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**The interval cycles in the music of Bartók and Debussy through  
1918**

**Karpinski, Gary Steven, Ph.D.**

**City University of New York, 1991**

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A

THE INTERVAL CYCLES  
IN THE MUSIC OF BARTÓK AND DEBUSSY  
THROUGH 1918

by

GARY S. KARPINSKI

A dissertation submitted to the  
Graduate Faculty in Music in partial  
fulfillment of the requirements for  
the degree of Doctor of Philosophy,  
The City University of New York.

1991

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This manuscript has been read and accepted for the Graduate Faculty in Music in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

September 12, 1991  
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ABSTRACT

THE INTERVAL CYCLES  
IN THE MUSIC OF BARTÓK AND DEBUSSY  
THROUGH 1918

by

GARY S. KARPINSKI

Adviser: Leo Treitler

A number of books and articles have discussed a special property of pitch collections found in the music of a few twentieth-century composers. A collection of pitches possesses this special property if it comprises at least one repetition of an interval. Particularly central are those collections that entirely divide the octave into equal partitions, otherwise known as the interval cycles.

Although some scholars began to view Bartók in the light of the interval cycles as early as the 1950s, scholarship in this area has been increasing in recent years. This study shows that the interval cycles play an important role in the works of Bartók even during the early part of his career before the death of Debussy.

This study also shows that Debussy's celebrated use of the whole-tone collection-type is merely a specific case of a much more general practice involving the interval cycles. It

contends that Debussy's use of such collections is pervasive, while perhaps not as systematic as Bartók's.

Parallels are also drawn between the types of collections these composers used and the compositional contexts in which they used them. Transformations among collections and the voice leading involved are also discussed. In addition, this study asserts that many of the passages which have been lumped under such headings as "planing" and "pantonality" can be shown to be generated by or otherwise related to the interval cycles, often through examining how the cycles operate on various structural levels and interact with diatonic collections.

To Jean and Julie

## ACKNOWLEDGEMENTS

Leo Treitler has been the guiding force behind this dissertation since its outset. He has shaped the nature and scope of this study--often through seemingly innocent questions or simple remarks. It was his early work on cell Z that spurred me to ask him to serve as my adviser, yet his keen mind has proven to be invaluable in matters far beyond such details: without his questions about methodology, epistemology, and musicality, this dissertation would not be what it is.

Elliott Antokoletz has assisted me through words of encouragement and words, words, and more words about details. He understands the subtlest and most complex aspects of these two composers and the theories that underlie their music. He has given me hundreds of illuminating questions and comments about my application of those theories to that music. How he finds the time to pursue his own excellent work and yet offer such attention to students, I do not know. That he does so while being so gracious is extraordinary.

Joel Lester has served as resident skeptic for this study. He, too, has offered numerous pages of questions and comments, many of which cut right to the heart of, say, epistemological issues raised by Leo Treitler or theoretical issues raised by Elliott Antokoletz. As a theorist, his

systematic eye has helped to keep this dissertation consistent; as a performer, his healthy skepticism has helped to make it musical. His careful editing of my drafts far surpasses any such work done by professional editors with whom I have worked. Remarkably, he does all of this with great speed and accuracy.

Other scholars are due thanks, as well. Bruce Archibald first introduced me to systematic approaches to twentieth-century music, particularly to the concept of equal division of the octave. George Perle showed me (first through his writings and later in his classes) the principles surrounding the interval cycles. He also first suggested to me that these principles might apply to Debussy's music. Richard Cohn has contributed to my understanding of some broader post-tonal theoretical issues through discussions in the hallways at SMT meetings, through the mail, and over the telephone. Joseph Straus helped me to formalize and clarify many of the theoretical principles central to this dissertation. Peter Bergquist generously offered corrections and suggestions concerning the musical examples.

Thanks also go to my students, especially those who attended my 1989 University of Oregon seminar in Bartók, Debussy, and Schoenberg. Their suggestions helped me to formulate my ideas more clearly and I'm sure that many of their contributions have made their way into my thinking.

Special thanks go to E. Benjamin Tomassetti who helped with data entry for some of the musical examples.

Finally, to Barry Brook and Allan Atlas--the two successive Executive Directors of the Ph.D. Program in Music at the City University of New York during my matriculation there--thank you for your confidence, advice, and support. I owe a great deal to you and your program.

## TABLE OF CONTENTS

ABSTRACT . . . . .	v
ACKNOWLEDGEMENTS . . . . .	vii
LIST OF EXAMPLES . . . . .	xi
LIST OF TABLES . . . . .	xvi
INTRODUCTION . . . . .	1
CHAPTER I. SYMBOLOGY AND TERMINOLOGY . . . . .	8
CHAPTER II. THE INTERVAL CYCLES AND RELATED COLLECTIONS . . . . .	25
CHAPTER III. LOCAL AND STRUCTURAL USES OF THE INTERVAL CYCLES . . . . .	81
CHAPTER IV. ANALYSES . . . . .	116
CHAPTER V. CONCLUSION . . . . .	187
BIBLIOGRAPHY . . . . .	194

## LIST OF EXAMPLES

	Page
0.1. A Venn diagram of the interval cycles and related collections.	4
1.1. Pitch collections which, when unordered, should receive the same designation.	9
1.2. An augmented triad and its inversion.	12
1.3. The two inversions of set 6-30.	12
1.4. An interval series viewed as a ring.	18
1.5. A hybrid collection with overlapping subsets.	21
1.6. The interval series of a hybrid collection in the form of a ring.	22
2.1. The chromatic scale in a common-practice-period tonal context.	27
2.2. Verdi, <i>Requiem, Dies irae</i> . mm. 117-18.	29
2.3. Melodic figure from Debussy, <i>La terrasse des audiences du clair de lune</i> , m. 37.	30
2.4. [1-1-1-3-1-1-1-3] as a product of transposing two chromatic segments at the interval of a tritone.	31
2.5. Debussy, <i>Feux d'artifice</i> , m. 1.	32
2.6. [1-1-1-1-1-7]t5 as a product of combining two transpositions of [2-2-8].	33
2.7. Bartók, <i>Four Piano Pieces</i> , No. 4, mm. 100-103.	34
2.8. The two whole-tone collections and how they form the chromatic collection.	35
2.9. Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 57-64.	36
2.10. Debussy, <i>Voiles</i> , mm. 1-2.	37
2.11. Debussy, <i>Voiles</i> , m. 31.	38
2.12. Debussy, <i>Pour le piano</i> , Prélude, mm. 71-79.	40
2.13. Debussy, <i>Les tierces alternées</i> , mm. 115-16.	42
2.14. Bartók, <i>Suite</i> , Op. 14, No. 1, mm. 106-109.	43
2.15. Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 81-90.	44
2.16. Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 97-102.	45
2.17. Bartók, <i>Four Piano Pieces</i> , mm. 488-91.	46
2.18. Two augmented triads combining to form a whole-tone scale.	47
2.19. Debussy, <i>Les tierces alternées</i> , mm. 117-120.	48
2.20. C <sub>40</sub> and C <sub>42</sub> combine to form C <sub>20</sub> .	48
2.21. Debussy, <i>pour les tierces</i> , m. 11.	49
2.22. The augmented scale as a product of two augmented triads.	50
2.23. Bartók, <i>Suite</i> , Op. 14, No. 2. mm. 1-12.	51

2.24.	The two levels of cyclic activity in Bartók, <i>Suite</i> , Op. 14, No. 2. mm. 1-12.	52
2.25.	Bartók, <i>Suite</i> , Op. 14, No. 3, mm. 60-65.	56
2.26.	Bartók, <i>Suite</i> , Op. 14, No. 3, mm. 124-129.	57
2.27.	Debussy, <i>Etudes</i> No. 6, <i>Pour les huit doigts</i> , m. 65.	58
2.28.	Debussy, <i>Ce qu'a vu le Vent d'Ouest</i> , mm. 1-6.	59
2.29.	A D <sub>7</sub> chord and [Eb, Gb, Ab] join to form a subset of the octatonic collection.	60
2.30.	[D, Eb, F#, Ab, A, C] as a transpositionally invariant collection.	61
2.31.	Debussy, <i>Ce qu'a vu le Vent d'Ouest</i> , mm. 7-9.	62
2.32.	The acoustic scale as a product of whole-tone and octatonic segments.	65
2.33.	Debussy, <i>L'isle joyeuse</i> , mm. 19-21.	67
2.34.	[2-2-2-3-3] as a combination of whole-tone and C <sub>3</sub> segments.	68
2.35.	Debussy, <i>Suite bergamasque</i> , m. 33.	69
2.36.	Debussy, <i>L'isle Joyeuse</i> , mm. 204-5.	70
2.37.	Transformations from 5-34, to whole-tone, to the acoustic scale.	72
2.38.	Whole tone and acoustic collections.	73
2.39.	[3-1-3-1-2-2] as a combination of augmented and whole-tone subsets.	75
2.40.	Debussy, <i>Pour le Piano</i> , Prelude, mm. 150-151.	76
2.41.	Diatonic and whole-tone collections.	77
2.42.	The diatonic collection viewed as two whole-tone segments.	77
2.43.	Debussy, <i>Les sons et parfums</i> , mm. 18-23.	79
2.44.	Transformation between [2-2-2-3-3]t <sub>11</sub> and [2-1-2-1-3-3]t <sub>10</sub> .	80
3.1.	Debussy, <i>Images</i> Book II, <i>Et la lune descend sur le temple qui fut</i> , m. 19, second half.	82
3.2.	Debussy, <i>Images</i> , Book I, <i>Reflets dans l'eau</i> , m. 20.	83
3.3.	Bartók, <i>Bagatelle</i> No. 8, mm. 1-2.	84
3.4.	Bartók, <i>Bagatelle</i> No. 8, mm. 28-31.	85
3.5.	Bartók, <i>Bagatelle</i> No. 10, mm. 9-13.	86
3.6.	Debussy, <i>La terrasse des audiences du clair de lune</i> , m 29.	87
3.7.	Debussy, <i>La terrasse des audiences du clair de lune</i> , m 31.	88
3.8.	Debussy, <i>Pour le Piano</i> , Sarabande, mm. 11-14.	89
3.9.	Bartók, <i>Bagatelle</i> No. 10, m. 67.	90
3.10.	Debussy, <i>Pour le piano</i> , Prelude, mm. 64-71.	92
3.11.	Debussy, <i>La terrasse des audiences du clair de lune</i> , mm. 21-24.	94
3.12.	Voice leading for Debussy, <i>La terrasse des audiences du clair de lune</i> , mm. 21-23.	95
3.13.	Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 1-24.	97
3.14.	Debussy, <i>Pour le piano</i> , Prélude, mm. 43-46.	99
3.15.	Downbeat chords forming C <sub>20</sub> segment in Debussy, <i>Pour le piano</i> , Prelude, mm. 43-46.	100

3.16.	Structural graph of Toccata from Debussy, <i>Pour le piano</i> , mm. 167-169.	101
3.17.	Bartók, <i>Bagatelle</i> No. 10, mm. 67-69.	102
3.18.	Bartók, <i>Suite</i> , Op. 14, No. 3, mm. 50-59: (a) music; and (b) graph of bass voice.	104
3.19.	Bartók, <i>Suite</i> , Op. 14, graph of mm. 60-80	105
3.20.	Debussy, <i>La Cathédrale engloutie</i> , mm. 16-22, graph of functional roots.	106
3.21.	Debussy, <i>Pour le Piano</i> , Toccata, mm. 137-149, graph of chord roots.	107
3.22.	Graph of bass voice of Bartók, <i>Four Piano Pieces</i> , No. 1, mm. 97-114.	108
3.23.	Bartók, <i>Four Piano Pieces</i> , No. 1, mm. 117-120.	109
3.24.	Bartók, <i>Funeral March</i> from "Kossuth," mm. 23-28.	111
3.25.	A graph of the harmonic motion of Bartók, <i>Funeral March</i> from "Kossuth," mm. 23-28.	112
3.26.	Structural graph of bass voice from Debussy, <i>La Cathédrale engloutie</i> .	114
3.27.	Structural graph of bass voice from Bartók, <i>Three Rondos</i> , Number 1.	115
4.1.	The opening pattern from Debussy, <i>Feux d'artifice</i> , m. 1.	118
4.2.	The opening pattern from Debussy, <i>Feux d'artifice</i> as a product of transpositional combination.	119
4.3.	The transformation from [1-1-1-1-1-1-6] <sub>t5</sub> to the pentatonic collection [2-3-2-2-3] <sub>t1</sub> .	120
4.4.	The two pitch cells in Debussy, <i>Feux d'artifice</i> mm. 20-24.	121
4.5.	The process of dual transposition generates the collections in Debussy, <i>Feux d'artifice</i> , mm. 20-24.	122
4.6.	[2-2-2-3-3] as a dominant ninth chord built on C.	123
4.7.	The two-note and three-note motives from Debussy, <i>Feux d'artifice</i> .	123
4.8.	The diatonic collections implied in Debussy, <i>Feux d'artifice</i> , mm. 29-30.	124
4.9.	The two collections in Debussy, <i>Feux d'artifice</i> mm. 33-34.	125
4.10.	The transformation from measures 34 to 35 in Debussy, <i>Feux d'artifice</i> .	127
4.11.	The motivic materials in mm. 27-30 and 35-38 of Debussy, <i>Feux d'artifice</i> compared.	128
4.12.	The transformation from measures 38 to 39 in Debussy, <i>Feux d'artifice</i> .	129
4.13.	The "inexact" sequence in Debussy, <i>Feux d'artifice</i> , m. 44.	130
4.14.	The two collections in Debussy, <i>Feux d'artifice</i> , m. 47.	133
4.15.	The transformation from diatonic to whole-tone in Debussy, <i>Feux d'artifice</i> , m. 57.	134

4.16.	The transformation among chords between the two fermati in Debussy, <i>Feux d'artifice</i> , m. 67.	138
4.17.	The bitonality in Debussy, <i>Feux d'artifice</i> , m. 67.	139
4.18.	The root progression in Debussy, <i>Feux d'artifice</i> , m. 70.	140
4.19.	The three voices in Debussy, <i>Feux d'artifice</i> , m. 71 as products of interval cycles.	141
4.20.	The alternation between whole-tone subsets in Debussy, <i>Feux d'artifice</i> , mm. 74-75.	142
4.21.	The roots of the sequence in Debussy, <i>Feux d'artifice</i> , m. 84.	143
4.22.	The four statements of the motive in Debussy, <i>Feux d'artifice</i> , mm. 85-86.	144
4.23.	The added pitch D leans in favor of C <sub>20</sub> in Debussy, <i>Feux d'artifice</i> , mm. 88-89.	149
4.24.	Db completes the second of two balanced whole-tone subsets in Debussy, <i>Feux d'artifice</i> , mm. 88-90.	150
4.25.	An augmented triad as a subset of a whole-tone collection.	152
4.26.	The three augmented triads and their "roots" in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 1-3.	153
4.27.	The cycle of descending fifths as it controls Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 1-4.	154
4.28.	The voice leading in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 1-4 as it forms a cycle of semitones.	155
4.29.	The alternating whole-tone subsets in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 1-4.	156
4.30.	The voice leading in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 5-8 as it forms a cycle of semitones.	157
4.31.	Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 17-18 as they form a complete whole-tone collection by joining augmented triads separated by a whole step.	158
4.32.	The unfolding of alternate whole-tone collections in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 17-24.	159
4.33.	The cycle of interval 7 formed by alternate measures in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 17-25 (downbeat).	160
4.34.	The hierarchy of interval cycles in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 17-25.	161
4.35.	The descending cycle of semitones in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 57-60.	164
4.36.	The ascending cycle of semitones in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 61-64.	165
4.37.	The cycle of interval 7 as it generates mm. 65-68 from Bartók, <i>Suite</i> , Op. 14, No. 2.	166
4.38.	The statements of cell Z produced in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 65-67.	167
4.39.	The parallel ascending cycles of semitones in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 65-68.	168

4.40.	The ascending cycle of semitones in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 65-71.	168
4.41.	The five-flat diatonic collection partitioned into one whole-tone and one symmetrical subset.	170
4.42.	The augmented triads [F#,Bb,D] and [E,G#,C] as they form C <sub>20</sub> in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 81-121.	171
4.43.	C <sub>30</sub> and C <sub>20</sub> as they join in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 108-116.	173
4.44.	The voice leading in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 123-26 as it forms a cycle of descending semitones.	174
4.45.	The voice leading in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 127-130.	174
4.46.	The collection [1-3-1-1-1-3-1-1]t <sub>7</sub> as a product of combining [1-3-1-(7)] with itself at t <sub>7</sub> and t <sub>1</sub> .	176
4.47.	The statements of cell Z produced in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 139-42.	177
4.48.	The whole-tone sequence of [1-4-1-(6)] in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 147-162.	178
4.49.	The two diverging sequences in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 147-162.	179
4.50.	The descending semitone and whole-tone patterns in mm. 168-74 in Bartók, <i>Suite</i> , Op. 14, No. 2.	180
4.51.	The ascending semitone pattern in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 168-74.	180
4.52.	The diverging voices in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 168-174.	181
4.53.	The patterns of whole and half steps in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 180-82.	182
4.54.	The patterns of whole and half steps in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 184-87.	183
4.55.	The alternation of whole-tone collections in Bartók, <i>Suite</i> , Op. 14, No. 2, mm. 186-223.	185

LIST OF TABLES

	Page
2.1. Transpositionally invariant collections	26

## INTRODUCTION

There is no doubt that there is an affinity between the music of Bartók and Debussy. A cursory examination of the literature as well as the music will yield that conclusion.<sup>1</sup> In terms of pitch, the connections between the two that have usually been mentioned involve the use of "pentatonicism, modality, and occasional whole-tone passages,"<sup>2</sup> but it is my contention in this dissertation that certain special principles of pitch organization--what Antokoletz has

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<sup>1</sup>See, for example, Paul Griffiths, *Bartók* (London: J.M. Dent & Sons, 1984), passim; Elliott Antokoletz, *The Music of Béla Bartók* (Berkeley: University of California Press, 1984), 6-10, and George Perle, *Serial Composition and Atonality*, 6th ed., (Berkeley and Los Angeles: University of California Press, 1991), 40-41. For Bartók's own words on the subject, see "The Influence of Debussy and Ravel in Hungary," in *Béla Bartók Essays*, ed. Benjamin Suchoff (New York: St. Martins Press, 1976), 518; and "Autobiography," *ibid.*, 408-11. For more information on Debussy's influence on Bartók, see the list of primary and secondary references in Elliott Antokoletz, *Béla Bartók: A Guide to Research* (New York: Garland Publishing, 1988), 353.

<sup>2</sup>Anthony Cross, "Debussy and Bartók," *Musical Times* 108 (1967): 127. In "Autobiography," Bartók refers specifically to Debussy's "'pentatonic phrases' similar in character to those contained in our peasant music" and, of course, Bartók's own music (p. 410).

referred to as "abstract pitch formations"<sup>3</sup>--lie at the heart of a community of practice between these two composers.

