scale, thus forming in the opening five measures the aggregate minus only two pitch classes. However, these four measures sound far less chromatic than the melodic ornamentation prolonging the structural dominant that ends this phrase. Once the 4–3 suspension within this chord is resolved, a strictly sequential passage descends chromatically through almost two octaves and definitively forms the total chromatic. Chopin uses this passage to prolong a single harmony, while the registral shift between the beginning and end of the sequence is traversed in a manner infinitely more elegant than would be achieved by an abrupt shift between the two extremes.

It is the formation of an aggregate within a single sequential gesture that makes this chromatic flourish stand out so clearly from its harmonic background. This context is crucial in providing an answer to Baker's question cited above: while aggregate formation in a Mozart score is readily perceptible, the increased use of mixture in the 19th century blurs the distinction between diatonic and chromatic harmony. Thus, in the Romantic era, aggregate formation within a gesture unified by sequential motion is necessary to achieve the same impact as aggregate formation within a phrase or period in Mozart.

While other methods of aggregate formation can be found in works of the 19th and early 20th century, a thorough investigation of this phenomenon would lie outside the scope of this study. The type of aggregate formation used in the Chopin example above was chosen specifically because it provides a clear link to the works of Debussy. It is well known that Debussy admired the works of Chopin, and a passage from the Danse Bohémienne of 1880 suggests that he used Chopin as a model in his earliest works (Example 2). Just prior to the return of the work's main theme, a sequence of chromatically-descending major triads prolongs the dominant in the service of a registral shift; the entire gesture forms the aggregate.

While Debussy quickly matured beyond modeling his music on that of Chopin, his works almost exclusively used the method of aggregate formation that he learned from the Polish composer. The technical nature of Debussy's aggregate formation developed beyond sequential transposition only in his late works, although the musical reasons for its appearance are varied. In this study, I categorize the numerous roles that aggregate formation plays in Debussy's works. I then conclude with an exploration into the central role that aggregate formation plays in several of Debussy's works composed between 1912–15 and the expanded means to achieve these results.

Although there are exceptions, Debussy's aggregate formation involves the systematic transposition of a given set class to form a larger pitch collection. Richard Cohn has exhaustively explored this process, which he calls transpositional combination (TC). I adopt Cohn's theory of transpositional combination in this study because it relates so naturally to Debussy's method of aggregate formation, and also because it makes aggregate formation explicit in analytic

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4 Roy Howat has published an analysis of the prelude “Des pas sur la neige” that is identical in its methodology to that of Burnett and O'Donnell. D Aeolian is established in the opening measures of the work while the chromatic pitch classes are gradually added by ascending perfect fifth, beginning with B? and ending with E?. See Howat 1988, 83.

EXAMPLE 1. Chopin, Nocturne, op. 9, no. 3 (1830–32), final eight measures.
Return of Main Theme

Complete Aggregate Formation

EXAMPLE 2. Debussy, Danse Bohémienne (1880), mm. 67-70.

terms. For example, the passage from the Danse Bohémienne transposes major triads from F# to C# by interval 11, or the descending chromatic scale. The aggregate formed in this passage is more easily seen using the numerical notation shown below the music in Example 2. There is a significant

Conversely, interval 1 indicates the ascending chromatic scale.

This notation is borrowed from Cohn and requires some explanation. The set class that is transposed is found under the border on the bottom of this equation, while the transposition levels at which the set class appears are found outside the border running up the left side. The “multiplication” of set class and transposition level appears inside the borders of the equation along the intersecting row. The resulting pitch classes from each multiplication are stacked row upon row, and the complete set class that is formed consists of the numbers that appear within the borders of the equation. Cohn uses the normal form of his set classes, which allows him to develop his theory in significant ways. The normal form of set classes will not be used in this study in order to represent the precise pitch classes that result from this multiplication.
amount of duplication within this aggregate: 8 pitch classes 1, 5, 6, 8, 9, and 10 each appear twice, while the remaining six pitch classes only appear once. 9 This is common among aggregates heard within a tonal context, whether formed by TC in Debussy or by other means in earlier works.

As mentioned above, the passage cited in Example 2 occurs immediately before the return of the work's main theme. This is the role that aggregate formation plays most frequently in Debussy's mature works. Two factors help to explain this preference: first, aggregate formation implicitly signals a completion of some type, which may explain why Debussy places such events immediately before important structural divisions. 10 Second, there is a satisfying release of tension as the aggregate gives way to the following theme, one that is often strictly diatonic in order to heighten the contrast across the formal boundary. Debussy was hardly the first composer to use aggregate formation in this way; Baker shows that Mozart frequently places aggregates near formal boundaries, and Burnett and O'Donnell find the same practice in works by Haydn, Dittersdorf, J. C. Bach, C. P. E. Bach, Mozart, and Beethoven.

Debussy takes advantage of the instability generated by aggregate formation and also employs such passages as modulating transitions. One such example is found in "Nuages" from the Trois Nocturnes (1897–99). The opening two-part counterpoint gradually intensifies until a series of dominant major-ninth chords (B⁹, A♭⁹, G♭⁹, E♭⁹, C⁹, and B♭⁹) serves as a transition from the opening theme's B centrality to the B♭ centrality of the following music. The previous example transposed a given set through an interval cycle to produce the chromatic aggregate, albeit with duplications. Debussy frequently uses interval cycles 1/11, 2/10, and 3/9, although it is not surprising that a composer with an aversion of formulae of any kind also uses transpositional combination without recourse to a specific interval cycle. Such is the case in "Nuages": the chords are transposed by only two intervals —9 and 10—although their asymmetrical distribution (9–10–9–9–10) eliminates the possibility of even a mixed interval cycle. 11

This transitional measure appears later in "Nuages," once again serving as a modulatory link, now with the movement's central pentatonic theme. However, there are several important differences in this second presentation. First, the transitional measure appears twice, with a new whole-tone motive heard between these statements. Second, the reduction in texture from five to four voices makes it more difficult to form an aggregate here, and indeed the note A is missing (see Example 3). Debussy occasionally omits a single note in his aggregate formation. For example, the missing pitch-class A would have appeared to complete the aggregate had all six chords in this passage been of the same quality. Instead, there are two qualities of chords within this passage: the lowest two notes (G♯–D) of the first chord would need to be transposed up a semitone (A–D♯) to make all of the chords identical. 12 On the downbeat of the second transitional measure, the hypothetical A/D♯ in the lowest voices do not belong to the preceding whole-tone collection while the transposed notes G♯/D do. The potential aggregate

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8 In his study of Schoenberg's music, Ethan Haimo makes the distinction between chromatic completion, where pitch classes can be repeated before all twelve appear, and aggregate formation, in which there is no doubling. The term aggregate will be used in this study to describe both types of events since Debussy's use of aggregate formation was entirely different—both technically and aesthetically—from that of Schoenberg. See Haimo 1990, 44 and 183.

9 Cohn's later writings on TC do not allow pitch-class duplications among the transpositionally-combined set classes. This study, like Cohn's dissertation and first article, does not limit itself by this constraint.

10 It must be noted that Debussy occasionally begins a phrase by forming an aggregate. An instance of this from Debussy's string quartet is discussed below in Example 4.

11 For more information on Debussy's use of interval cycles, see Gary Karpinski 1995, 183–206.

12 This imprecision in TC is indicated in the example by the appearance of pitch-class integers in parentheses.
formation here through unblemished TC is sacrificed in order to form a smooth motion between the whole-tone motive and the transitional measure, a fluidity created by three common pitch classes rather than only one.

It is ironic that Debussy took such care to create smooth connections between these measures, since together they actually serve as an unstable and modulating transition. The central whole-tone measure is slightly more stable than the outer measures, and thus the entire transition is not accomplished in a single motion. Debussy's sensitivity to levels of instability often involves the juxtaposition of passages using symmetric scales—whether whole-tone, octatonic, or chromatic (presented as an aggregate formed through TC)—with the resolution of this instability brought about through the appearance of diatonic harmony.

The final movement of Debussy's string quartet of 1893 uses aggregate formation in combination with octatonic and whole-tone harmony to create an extended passage that is remarkable due to the careful control of its levels of instability over an extended phrase. This passage begins immediately after the slow introduction, which concludes with something quite rare in Debussy's oeuvre: an authentic cadence. A motive featuring chromatically-descending minor thirds that encompass seven of the twelve chromatic pitch
classes first appears in the solo cello. The intensity quickly builds as the viola enters, and each of the two measures of this duet forms an aggregate. Once all four instruments enter, the intensity reaches its peak as aggregates are repeatedly formed through the transposition of a fully-diminished seventh chord. This is shown in Example 4(a).

The same motive is then heard with subtle modifications in order to accommodate its new setting in an octatonic context. These four measures consist of a single repetition of the motive, these first two measures being transposed up by a minor third; between the two statements of this motive, collection II is fully stated. This octatonic passage, shown in Example 4(b), is considerably less dense than the preceding aggregate formation, although it certainly does not represent the latter’s resolution due to the harsh dissonance formed between the F of the first violin and the F# of the second violin and viola.

The motive next appears close to its original form and harmonic setting, although it is heard at a single transposition level and accompanied by fragments of the descending chromatic scale. Despite the reduction in density, this form of the motive is developed more systematically by TC and is able to form an aggregate within two measures (Example 4(c)). The motive is altered once again in the final three measures: minor thirds are replaced with major thirds, and these intervals are transposed by both interval 10 and 11. Whole-tone collection A is formed by the initial transposition of these thirds by interval 10, although the following transposition by interval 11 presents half of collection B. An uneasy whole-tone context is thus formed (Example 4(d)). This passage is followed by major thirds transposed strictly by interval 11, first by the viola and cello and then the cello alone (Example 4(e)). Within this concluding gesture an aggregate is formed minus a single note, G. The reduction in texture and the rest that immediately precedes the final statement of the thirds strongly signals a reduction in instability. In fact, the five separate passages described above represent a gradual movement from instability towards stability, one that begins after a rapid motion in the opposite direction as the quartet gradually enters. This entire passage serves to delay the introduction of the main theme of the movement, whose tonic pitch-class G completes the aggregate left incomplete in the previous measure.