Those abstract pitch formations are the interval cycles and related collections.<sup>4</sup> The interval cycles are collections generated by the continuous repetition of a single interval: the cycles of intervals 6, 4, 3, 2, and 1 respectively--otherwise known as the tritone, augmented triad, diminished-seventh chord, whole-tone scale, and chromatic scale (see those entries in Table 2.1). The process of repetition may be expanded to create a more inclusive group: those collections which exhibit total pitch-class invariance under transposition.<sup>5</sup> The cycles of single intervals are a subgroup of this group of collections, but the larger group also contains those collections generated by the continuous repetition of a *combination* of intervals (such

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<sup>3</sup>Antokoletz, *Music of Bartók*, 1.

<sup>4</sup>First discussed by George Perle. See, for example, George Perle, "Berg's Master Array of the Interval Cycles," *Musical Quarterly* 63/1 (January, 1977): 1; passim; Antokoletz, *Music of Bartók*, xii; passim.

<sup>5</sup>Richard Chrisman, "Describing Structural Aspects of Pitch-Sets Using Successive-Interval Arrays," *Journal of Music Theory* 21 (Spring 1977): 13-15. An equivalent term--"complete invariance under transposition"--is used by Allen Forte in *The Structure of Atonal Music* (New Haven: Yale University Press, 1973), 37.

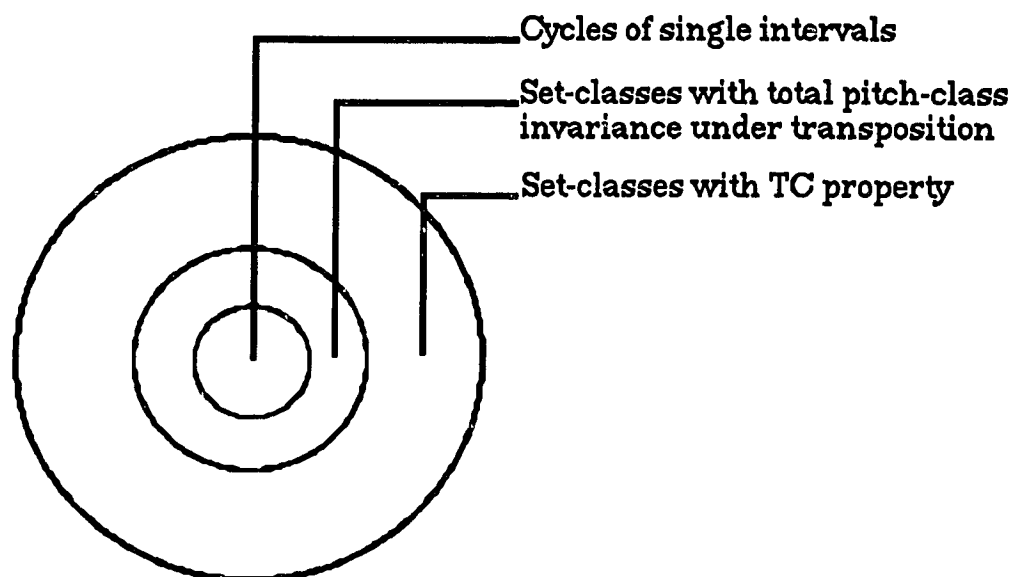
as the octatonic collection-type or cell  $Z^6$ ; see the remaining entries in Table 2.1). Finally, an even more inclusive group of collections--137 in all--consists of those generated merely by one or more repetitions of an interval or interval series. Thus, this group includes not only the cycles of single intervals and combinations of intervals, but also any segment of an interval cycle (e.g. a diminished triad or a whole-tone segment such as [C,D,E,F#]) and other non-continuous repetitions (e.g. [C,C#,D,F,F#,G]). These collections are the set-classes which--in Richard Cohn's words--bear the property of transpositional combination (TC).<sup>7</sup> Example 0.1 shows how each successive group of set-classes includes the previous ones.

---

<sup>6</sup>A single repetition of interval series [1-5]. Originally named the "z-group" by Leo Treitler in "Harmonic Procedure in the Fourth Quartet of Béla Bartók," *Journal of Music Theory* 3/2 (November, 1959): 292-97.

<sup>7</sup>Richard Cohn, "Inversional Symmetry and Transpositional Combination in Bartók," *Music Theory Spectrum* 10 (1988): 19-42.

Example 0.1. A Venn diagram of the interval cycles and related collections.



Although some scholars began to view Bartók in the light of the interval cycles as early as the 1950s,<sup>8</sup> the number of studies on the interval cycles in the music of various composers has been increasing in recent years: note particularly George Perle's work on Berg,<sup>9</sup> Elliott Antokoletz's work on Bartók,<sup>10</sup> the writings of both

---

<sup>8</sup>See particularly George Perle "Symmetrical Formations in the String Quartets of Béla Bartók," *Music Review* 16 (November, 1955): 300-312; and Treitler, "Harmonic Procedure."

<sup>9</sup>See especially Perle, "Berg's Master Array"; and Perle, *The Operas of Alban Berg*, vol. 2, *Lulu* (Berkeley: University of California Press, 1984).

<sup>10</sup>See especially Elliott Antokoletz, *Music of Bartók*.

Antokoletz and Pieter Van den Toorn on Stravinsky,<sup>11</sup> and--most recently--J. Philip Lambert's work on Ives.<sup>12</sup> Of course, Antokoletz's monograph on Bartók bears directly on the study at hand since it focuses on (among other things) Bartók's use of the interval cycles. However, whereas Antokoletz often makes overt connections between the interval cycles and their inversionally symmetrical properties,<sup>13</sup> Richard Cohn has argued that much of Bartók's music should be viewed in cyclic terms (or, more generally, in terms of the "TC-property") and that, in many cases, inversional symmetry is a mere coincidental by-product of these collections.<sup>14</sup> Antokoletz has shown that inversional symmetry is central to a number of Bartók's compositions, and pervasively since the *Fourth String Quartet* (1928).<sup>15</sup> In addition, Antokoletz has pointed out Debussy's symmetrical use of these collections.<sup>16</sup>

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<sup>11</sup>Pieter C. Van den Toorn, *The Music of Igor Stravinsky* (New Haven: Yale University Press, 1983); Elliott Antokoletz, "Interval Cycles in Stravinsky's Early Ballets," *Journal of the American Musicological Society* 34 (1986): 578-614.

<sup>12</sup>J. Philip Lambert, "Interval Cycles as Compositional Resources in the Music of Charles Ives," *Music Theory Spectrum* 12/1 (Spring, 1990): 43-82.

<sup>13</sup>For example, "The functions and interrelations of symmetrical cells are basic in the generation of the interval cycles in many of Bartók's works." Antokoletz, *Music of Bartók*, 271.

<sup>14</sup>Richard Cohn, "Inversional Symmetry."

<sup>15</sup>Antokoletz, *Music of Bartók*, chapter VI, "Tonal Centricity Based on Axes of Symmetry," 138-203.

Nonetheless, inversional symmetry is not an integral part of this dissertation since neither composer exploited--during the period when both composers were active--the inversionally symmetrical properties of these collections to any extent approaching that with which they exploited the cyclic ones. I will show that the cyclic aspects of these collections play an important role in the works of Bartók and Debussy during this period.

Much has been written concerning the presence of one cyclic collection-type--the whole-tone scale--in the music of Debussy.<sup>17</sup> This dissertation contends that, in Debussy's music, the whole-tone collection-type is merely a specific case of a much more general practice involving transpositionally invariant collections--those generated by one or more of the interval cycles--or involving transpositional combination in general. I also contend that Debussy's use of such collections is pervasive, while perhaps not as systematic as Bartók's. Parallels will also be drawn between not only the types of collections these composers

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<sup>16</sup>Antokoletz, *Music of Bartók*, 6-8 and *Twentieth-Century Music* (Englewood Cliffs, NJ:Prentice-Hall, forthcoming [1992]).

<sup>17</sup>See, for example, Arnold Whittall, "Tonality and the Whole-tone Scale in the Music of Debussy," *The Music Review* 36 (1975): 261-271; Simon Harris, "Chord-Forms Based on the Whole-Tone Scale in Early Twentieth-Century Music," *The Music Review* 41 (1980): 36-51; or just about any other introduction to the music of Debussy or to the whole-tone scale in general.

used, but between the compositional contexts in which they used them. In addition, I assert that many of the passages which have been lumped under such headings as "planing" and "pantonality" can be shown to be generated by or otherwise related to the interval cycles.

These methods of pitch organization common to Debussy and Bartók have not been thoroughly studied. Earlier writers have mentioned isolated instances of similar techniques<sup>18</sup> or focused on general stylistic similarities,<sup>19</sup> but no study has undertaken an exhaustive comparison of the theoretical bases for their compositions. Such a study seems necessary in light of Antokoletz's interpretations of Bartók: the principles outlined in his book are also applicable to Debussy. This dissertation will accumulate and analyze the musical evidence for the relationship between the two composers in terms of these special principles of pitch organization. I will focus on the period when both composers were active, to the time of Debussy's death.

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<sup>18</sup>As discussed above. See also Pierre Citron, *Bartók*, (Paris: Solfeges/Seuil, 1963).

<sup>19</sup>See, for example, Cross, "Debussy and Bartók."

CHAPTER I  
SYMBOLGY AND TERMINOLOGY

Symbols and terms for representing and describing pitch content in post-tonal music are important for at least the following two reasons: (1) a standard of interchange between scholars is necessary for meaningful dialogue; and (2) the means themselves illuminate and determine the modes of thought used by those scholars. For this dissertation, the proper choice of symbology and terminology is crucial. The systems chosen must be specific and clear. At times they must be rich in meaning, specifically designating the characteristics under study; at other times, they must be relatively neutral, allowing for the various potential functions of a collection or set of pitches.<sup>1</sup>

We must have at least one system which deals with unordered collections of pitches. In other words, the system must designate the specific pitches which make up a given

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<sup>1</sup>For the present discussion, I will use both terms "set" and "collection" to refer to a group of pitches. However, when issues particular to the interval cycles arise, I will use the term "collection" since the term "set" has a specific meaning (with regard to precompositional order) in Perle's work with the interval cycles. See George Perle, *Twelve Tone Tonality* (Berkeley and Los Angeles: University of California Press, 1977).

passage without reference to hierarchy or ordering within that passage. Under such a system, the designation for a chord consisting of the pitches [F,F#,B,C#] would be the same as that for the melodic fragment [B,F,C#,F#] (see Example 1.1)

Example 1.1. Pitch collections which, when unordered, should receive the same designation.



Common to virtually all systems of labelling unordered pitch collections is the notion of octave equivalency. Under octave equivalency, all octave-instances of a particular member of the twelve chromatic pitches are functionally equivalent, all being referred to as instances of a particular *pitch-class*, and sets which contain identical pitch-classes are seen as instances of a single *pitch-class set*.<sup>2</sup> Thus, all octave doublings are considered redundant

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<sup>2</sup>See Forte, *Structure of Atonal Music*, 1-3.

with respect to pitch-class, and a list of all pitch-classes in a particular collection is considered sufficient to describe all pitches in that collection. This procedure of identifying and listing the pitch-class members of a group of pitches is common to a number of systems of set labelling. It is even used in the analysis of tonal music, being axiomatic to the concept of inversional equivalence under traditional harmonic inversion.

Another principle central to most post-tonal analysis is that of transpositional equivalence. Under this principle, all transpositions of a particular collection are given a single designation.<sup>3</sup> In this manner, for example, the whole-tone collection [Bb,C,D,E,F#,Ab] is transpositionally equivalent to the other whole-tone collection [B,C#,D#,F,G,A].

The most frequently used system for labelling pitch-class content in post-tonal music is undoubtedly that set forth by Allen Forte in his list of set-classes.<sup>4</sup> Forte's list assigns each set-class a unique "name" which consists of two numbers separated by a hyphen. The first number represents an inherent characteristic of the set-class: the number of pitch-classes it contains. The meaning of the second number

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<sup>3</sup>This is a common principle, codified by Forte in *Structure of Atonal Music*, 5-7. Again, a parallel exists in tonal analysis in the form of transpositionally neutral labels such as "major triad."

<sup>4</sup>Forte, *Structure of Atonal Music*, 179-181.

is less explicit: it is merely an index to that set's placement in Forte's list. This designation is unambiguous and facilitates communication about the set-class in question. However, it tells little about the structure of the set-class itself. Since the first number represents a rather trivially obvious characteristic of the set-class and the second number directly represents no characteristic of the set-class at all (but merely a location in Forte's list), symbols such as "6-35" which represent specific set-classes (in this case the whole-tone collection-type) carry with them little meaning except the injunction "look this up in Forte's list." At times, this relatively neutral designation is useful; for the purposes of this study--as we shall soon see--more meaningful labels are in order.

Another factor which must be considered is that Forte's list applies identical labels to a set and its inversion. This is not a frequent concern in relation to sets which are completely invariant under transposition; only one such set-class is not also invariant under inversion: 6-30.

Example 1.2 shows an augmented triad and its inversion. Note that the pitch content of this collection remains invariant under inversion.

Example 1.2. An augmented triad and its inversion.



As mentioned above, invariance under inversion holds true for all transpositionally invariant sets with the exception of set-class 6-30. According to Forte, the collections in Example 1.3 are both labeled as set-class 6-30 since they are equivalent under inversion. However, these two collections do not contain the same pitch-classes, nor are they equivalent under transposition.<sup>5</sup>

Example 1.3. An instance of set-class 6-30 and its inversion.




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<sup>5</sup>Note that the second collection is a transposition of the Petrushka chord (two major triads with roots a tritone apart) whereas the first collection consists of two *minor* triads with roots a tritone apart.

Forte's elevation of equivalence under inversion to the level of labelling becomes an even larger issue when applied to other sets that, like 6-30, are not invariant under inversion. At the heart of this matter lies the concept of equivalence itself. Forte's system of set-class "names" contains certain assumptions, especially the notions of equivalence under transposition and inversion. Under Forte's rules, all transpositions and inversions of a set are given a single name. It seems to me that, whereas most musicians are comfortable, even familiar with the idea of equivalence under transposition, many do not view equivalence under inversion as such an axiomatic principle.<sup>6</sup> Indeed, in Richard Cohn's words, "While not all theorists grant equivalence status to inversionally related pitch- or pc-sets, transpositional equivalence is, to my knowledge, completely uncontroversial."<sup>7</sup> The relationship between a set and its inversion is not an unimportant one, but--since importance is not necessarily equivalence--a suitable method of labelling sets should, unlike Forte's, readily distinguish between the two.

At the other extreme of set labelling are designations such as "a five-note segment of the whole-tone scale plus one

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<sup>6</sup>See, for example, Richmond Browne's review of *The Structure of Atonal Music* in *The Journal of Music Theory* 18 (1974): 404-405, and Richard Cohn, "Inversional Symmetry," 42.

<sup>7</sup>Cohn, "Inversional Symmetry," 42.

'odd' note,"<sup>8</sup> here used by Perle to represent the pitch-classes F-G-A-B-C#-D. This type of label is rich in meaning, but much less systematic in approach. Such labels carry with themselves a certain amount of analysis or interpretation; in this example the whole-tone subset is viewed as referential for the entire set. While such analysis is frequently the purpose of investigations into unordered pitch-class sets, there are instances in which less specific designations are desirable. In addition, the sheer verbosity of such labels can lead even the tersest analytical prose down a convoluted and flowery path. In general, it will be convenient to employ more context-free labels for sets, and to discuss those sets in more descriptive terms made appropriate by each context.

This would seem to lead us back to Forte's list of pc-set names. However, because Forte's set names are relatively context-free, they remain practically devoid of description. It would be helpful to have at our disposal certain designations which convey richer meaning. At least one type of label necessary for this investigation should overtly designate any patterns which occur within a set. Consider once again the whole-tone collection-type. Forte's name for this set-class is "6-35," which--in and of itself--does not designate the pattern of whole steps it contains. In integer

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<sup>8</sup>Perle, *Serial Composition and Atonality*, 38.

notation,<sup>9</sup> the whole-tone collection-type is represented as [0,2,4,6,8,10]. The pattern is more obvious here, but a small amount of mathematical operation (subtraction of successive elements) is necessary in order to clearly see this pattern. It is this operation of subtracting successive elements--measuring intervals between pitches--which is fundamental to the principle of transpositional equivalence. A labelling system which allows for the easy identification of interval patterns and equivalence among sets should consist of those very intervals themselves. Forte laid the groundwork for such a system with his "interval succession."<sup>10</sup> The interval succession for a set lists the distances between successive members in the form of integers which represent those distances in semitones. This process is carried out in a linear fashion for members of the set in normal order. Thus, the interval succession for the whole-tone collection-type (set 6-35:[0,2,4,6,8,10]) would be [2-2-2-2-2]. Immediately, the pattern of this set becomes clear. Also note the use of hyphens to separate intervals, as opposed to the commas used in pc-integer designations.

However, there are certain features of this approach which fall short of the desirable, especially in relation to

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<sup>9</sup>Rahn's normal form. See John Rahn, *Basic Atonal Theory* (New York: Longman, 1980), 31-39.

<sup>10</sup>Forte, *Structure of Atonal Music*, 63.

cyclic collections. First, distinguishing between those collections which entirely divide the octave into equal partitions and other collections which are merely subsets of that first group is at times difficult when using Forte's interval succession. Consider, for example, set-class 3-1:[0,1,2]. The interval succession for this set-class is [1-1], seemingly similar in its repetitive nature to the whole-tone collection-type discussed above, [2-2-2-2-2]. However, set-class 3-1 does not completely divide the octave into equal partitions, or--to put it another way--it does not exhibit "total pitch-class invariance under transposition."<sup>11</sup> What is the difference between these set-classes which the interval succession does not represent? Simply stated, the interval succession of a set-class does not indicate the final interval necessary for a complete description of a collection-type. In order to show all possible intervals between successive pitch-classes in various cyclic permutations of a collection, such a system should also indicate the distance from the rightmost pitch-class in normal form to the leftmost, by subtracting the former from the latter, mod 12. In this manner, the whole-tone collection-type would be represented as [2-2-2-2-2-2], whereas set-class 3-1 would be represented as [1-1-10], thereby pointing up a fundamental difference between these

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<sup>11</sup>Chrisman, "Describing Structural Aspects of Pitch-Sets," 13-15.

two set-classes: the whole-tone collection-type divides the octave completely into equal segments whereas set-class 3-1 does not. This type of designation is referred to as an "interval series"<sup>12</sup> and, as we shall see, it has special benefits in relation to cyclic collections.

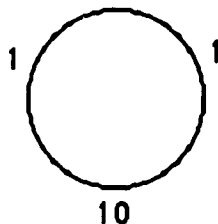
A second problem related to Forte's interval succession, and to normal order as well, is presented by cyclic permutation. Analogous to chord inversion in tonal music, the cyclic permutations of a set are produced by successively placing its last members first or its first members last. For example, the cyclic permutations of set-class 3-1 beginning on C would be [C,C#,D], [C#,D,C], and [D,C,C#]. This set's interval succession, [1-1], clearly describes the first permutation of the set listed above, but more tenuously refers to the other two. On the other hand, the interval series is itself cyclically permutable; the three forms of interval series for set-class 3-1 are [1-1-10], [1-10-1], and [10-1-1], each corresponding respectively to the three permutations of the set-class. Any particular permutation may be read without respect to point of origin, thus [1-1-10] and [1-10-1] and [10-1-1] may each stand for all incarnations of set-class 3-1. It may be helpful to view the interval

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<sup>12</sup>Ibid., 7-8. See also Eric Regener, "On Allen Forte's Theory of Chords," *Perspectives of New Music*, 13/1 (Fall-Winter 1974): 191-212.

series as a ring, the elements of which form a continuous cycle. (see Example 1.4)

Example 1.4. An interval series viewed as a ring.



This approach obviates the need for a "normal" order. When one considers the cyclic permutations of a set as equivalent to one another, the interval series--which can be blind to permutation--is an appropriate form of designation.

However, when permutation and transposition are important considerations, the interval series is capable of indicating these characteristics as well. It should be obvious that any permutation of a set may be designated by a permutation of the interval series. As stated above, each of the permutations of the interval series for a set corresponds respectively to the permutations of the set itself. Thus, for example, [4-3-5] might represent [C,E,G] whereas [3-5-4] would represent [E,G,C]. Transposition level is best represented by placing, after the interval series, the letter

"t" followed by an integer.<sup>13</sup> This t-number indicates the pitch-class (in Forte's integer designation) of the first member of the permutation. Thus, for example, [4-3-5]t0 would represent [C,E,G] whereas [4-3-5]t2 would represent [D,F#,A], and so on.

This system allows for conversion from the interval series designation to the integer content of a set. The first member of the set is taken from the t-number; the other members of the set are arrived at by successively adding the numbers in the interval series, mod 12. For example, the interval series [3-4-5]t6 may be converted as follows: (1) the first member is [6], the t-number; (2) the second member is [9], or 6+3; (3) the third member is 1, or 9+4 mod 12. Thus, the integer content of this set is [6,9,1], which converts to pitch-classes as [F#,A,C#]--a minor triad with a root of F#.

Should one wish to derive the normal form of a set from its interval series, one need only cyclically permute the interval series so that the largest interval appears at the far right of the series (at the "end").<sup>14</sup> In this fashion,

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<sup>13</sup>Compare Forte's "transposition operator," *Structure of Atonal Music*, 6-7.

<sup>14</sup>Since the interval series treats an inversionally variant set and its inversion as separate entities, this procedure will yield two separate normal forms for such sets which--to Forte--are equivalent under inversion and thus result in only one normal order. Compare Forte, *Structure of Atonal Music*, 12-13.

the normal form of the set-class with interval series [1-10-1] would be [1-1-10]. Should there be two cyclic permutations with equally large ending intervals, the next-to-last interval should also be largest, and so on.<sup>15</sup> In this fashion, [2-4-1-1-4] would appear in normal form as [1-1-4-2-4]. In general, when no specific permutation is more important than any other (as in Table 2.1), the normal form will be used. However, the reader should be aware that any cyclic permutation may be used to represent a set, and that simple cyclic manipulation of the intervals will yield the other possible permutations.

Note that the interval series does not apply identical labels to a set and its inversion. If we return to the two inversions of set-class 6-30 shown in Example 1.3, the interval series for the first would be [1-2-3-1-2-3] whereas the interval series for the second would be [2-1-3-2-1-3]. One is not a permutation of the other. However, this does not mean that the interval series is blind to equivalence under inversion: reading the elements of an interval series in reverse order (i.e., from last to first) will yield one cyclic permutation of its inversion. Thus, [1-2-3-1-2-3]

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<sup>15</sup>This algorithm functions exactly like that found in Rahn, *Basic Atonal Theory*, 31-39. See also Milton Babbitt, "Set Structure as a Compositional Determinant," *Journal of Music Theory* 5/1 (1961): 77. Compare the slightly different algorithm used in Forte, *Structure of Atonal Music*, 3-5. Also compare Regener's "interval normal form" in "On Allen Forte's Theory of Chords," 196-98, which uses the interval series but places the largest interval *first*.

read backwards yields [3-2-1-3-2-1] which is a cyclic permutation of [2-1-3-2-1-3]. In this manner, the interval series explicitly represents any differences between a collection-type and its inversion, yet allows for a simple procedure to recognize that they are related by inversion.

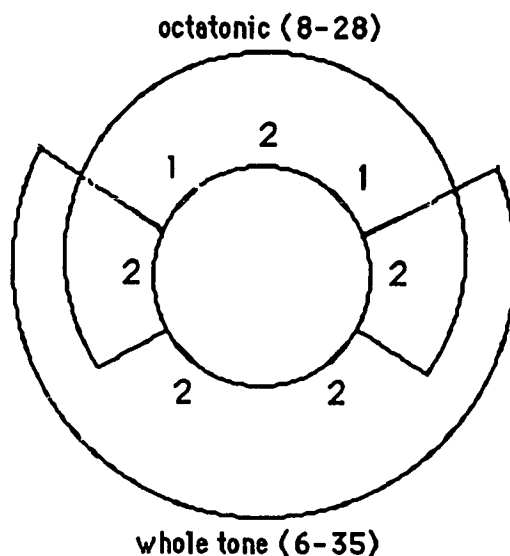
The interval series also facilitates viewing certain collections as hybrid, i.e. the concatenation of two other collections. For example, the collection-type [2-2-2-3-3] might be written as [2-2-2(-6)] + [(6-)3-3]. However, when a hybrid collection contains two subsets which overlap, such as [2-2-2-2-1-2-1] = [2-2-2-2(-4)] + [(4-)2-1-2-1-2], it is clearer to indicate the pitch-class content on a musical staff in order to show the two overlapping subsets with opposing beams (Example 1.5); it is also helpful to show the interval series in the form of a ring (Example 1.6).

Example 1.5. A hybrid collection with overlapping subsets.

whole tone (6-35)

octatonic (8-28)

Example 1.6. The interval series of a hybrid collection-type in the form of a ring.



At times, a form of designation that specifically interprets collections as interval cycles will also be useful. This system of designation will be referred to as cyclic notation. Designations of this type take the following form: the letter C followed by a number representing the half steps contained in the repeated interval. This type of labelling provides a succinct way of indicating complete interval cycles, such as the whole tone scale which would be referred to as C2. Transpositions of a cyclic collection are indicated by subscript integers which indicate a pitch-class or pitch-classes contained in the

actual cycle (with 0 arbitrarily assigned to pitch-class C). Thus, the whole-tone scale on C may be referred to as  $C2_0$  whereas the whole-tone scale on C# would be represented as  $C2_1$ . Compound interval cycles are indicated with multiple subscripts representing a group of pitch-classes repeatedly transposed. Thus, for example, the octatonic scale [C,C#,D#,E,F#,G,A,Bb] may be represented as  $C3_{0,1}$ .<sup>16</sup> These subscripts may also be used to indicate transpositions:  $C3_{4,5}$  would represent [E,F,G,G#,A#,B,C#,D].<sup>17</sup> Cyclic permutations and transpositions of a single interval cycle cause little confusion under this system. However, compound interval cycles are a bit more problematic. For example,  $C6_{0,1}$  and  $C6_{1,6}$  are cyclic permutations (not transpositions) of one another, whereas  $C6_{2,4}$  is related to neither through transposition or permutation. In such a case, the interval series of each set is more helpful. The interval series for  $C6_{0,1}$  is [1-5-1-5]t0, for  $C6_{1,6}$  [5-1-5-1]t1, and for  $C6_{2,4}$  [2-4-2-4]t2. For compound interval cycles, the similarities and differences are much clearer when using the interval series as a designator.

For the purposes of this dissertation, I will choose from among the various forms of designation discussed above depending upon the purpose at hand. When introducing a

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<sup>16</sup>For a fuller discussion of cyclic notation, see Perle, *The Operas of Alban Berg*, vol. 2: *Lulu*, 198-200.

<sup>17</sup>Antokoletz, *Music of Bartók*, 328.

collection-type in general, I will usually use its interval series (e.g., [2-1-2-1-2-1-2-1]) and its common name (if one exists, e.g., "the octatonic scale"). When discussing a particular instance of that collection-type, a t-number will be added to the interval series (e.g., [2-1-2-1-2-1-2-1]t1), the pitch-class elements of the collection may be listed (e.g., [C#,D#,E,F#,G,A,A#,C]), and a verbal description may be used (e.g., "the octatonic collection containing C# and D#). In addition, cyclic notation will be used to show a collection's relation to an interval cycle (e.g., C<sub>31,3</sub>). Graphic representations (such as Examples 1.5 and 1.6) will also be used in order to emphasize certain features of a collection or collection-type.

In conclusion, it is clear that every system of labelling collections involves certain biases. Under each set of circumstances, depending upon the particular characteristics of the collection germane to the discussion at hand, a particular set of labels will be appropriate. Since the focus of this dissertation is cyclic collections, I will most often choose the interval series or cyclic notation.

CHAPTER II  
THE INTERVAL CYCLES AND RELATED COLLECTIONS

Introduction

Table 2.1 lists in different forms of designation the collection-types which map into one octave that are completely invariant with respect to pitch-class under transposition. The discussion which follows groups these and related collection-types into families based on the cycles of intervals 1, 2, or 3 (with cycle 4 being a product of interval 2, and cycle 6 a product of both 2 and 3). Each family includes the collection-type comprised entirely of a particular interval cycle, collection-types that are subsets of that cycle, and supersets generated by that cycle. In addition, hybrid collections and transformations from one collection to another will be discussed.

Table 2.1  
Transpositionally invariant collections.

Set no.	Integer content	Interval series	Self transposition	Cycle	Common name
0-1	[ ]	[ ]			null set
2-6	[0,6]	[6-6]	t6	C6 <sub>0</sub>	tritone
3-12	[0,4,8]	[4-4-4]	t4, t8	C4 <sub>0</sub>	augmented triad
4-9	[0,1,6,7]	[1-5-1-5]	t6	C6 <sub>0,1</sub>	cell Z
4-25	[0,2,6,8]	[2-4-2-4]	t6	C6 <sub>0,2</sub>	Fr6 chord
4-28	[0,3,6,9]	[3-3-3-3]	t3, t6, t9	C3 <sub>0</sub>	diminished 7th chord
6-7	[0,1,2,6,7,8]	[1-1-4-1-1-4]	t6	C6 <sub>0,1,2</sub>	
6-20	[0,1,4,5,8,9]	[1-3-1-3-1-3]	t4, t8	C4 <sub>0,1</sub>	augmented scale
6-30	[0,1,3,6,7,9]	[1-2-3-1-2-3]	t6	C6 <sub>0,1,3</sub>	
6-30 (inv.)	[0,2,3,6,8,9]	[2-1-3-2-1-3]	t6	C6 <sub>0,2,3</sub>	Petrushka chord
6-35	[0,2,4,6,8,10]	[2-2-2-2-2-2]	t2, t4, t6, t8, t10	C2 <sub>0</sub>	whole-tone scale
8-9	[0,1,2,3,6,7,8,9]	[1-1-1-3-1-1-1-3]	t6	C6 <sub>0,1,2,3</sub>	
8-25	[0,1,2,4,6,7,8,10]	[1-1-2-2-1-1-2-2]	t6	C6 <sub>0,1,2,4</sub>	
8-28	[0,1,3,4,6,7,9,10]	[1-2-1-2-1-2-1-2]	t3, t6, t9	C3 <sub>0,1</sub>	octatonic scale
9-12	[0,1,2,4,5,6,8,9,10]	[1-1-2-1-1-2-1-1-2]	t4, t8	C4 <sub>0,1,2</sub>	
10-6	[0,1,2,3,4,6,7,8,9,10]	[1-1-1-1-2-1-1-1-1-2]	t6	C6 <sub>0,1,2,3,4</sub>	
12-1	[0,1,2,3,4,5,6,7,8,9,10,11]	[1-1-1-1-1-1-1-1-1-1-1-1]	t1, t2, t3...t11	C12 <sub>0</sub>	the aggregate

### C1 collections

The cycle of interval 1 is also known as the chromatic scale or the aggregate. In common-practice-period tonality, it functions against a diatonic background, so that the diatonic members of the twelve tones are heard as referential while the chromatic pitches play a subordinate role; in other words, the diatonic members of the chromatic collection play a more fundamental role than the other members do (Example 2.1).

Example 2.1. The chromatic scale in a common-practice-period tonal context.



In addition, a chromatic pitch will appear in one of two forms (e.g., C# vs. Db) depending upon its function. Here, too, the diatonic collection is referential since this function is determined by which diatonic pitch is being inflected and/or to which diatonic pitch the chromatic resolves. The diatonic collection thus serves as a matrix against which the pitch-classes of the chromatic collection

are laid. Furthermore, depending upon the prevailing harmonic condition, certain of those diatonic pitches will be even more fundamental than the others. See the passage from Verdi's *Requiem* in Example 2.2, where the pitches of the dominant seventh chord Eb,G,Bb, and Db serve as harmonic tones against which other pitches in the bass line--both chromatic and diatonic--are heard as passing tones. Verdi has rhythmically placed the chromatic line so that harmonic tones fall on three of the four beats in each measure. The point here is that although the bass line is chromatic, it is perceived in a hierarchical noncyclic way because of the a priori assumptions of the dominant seventh and other tertian harmonic constructions in tonal music.

Example 2.2. Verdi, *Requiem*, *Dies irae*.

mm. 117-18.

117

Hark  
Tu -

the trump-ets sound - ing,  
be mi-rum spang-ens su - rum.

*ff*

12 12 12 6

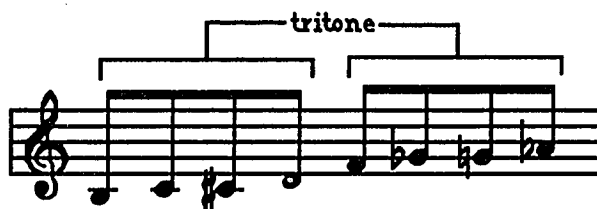
3 3 3 3 3 3

In contexts other than common-practice-period tonality,  
the chromatic collection and segments thereof are capable of



by a tritone<sup>1</sup> (see Example 2.4). Thus, it is self-transposing at the tritone. It may be represented as C6<sub>5,6,7,8</sub>, or merely by its interval series [1-1-1-3-1-1-1-3]t5/11.<sup>2</sup>

Example 2.4. [1-1-1-3-1-1-1-3] as a product of transposing two chromatic segments at the interval of a tritone.



The above example combines chromatic segments to form a larger collection. A different example involving the chromatic scale occurs in Debussy's last Prelude, *Feux*

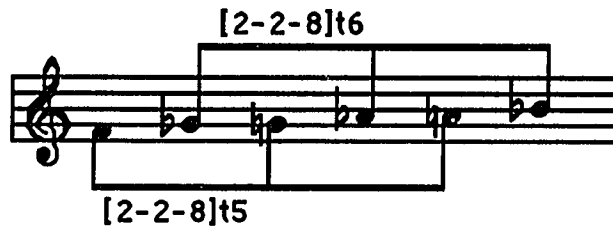
<sup>1</sup>This is similar to Richard Cohn's view of such collections as "transpositional combinations." Cohn would view set 8-9 as a product of transpositionally combining set 4-1 with itself at interval 6. See Cohn, "Inversional Symmetry."

<sup>2</sup>Not only the chromatic collection creates a referential structure in this passage. Obviously the tritone [B,F] plays a fundamental role as the interval of transposition between the two chromatic segments, and the cycle of interval 3 [B,D,F,Ab] which bounds those segments might also be heard as referential.

*d'artifice*, in which whole tone segments are combined to form a chromatic segment. The figural pattern which opens *Feux d'artifice* (see Example 2.5) is produced through the combination of two transpositions of the three-note segment of the whole-tone scale. These two segments, [2-2-8]t5 and [2-2-8]t6, are separated by a semitone, so that the resulting collection, [1-1-1-1-1-7]t5, is a six-note segment of the chromatic scale (see Example 2.6).

Example 2.5. Debussy, *Feux d'artifice*, m. 1.

Example 2.6.  $[1-1-1-1-1-7]t_5$  as a product of combining two transpositions of  $[2-2-8]$ .



A similar procedure can be found in the last of Bartók's *Four Piano Pieces*. The transitional figure which appears in measures 100-103 consists of two interlocking whole-tone scales, which are separated on the compositional surface through being placed in separate hands at the distance of an octave (Example 2.7).

Example 2.7. Bartók, *Four Piano Pieces*, No. 4,  
mm. 100-103.

These two whole-tone scales combine to form a chromatic scale; indeed, the two unique whole-tone collections are merely equal partitions of the aggregate<sup>3</sup> (Example 2.8). In this case, the two complementary parallel cycles merge to form another cyclic collection.

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<sup>3</sup>Hauer incorporated this idea into his early twelve-tone techniques in the form of two whole-tone "tropes." See Joseph Matthias Hauer, *Vom Melos zur Pauke* (Vienna: Universal-Edition, 1925), and *Zwölftontechnik* (Vienna: Universal-Edition, 1926).

Example 2.8. The two whole-tone collections and how they form the chromatic collection.



Bartók also occasionally used chromatic segments without reference to the whole-tone collections, as in number 2 from the *Suite*, Op. 14. Measures 57-64 contain two chromatic segments, one descending and one ascending, both diverging from the semitone E/E# (Example 2.9). In this instance, two *inversionally* related cycles combine to form a larger collection.

Example 2.9. Bartók, *Suite*, Op. 14, No. 2, mm. 57-

64.

**Tempo I.**

**ff marcatisimo**

**C1**

**C1**

### C2 collections

The whole tone scale and its subsets form a complex of sets common to the music of Debussy and Bartók. The whole tone set-class [2-2-2-2-2-2] has the following subsets:

#### One five-member subset

[2-2-2-2-4] a whole-tone segment

#### Three four-member subsets

[2-2-2-6] a whole-tone segment

[2-2-4-4]

[2-4-2-4] the French augmented-sixth chord

Four three-member subsets

[2-2-8] a whole-tone segment

[2-4-6]

[2-6-4]

[4-4-4] the augmented triad

One of the most celebrated uses of the whole-tone scale is Debussy's *Voiles* from the first book of *Préludes*. Every measure of the opening and closing sections of *Voiles* consists of the whole-tone collection containing C (C<sub>20</sub>), as presented in the first two measures. See Example 2.10.

Example 2.10. Debussy, *Voiles*, mm. 1-2.

The image shows a musical score for the first two measures of Debussy's 'Voiles'. It is written in 2/4 time and features a whole-tone scale starting on C. The notation is as follows:

- Measure 1:** The right hand plays a whole note chord of C4, D4, E4, F4, G4, A4. The left hand has a whole rest.
- Measure 2:** The right hand plays a whole note chord of D4, E4, F4, G4, A4, B4. The left hand has a whole rest.

The score includes a dynamic marking of *p* and the instruction *très doux* (very soft).

Once this whole-tone collection has been established as referential, slight deviations from the collection function as nonharmonic and chromatic tones do in tonal music.<sup>4</sup>

<sup>4</sup>One might think of such slight deviations as nonharmonic tones in that they lie outside the prevailing harmony. If,

Consider, for instance, the Db's and G's in measure 31 (See Example 2.11) which function as passing tones between pitches of the C<sub>20</sub> collection.

Example 2.11. Debussy, *Voiles*, m. 31.

A subset of a collection is often sufficient to provide the particular character of that larger collection. This assumes that the larger collection is normative and precompositional, as opposed to being contextually defined by the composition itself as a reflexive point of reference.<sup>5</sup> In the *Prélude* from *Pour le piano*, mm. 71-78, Debussy

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however, such deviations lie outside the prevailing *collection* (not just the prevailing harmony) then they are similar to chromatic tones.