As impressive as the careful handling of the relative instability in this passage is, it also illustrates another important aspect of Debussy’s aggregate formation. While the final measures complete an aggregate, these measures are the most stable before the return of diatonic harmony. Because the previous two instances of aggregate formation were both less stable than the final one, Debussy’s aggregate formation need not always constitute a striking event in the musical argument. Indeed, the final aggregate formed in this passage was actually more stable than the whole-tone and octatonic passages that preceded it. It was argued above that aggregate formation within a single gesture unified by sequential motion is necessary in order for such an event to stand out from its harmonic background in 19th- and early 20th-century music. An addendum must be added to this rule, one that

13 An additional pitch class appears after the strict transposition of the minor third ends. A different reading of these opening measures is possible, one that consistently treats the second minor third of each chromatic descent as non-harmonic. This interpretation yields an octatonic reading of these opening measures, one that moves from collection II in measures 1–4 to collection III in measures 5–6. Throughout this article, I will follow van den Toorn’s designations of the three octatonic collections. The one that includes the semitone E–F is referred to as collection I, the one that includes the semitone F–F#, collection II, and the last that includes F#–G, collection III. See van den Toorn 1983.

14 Note that this analysis discounts the motive’s concluding diminished-seventh chord arpeggiation since this lies outside the TC organization of this passage and therefore stands apart from this unified gesture. The distinction made between TC and its ornamentation will be used throughout this study.

15 The whole-tone scale that includes the whole-step C–D will be referred to as collection A, while the one that includes the whole-step C#–D# will be collection B.
(a) Debussy, String Quartet (1893), iv, no. 15–15+5

EXAMPLE 4
Octatonic Collection II
(0 3 9 11) T6

Violin I

Violin II

Viola

Violoncello

Octatonic Collection II (0 3 9 11) T6
(0 3 9 11) T9
(0 3 9 11) T9

Harmonic TC

Melodic TC

Octatonic Collection II (5,6,8,9,11,0,2,3)

(b) Debussy, String Quartet (1893), iv, no. 15+6–15+9.

EXAMPLE 4. [continued]
accounts for the relative strength of the aggregate formation. In order to make the most striking effect, aggregate formation should occur in the shortest time possible (a chord is felt more strongly than a sequence drawn out over a number of measures); it should involve the greatest number of musical lines in the TC (it should transpose ninth chords, for example, rather than single intervals); it should feature transposition by interval 1/11 (since for Debussy the semitonal motion between chords most immediately invokes the interval that characterizes the aggregate); and it should duplicate the greatest number of pitch classes within the aggregate, preferably all to the same degree.

While each of the aggregates found in Classic era works by Baker and Burnett and O'Donnell play an important, and
even motivic role, this is not true in Debussy’s oeuvre. Transpositional combination within a single gesture is such a common feature in Debussy’s scores that the strength of the aggregate formation and the placement of this gesture within its musical context determine if it will be conspicuous or not. However, some of Debussy’s last scores consistently use the chromatic aggregate in a conspicuous way, and such passages are often used as cadential gestures. Further, Debussy attaches importance to the distinction between complete and incomplete aggregates by sometimes withholding pitch classes in order to delay the large-scale musical climax to coincide with true aggregate formation. These works, including Jeux (1912–13), “Feux d’artifice” from the Préludes Book II (1910–13), and the Études “Pour les cinq doigts” and “Pour les huit doigts” (1915), represent a significant development in his use of aggregate formation. Each of these works will be discussed briefly in chronological order to show the development of Debussy’s compositional thought.

The music heard before the curtain rises in Jeux is written in a three-part structure: a central scherzando section is framed by mysterious and languid music featuring whole-tone harmony. The scherzando section immediately presents two of the primary motives of the ballet; these are labeled A and B in Example 5.16 The second note of motive B is initially heard as a diatonic, rather than chromatic, upper neighbor.