<sup>5</sup>For more on the ideas of reflexive reference and normative structures in post-tonal music, see Perle, *Twelve-Tone Tonality*, 162-72.

presents the five-member subset of the whole-tone collection  
[Ab,Bb,C,D,E] [2-2-2-2-4]t8, as shown in Example 2.12.

Example 2.12. Debussy, *Pour le piano*, Prélude,  
mm. 71-79.

The musical score consists of three systems of two staves each. The first system begins with a box containing the number '71'. The right-hand staff (treble clef) features a melodic line with a slur over the first two measures, a fermata over the third measure, and a final chord. The left-hand staff (bass clef) has a dynamic marking of *mf* and contains a rhythmic accompaniment of eighth notes. The second system continues the melodic line in the right hand, with a dynamic marking of *pp* in the left hand. The third system concludes the passage with a triplet of eighth notes in the right hand and continues the rhythmic accompaniment in the left hand. Various musical notations such as slurs, fermatas, and dynamic markings are present throughout.

Only later, in m. 79, does F# enter to complete the whole-tone cycle. Nonetheless, the essential whole-tone character of this passage is quite clear from the outset.

The whole-tone character of the French augmented-sixth chord is emphasized in Debussy as well. One such instance occurs in *Les tierces alternées* from the second book of *Préludes*. Leading to the whole-tone passage in measures 117-120, there appears the collection [C,E,Gb,Bb] in measures 115-16 (Example 2.13). This is the French augmented-sixth chord (interval series [4-2-4-2]), yet it does not function as such. Here, it serves as a subset of the whole-tone collection which is gradually completed over the following bars (measures 117-20 will be discussed shortly).

Example 2.13. Debussy, *Les tierces alternées*,  
mm. 115-16.

115

The musical score for Example 2.13 consists of three staves. The top staff is in treble clef, the middle in bass clef, and the bottom in bass clef. The key signature has two flats. The first staff contains a melodic line with a half note and a quarter note. The second staff contains a bass line with a half note and a quarter note. The third staff contains a bass line with a half note and a quarter note. The score includes dynamic markings 'm.d.' and 'p'.

Bartók uses the whole-tone collection-type in a number of different ways. A simple example appears in the *Suite*, Op. 14, No. 1. The ascending scalar figure which begins at the final *Tempo Primo*, in measure 106, is comprised of a single whole-tone collection, C<sub>20</sub> (See Example 2.14).

Example 2.14. Bartók, *Suite*, Op. 14, No. 1, mm.

106-109.

106 **Tempo I.**

*non legato* *piu cresc.* - - - **f**

C<sub>20</sub>

The pitches of the passage that follows also belong to this collection, with the exception of the bass note G which appears in measures 110 and 114.

No. 2 from the same suite contains passages built on whole-tone collections, the most extensive of which appears in measures 81 and following (Examples 2.15 and 2.16). There, nearly all of the pitches are members of C<sub>20</sub>, with the exception of a few grace notes.



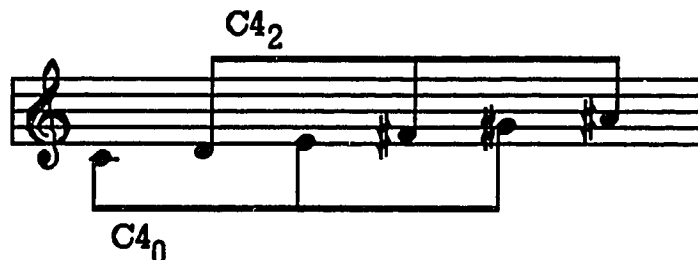
Example 2.16. Bartók, *Suite*, Op. 14, No. 2,  
mm. 97-102.

In reference to the last of Bartók's *Four Piano Pieces* (Example 2.8), I discussed how the two whole-tone collections may be combined to form the chromatic collection. Bartók does just that in measures 100-103, and 368-71; however, the last appearance of this figure, in measures 488-91 (Example 2.17) combines two augmented triads separated by the interval of a whole step in order to create a whole-tone scale. A simplified representation of this procedure is shown in Example 2.18.

Example 2.17. Bartók, *Four Piano Pieces*, mm. 488-91.

The image displays two systems of musical notation for Example 2.17, Bartók's *Four Piano Pieces*, measures 488-91. The first system begins with a boxed measure number '488' in the upper left corner. The notation is presented in grand staff format, consisting of a treble clef staff and a bass clef staff. The key signature is three sharps (F#, C#, G#). The first system covers measures 488 through 490. The second system covers measures 491 through 493. The music features complex rhythmic patterns, including sixteenth and thirty-second notes, and rests. The bass line is particularly active, with frequent sixteenth-note runs and rests. The treble line contains more melodic fragments and rests. The notation includes various accidentals and dynamic markings, though the latter are not clearly legible.

Example 2.18. Two augmented triads combining to form a whole-tone scale.



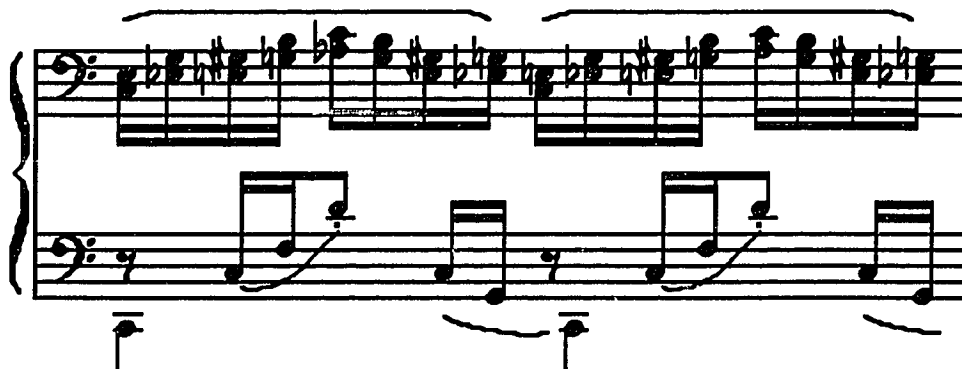
One way of viewing the transformation of this figure from whole-tone/chromatic to augmented triad/whole-tone is to consider it as a doubling of the intervals involved: in the first instance (measures 100-103 and 368-371), collections of interval 2 combine to create a collection of interval 1; in the second instance (measures 480-483) collections of interval 4 combine to create a collection of interval 2.

Debussy employs a similar combination in *Les tierces alternées* from the second book of *Préludes*. The passage from measures 117 through 120 (Example 2.19) consists of two augmented triads presented in opposing hands: the right hand presents C4<sub>2</sub> while the left hand presents C4<sub>0</sub>. These are two transpositionally equivalent subsets of C2<sub>0</sub> (the whole-tone scale containing C) and they combine to form the entire collection of that superset (see Example 2.20).



Related to the augmented triad--and thus the whole-tone scale--is the "augmented scale,"<sup>6</sup> [1-3-1-3-1-3] or set 6-20. I will discuss its relation to the augmented triad presently, but first consider this collection-type as it appears in Debussy's *pour les Tierces* from the first book of *Études*. In m. 11, right hand (Example 2.21), major thirds are sequenced over alternating minor thirds and half steps, which results in the pitch-classes [C, Eb, E, G, G#, B, C].

Example 2.21. Debussy, *pour les Tierces*, m. 11.



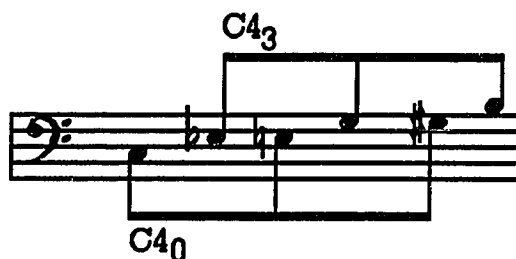
The interval series for this collection-type is [3-1-3-1-3-1]--the augmented scale. This collection-type is

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<sup>6</sup>So-called in a number of jazz references. See, for example, Jerry Coker, Jimmy Casale, Gary Campbell, and Jerry Greene, *Patterns for Jazz*, 3d ed. (Lebanon, IN: Studio Publications, 1970), 134-38; and Dan Haerle, *The Jazz Language* (Hialeah, FL: Columbia Pictures Publications, 1980), 34-36.

a superset of the augmented triad; indeed, it can be viewed as the combination of two augmented triads, as shown in Example 2.22.

Example 2.22. The augmented scale as a product of two augmented triads.



This collection-type, [3-1-3-1-3-1], may also be viewed in two different ways as interlocking cycles of interval 4: (1) as a semitone dyad cycled through interval four,  $C4_{11,0}$ , and (2) as a minor-third dyad cycled through interval four,  $C4_{0,3}$ .

In the *Suite*, Op. 14, Bartók also combines augmented triads at the interval of a semitone, or rather he concatenates them. In the opening measures of No. 2 (Example 2.23), augmented triads are strung together descending by perfect fifths, each with pitch-classes one half step higher than those in the previous triad, so that any two adjacent augmented triads will form set 6-20. This passage contains cycles on two levels: (1) each measure comprises a

transposition of interval cycle 4, and (2) each group of four measures may be viewed as either (a) descending by cycle 7 or (b) ascending by cycle 1 (Example 2.24).

Example 2.23. Bartók, *Suite*, Op. 14, No. 2. mm.

1-12.

The first system of musical notation consists of two staves, treble and bass clef, with a 3/4 time signature. The treble staff contains a melodic line starting with a quarter note G4, followed by a dotted quarter note F#4, a quarter note E4, and a quarter note D4. The bass staff is mostly empty, with a few notes in the final measure: a half note G3 and a quarter note F#3. The dynamic marking *f marcato* is written in the first measure. The system ends with a double bar line.

The second system of musical notation consists of two staves, treble and bass clef, with a 3/4 time signature. The treble staff continues the melodic line from the first system, with notes G4, F#4, E4, D4, C4, B3, A3, and G3. The bass staff is mostly empty, with a few notes in the final measure: a half note G3 and a quarter note F#3. The system ends with a double bar line.

The third system of musical notation consists of two staves, treble and bass clef, with a 3/4 time signature. The treble staff continues the melodic line from the second system, with notes G3, F#3, E3, D3, C3, B2, A2, and G2. The bass staff is mostly empty, with a few notes in the final measure: a half note G3 and a quarter note F#3. The system ends with a double bar line.

Example 2.24. The two levels of cyclic activity in  
Bartók, *Suite*, Op. 14, No. 2, mm. 1-12.

mm. 1-4

C<sub>4</sub><sub>3</sub> C<sub>4</sub><sub>0</sub> C<sub>4</sub><sub>1</sub>

C<sub>1</sub>

mm. 5-8

C<sub>4</sub><sub>3</sub> C<sub>4</sub><sub>0</sub> C<sub>4</sub><sub>1</sub>

C<sub>1</sub>

mm. 9-12

C<sub>4</sub><sub>0</sub> C<sub>4</sub><sub>1</sub> C<sub>4</sub><sub>2</sub>

C<sub>1</sub>

### C<sub>3</sub> collections

The cycle of minor thirds (referred to in tonally functional music as the "diminished seventh chord") occurs frequently in compositions by Bartók and Debussy. Since this

collection-type has only four members, it has only one three-member subset:

[3-3-6] the diminished triad

The two two-member subsets of the cycle of minor thirds are also an integral part of the characteristic sound of this cycle:

[6-6] the tritone

[3-9] the minor third

The cycle of minor thirds has a very significant superset: the octatonic collection-type. The octatonic collection-type and its subsets are common in the music of both Bartók and Debussy, as well as that of many other twentieth-century composers. The octatonic collection-type has numerous subsets; Joel Suben has referred to "its incorporation of an impressive set of smaller groupings, some of which derive from the repertory of functional tonality."<sup>7</sup> However, this dissertation is not concerned with merely any collection which may happen to be an octatonic subset. Indeed, since the octatonic collection-type contains eight members of the twelve-member aggregate, the incautious analyst might find octatonic subsets in passages with a distinctly nonoctatonic flavor.<sup>8</sup> What is significant are

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<sup>7</sup>Joel Eric Suben, "Debussy and Octatonic Pitch Structure," (Ph.D. dissertation, Brandeis University, 1980), 6.

<sup>8</sup>See particularly Suben, "Debussy and Octatonic Pitch Structure," 8-14, in which Suben finds octatonic collections in Bach, Beethoven, Chopin, Wagner, and Brahms. Although

either those subsets which retain their octatonic/C3 characteristics or those which appear contextually as fragments of some larger set which does. I will address each of these circumstances in turn.

Certain subsets of the octatonic collection-type retain its cycle-3 sound more than others. For instance, both the major and minor triads are subsets of the octatonic collection-type, yet the mere presence of one or both of these (even if they occurred as subsets of the same octatonic collection) would not be sufficient to convey the cyclic characteristics of the octatonic superset. On the other hand, some octatonic subsets, such as the diminished triad and diminished seventh chord (both generated by interval 3) or cell Z (generated by interval 6), have much in common with the cycle-3 aspects of the octatonic collection-type. The diminished triad is both a subset of the octatonic collection-type and a superset of [3-9]; cell Z is both a subset of the octatonic collection-type and a superset of [6-6]. In this manner, one can readily see the myriad

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Suben refers to these as "locally placed octatonic structures in a tonal (and essentially diatonic) context" (p. 14), he nonetheless sees their octatonic structure as somehow important--e.g. "strongly suggestive of octatonic background" (p. 12)--rather than as a coincidence of tonal procedures. It does seem that octatonicism historically developed from tonal combinations. See Richard Taruskin, "Chernomor to Kashchei: Harmonic Sorcery; or, Stravinsky's 'Angle'," *Journal of the American Musicological Society* 38 (Spring, 1985): 72-142, which traces the roots of octatonicism back to the early Romantic era and shows how it developed through cyclic combinations of tonal elements.

relations among sets and subsets, especially those with a large number of members such as the octatonic collection-type.

An example of an octatonic collection interacting with its subsets occurs in Bartók's *Suite* Op. 14, No. 3. In the *Poco più mosso*, which begins at measure 60 (Example 2.25), the prevailing collection is  $C_{30,1}$ --the octatonic scale containing  $[C, C\#, D\#, E, F\#, G, A, A\#]$ . The accompanying dyads unfold the diminished seventh chord  $C_{30}$   $[F\#, A, C, E_b]$ , a subset of  $C_{30,1}$  which prevails during these measures.

Example 2.25. Bartók, *Suite*, Op. 14, No. 3, mm.

60-65.

**Poco piu mosso** ( $\text{♩} = 160$ )

Cell Z has appeared often throughout this movement (see mm. 11ff, RH, for instance), but it is most directly connected with its octatonic superset in measures 124 and following (Example 2.26). In this passage, an instance of cell Z, in this case  $C6_{2,3}$  [D, Eb, G#, A], is presented in the larger context of the octatonic collection  $C3_{2,3}$  [D, Eb, F, (F#), G#, A, B, C]. Cell Z appears as a melodic figure which alternates with chordal figures that complete the octatonic collection (minus the F#).

Example 2.26. Bartók, *Suite*, Op. 14, No. 3, mm.  
124-129.

The musical score consists of two systems of piano music. The first system contains measures 124 and 125. The second system contains measures 126, 127, and 128. The music is written in a key signature of one flat (B-flat major or D minor). The notation includes complex rhythmic patterns, chromatic harmonies, and various dynamic markings. Handwritten annotations include slurs, accents, and dynamic markings such as *sf*, *f*, and *f cresc.* The score is presented in a clear, legible format with standard musical notation.

Whereas Bartók often presented cyclic collections (such as cell Z and the diminished seventh chord) as subsets of octatonic structures, Debussy was more disposed towards combining seemingly unrelated diatonic structures which result in an octatonic superset. Consider first, as a small

example, measures 64-65 from *pour les huit doigts*, No. 6 from the first book of *Études* (Example 2.27). The right hand contains the diatonic cell [Fb/E,G,A], and the left hand contains a minor-minor seventh chord from another diatonic collection [Db,Eb,Gb,Bb]. Together they form the collection [Db,Eb,E,Gb,G,A,Bb]. It can be readily seen that this is a nearly complete statement of C<sub>30,1</sub>; all that is missing is pitch-class C.

Example 2.27. Debussy, *Études*, No. 6, *pour les huit doigts*, mm. 64-65.

64

The musical score consists of two systems of two staves each. The first system is marked with a box containing the number '64'. The right-hand staff (treble clef) contains a melodic line with many sixteenth notes, primarily in the upper register. The left-hand staff (bass clef) contains a rhythmic accompaniment with many sixteenth notes, primarily in the lower register. The second system continues the same rhythmic pattern. The piece is marked with a piano (*p*) dynamic in the first system and a mezzo-forte (*mf*) dynamic in the second system.

A similar example appears at the opening of *Ce qu'a vu le Vent d'Ouest* from *Préludes* Book I (Example 2.28).

Example 2.28. Debussy, *Ce qu'a vu le Vent d'Ouest*,  
mm. 1-6.

**Animé et tumultueux**

*pp*

*m.g.*

*molto*

*pp*

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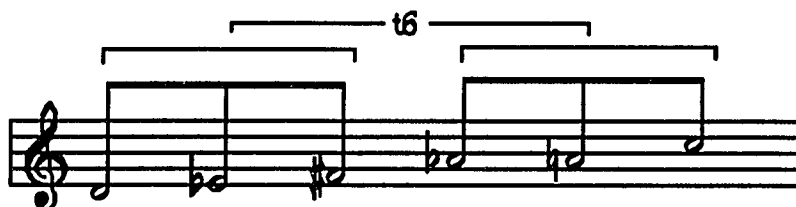
The first two measures present a dominant seventh chord on D [D,F#,A,C], but this is joined in measures 3 through 6 by the pitch-classes [Eb,Gb,Ab]. Together, these two structures form a six-pitch-class subset of the octatonic collection C<sub>3,2,3</sub> [D,Eb,(F),F#,Ab,A,(B),C] (Example 2.29).

Example 2.29. A D<sub>7</sub> chord and [Eb,Gb,Ab] join to form a subset of an octatonic collection.

The image shows a musical staff with a treble clef. The notes are: D4 (quarter), Eb4 (quarter), F#4 (quarter), A4 (quarter), Gb4 (quarter), Ab4 (quarter), and A4 (quarter). Above the staff, a bracket labeled "[Eb, Gb, Ab]" spans the Eb, Gb, and Ab notes. Below the staff, a bracket labeled "D<sub>7</sub> chord" spans the D, F#, and A notes.

Perhaps just as important is the structure of this particular subset itself. The interval series for this collection is [1-3-2-1-3-2]t<sub>2</sub>. This, too, is a cyclic collection--in this case C<sub>6,2,3,6</sub> (Example 2.30).

Example 2.30. [D, Eb, F#, Ab, A, C] as a  
transpositionally invariant collection.



However, my earlier caveat concerning octatonic interpretations of tonally functional passages might also apply here. While it is possible to interpret the opening of *Ce qu'a vu le Vent d'Ouest* as above, one can also focus on the functional aspects of the D dominant seventh chord and thus view the Eb as a minor ninth and the Ab as a neighbor or appoggiatura to the F#/Gb. In this case, I would contend that the larger context invites us *not* to hear it this way: the structure never *functions* as a dominant--it never resolves. Indeed, it moves in measures 7-9 to a series of major triads built on F#, A, and Eb as shown in Example 2.31.