Here and below I follow the motivic designations used in Pasler 1982.
making the TC in its first appearances imprecise. By no. 3, however, the motive is normalized into a descending chromatic trichord, each member of which is embellished with a chromatic upper neighbor. Once this occurs, the harmonic support of this motive is transposed systematically. Within the four-measure gesture beginning at no. 3, TC in both the melody and its accompaniment form set-class 10–1 (the aggregate minus a [01] dyad). At no. 3+4 the harmonic accompaniment inverts the motivic trichord from descending to ascending, and the melody is transformed into a two-measure idea through the addition of a concluding chromatic trichord. The statement of this two-measure idea forms the exact collection of pitch classes as the previous four-measure gesture. However, the missing pitch classes A♭ and A♯ are supplied when the second measure of this idea is

\footnote{This is indicated in the example by pitch-class integers appearing in italics.}
TRANSPOSITIONAL COMBINATION AND AGGREGATE FORMATION IN DEBUSSY

Motive A  Motive B  Motive A  Motive B  Motive A  Motive B  Motive A

\( (0 \ 11 \ 10) \ T_1 \ \ T_4 \ \ T_7 \ \ T_1 \)

\( (0 \ 11 \ 10) \ T_5 \ \ T_8 \ \ T_7 \ \ \)

Set 10-1 T10/T7I

Complete Aggregate Formation

\( (0 \ 11 \ 10) \ T_4 \ \ T_5 \ \ T_7 \ \ T_6 \)

\( (0 \ 11 \ 10) \ T_9 \ \ T_4I \ \ T_7I \ \ T_1I \)

\( (0 \ 11 \ 10) \ T_2I \ \ T_5I \ \ T_8I \ \)

Set 10-1 T10/T7I

Complete Aggregate Formation

\[
\begin{array}{c|ccc}
\text{no. 1} & 2 & 1 & 0 \\
1 & 1 & 0 & 11 \\
0 & 11 & 10 \\
\end{array}
\]

\[
\begin{array}{c|cccc}
\text{no. 2} & 1 & 1 & 0 & 11 \\
0 & 1 & 10 & 10 \\
0 & 11 & 10 \\
\end{array}
\]

\[
\begin{array}{c|ccc}
\text{no. 2+2} & 2 & (3) & 1 & 0 \\
1 & 1 & 0 & 11 \\
0 & 11 & 10 \\
\end{array}
\]

\[
\begin{array}{c|cccc}
\text{no. 2+4} & 5 & 5 & 4 & 3 \\
2 & (3) & 1 & 0 \\
1 & 1 & 0 & 11 \\
0 & 11 & 10 \\
\end{array}
\]

Example 5. [continued]

repeated a semitone higher, thus completing the aggregate. The two-measure idea is then repeated at its original transposition level, and the subsequent transposition of the second measure not once, but three times, further emphasizes the aggregate formation within this gesture. This is the climax of the ballet’s introduction, one that is abruptly juxtaposed with the framing whole-tone music. Aggregate formation therefore relates to the formal discontinuity here as it does elsewhere in the ballet, including the following section.

As the curtain rises “on an empty park,” motives C and D are quickly introduced (see Example 6). Motive B disrupts the diatonic calm of these two motives at no. 6+5 by presenting set-class 6-1[012345], which is possible now that its two intercalated chromatic trichords are related by a minor third. The motion between chromatic and diatonic music quickens as motives B and D alternate beginning at no. 7. Each of the first two statements of motive B and its TC accompaniment here forms an aggregate minus a single pitch class, E. This note does appear as the final melodic pitch in this gesture, although the lack of the minor third immediately after this note and the increase in rhythmic activity encourages it to be heard as a passing note to the opening D# of motive D.18 The same alternation of motives appears in the following six measures, although a diatonic harmonization is maintained throughout this passage. The final measures of this section beginning at no. 8 serve as its climax; motive B is accompanied here by chromatically descending triads, and an

As indicated in Example 6, I analyze this measure as four descending statements of a chromatic trichord from $T_6$, $T_3$, $T_7$, and $T_{10}$. The melodic pitch-class E is not part of any of these statements, and so set-class 11-1 is formed rather than the chromatic aggregate. However, it is possible to analyze motive B as set-class [0, 3] presented at $T_7$, $T_6$, $T_5$, and (partially) at $T_4$. This interpretation ignores the importance of the chromatic trichord in these measures, but yields a complete aggregate. Whichever interpretation is preferred by the reader, the smooth connection between motives B and D, formed by the continuation of the TC into the diatonic measure, significantly weakens the impact of these chromatic set classes.
aggregate is formed in each of these three measures.\textsuperscript{19} The conclusion of this gesture serves as the abrupt end of this section, which is then juxtaposed with new music accompanying the appearance of the tennis ball on stage.

Aggregate formation is used in this form-defining role again between nos. 51 and 78, from when the young man separates the heads of the two young girls to their triple kiss. At this point in the ballet, the jealousy of the three characters has finally been overcome, and the stage directions tell us “everything encourages them to give free rein to their fancy.” It is for this reason that the triple dance is the most continuous passage of the entire ballet. Thus, the aggregate formations before nos. 53, 58-4, 65-4, and 70 do not create discontinuities within the score, but simply create formal punctuations within this extended passage. However, the final aggregate formation of the ballet is similar to those at its opening. In fact, three passages appear in quick succession just prior to no. 78 to mark decisively the arrival of the ballet’s climax with the triple kiss. The first two of these passages each create an aggregate through the rapid juxtaposition of complete diatonic collections—formed first in scalar runs (Example 7(a)), and then within a chain of chords (Example 7(b)—one an exact transposition of the other by semitone. The third passage uses smaller sets in its TC organization and is missing the single note G# (Example 7(c)).\textsuperscript{20}

\textsuperscript{19} The final melodic note of motive B is again heard as a passing tone since it is not fully incorporated into the TC organization of this motive. Yet while the rhythm of the accompanying triads could cause the last of them to be labeled a passing chord, its notes are included in the aggregate tally because this final chord is fully incorporated into the TC organization of this gesture.