Example 2.31. Debussy, *Ce qu'a vu le Vent d'Ouest*,  
mm. 7-9.

The combination of these triads yields the collection [F#,G,A,A#,C#,Eb,E], which is one pitch-class [C] short of a complete octatonic collection. To further solidify an octatonic interpretation of this material, when it returns towards the end of the work in measures 59-61, the cycle of roots becomes [F#,A,C,Eb]--completed by the addition of a C major triad which also completes the entire octatonic collection: [F#,G,A,A#,C,C#,Eb,E].

This is the material to which the "D dominant minor ninth chord with added Ab" resolves. This material, as it combines triads in a cyclic fashion, is octatonic in precisely the manner described by Taruskin as a "logical extension and

culmination of a prior tendency in Western music,"<sup>9</sup> since "any complete rotation of triads (whether major, minor, or mixed) through a circle of minor thirds will exhaust any given octatonic collection."<sup>10</sup> Thus, the opening materials ought to be viewed in this light as well.

#### Hybrid collections

In addition to the pure interval cycles, compound interval cycles, and their subsets which appear in the music of Bartók and Debussy, combinations involving interval cycles--what I shall refer to as hybrid collections--also occur. For the purposes of this study, a collection may be viewed as hybrid if it separable into two subsets at least one of which is a segment of a pure interval cycle or compound interval cycle.

A hybrid collection-type or scale which appears frequently in Bartók is the so-called "acoustic scale."<sup>11</sup>

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<sup>9</sup>Taruskin, "Chernomor to Kashchei," 79.

<sup>10</sup>Ibid., 101.

<sup>11</sup>So called by Ernő Lendvai in *The Workshop of Bartók and Kodaly*, Budapest: Editio Musica, 1983. Despite the popular use of the term "acoustic" for this scale, it should be noted that its pitches only approximate the intonation of partials 8-14 of the overtone series. In addition, Bartók did not use the term and never mentioned the overtone series as a basis for this scale. He did, however, catalog it as a nondiatonic Rumanian folk mode in Bartók, *Rumanian Folk Music*, vol. IV, ed. Benjamin Suchoff, trans. E. C. Teodorescu et al (The Hague: Martinus Nijhoff, 1975), 20. Antokoletz cites several occurrences of this "transformed mode" in Bartók's music in *Music of Bartók*, 249. The acoustic scale--interval series [2-2-2-1-2-1-2]--is a circular permutation of the ascending

This collection-type also plays a role in the music of Debussy. Its presence in Debussy has been identified by Roy Howat, who also notes its closeness to the whole-tone scale.<sup>12</sup> There is another special feature of this collection-type which was exploited by both Bartók and Debussy: its hybrid nature as a combination of whole-tone and octatonic segments.<sup>13</sup> The five-member whole-tone segment [2-2-2-2-(4)] and a six-member octatonic segment [(4)-2-1-2-1-2] overlap as in Example 2.32 to create an acoustic scale.

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form of the melodic minor scale [2-1-2-2-2-2-1]. In yet another permutation--[2-2-2-2-1-2-1]--the acoustic scale has also been called the "Lydian augmented scale" in certain jazz contexts. See the discussion in Coker, Casale, Campbell, and Greene, *Patterns for Jazz*, 145-154. The name "Lydian augmented scale" was first applied by George Russell in *The Lydian Chromatic Concept of Tonal Organization for Improvisation*, (New York: Concept Publishing Company, 1959), vi. Also see the list of scales in Haerle, *The Jazz Language*, 27, which refers to all three permutations: melodic minor, Lydian-augmented, and "Lydian, b7" (for the acoustic scale). Antokoletz refers to the acoustic scale as a "hybrid Lydian/Mixolydian mode" in "Interval Cycles in Stravinsky's Early Ballets," *Journal of the American Musicological Society* 34 (1986): 597.

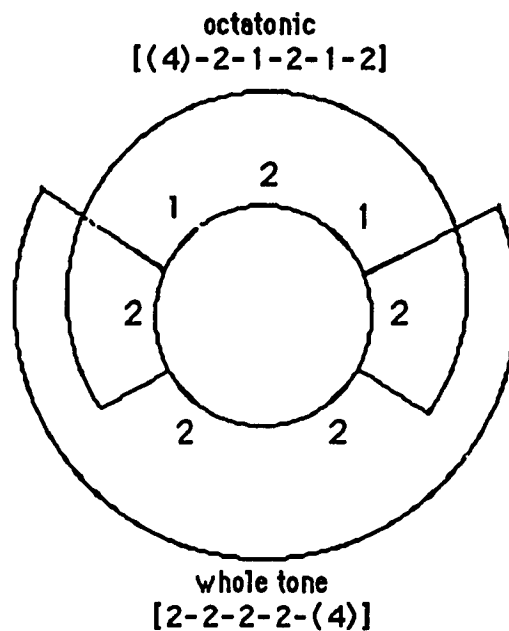
<sup>12</sup>Roy Howat, *Debussy in Proportion* (Cambridge: The Cambridge University Press, 1983), 48-49, *passim*.

<sup>13</sup>See Antokoletz's discussion of this feature in relation to Bartók's "nondiatonic folk modes" in *Music of Bartók*, 204-6, 246-49. Also see his discussion of diatonic, octatonic, and whole-tone interactions with the "hybrid Lydian/Mixolydian mode" (i.e. the acoustic scale) in "Interval Cycles in Stravinsky," 597-600.

Example 2.32. The acoustic scale as a product of whole-tone and octatonic segments.

whole tone  
[2-2-2-2-(4)]

octatonic  
[(4)-2-1-2-1-2]



The several faces of this collection-type, including its hybrid nature, are made clear on the surface of Debussy's *L'isle joyeuse*. Howat discusses the transformation which occurs from the acoustic scale in measures 15-19 to the

whole-tone scale in measures 21-24.<sup>14</sup> One interesting aspect of this transition occurs in measures 19-20, just before the change from acoustic to whole-tone (Example 2.33). In these measures, the F# has disappeared and the melodic figuration in the right hand--in combination with the sustained G-- extracts the whole-tone segment from the acoustic scale and uses it as a set of common tones when moving to the whole-tone collection in measure 21.<sup>15</sup> Debussy plainly treats the acoustic scale as a hybrid collection in this passage, separating out its whole-tone component for subsequent inclusion in a complete whole-tone collection.

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<sup>14</sup>Howat, 48-49.

<sup>15</sup>More about transformations from one collection to another will be presented shortly.

Example 2.33. Debussy, *L'isle joyeuse*, mm. 19-21.

19

*p*

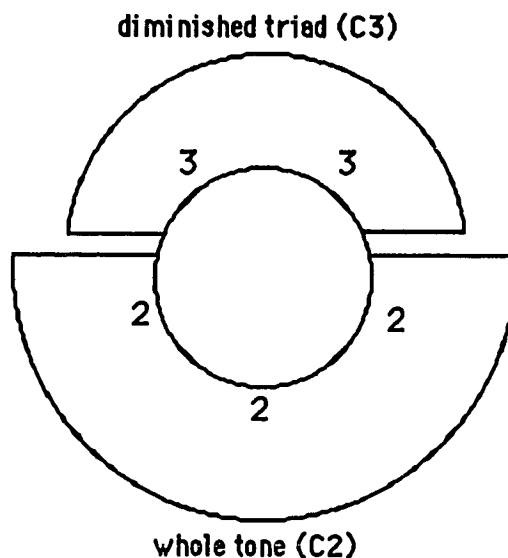
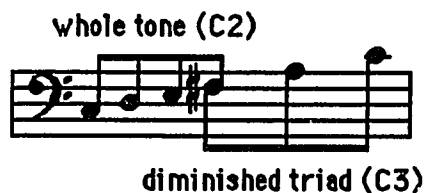
*pia p*

*pp*

*au péda en dehors*

Another hybrid collection-type consists of the interval series [2-2-2-3-3]. This may be viewed as the product of two uni-intervallic subsets: a four-member whole-tone segment and a diminished triad, as seen in Example 2.34. Also note that this collection-type is a subset of the acoustic scale, being equivalent to that scale minus its fifth and seventh pitches.

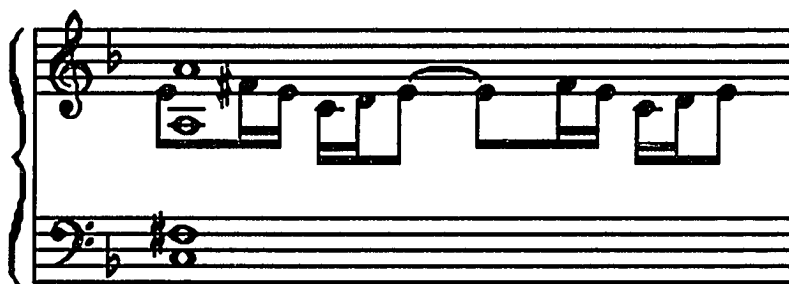
Example 2.34. [2-2-2-3-3] as a combination of whole-tone and C3 segments.



Debussy makes use of this collection-type in a number of compositions; its segmentation into whole-tone and diminished subsets may be seen in the Prelude from *Suite bergamasque*. The melodic material in m. 33 (Example 2.35) consists of the pitch-classes [C,D,E,F#]; the accompanying chord contains the pitch-classes [C,F#,A]. Together, these pitch-classes form

the hybrid collection [2-2-2-3-3]t0, yet it is obvious that the whole-tone component has been separated from the diminished-triad component, so that the melody consists of the whole-tone segment and the accompaniment consists of the diminished triad.

Example 2.35. Debussy, *Suite bergamasque*, Prelude,  
m. 33.



Similar use of the collection-type [2-2-2-3-3] may be found in *L'isle joyeuse*. In mm. 204-5 (Example 2.36), the melodic figuration consists of the whole-tone segment [Db, Eb, F, G]; the accompanimental figures consist of the diminished triad [G, Bb, Db].

Example 2.36. Debussy, *L'isle joyeuse*, mm. 204-5.

Transformations from  
one collection to another

At times, Debussy will arrive at the pitches of one collection by adding to, subtracting from, or substituting for pitch-classes in the preceding collection. Hereafter, this type of process will be referred to as a transformation.

A particularly interesting aspect of these transformations is the voice leading produced by moving from one collection to the next. If we return to the Prelude from *Suite bergamasque* and examine mm. 33-35, we can see how cyclic collections--especially hybrid ones--can be arrived at as a product of such voice leading. Measure 33 contains the collection  $[2-2-2-3-3]_{t0}$  (as discussed above), whereas m. 34 contains the whole-tone subset  $[2-2-2-4-2]_{t0}$ . Through the use of common tones and the shifting of other pitches, each

subsequent collection in this passage is created as a product of the previous one. As shown in Example 2.37, by moving the A in m. 33 to A# in m. 34, the hybrid collection [2-2-2-3-3]t<sub>0</sub> becomes the whole-tone subset [2-2-2-4-2]t<sub>0</sub>;<sup>16</sup> by expanding the A# in m. 34 to G#, A, and B, the whole-tone subset is transformed into an A melodic minor scale.

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<sup>16</sup>Schoenberg describes the same procedure in *Theory of Harmony*, trans. Roy E. Carter (Berkeley and Los Angeles: University of California Press, 1978), 391-92. He discusses--in purely theoretical terms--the dominant ninth chord (which reduces to [2-2-2-3-3]) as a forerunner of the whole-tone scale: when the the fifth of the dominant ninth chord has been augmented, "of the six tones of the whole-tone scale this chord contains five" (p. 292). Also see Antokoletz's discussion of Schoenberg's view in *Music of Bartók*, 321-22. In *Twentieth-Century Music* (Englewood Cliffs, NJ:Prentice-Hall, forthcoming [1992]), Antokoletz shows an instance of this same progression in Debussy's *Pelléas et Mélisande*.

Example 2.37. Transformation from [2-2-2-3-3]t0 to [2-2-2-4-2]t0 to an A melodic minor.

[2-2-2-3-3]

whole tone subset  
[2-2-2-4-2]

A melodic minor  
[2-2-2-2-1-2-1]  
(permuted)

[ 2 - 2 - 2 - (6) ]

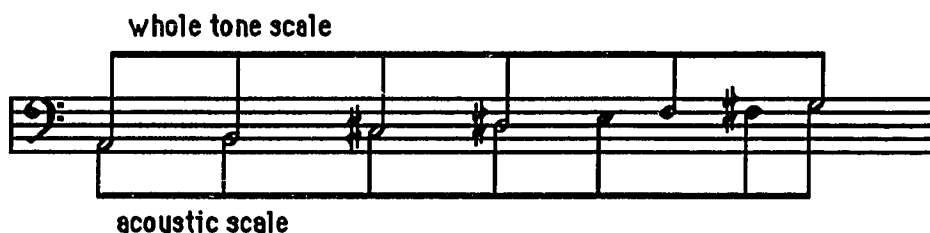
Of course, the melodic minor scale [2-1-2-2-2-2-1] is a permutation of the acoustic scale [2-2-2-1-2-1-2], but the following factors indicate an A-minor interpretation:

Just as in measures 33 and 34, certain pitches are extracted from the collection in measure 35 to form an accompaniment. However, in this case those pitches form not another cyclic subset, but rather a dominant seventh chord on E [E,G#,B,D]. Add to this the resolution to A minor in measure 36, and it is clear that this collection ought to be viewed in terms of its permutation on E [2-2-1-2-1-2-2]t4, and in terms of its function as an A melodic minor scale

[2-1-2-2-2-2-1]t9 supported by an E dominant-seventh chord. Here, as elsewhere, Debussy uses these procedures of transformation to move between cyclic and tonal materials.

Two-thirds of this procedure--the transformation between whole-tone and acoustic collections--has been pointed out by Roy Howat as it appears in *L'isle joyeuse*. Howat demonstrates that, in order to transform an acoustic scale into a whole tone scale, one need only substitute "an augmented fifth above the root in place of its fifth and sixth degrees."<sup>17</sup> The relationship between the two collections is shown in Example 2.38.

Example 2.38. Whole tone and acoustic collections.



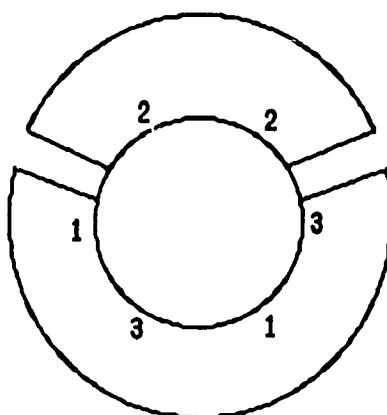
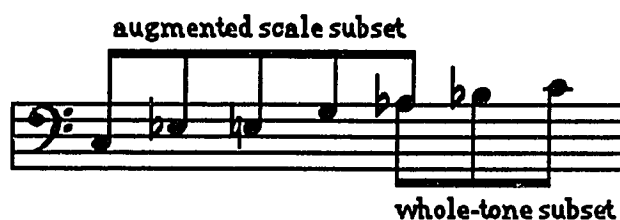
In discussing the so-called "augmented scale" [3-1-3-1-3-1], I mentioned a passage from *pour les Tierces* from *Études*, Book One. The right hand part in m. 11 consists

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<sup>17</sup>Howat, 48-49.

of an augmented scale. Perhaps just as important, since this is an etude for thirds, is the fact that the roots of these thirds form a segment of that augmented scale: C, Eb, E, G, Ab [3-1-3-1-(3-1)]t<sub>0</sub>. In other words, Debussy uses the augmented scale as a cycle of transposition moving the interval-4 dyad through t<sub>0</sub>, t<sub>3</sub>, t<sub>4</sub>, t<sub>7</sub>, and t<sub>8</sub>. Those levels of transposition form a nearly complete statement of the augmented scale. In m. 12, the roots ascend through several octaves, but Bb is added to the top of this pattern resulting in the interval series [3-1-3-1-2-2]t<sub>0</sub>. This has transformed the augmented scale into a hybrid one, the product of segments from the augmented and whole-tone scales (see Example 2.39).

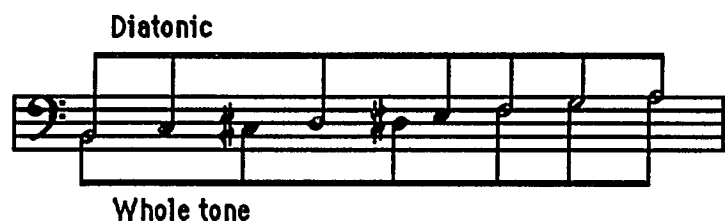
Example 2.39. [3-1-3-1-2-2] as a combination of augmented and whole-tone subsets.



Transformations involving both cyclic and noncyclic collections seem to occur frequently in the music of Debussy (and in later works of Bartók; see for example "Diminished Fifth" from *Mikrokosmos*). We have already seen one such example in the Prelude to *Suite bergamasque*; a few more examples of such transformations will be illustrative. In the Prelude from *Pour le piano*, the passage shown in Example 2.40--measures 150 and following--fluctuates between diatonic and whole tone collections. The diatonic collection is

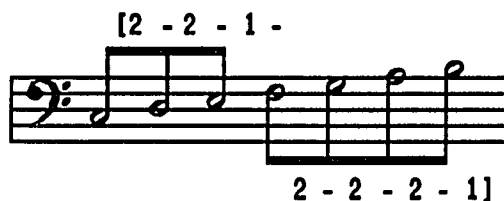


Example 2.41. Diatonic and whole-tone collections.



Indeed, the diatonic collection-type contains two whole-tone segments (of three and four members respectively) separated by half steps<sup>18</sup> (Example 2.42).

Example 2.42. A diatonic collection viewed as two whole-tone segments.



<sup>18</sup>Compare Antokoletz's discussion of how the pentatonic collection (a subset of the diatonic collection) may serve as a "point of departure for the generation of a larger set of interval cycles (two whole-tone scales and the cycle of fifths)," in *Music of Bartók*, 40-42. In this instance, Antokoletz is referring to No. 5 from Bartók's *Eight Hungarian Folk Songs*.

Debussy uses the four-member whole-tone segment of the diatonic collection in *Pour le piano* as a shared subset between diatonic and whole-tone collections. In this case, that four-member segment appears as the pitches F,G,A,B.

An even more inventive transformation involving diatonic subsets appears in *Les sons et les parfums tournant dans l'air du soir* from the first book of *Préludes*. Measures 18-23 (Example 2.43) present an alternation between two collections: [2-2-2-3-3]t11 and [2-1-2-1-3-3]t10.

Example 2.43. Debussy, *Les sons et parfums*, mm.

18-23.

18 [2-2-2-3-3]-t11 [2-1-2-1-3-3]-t10 [2-2-2-3-3]-t11

*pp*  
*en dehors*

Serrez un peu - - - - // Retenu - - - //

[2-1-2-1-3-3]-t10

*p* *p*

The first collection-type, [2-2-2-3-3], is the whole-tone/diminished-triad hybrid discussed above; the second collection-type, [2-1-2-1-3-3], is a subset of the octatonic collection-type (i.e. if the final diminished triad [3,3] were filled in with [2,1,2,1] then this would be a complete statement of  $C_{30,1}$ ). In order to effect the transformation from one collection to the other, Debussy places two of the common tones in a static accompaniment figure [C#,D#] while

the moving chords alternate between two dominant-seventh-type chords with roots of C# and C respectively. This transformation is shown in Example 2.44.