\textsuperscript{20} Debussy’s initial version of this passage did not include this final passage of TC, and Diaghilev suggested that he rewrite it. Debussy obliged, and wrote to his publisher “the few measures requested by Diaghilev have obliged me to modify—quite happily—the end of Jeux
Juxtaposition of C and C# Aeolian
Complete Aggregate Formation

(a) Debussy, Jeux (1912–13), no. 75+4.

EXAMPLE 7

The release of passion in the triple kiss is reflected in an abrupt change of rhythm, texture, and motive, and the languorous presentation of motive C that begins on G♯ completes this final aggregate.

The sections of the ballet analyzed above represent its opening and conclusion. This is not to imply that aggregate formation does not occur in the interior of the ballet; rather, stage action controls the formal organization of this music rather than the punctuating appearance of the total chromatic. Stage action was not an issue in the next work that Debussy composed, the piano prelude “Feux d’artifice,” and aggregate formation and its deliberate suppression are consistently used to form the climaxes of this work and to create formal divisions.\(^{21}\)

\(^{21}\) Orledge explores the genesis of this ballet in detail. He writes that Debussy composed Jeux in July and August of 1912, made some revisions to its ending at the request of Diaghilev in September, and finished its orchestration between March and April of the following year. See Orledge 1982, 164–65. The chronology of the piano preludes is much more difficult to determine. However, based on extent letters and manuscript evidence, Roy Howat writes that both “Feux d’artifice” and “Les tierce alternées” were the last of the preludes to be composed, at the latest by the beginning of 1913. See Howat 1985, xv.

... it is better in place now and the voluptuousness oozes out freely (the Russians are like Syrian cats)." See Orledge 1982, 165.
The introduction of this prelude features the ostinato F–G–A–B♭–A♭–G♭ that creates set-class \([012345]\), or exactly half of the aggregate. Because this ostinato is heard four times in each of the opening sixteen measures, “Feux d’artifice” begins with a chromatic blur that foreshadows complete aggregate formations later in the prelude.\(^{22}\) The work’s main theme appears soon after the double bar lines of measure 24 signal the end of the introduction. This theme opens with the germinal cell C–G (motive A) that is then embellished with an upper neighbor to form C–A–G (motive B). The arpeggiation of a five-note chord G–B♭–C–D–E forms the harmonic setting against which the theme is heard (see Example 8). Motive B and its harmonic accompaniment are both developed via TC, each with slight changes. Motive B rotates its first note to its final position at the end of this passage, while only four of the five notes of the original arpeggio are transposed, the second statement in inverted form.\(^{23}\) In spite of these changes, the transpositional connections among the three statements of this music are immediately audible. Slight changes such as these are what keep interest in this musical machinery, which David Lewin has described as “almost too parodistic.”\(^{24}\) These measures contain the first statement of aggregate completion in the prelude; this placement seems deliberate, for its only other appearance occurs at the climax of the work in measures 85–87. The intervening phrases all end with cadences similarly formed through TC, yet with at least a single pitch class missing from the aggregate. The method by which Debussy withholds pitch classes from these cadences varies, as shown in the following analysis.

The next statement of the main theme withholds the most number of pitches from the chromatic aggregate; this is because the theme has been modified to fit into a whole-tone context (F–C♭–F–D♭–C♭), and it is only transposed once by interval 2.\(^{25}\) Whole-tone collection B is fully stated, and thus half of the total chromatic is withheld in this

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\(^{22}\) This opening ostinato, F–G–A–B♭–A♭–G♭, favors the application of IS over TC since the temporal ordering of its notes suggests an ascending trichord followed by its descending inversion transposed up by a semitone. However, throughout “Feux d’artifice” there is a rise-and-fall motion in the accompaniment with programmatic intent (namely, fireworks). Because the set classes that are presented in this manner all have the TC but not the IS property, the compositional surface that favors an IS reading is simply a byproduct of the motion used to depict the flight of the fireworks. Therefore I will use TC, rather than IS, in the analysis of this prelude. More on the distinction between the applications of either TC or IS is found in the discussion of the etude “Pour les huit doigts” below. For another interpretation of this ostinato, see Lewin 1993, 106.

\(^{23}\) This is indicated by integers in bold type in the example.

\(^{24}\) Lewin 1993, 102.

\(^{25}\) The harmonic accompaniment remains the same throughout this thematic statement.
phrase. The following phrase more clearly reveals Debussy’s intent to subvert complete aggregate formation (see Example 9(a)). The main theme is again modified (B♭–Eb/ B♭–F–Eb), and, aside from the rotation within motive B, its subsequent development by TC (B♭–G♭–F♭/G♭–F♭–B♭) is not strict: in order to make this transposition exact, the first note of its initial presentation would need to be A rather than B♭. A similar problem is found in the harmonic support of this passage. The TC in the accompaniment differs from that of the melody: rather than rising strictly by semitone, a five-note subset of the original chord first descends by step; then, only two notes of this chord join the melody in its semitonal ascent. Voice leading is therefore less than obvious in this passage. Nevertheless, it would have been easy for Debussy to transpose the A♭ of the ascending chord in the final measure up by semitone. Not doing so makes the pitch-class A♭ the only note missing from the aggregate formation here.

The central scherzando section features a motive introduced in the preceding measures, one that is now developed through transpositional combination (see Example 9(b)). As in the previous phrase, a single pitch class is withheld from the formation of the total chromatic; the opening pitch-class G of measures 49–50 should be G♯ to make the TC strict, and it is the note G♯ that is missing from the aggregate here. The following diatonic phrase ends with clouded octatonic
Motive B TC
11 11 7 5
10 10 6 4
9 (10) 5 3
0 8 6

L. H. TC
7
6
8
0 7 10 4 2 5 9

Aggregate minus pitch-class A
*Parentheses indicate imprecise TC
Italics indicate inversion of melodic set
$Bold type indicates rotation within motive B

(a) Debussy, “Feux d’artifice,” mm. 42–44.
EXAMPLE 9. [continued]

The following reappearance of the main theme in measure 65 would seem to signal a return to aggregate formation, as in its initial presentation. In this statement as well as the following three appearances of this theme, however, the concluding development is unaccompanied, and so even the extended TC heard at the end of the second and fourth of these phrases is insufficient to form aggregates. After denying aggregate formation for so long, the climactic passage of the prelude is reached in measure 85: the motive from the scherzando section is reharmonized and transposed along interval 1 to form an aggregate, as do the following simultaneous black- and white-note glissandi.

in these measures in order to contrast the white of C major with the black of E_b minor. This change is minor compared to the glissandi, not shown in the above example, which cover all the white keys in the first measure and all the black keys in the second. For more on this opposition, see Howat 1988, 86–87.
The final measures bring the prelude to rest in D♭, although the manner by which this is achieved is remarkable. Throughout the prelude, TC has clouded the establishment of a centric pitch class and has formed unstable sets at climactic moments or cadences. In these final measures, however, Debussy employs TC in precisely the opposite manner.

The bass pedals D♭–A♭ are sustained until the penultimate measure, while above this pedal both the main theme and La Marseillaise are heard in C major. Just as La Marseillaise fragment ends, motive B is transposed up a semitone. Thus, TC eliminates the tension between these two competing pitch-class centers by bringing the tonality of both the bass pedal
and the melody into agreement and establishing Db as the key of the prelude. This is an important point, as it suggests that Debussy used TC in “Feux d’artifice” to both form the chromatic aggregate at climaxes as well as to logically arrive at the final triadic sonority. It is this duality of purpose given to TC that imparts such power to the final measures.

Like “Feux d’artifice,” the études “Pour les cinq doigts” and “Pour les huit doigts” also consistently treat aggregate formation as cadential or climatic events. Yet both works, written only two years after the prelude, reveal Debussy’s exploration of new methods besides TC to create aggregates. In “Pour les cinq doigts,” this is accomplished simply through the juxtaposition of two diatonic collections related by semitone. Because these juxtaposed diatonic collections are not related by transposition on the compositional surface, Debussy finally exceeded the bounds of TC that he had tested in previous works. Once this boundary was crossed, he began to explore new methods of aggregate formation in “Pour les huit doigts.”

This study opens with pure diatonic writing in the first measure; by the second measure, Debussy begins to form large subsets of the aggregate, beginning with set-class 8–1 (an eight-note chromatic collection) followed by set-class 10–1 in the next measure. The alternation between diatonic and chromatic harmony continues, although the passage in measures 7–8 differs from the preceding chromatic material in an important way: both indicate the application of a different analytic method. In measures 2–4, the aggregate subsets were formed by the semitonal transposition of the first beat to the second, albeit with slight modifications (see Example 10(a)). Thus, the compositional surface clearly favors the application of TC here. In measures 7–8, two gestures create set-classes 8–1 and 7–1, but these sets are formed by adjacent pentachords (see Example 10(b)). Because of the contrary motion between the pentachord pairs, and the lack of a transpositional relation between the pentachords that form set class 8–1, the compositional surface favors the application of IS over TC. The following measure features two pentachords that are neither transpositionally nor inversionally related, a situation which is found again in measures 40–41 (Example 10(c)). The choice behind Debussy’s selection of pentachords is nevertheless clear; together they form a tightly spaced subset of the aggregate, just as in the previous two chromatic passages. That these three set-class relations share a common compositional goal in this étude—while this goal of aggregate formation had previously been exclusively associated with TC—suggests that these new methods grow out of Debussy’s use of TC.