Example 2.44. Transformation between  
[2-2-2-3-3]t11 and [2-1-2-1-3-3]t10.

The image shows two staves of musical notation in bass clef. The top staff is labeled with the chord symbol C#7 and the fingering [2-2-2-3-3]. The bottom staff is labeled with the chord symbol C7 and the fingering [2-1-2-1-3-3]. Vertical lines connect the notes between the two staves, illustrating the transformation between the two chord voicings. The notes in the top staff are G2, A2, B2, C#3, and D3. The notes in the bottom staff are F2, G2, A2, B2, and C3.

## CHAPTER III

### LOCAL AND STRUCTURAL USES OF THE INTERVAL CYCLES

#### Local uses

##### Planing

Debussy was especially fond of taking a verticality and repeatedly transposing it, a procedure sometimes referred to as "planing." Richard Cohn has discussed this procedure in relation to his concept of transpositional combination.<sup>1</sup> An important consideration in this procedure is the interval of transposition: does it remain constant or in some other way represent an interval cycle? Some planing takes place over the intervals of a diatonic scale or chord, but other instances occur in which the levels of transposition form an interval cycle. A small example of this is found in *Et la lune descend sur la temple qui fût* from *Images*, Set II (1907). In the second half of m. 19 (Example 3.1), a three-note subset of the whole tone collection [F,A,B] is sequenced

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<sup>1</sup>See Richard Cohn, "Transpositional Combination in Twentieth-Century Music," (Ph.D. thesis, Eastman School of Music, University of Rochester, 1986), 44-46, and 262; and "Some Significant Properties of Transpositionally Invariant Collections," a paper presented at the 11th annual meeting of the Society for Music Theory, Baltimore, MD, 1988, 20-21 in reference to Debussy's *Ce q'ua vu le Vent d'Ouest*, m. 9.

through the pitches of a diminished seventh chord [F,Ab,B,D]. In other words, a subset of C2 is transposed across C3. Note also that the resulting collection is octatonic--generated by C3 in a manner similar to that described by Taruskin with reference to triads rather than whole-tone subsets.<sup>2</sup>

Example 3.1. Debussy, *Images* Book II, *Et la lune descend sur le temple qui fût*, m. 19, second half.



A similar procedure appears in *Reflets dans l'eau* from the first book of *Images*, in measure 20 (Example 3.2; this is repeated in measure 21 an octave higher). In this passage, Debussy sequences a chord made up of the collection-type

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<sup>2</sup>Taruskin, "Chernomor to Kashchei," 79. Antokoletz shows the identical relationship between whole-tone subsets and the octatonic collection in Stravinsky's *Firebird*: "all four transpositions of the cell also establish the other cyclic interval of the octatonic collection: the four transpositions--B-D#-F, D-F#-G#, F-A-B, and Ab-C-D)--are separated by a series of minor thirds (interval 3s)" (Antokoletz, "Interval Cycles in Stravinsky," 587).

[2-2-2-3-3] over the same diminished-seventh chord as in *Et la lune descend sur le temple qui fût*, so that the pattern of sequence (or planing) is once again [F,G#,B,D] or C3<sub>2</sub> (or C3<sub>5</sub>, if you prefer).

Example 3.2. Debussy, *Images*, Book I, *Reflets dans l'eau*, m. 20.

20

**Quasi cadenza**

*pp poco a poco cresc. stringendo*

Planing is much less common in Bartók's music; however, a few examples do exist. *Bagatelle No. 8* begins with an interval pattern ([4-1-7]<sub>t8</sub>, here disposed as a major third and minor ninth) which is sequenced over a descending chromatic cycle (Example 3.3).

Example 3.3. Bartók, *Bagatelle No. 8*, mm. 1-2.

**Andante sostenuto  $\text{♩} = 54-60$**

A descending chromatic cycle is used again at the end of this bagatelle as a vehicle of transposition for cell Z, [1-5-1-5]. In measures 28-31 (Example 3.4), cell Z appears five times, with each subsequent appearance one-half step lower than the previous one.<sup>3</sup>

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<sup>3</sup>See Antokoletz's discussion of the harmonic and linear uses of cell Z in this passage in *Music of Bartók*, 78-9.

Example 3.4. Bartók, *Bagatelle* No. 8, mm. 28-31.

The musical score for Example 3.4 consists of two systems of piano music. The first system covers measures 28 to 31. It is in 2/4 time, marked 'Ritenuato' (ritardando) and 'p solciss.' (piano, *solcissimo*). The right hand features a melodic line with chromatic movement and slurs, while the left hand provides a rhythmic accompaniment with chords and moving lines. The second system shows measures 30 and 31, continuing the melodic and harmonic development.

In the tenth *Bagatelle* (Example 3.5), Bartók presents a chord at the end of measure 9 which is a complete statement of the whole-tone collection  $C2_1$  [Eb, F, G, A, B, Db] disposed symmetrically in the vertical dimension (the pitches minus the low E-flat are symmetrical about E4). When this chord returns in measure 10, a sequence begins which transposes the chord across the following bass pitches: [Eb, C, A, Gb/F#]--a complete statement of cycle 3. Thus we have, from measure 10 through 13, a complete whole-tone cycle in the vertical dimension and a complete diminished-seventh cycle in the horizontal dimension.

Example 3.5. Bartók, *Bagatelle No. 10*, mm. 9-13.

The image shows a musical score for Bartók's *Bagatelle No. 10*, measures 9-13. The score is in 2/2 time and features a piano part. The first system (measures 9-12) is marked *dolce* and *cresc.* The second system (measures 13-14) is marked *f*. The score consists of two systems of staves, each with a treble and bass clef. The music is written in a key signature of one flat (B-flat major/D minor).

At times, an interval cycle is used as the means of transposing more traditional chordal structures, such as a major triad or a dominant-seventh-type chord. Debussy was especially fond of this procedure; a few examples will demonstrate this. In *La terrasse des audiences du clair de lune*, from Book II of the *Préludes*, a small passage occurs in measures 29 and 31 which sequences the dominant-seventh-type chord formation across the cycle of interval 3.<sup>4</sup> In this

<sup>4</sup>Note that this procedure yields a complete octatonic collection. As before, the reader is referred to Taruskin's

case, the chords all have roots of G, Bb, C#, or E. Example 3.6 shows measure 29, in which the chord roots ascend and then descend through this cycle; Example 3.7 shows measure 31, in which the roots merely ascend. In both cases, the traditional structure of the "dominant seventh" chord is reinterpreted in the context of the cycle of interval 3.

Example 3.6. Debussy, *La terrasse des audiences du clair de lune*, m. 29.

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observation that "any complete rotation of triads (whether major, minor, or mixed) through a circle of minor thirds will exhaust any given octatonic collection" (Taruskin, "Chernomor to Kashchei," 79). This principle extends to major and minor chords with minor sevenths as well, as in *La terrasse*.

Example 3.7. Debussy, *La terrasse des audiences du clair de lune*, m. 31.

Another such instance occurs in the Sarabande from *Pour le piano*. From measure 11 through the downbeat of measure 14 (Example 3.8), a dominant-seventh-type chord goes through a process of planing. The level of transposition for each statement of this chord always falls within the whole-tone collection  $C2_0$ ; looked at another way, the roots of these chords form a five-member segment of the whole-tone scale  $[D, E, F\#, G\#, A\#]$ .

Example 3.8. Debussy, *Pour le piano*, Sarabande,  
mm. 11-14.

The musical score for Example 3.8 consists of two systems. The first system, measures 11-12, is written for piano and features a treble and bass clef. The music is in G major and 3/4 time. The dynamics are marked 'p'. The second system, measures 13-14, is written for piano and features a bass clef. The dynamics are marked 'plus p' and 'pp'. The instruction 'retenu' is written above the staff in measure 14. The score includes various musical notations such as slurs, ties, and dynamic markings.

Bartók used this procedure sparingly. One example may be found in *Bagatelle No. 10*, m. 67 (Example 3.9). In this measure, the left hand plays a series of set-class 3-8 (in the same dominant-seventh type voicing that was found in Debussy's *La terrasse des audiences du clair de lune*), each of which is a semitone lower than the previous one.

Example 3.9. Bartók, *Bagatelle* No. 10, m. 67.

The image shows a musical score for two staves. The top staff is in treble clef and the bottom staff is in bass clef. The music consists of a sequence of notes and chords. Below the bottom staff, there are four brackets, each spanning a measure, with the label 'C1' centered under the first bracket.

Measures 68 and 69 seem to follow this same pattern at higher pitch levels, but closer examination reveals that, although the lowest pitch in each set still follows a descending cycle 1, the sets themselves begin to change, thus breaking the sequence. See Example 3.17 below.

#### Harmonic alternation

In many cases Debussy alternates between the two whole tone collections, a procedure which produces a sense of harmonic oscillation. One example of this appears in the Prelude to *Pour le piano* at measures 64-71 (Example 3.10). Measure 64 presents two beats of [2-4-6]<sub>t8</sub> [Ab,Bb,D]--a C<sub>20</sub> subset--followed by one beat of [2-4-6]<sub>t9</sub> [A,B,Eb]--a C<sub>21</sub>

subset.<sup>5</sup> Measures 65 and 66 each sequence this pattern up a whole step, so that the alternation of whole-tone sets continues. Measures 67-70 accelerate this alternation to every beat. In fact, this entire passage is a product of C1 transposition: [2-4-6] is presented 19 times in measures 64-71, each time a semitone higher. Once measure 71 is reached, the whole-tone collection C2<sub>0</sub> reigns until measure 96.

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<sup>5</sup>Also note the tonal implications of [2-4-6] as a subset of the dominant-seventh chord: root, third, and seventh.

Example 3.10. Debussy, *Pour le piano*, Prelude, mm.

64-71.

64

The image displays a musical score for Debussy's 'Pour le piano' Prelude, measures 64-71. The score is written for piano and consists of four systems of music, each with a grand staff (treble and bass clefs). The key signature is one flat (B-flat major or D minor), and the time signature is 3/4. The first system (measures 64-65) shows a complex rhythmic pattern in the right hand with many beamed notes and a steady bass line. The second system (measures 66-67) features a *pp* dynamic marking and includes the word 'cre' with a long dash. The third system (measures 68-69) includes the word 'sen' with a long dash. The fourth system (measures 70-71) features a *mf* dynamic marking and ends with a final chord. The score includes various musical notations such as slurs, ties, and dynamic markings.

Another example of this occurs in *La terrasse des audiences du clair de lune*, from the second book of *Préludes*, in measures 21-24 (Example 3.11). In this passage--even though there is a G# pedal tone and the C<sub>2</sub><sub>1</sub> collection is embellished by upper neighbor sixteenth notes on each third beat--the upper voices alternate between the two whole-tone collections just as in the Prelude to *Pour le piano*. In *La terrasse des audiences du clair de lune*, however, simple sequence is not the generating procedure. Instead, the middle staff contains a series of transpositions of [2-4-6] (here voiced like the traditional "dominant-seventh chord" without a fifth [4-6-(2)]) sequenced up by half steps from ("roots") D to A, whereas the upper staff contains a series of major thirds sequenced *down* by half step, first from ("roots") C to B<sub>b</sub>, then from F to C#. Example 3.12 shows a simplification of this process.

Example 3.11. Debussy, *La terrasse des audiences du clair de lune*, mm. 21-24.

21 (6/8)

*p*

*p*

8va Cedez //

Example 3.12. Voice leading for Debussy, *La terrasse des audiences du clair de lune*, mm. 21-23.

Like planing, the alternation of whole-tone collections is more frequent in Debussy than in Bartók. One passage containing this alternation does appear, however, in the *Suite*, Op. 14, a passage I have already discussed with regard to the so-called "augmented scale." This appears in measures 1 through 24 in Number 2 from the *Suite* (Example 3.13). These measures alternate consistently between the two transpositions of C2. This is in part due to the use of interval 1 as a unit of sequence for the augmented triads in measures 1-14: any whole-tone set or subset when transposed by an odd-numbered interval will yield members of the other whole-tone set. However, even when the pattern of sequence by semitone breaks off, as at measure 15, the alternation continues. And when the rhythm of alternation slows to every

second measure in measures 17-24, each pair of measures now presents all six tones of its respective whole-tone collection.

Example 3.13. Bartók, *Suite*, Op. 14, No. 2,  
mm. 1-24.

**Scherzo.** (♩. = 122)

*f marcetissimo*

7

13

*p*

19

## Structural uses

### Foreground

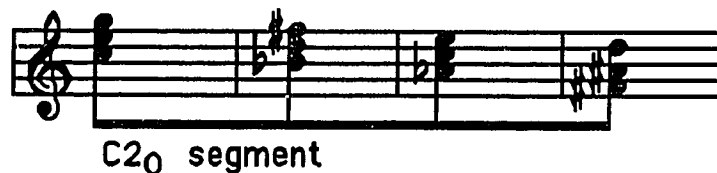
In many instances, Bartók and Debussy use the interval cycles as a controlling factor for structures slightly larger than note-to-note or chord-to-chord relationships. This often involves a series of chord roots or collections which occur on successive downbeats or similar structural positions. For example, mm. 43-46 from the Prelude to *Pour le piano* (Example 3.14) contain pitches from both whole-tone collections.

Example 3.14. Debussy, *Pour le piano*, Prélude,  
mm. 43-46.

The musical score for Example 3.14 shows measures 43-46 of Debussy's *Pour le piano*, Prélude. The score is in 3/4 time and features a series of chords in the right hand and a bass line in the left hand. The right hand chords are marked with accents and slurs, and the left hand chords are marked with 'ff' and accents. The chords in the right hand are: C major (m. 43), Bb major (m. 44), Ab major (m. 45), and F# major (m. 46). The bass line consists of a descending whole-tone scale: C, Bb, Ab, F#.

However, the chords which fall on the downbeats of these measures form a series of roots which follows a descending whole-tone scale: [C, Bb, Ab, F#], as shown in Example 3.15. All but the first of these chords is an augmented triad (the first is major) and each augmented triad is a subset of C<sub>20</sub>. The embellishing chords (also augmented triads) which fall on the last eighth note of each measure all belong to the other whole-tone collection C<sub>21</sub>.

Example 3.15. Downbeat chords forming  $C2_0$  segment  
in Debussy, *Pour le piano*, Prelude, mm. 43-46.



The Toccata from *Pour le piano* contains an interesting example of interval cycles operating on different levels. In measures 167-69, tritones are sequenced at the interval of a half-step in the right hand. Each of these three measures contains four tritones built on an ascending segment of the chromatic scale (e.g. m. 167 contains tritones built on B#, C#, D, and Eb). At the same time, the left hand presents descending segments of the chromatic scale (e.g. m. 167 = Ab, G, Gb, F). This two-hand pattern, once presented in measure 167, is sequenced up one whole step in each of the two following measures, so that the controlling interval within each measure is the half step, whereas the controlling interval from downbeat to downbeat is the whole step (See Example 3.16).

Example 3.16. Structural graph of Toccata from  
Debussy, *Pour le piano*, mm. 167-169.

The image shows a musical score for three measures (167-169) from Debussy's 'Toccata' in 'Pour le piano'. The score is presented in two staves, both in bass clef. The upper staff contains a melodic line with a tritone interval highlighted. The lower staff contains a bass line. Above the upper staff, there are three rectangular boxes representing structural units. Labels 'C2', 'C1', and 'tritone' are placed to the left of the upper staff, and 'C2' and 'C1' are placed to the left of the lower staff.

Measure 67 of Bartók's tenth *Bagatelle* was discussed above with regard to planing across C1. It is also interesting to note that the three downbeats in measures 67-69 (Example 3.17) form another interval cycle: C4<sub>0</sub>.

Example 3.17. Bartók, *Bagatelle* No. 10, mm. 67-69.

Also note that--as in measures 43-46 from the Prelude to Debussy's *Pour le piano*--measures 67-69 of Bartók's *Bagatelle* No. 10 use a cycle as a controlling factor which unifies a series of *dissimilar* chords.

### Middleground

In some instances, Bartók and Debussy use the interval cycles for controlling patterns over spans larger than those discussed above. Consider as an example a passage in No. 3 from Bartók's *Suite*, Op. 14. This middle section, from measure 50 through measure 80 or so, first presents a gradual unfolding of a diminished triad [F#,A,C] in the bass voice over measures 50-59 (Example 3.18). The triads which these bass notes support are themselves not diminished--they are in fact minor triads; this is yet another example of an interval

cycle being used as a structure over which other configurations may be sequenced.<sup>6</sup>

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<sup>6</sup>Once again, cycling diatonic triads through interval 3 yields octatonic material. In this case, three minor triads with roots separated by minor thirds comprise a seven-note subset of an octatonic collection: [C,C#,Eb,E,F#,G,A,(Bb)].

Example 3.18. Bartók, *Suite*, Op. 14, No. 3,  
mm. 50-59: (a) music; and (b) graph of bass voice.

(a)

50

*ff* *ff* *ff*

*poco allarg.* *fff*

(b)

50 54 58

C3

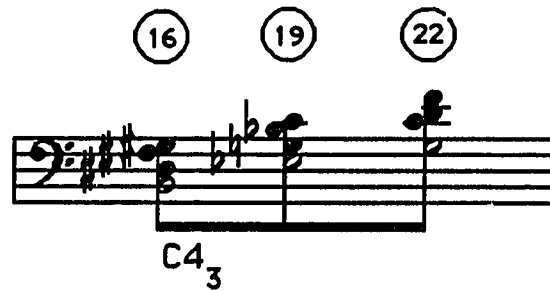
Cycle 3 continues its controlling role; what follows in measures 60-80 is based on the harmonic underpinning of a diminished seventh chord [F#,A,C,Eb] which appears in the accompanimental chords throughout this passage. This underpinning is shown in Example 3.19.

Example 3.19. Bartók, *Suite*, Op. 14, No. 3, graph  
of mm. 60-80

The diagram shows a single staff of music with a bass clef. Above the staff, nine measures are circled and labeled with their measure numbers: 60, 64, 68, 72, 73, 74, 75, 76, and 77. Below the staff, the notes for each measure are written: 60 (Bb), 64 (B), 68 (Bb), 72 (Bb), 73 (A), 74 (B), 75 (Bb), 76 (Bb), and 77 (A). The starting pitch is labeled C3.

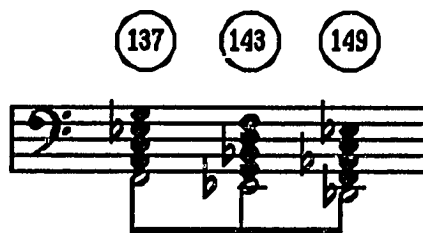
Debussy also used such procedures. In *La Cathédrale engloutie*, measures 16-22 contain a progression in which each chord is again not a strict transposition of the previous one. Yet, as I have indicated in Example 3.20, the functional roots of the three chords form a cycle of major thirds--the augmented triad. This procedure is quite common in Debussy, with chord roots outlining various interval cycles such as whole-tone, diminished, and octatonic configurations.

Example 3.20. Debussy, *La Cathédrale engloutie*,  
mm. 16-22, graph of functional roots.