Once inversional symmetry substitutes for transpositional combination to form aggregate subsets in measures 7–8, Debussy begins to explore IS in different harmonic settings. For example, Debussy links tetrachords to form scales; diatonic scales were formed in measures 5–6 and in the final measure of this opening section, while chromatic scales, rather than chromatic clusters, first appear in measures 10–11. Debussy fills out an octave here with both transpositionally- and inversionally-related tetrachords; the former measure

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28 The passages in question include the juxtaposition of G and Ab major in mm. 42–44 to form the complete aggregate, and the final measures that feature incomplete aggregate formation with the juxtaposition of the Db-major scale and the closing C-major triads.

29 These imprecisions in TC are noted in the example: in mm. 2–3, pitch-class B is held as the opening note of each gesture, while in m. 4 the change from minor to major pentachords is due to a play between black and white keys similar to that noted above in “Feux d’artifice.”

30 IS refers to inversional symmetry, an analytic technique most often applied to the music of Bartók. IS implies a texture in which two voices mirror one another around a central pitch axis. See Perle 1955, Treitler 1959, and Antokoletz 1984.

31 The relation between the tetrachords in measure 9 is similar to the modification of TC found in measures 2–3. However, the tetrachords in measure 9 are not part of a transpositional process, and thus they appear to be neither transpositionally- nor inversionally-related. The passage in measures 40–41, which in no way can be related to TC, suggests that one criterion for tetrachord selection here is the ability to form aggregate subsets.
features a descending [0, 2, 3, 5] tetrachord and completes
the octatonic scale, while the latter measure uses an ascending
[0, 2, 4, 5] tetrachord to form Messiaen's sixth mode of
limited transposition.32

The next section of the work (mm. 13–41) begins with a
two-note trill-like motive. This change in motive also coincides with a change in harmony, since neither scales nor
tightly spaced aggregate subsets are initially formed. Instead,
the trill motive is expanded from a major second through the
minor and major thirds to a perfect fourth, and all four of
these intervals are freely transposed and combined from one
measure to the next. Because of this, neither TC nor IS seem
appropriate for the analysis of these measures. However,
a large-scale voice-leading pattern, one highlighted by De-
bussy's use of tenutos, shows that this music initially builds
towards measures 24–25, both of which feature sets that are
transpositionally and inversionally related (Example 11).33 A
case could be made for the application of both theories: TC
is uniquely capable of revealing the method by which the
concluding whole-tone harmony is formed, while IS high-
lights the axis of symmetry D/A♭ in measure 25 (both notes
of which are implied in the score), this tritone serving as ten-
dency tones of Eb major, the ostensible key of this section.

32 In the “Technique of My Musical Language,” Messiaen spells his sixth
Example 12 shows that the music then gradually builds to the climax of the first half of the study in measures 31–34: the first measure forms set 10–1, the next 11–1, and the following measure begins the alternating black- and white-note glissandi that complete the aggregate.34

After a repetition of the work's opening material, the final section opens with three two-measure phrases (mm. 54–59) that reveal Debussy's remarkable control of aggregate formation and represent his most thoroughgoing exploration of inversionally related sets. These six measures are the climax of the second half of the étude, and each of its three two-measure phrases gradually decreases the level of chromatic saturation to balance the chromatic climax of mm. 31–34: the first two phrases complete the chromatic aggregate while the third phrase omits two pitch classes (E and B).35

The decrease in chromatic saturation is even more gradual if the final B of measure 57 is read as a B♭ (as it appears in most scores). In this reading, the first phrase completes the aggregate, the second phrase omits a single pitch class (B), and the third phrase omits two pitch classes (E and B). The analysis above follows the Debussy Complete Edition, which confirms that there is no natural in front of the B of m. 56 in either the complete autograph manuscript or the first edition, and concludes that m. 56 is "probably a repeat of bar 54." See Helffer 1991, 109.
control of the pitch-class content in these measures is matched by the consistency of the axes of symmetry that are projected. The four-note figures in each hand of the first phrase are inversionally-related for the first two beats of measure 54, as are many of the tetrachord pairs in this passage. Inversional symmetry is clearly an important aspect of this music, although it is not a feature common to each of the tetrachord pairs.

The full extent to which IS controls these measures is revealed when trichords, rather than tetrachords, are analyzed. The opening note of each tetrachord pair is the same, separated by an octave; the lower note is emphasized by a tenuto line, marking a slight distinction between these initial octaves and the rest of the tetrachord. The following trichords, with few exceptions, form set classes that are either transpositionally- and inversionally-related, or simply inversionally-related. While the harmonic goal of this passage is the axis of symmetry with the index number of 3, the axes leading to this climax lie along the diminished seventh chord F#-A-C-Eb (see Example 13). These four pitch classes are used

(c) Debussy, “Pour les huit doigts,” from Etudes Book II, mm. 9, 40–41.