A similar procedure underlies measures 137ff in the Toccata from *Pour le piano*. In this passage, three "dominant ninth" chords appear at six-measure intervals--in measures 137, 143, and 149--each at the beginning of a sequence of an ascending gesture followed by a descending figuration. The roots of these ninth chords form a segment of a whole tone scale: F, Eb, Db. Indeed, the entire passage is sequenced down by whole step each time (see Example 3.21).

Example 3.21. Debussy, *Pour le piano*, Toccata, mm.  
137-149, graph of chord roots.



The first of Bartók's *Four Piano Pieces* contains another example of how an interval cycle may be used as a controlling factor for the bass voice. In measures 97-114, the bass voice moves through the pitches B, D, and F--a diminished triad. The D and F are each reached through their leading tones, thereby creating a segment of the octatonic scale: B,C#,D,E,F [2-1-2-1(-6)]t11, as shown in Example 3.22.

Example 3.22. Graph of bass voice of Bartók, *Four Piano Pieces*, No. 1, mm. 97-114.

The image shows a musical staff in bass clef with a key signature of one sharp (F#). Three measures are highlighted with circled measure numbers: 97, 110, and 114. Below the staff, an 'octatonic' scale is indicated, starting on C3. The scale is represented by a horizontal line with a box labeled 'nn' above it, and the starting note 'C3' is written below the line.

The diminished/octatonic character of this bass voice lays the groundwork for the transitional passage which follows in mm. 117-120 (Example 3.23). In that passage, an E diminished triad grows into an octatonic collection of which it is a subset--C3<sub>0,1</sub>.

Example 3.23. Bartók, *Four Piano Pieces*, No. 1,  
mm. 117-120.

The musical score consists of two systems of staves. The first system (measures 117-118) shows a piano introduction with a forte (sf) dynamic. Measure 117 is boxed and labeled with the chord E°7 (C34). The right hand features a melodic line with triplets and accents, while the left hand has a bass line with triplets. A note in measure 118 is marked 'becomes C31,2'. The second system (measures 119-120) continues the melodic and harmonic development, marked with a 'cresc. molto' dynamic and ending with a fortissimo (ff) dynamic. The score includes various rhythmic patterns, including triplets and accents.

An early example of this middleground process appears in the *Funeral March* from Bartók's Symphonic Poem "Kossuth."<sup>7</sup> Measures 23 and following contain a theme and accompanimental bass pattern which travel through several keys (or, more properly, chords). This theme and accompaniment first appear in measure 23 in C; measure 24 moves to Eb; measure 26 moves

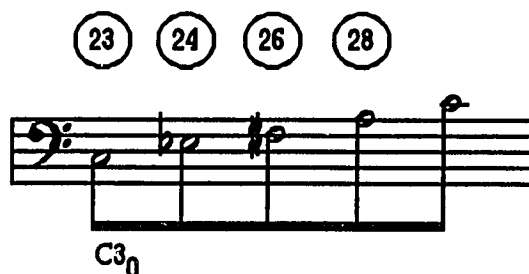
<sup>7</sup>This appears in Bartók's transcription for piano in *Piano Music of Béla Bartók*, series I, ed. Benjamin Suchoff (New York: Dover Publications, 1981).

to F#; measure 28 presents both A and C (see Example 3.24). These chords, reinforced by strong bass tones on each root, form a complete cycle of interval 3 (see Example 3.25).

Example 3.24. Bartók, *Funeral March* from  
"Kossuth," mm. 23-28.

The image displays a musical score for measures 23 through 28 of Bartók's "Funeral March" from "Kossuth". The score is written for piano and is organized into three systems. Each system consists of a grand staff with a treble clef on the upper staff and a bass clef on the lower staff. The key signature is one flat (B-flat major or D minor). Measure 23 is indicated by a box containing the number "23". The score includes various musical notations such as notes, rests, and dynamic markings. The first system begins with a piano (*p*) dynamic and an expressive (*espr.*) marking. The second system features a crescendo (*cresc.*) and a non-legato (*non legato*) instruction. The third system concludes with an expressive (*espr.*) marking, a fortissimo (*f*) dynamic, and a diminuendo (*dim*) marking. The music is characterized by dense, rhythmic textures and complex harmonic structures.

Example 3.25. A graph of the harmonic motion of Bartók, *Funeral March* from "Kossuth," mm. 23-28.



The appearance of this procedure in tonal music is not new with Bartók. Several writers have traced it back to the early part of the nineteenth century,<sup>8</sup> and even farther back into the eighteenth.<sup>9</sup> The most striking examples--passages like that in Bartók's "Kossuth" but also in works such as Schubert's *Mass* (D 950, see *Sanctus*, mm. 1-8) and many compositions of later composers, Liszt in particular--rotate through a complete interval cycle and often place the non-diatonically connected chords in bold succession. Such works seem to lead the way towards those which abandon circle of

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<sup>8</sup>See, for example, Antokoletz, *Music of Bartók*, 323-25; Taruskin, "Chernomor to Kashchei," 81-89; and Gregory Proctor, "Technical Bases of Nineteenth-Century Chromatic Tonality: A Study in Chromaticism" (Ph.D. dissertation, Princeton University, 1977).

<sup>9</sup>For example, Taruskin, "Chernomor to Kashchei," 95-96.

fifths tonality in favor of the interval cycles as a structural controlling factor.

### Background

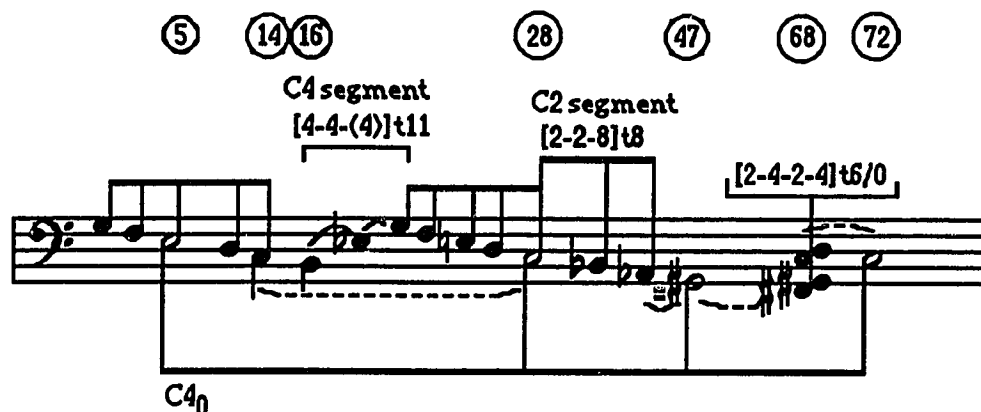
There are some instances in which Bartók and Debussy use cyclic constructions of structural proportions. *La Cathédrale engloutie* exhibits this type of procedure. Example 3.26 is a structural graph of the bass voice for the entire prelude.<sup>10</sup> Particularly interesting are the main structural points E, C, G# and C--all of which form a cyclic augmented triad. Related to this, of course, are smaller details such as the above-mentioned arpeggiation in mm. 16-22 and the whole-tone approach to Ab/G# in the measures preceding m. 47.<sup>11</sup>

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<sup>10</sup>This graph extends beyond m. 16 an analysis suggested by Allen Forte in "Schenker's Conception of Musical Structure," *Journal of Music Theory* 3 (1959): 28.

<sup>11</sup>Compare Joel Lester's analysis of the local and long-range structures in *La Cathédrale engloutie* in *Harmony in Tonal Music*, vol. 2, *Chromatic Practices* (New York: Alfred A. Knopf, 1982), 260-63.

Example 3.26. Structural graph of bass voice from Debussy, *La Cathédrale engloutie*.

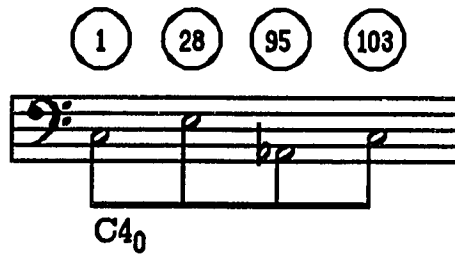


In one instance, Bartók used a cyclic collection--in fact the same one which appears above in *La Cathédrale engloutie*--as an underlying structure. Number 1 from *Three Rondos* (on Slovak Folk Tunes)<sup>12</sup> makes use of the following key areas in the following order: C, E, Ab, and C--a complete cycle of major thirds which form an augmented triad. See the structural graph of the bass voice in Example 3.27.

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<sup>12</sup>Number one was composed in 1916, numbers 2 and 3 in 1927.

Example 3.27. Structural graph of bass voice from  
Bartók, *Three Rondos*, Number 1.



CHAPTER IV  
ANALYSES

In this chapter I will analyze works of Bartók and Debussy using the principles discussed in the previous chapters. In order to make these concluding analyses particularly clear, I will focus on works in which the interval cycles function as fundamental components and in which common-practice-period tonality does not appear as a principal structural determinant. Where tonality does function, I will address its interaction with the interval cycles in each specific compositional context.

It is not my intention here to present comprehensive analyses of these works. Indeed, I doubt that anything as systematic as the interval cycles can globally explicate compositions such as these. Instead I will seek merely to demonstrate the extent to which the interval cycles operate in these works.<sup>1</sup>

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<sup>1</sup>Most studies which examine the interval cycles in the music of various composers similarly avoid the temptation to overreach. See, for example: Antokoletz, "Interval Cycles in Stravinsky"; Lambert, "Interval Cycles in Ives"; and Suben, "Debussy and Octatonic Pitch Structure."

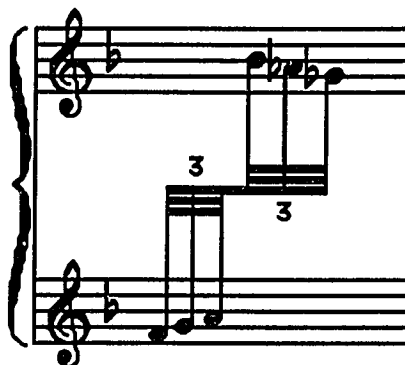
Debussy, *Feux d'artifice* from  
*Préludes*, Book II

The first of these works is *Feux d'artifice* from the second book of *Préludes* by Debussy. *Feux d'artifice* exhibits many interactions among cyclic and diatonic collections. Although *Feux d'artifice* contains much material which is drawn from the vocabulary of tonal music, it is not a tonal composition. The triadic collections do not relate to one another in a traditionally functional way; they do not progress through any traditional means such as the circle of fifths or linear intervallic progressions. *Feux d'artifice* also contains much material which is clearly not drawn from tonal vocabulary. Nearly all of those collections can be explained as products of one or more interval cycles. I will present a detailed account of how the interval cycles generate and connect the various collections in this prelude, and follow this with a brief discussion of the role the cycles play in relation to the work as a whole.

Measures 1-16: Opening figure--  
whole-tone and chromatic aspects

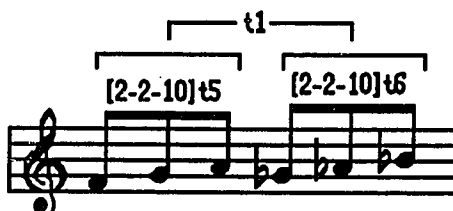
*Feux d'artifice* opens with the figurational pattern shown in Example 4.1.

Example 4.1. The opening pattern from Debussy,  
*Feux d'artifice*, m. 1.



The pitches in this pattern form a six-note segment of the chromatic collection [1-1-1-1-1-7]t5 which is separated into two three-note subgroups by the change in direction, as well as by the notational division between the two staves-- thus separated between the hands. Each of these three-note subgroups is a statement of the collection-type [2-2-10], the first at t5 and the second at t6. In this manner, the opening collection is a product of transpositional combination (see Example 4.2).

Example 4.2. The opening pattern from Debussy,  
*Feux d'artifice* as a product of  
 transpositional combination.



It is important to note that the three-note collection-type [2-2-10] is a subset of the whole-tone collection-type. Since it appears at both an odd-numbered and even-numbered transposition in the pattern (t5 and t6), this passage involves a rapid and constant alternation between the two whole-tone subsets  $C_{20}$  and  $C_{21}$ . However, the detached notes C, D, and Ab that punctuate measures 3-14 in the upper staff belong entirely to  $C_{20}$ , thereby weighting this passage towards that whole-tone collection.

Measure 17: Transformation from cyclic  
 to pentatonic via common subset

The first harmonic change in *Feux d'artifice* takes place at the downbeat of measure 17. At this point, the collection changes to pentatonic. The transformation from the opening to this new collection involves a common subset: the pitch-

classes [Gb,Ab,Bb] which functioned as one of the two initial subgroups (see Example 4.3).

Example 4.3. The transformation from  
[1-1-1-1-1-7]t5 to the pentatonic collection  
[2-3-2-2-3]t1.



or

[1 - 1 - 1 - 1 - 1 - 6]t5

[2 - 3 - 2 - 2 - 3]t1

Measures 20-24: A new figure; dual  
transposition of nonequivalent segments

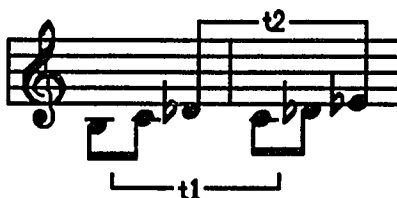
Measures 20 through 24 contain a new figurational pattern. This pattern consists of the two pitch cells shown in Example 4.4.

Example 4.4. The two pitch cells in Debussy, *Feux d'artifice*, mm. 20-24.



Like that at the opening, this pattern alternates between two collections. However, in this case the two collections are not exact transpositions of one another. Nonetheless, the process of transposition does seem to play a role in generating one from the other. The two lower pitches in the first [B,C] are transposed up a half step to [C,Db] while the highest pitch [Db] is transposed up a whole step to [Eb]. This process is shown in Example 4.5.

Example 4.5. The process of dual transposition generates the collections in Debussy, *Feux d'artifice*, mm. 20-24.



Measures 25-29: C dominant ninth and the two- and three-note motives

Yet another pattern appears in measures 25-29. This pattern contains the pitch-classes [G,Bb,C,D,E]. This five-note collection-type [3-2-2-2-3] was discussed in Chapter 2 as a hybrid between a whole-tone segment and a diminished triad [2-2-2-3-3]. In this instance, however, Debussy does not make overt use of this collection's cyclic properties. Indeed, the collection carries with it some tonally functional implications as a dominant ninth chord built on C as shown in Example 4.6.

Example 4.6. [2-2-2-3-3] as a dominant ninth chord  
built on C.



This functionality is enhanced by the tonal materials that are introduced starting in measure 27. These materials, which are mere diatonic fragments, emphasize the pitch-classes C and G--the root and fifth of the C dominant ninth chord above. I shall refer to these tonal fragments as the "two-note motive" and "three-note motive" respectively, as shown in Example 4.7.

Example 4.7. The two-note and three-note motives  
from Debussy, *Feux d'artifice*.

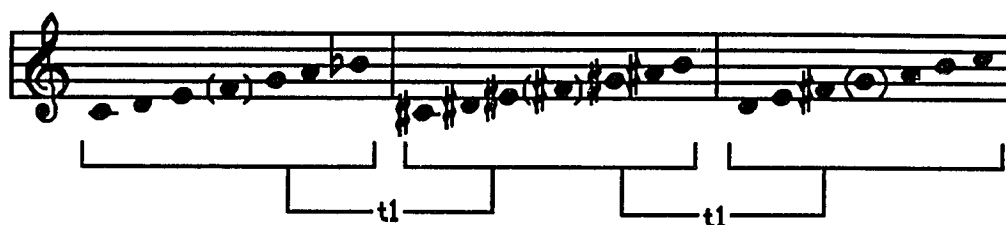


Measure 30: Sequence up by semitone

The opening of this prelude exhibited the process of combining a collection with itself a semitone higher: [F,G,A]

with [Gb,Ab,Bb]. This procedure is also used in measure 30, where the three-note motive first presented in m. 29 expands in m. 30 into a larger motive consisting of the original (up a semitone) and the same collection-type yet another semitone higher. In this fashion, the "roots" of these three-note groups are C, C#, and D respectively. The accompanimental materials are also moved by sequence up one half step, suggesting dominant functions with those same roots. Each level of the sequence implies a new diatonic collection: the first, one flat; the second, six sharps; and the third, one sharp. However, each of these levels falls short of unfolding an entire diatonic collection--in each case, the one pitch-class that would be the tonic of the implied dominant ninth chord is missing (see Example 4.8).

Example 4.8. The diatonic collections implied in Debussy, *Feux d'artifice*, mm. 29-30.



Measures 31-32: C dominant ninth

Measures 31 and 32 return to the materials from measures 27 and 28, and thus return to the pitch content implying the one-flat collection.

Measures 33-34: C-C# fluctuation

The following two measures, 33-34, present yet another alternation between two collections. This time, the "C dominant-ninth" chord from the previous measures undergoes a transformation wherein one member fluctuates by a semitone. Specifically, pitch-class C alternates with C# in these measures, yielding the two collections [3-2-2-2-3]t7 and [3-3-1-2-3]t7 as shown in Example 4.9.

Example 4.9. The two collections in Debussy, *Feux d'artifice*, mm. 33-34.



During these measures, pitch-class C is reiterated in the bass voice on alternate beats thereby strengthening its role

as the root of a dominant chord. This places pitch-class C# in a subordinate role as an embellishment of C.

Measures 35-38: Transformation from  
C dominant ninth to whole-tone

Another interesting transformation takes place at the downbeat of measure 35. The pitches in measures 35-38 belong to the whole-tone collection  $C2_1$ : [G, (A), Cb, Db, Eb, F]. That collection is arrived at through a process similar to that which generated the sequence in measures 29-30: transposition up by semitone. In this case, pitch-class G is retained while the other members of the collection are raised one half step<sup>2</sup> (see Example 4.10).

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<sup>2</sup>Antokoletz discusses a similar procedure--invariant tetrachords between diatonic and cyclic collections--in Bartók's *First Improvisation in Music of Bartók*, 220.

Example 4.10. The transformation from measures 34 to 35 in Debussy, *Feux d'artifice*.

[ 3 - 2 - 2 - 2 - 3 ]

[ 4 - 2 - 2 - 2 - 2 ]

At this point, the whole-tone collection becomes a new matrix in which the two- and three-note motives reappear, with their originally diatonic pitch structures now altered to conform to the whole-tone setting.<sup>3</sup> Thus, whereas measures 27-30 contain motivic materials in three different diatonic collections separated by half steps, measures 35-38 contain the same motivic materials all stated within the pitches of  $C2_1$ . This relationship is sketched out in Example 4.11.

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<sup>3</sup>This technique of transforming previous material to conform to a new collection is discussed (and with specific relation to the whole-tone collection) by Perle in *Twelve-Tone Tonality*, 162-63.

Example 4.11. The motivic materials in mm. 27-30 and 35-38 of Debussy, *Feux d'artifice* compared.

mm. 27-30

diatonic 1      diatonic 2      diatonic 3

mm. 35-38

$C_2^1$

Measures 39-40: Transformation from whole-tone to six-flat diatonic

At measure 39, the whole-tone collection undergoes a transformation to yet another diatonic collection, this time the one with six flats as shown in Example 4.12. Note the common subset [Cb,Db,Eb,F].

Example 4.12. The transformation from measures 38 to 39 in Debussy, *Feux d'artifice*.