EXAMPLE 10. [continued]
EXAMPLE II. Debussy, "Pour les huit doigts," mm. 21–25.
m. 31: set-class 10–1 $T_4$
aggregate

\[
\begin{array}{cccc}
1 & 1 & 9 & 1 \\
0 & 0 & 8 & 0 \\
11 & 11 & 7 & 11 \\
10 & 10 & 6 & 10 \\
0 & 0 & 9 & 0 \\
1 & 10 & 8 & 4 \\
0 & 9 & 0 & 8 \\
\end{array}
\]

Italics indicate inverted statement of melodic set

EXAMPLE 12. Debussy, “Pour les huit doigts,” mm. 31–34.

prominently as the opening notes of each tetrachord pair; indeed, the third phrase begins with the motion C–Eb, the opening phrase arpeggiates from A to Eb, using D as a passing note, while the second phrase arpeggiates through the entire chord, again using D as a passing note. These opening notes also display inversionsal symmetry in the third and final phrase; the last note D simultaneously completes the inversionsal symmetry of measures 58–59 (C–Eb–Db/ C–Eb–D♭) while at the same time confirming the modulation from the first axis to the last.39

39 The pitch-class axes formed by the opening note of these tetrachords (1/2 and 7/8) overlap with, but do not exactly match, the axis formed by the trichord on the third beat of measure 59 (2/8). However, the overlap between these axes is represented by the D♭ mentioned in the analysis above.
Despite the fact that Lockspeiser observed that “the abyss between Debussy and Schoenberg is indeed terrifying,” the identification of aggregate formation in Debussy and the chronology of his works raise interesting questions regarding the artistic paths of the French composer and the Second Viennese School. Similarly, the appearance of both TC and IS in Debussy begs the question of whether the appearance of these properties in the works of Bartók was the result of influence. As tantalizing as these questions are, they lie outside the scope of the current study. Yet aggregate formation formed through TC can help to explain one stylistic issue involving the remarkable similarity between passages in “Pour la danseuse aux crotales” from the *Six épigraphes antiques* and the last of Berg’s op. 2 lieder first identified by Stuckenschmidt (see Example 14). Berg’s song was published in a volume of *Der Blaue Reiter* in 1912, while Debussy composed the passage in question only in 1914. In light of the numerous derogatory comments he made regarding German music, it is highly unlikely that Debussy was influenced by one of Schoenberg’s students, as Stuckenschmidt suggests. Instead, the chord progression common to both works systematically transposes set \([0, 6, 11]\) by interval 11 to form the chromatic aggregate.

The mystery behind the similarity of these works is found in the trait they share: aggregate formation. A comparison between both complete works reveals the radically different role the common progression plays in each: Debussy’s aggregate appears only once in “Pour la danseuse aux crotales” and is used in the French composer’s typical role as formal punctuation, and is thus unexceptional (having been composed just after both *Jeux* and “Feux d’artifice”). By contrast, Berg’s aggregate is the product of the composer’s first steps towards atonality by way of his systematic exploration of interval cycles in his final student works. Debussy’s use of the aggregate does not reveal a hidden Germanophilic side to his art. Rather, it suggests that he instinctively viewed the aggregate as the harmonic totality implied by any diatonic or symmetrical scale. Debussy’s common placement of the aggregate at formal divisions supports this speculation; the fact that the Classical-era composers cited above used the aggregate in much the same way indicates that perhaps this musical instinct is universal.

The initial survey of Debussy’s use of the aggregate formed through TC led to an investigation of the development of this idea in his late works. This topic was then offered as a possible explanation for the similarity between works by Debussy and Berg. While Debussy is generally regarded as the father of 20th-century music, this status rests primarily on his use of scales other than major and minor. In its identification of aggregate formation through both TC and IS in Debussy’s works, it is hoped that this study has shown that the abyss that separates Debussy from his younger contemporaries is slightly smaller than once thought.

**REFERENCES**


Aggregate minus pitch-class A

Aggregate with pitch-class A appearing as tonic in previous phrase

(a) Debussy, “Pour la danseuse aux crotale,” from Six Épigraphe Antiques (1914), mm. 29–32.

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Der Ei-ne stirbt, da-ne-ben der An-dre lebt:

\[
\begin{array}{cccc}
3 & 3 & 9 & 2 \\
4 & 4 & 10 & 3 \\
5 & 5 & 11 & 4 \\
6 & 6 & 0 & 5 \\
7 & 7 & 1 & 6 \\
8 & 8 & 2 & 7 \\
0 & 6 & 11 & \end{array}
\]

Complete Aggregate Formation

(b) Berg, “Warm die Lüfte,” op. 2, no. 4, mm. 20–22.

EXAMPLE 14. [continued]