The image shows two staves of musical notation. The top staff is labeled 'm.m. 35-38' and contains a sequence of notes: G4, A4, Bb4, Cb5, and D5. A bracket above this staff is labeled 'C<sub>2</sub><sub>1</sub> subset'. The bottom staff is labeled 'm.m. 39-40' and contains a sequence of notes: Gb4, Ab4, Bb4, Cb5, D5, and Eb5. A bracket below this staff is labeled '6-flat diatonic'. Vertical lines connect the notes between the two staves, showing the transformation of the pitches.

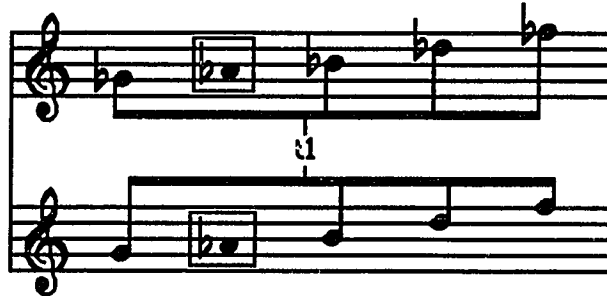
#### Measures 41-43: More diatonic materials

This six-flat collection changes to five flats at measure 41, which remains as an accompaniment to the motivic gestures in 42 and 43.

#### Measure 44: Inexact sequence

Measure 44 is analogous to measure 30, in that it is a sequence of the motive's pitches up a semitone. However, the accompanimental pitches do not form a perfect sequence in measure 44. Example 4.13 shows how the diatonic collection in the first half of the measure is altered to form a collection from the C<sub>3</sub> family--[3-3-3-2-1]t8--in the second half of the measure.

Example 4.13. The "inexact" sequence in Debussy,  
*Feux d'artifice*, m. 44.



In addition, the motive's pitches that are extracted from the diatonic collection in the first half of the measure form a whole-tone subset, like those in measures 36-38. This whole-tone character is retained in the motive in the second half of the measure, since it is an exact sequence up one semitone; in other words, the first motive is a subset of  $C2_0$ , the second a subset of  $C2_1$ . Thus, one might describe two separate processes in this measure: (1) the "inexact sequence" of the accompanimental pitches, and (2) the exact sequence of the motive's pitches from one whole-tone collection to the other.

Measures 45-46: Alternations--

$C2_0/C2_1$  and  $C2$ /diatonic

This motion between whole tone collections plays a role in the melodic/motivic materials in the following measures.

The upper voice in measures 45 and 46 alternates between [C,Ab] and [B,A,D#]. This clearly relates to the whole-tone statements of the motives in measures 36-38, but especially to measure 44 where the two statements occur in the two different whole-tone collections. In the case of measures 45-46, [C,Ab] is from C<sub>20</sub> and [B,A,D#] is from C<sub>21</sub>. In another sense, the [C,Ab] gesture continues the sequence from the previous measure, so that the motives in measures 44 and 45 present "roots" of B<sub>b</sub>, B, and C. Recognizing that two pitches a minor sixth apart (in this case, [C,Ab]) do not necessarily convey a whole-tone character, it is important to note two factors that lead towards a whole-tone interpretation of this passage. First, the [C,Ab] motive is supported by accompanimental pitches that form a more clearly whole-tone figure--[C,D,G<sub>b</sub>,Ab] or a "French augmented-sixth chord," [2-4-2-4]<sub>t0</sub> which is a subset of C<sub>20</sub>. Second, the previous use of the minor sixth in stating motivic material (measures 36-38) occurred in a clearly whole-tone context, so that this minor sixth would tend to be interpreted in a similar manner in the absence of any conflicting evidence.

However, although the first halves of measures 45 and 46 are simply whole-tone, the triplet figure in the second halves of these measures contains diatonic collections to support the motive statements. Here, [B,A,D#] is accompanied by pitches from the four-sharp collection; indeed, the chords suggest dominant-seventh chords built on B. Nonetheless,

interval cycles are also at the heart of this collection: the pitch-classes [A,B,C#,D#,F#] [2-2-2-3-3]t9 are a hybrid of whole-tone and interval 3 cycles. The subset [A,B,C#,D#] [2-2-2-6]t9 is a whole-tone segment (of which the motive's pitches [D#,A,B] are yet another subset), and the subset [D#,F#,A] [3-3-6]t3 is a diminished triad--a figure generated by the repetition of minor thirds. This parsing into whole-tone and diminished subsets is supported by the connection between this statement of the second three-note motive and the one in measure 37: both are whole-tone in character-- [B,A,D#] and [Eb,Db,G]--yet this time (mm. 45-6) the accompaniment is diatonic. Nonetheless, it is reasonable to extract the whole-tone character of both of these motivic statements.

Measures 47-48: Common two-note  
subset and whole-step transposition

The triplet figure from measures 45-46 carries into measures 47 and following, and undergoes some transformations of pitch content. In measure 47, the first triplet repeats the figure exactly as it appears in the preceding measures. On the surface, the second triplet retains the pitches C# and D#, yet also transposes the entire collection up one whole step; in terms of pitch-class content, this has the effect of transposing the overall collection up from [2-2-2-3-3]t9 to [2-2-2-3-3]t11 as shown in Example 4.14.

Example 4.14. The two collections in Debussy, *Feux d'artifice*, m. 47.



Measures 53-56: Note-pairs form  $C2_0$

After the series of chords in measures 49-52 (based on those in 47-48), the pitches  $A_b$  and  $B_b$  are tied into measure 53 where they are joined by pitch-classes  $[C, D, E, F\#, G\#(=A_b)]$  to form the whole-tone collection  $C2_0$ . This collection prevails through measure 56, with each note-pair acting, in a sense, like transpositions of the original pair  $[A_b, B_b]$ . In fact, this note-pair activity got its start back in measure 45, with the third note of the triplet figures  $[C\#, D\#]$  that form the basis of the measures that follow.

Measures 57-60: Diatonic/whole-tone  
alternation and C3 bass motion

A new process of alternation begins at measure 57, in which diatonic and whole-tone elements are counterposed. Here, the three-sharp diatonic subset [G#,C#,D,F#] [5-1-4-2]t8 in the first half of the measure undergoes a change of one element--C# to B#--and transforms into a whole-tone subset [G#,B#,D,F#] [4-2-4-2]t8 for the second half of the measure. This whole-tone subset is the same one used in the diatonic/whole-tone alternation in measures 45 and 46, however here the transformation is more subtle: through the semitone shift of one element (see Example 4.15).

Example 4.15. The transformation from diatonic to whole-tone in Debussy, *Feux d'artifice*, m. 57.



The transformation in measure 58 is even more subtle. In this measure, the C# is merely omitted in the second half leaving the collection [G#,D,F#] [6-4-2]t8, which is a subset

of the original diatonic subset [G#,C#,D,F#] but also of the whole-tone subset [G#,B#,D,F#]. Measure 59 returns to the diatonic/whole-tone transformation of measure 57, but adds one more pitch-class to the diatonic collection--[B] in the bass voice--and one more pitch-class to the whole-tone collection--[E] in the top voice. The last measure of this passage, measure 60, is a sequence of measure 59 up one whole step.

One more aspect of this passage also relates to the interval cycles. This occurs in measures 57-59, in which the bass voice moves from G# through B to D. In effect, while the upper voices are playing out their diatonic/whole-tone interactions, this small bass progression moves through a portion of interval cycle 3. The sequence in measure 60 seems as if it would also continue this minor-third motion beyond C# and E to G (and maybe Bb), or perhaps continue the sequence (so that measure 61 would present D# and E#), but breaks off instead after a single minor third to begin the new section in measure 61. What is presented at the downbeat of 61 is a major triad with a root and bass of C. This C does serve as a logical consequence of the previous material: the collection that closes measure 60 is a whole-tone collection minus C [E,F#,G#,A#,(C),D]; the C completes this collection.

Measures 61-64: Cyclic connections  
among diatonic elements

The next section (measures 61-64) presents more juxtapositions of diatonic and cyclic elements. Each of the chords in these measures is either a major or minor triad. Thus, each one is a diatonic subset--in fact, a reference to diatonicism and triadic tonality in general. In addition, the glissandi are also diatonic: the white-key glissando is obviously a complete diatonic collection; the black-key glissando forms a pentatonic collection which is a diatonic subset.

However, the connections among these diatonic elements are not diatonic. For example, in measure 61 the four chord roots C, F#, E, and Bb form the C<sub>20</sub> whole-tone subset [4-2-4-2]<sub>t0</sub>. The significance of this collection is supported by the fact that it has played a role in the passage leading up to these measures: it appears in measures 45, 46 and 57-59. Measure 62 repeats this material, with the exception of its final chord (G major) which belongs harmonically with the following two measures. Those measures--63 and 64--contain triads with roots of Eb, G, A, and C#: a sequence of measures 61-62 up a minor third. This forms the C<sub>21</sub> subset [4-2-4-2]<sub>t3</sub>.

In summary, measures 61-62 contain diatonic elements that are arranged across a whole-tone collection and then undergo inexact sequence by interval 3 into measures 63-64.

Measures 65-67: The motives in the six-sharp diatonic collection, and another sequence up by semitone

The next section of *Feux d'artifice* recalls the material from measures 25-44 in which the two- and three-note motivic material was first presented. The pitch-class content of measures 65-66 corresponds to that in 25 and following, but one semitone higher. Thus, what was in the one-flat diatonic collection in measure 25 is now in the six-sharp collection, and what implied a dominant ninth chord built on C now implies that same chord on C#. The motives are stated at the ends of measures 65 and 66, and the bass voice E#-B has been added. At the beginning of measure 67, the three-note motive is followed by a reordering of that motive, up one semitone to [B,A,D]. This is the same kind of sequence of motives that appeared in measures 30 and 44, and is part of the larger process of operation by semitone that produced the opening figure, [F,G,A] plus [Gb,Ab,Bb].

Measure 67: Combinations of diatonic elements

The *Quasi cadenza* section in measure 67 is made of several diatonic figures which combine to produce some tonal and bitonal implications. The ascending figure that appears immediately after the first fermata implies a dominant minor

ninth built on D [D,F#,A,C,Eb]. However, the D is not restated in subsequent octaves so that the other pitch-classes predominate to create a diminished-seventh chord [F#,A,C,Eb]. Next, the F# is supplanted by F-natural, leaving the last four pitches which state an F-major chord. This transformation is demonstrated in Example 4.16.

Example 4.16. The transformation among chords between the two fermati in Debussy, *Feux d'artifice*, m. 67.

The image shows three staves of musical notation. The top staff is labeled 'D dom. min. 9' and contains a sequence of notes: D (quarter), F# (quarter), A (quarter), C (quarter), Eb (quarter), and Bb (quarter). The middle staff is labeled 'F# dim. 7' and contains notes: F# (quarter), A (quarter), C (quarter), Eb (quarter), and Bb (quarter). The bottom staff is labeled 'F maj.' and contains notes: F (quarter), A (quarter), C (quarter), and Eb (quarter). Vertical lines connect the notes across the staves, showing the transformation from the D dominant-minor 9th chord to the F# diminished 7th chord, and then to the F major chord.

The right hand continues this F major chord for the rest of the measure. The left hand first presents the pitch-classes [C,Eb,Gb] which are drawn from the preceding diminished-seventh figure. After four repetitions of this figure, pitch-class Ab is added resulting in an Ab dominant-

seventh chord [Ab,C,Eb,Gb]. The combination of left and right hands in this measure results in the bitonality shown in Example 4.17.

Example 4.17. The bitonality in Debussy, *Feux d'artifice*, m. 67.

F major

Ab dominant 7th

[ 3 - 2 - 1 - 2 - 1 - 3 ]

(an octatonic subset)

Measures 68-70: The motives again in the six-sharp diatonic collection and yet more sequences up by semitone

Measures 68-69 are a repetition of measures 65-66, once again ending with statements of the motives. What follows in measure 70 uses the procedure of sequence by semitone found in measures 30, 44, and 67, but this time the motivic material is presented at four successive pitch levels. The "roots" in measure 70 are C#, D, Eb, and E as shown in Example 4.18.

Example 4.18. The root progression in Debussy,  
*Feux d'artifice*, m. 70.



Measure 71: The semitone progression continues with inexact sequences of the motives

In measure 71, the motives undergo more sequential transformation in the upper staff. As shown in Example 4.19, the inexact sequence in this measure is a product of three voices that move in somewhat disjunct semitone and whole-tone cycles.

Example 4.19. The three voices in Debussy, *Feux d'artifice*, m. 71 as products of interval cycles.

The lowest voice in this sequence, with roots of F, F#, G, and G#, combines with measures 70 to produce a semitone cycle which progresses from C up to G#.

Measures 71-73: Accompaniment based  
on mm. 20-24 and 45-56

While this is going on, the lower staves begin an accompanimental figure which suggests the pattern presented in measures 20 and following. Its similarity to this pattern lies in its construction from whole and half steps, its use of tremolo, and the bass voice motion which alternates by semitone. This accompaniment continues through measure 73, while measure 72 adds note pairs like those in measures 45-56

(especially like 53-56), and measure 73 repeats the contents of measure 71.

Measures 74-78: Alternation of whole-tone subsets

Yet another alternation between collections appears in measures 74 and 75. In each of these measures (75 repeats 74), the first beat uses a  $C2_1$  whole-tone subset [B, Db, Eb, F, G] whereas the rest of the measure uses a subset of the other whole-tone collection  $C2_0$  [Bb, C, D, Gb, Ab]. Both of these subsets are transpositions of a single configuration: [2-2-2-2-4]t11 and [2-2-2-2-4]t6. See Example 4.20. Note also how the pitches in the upper staff are derived from the earlier three-note motives.

Example 4.20. The alternation between whole-tone subsets in Debussy, *Feux d'artifice*, mm. 74-75.

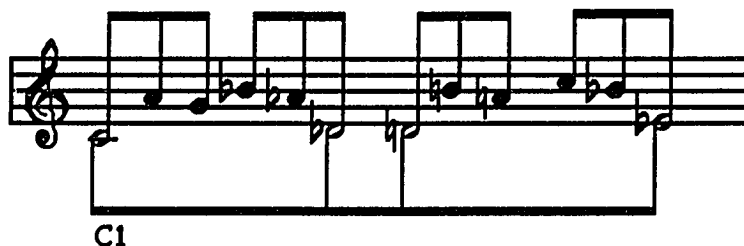
The image displays two musical staves. The top staff shows a sequence of notes: B, Db, Eb, F, G. Below these notes are three brackets, each labeled 't1' with a downward arrow, indicating transpositions. The bottom staff shows a sequence of notes: Bb, C, D, Gb, Ab. Below these notes are three brackets, each labeled 't1' with an upward arrow, indicating transpositions. To the right of the top staff is the intervallic configuration [ 2 - 2 - 2 - 2 - 4 ] t11. To the right of the bottom staff is the intervallic configuration [ 2 - 2 - 2 - 2 - 4 ] t6.

The  $C2_0$  subset from the end of measure 75 continues through measure 78.

Measures 79-84: Continuation of  $C2_0$  subset and return of motives and semitone sequence

The figural patterns in measures 79 and 80 continue some of the  $C2_0$  pitch-classes [Bb,C,D], but the three-note motives return at the ends of these measures and provide a diatonic (one flat) context for these pitch-classes. Just as the motivic materials in measures 27-29 underwent a sequence in measure 30 (or, similarly, measures 44, 67, and 70-71), the motives again undergo sequence by ascending semitone in measure 81. Measures 82-83 repeat measures 79-80, but now the sequence in measure 84 continues with roots of C, Db, D, and Eb (see Example 4.21).

Example 4.21. The roots of the sequence in Debussy, *Feux d'artifice*, m. 84.

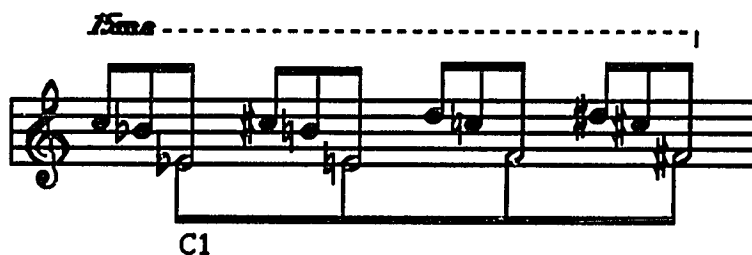


C1

Measures 85-86: The three-note motive  
continues the ascending semitone cycle

This ascending semitone cycle continues in the bass voice in the next two measures, so that measures 84-86 move up by half steps from C to F# in a manner similar to that in measures 70 and 71. The specific content of measures 85 and 86 derives melodically from the second three-note motive, so that the upper voice presents four statements of the motive on successive pitch levels as shown in Example 4.22.

Example 4.22. The four statements of the motive in  
Debussy, *Feux d'artifice*, mm. 85-86.



The harmonic content of the model for sequence in measures 85-86 is a product of combining a C minor chord, an Eb major chord, and a diminished seventh chord whose lowest pitch is G (i.e. [G,Bb,Db,E]). The overall collection that results from this combination is [Eb,E,G,Bb,C,Db] or [1-3-3-2-1-2]t7--an octatonic subset (i.e. [Eb,E,(F#),G,(A),Bb,C,Db]). Nonetheless, these materials are

disposed on the compositional surface as traditional diatonic elements, and their juxtaposition relates them more closely to the bitonal materials in measure 67 or those which follow in measures 90-95. This is the kind of octatonicism referred to in chapter 2--that which conveys a sense of tonal contradictions.<sup>4</sup>

Measure 87: Concurrent black-key  
and white-key glissandi

The two simultaneous glissandi in measure 87 might also be thought of as a kind of bitonality, with the black-key glissando supplying a pentatonic subset of the five-flat diatonic collection and the white-key glissando supplying the no-sharps/flats collection. The separateness of these two collections was certainly clear back in measures 61-64, where they occurred at different times. However, in measure 87 the two are presented at the same time and thus result in a complete statement of the aggregate in which no real separation into diatonic subsets is apparent.

Measures 88-89: Return of the  
opening figure, with added D

The opening material returns in measure 88. The two original three-note groups, [F,G,A] and [Bb,Ab,Gb], are

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<sup>4</sup>As before, the reader is referred to Suben, "Debussy and Octatonic Pitch Structure," 8-14; and Taruskin, "Chernomor to Kashchei."

restated with the addition of the pitch D. This D recalls the D's in measures 3 and following which punctuate the opening section of the piece and give weight to the C2<sub>0</sub> collection.

Measures 90-98: C/Db bitonality,  
which resolves by semitone sequence

The final section of the piece spans measures 90 through 98. These measures are underpinned by a pedal point tremolo on Db and Ab which--through repetition if not through function--suggests Db as tonic. Coupling this with the C-major material in the upper staves in measures 92-95 results in yet more bitonality--the strongest and most blatant clash of diatonic elements in the work. "La Marseillaise" appears here in C major (measures 92 and following, top voice), as do the two- and three-note motives in that same key. This C/Db clash remains through the end of measure 95, after which the final statement of the first three-note motive in C undergoes the same sequencing that was found in measures 27-30, 44, 67, 70-71, 73, 81, and 84. This final sequence, from C up to Db, resolves the bitonal conflict so that Db major prevails in the end.

Conclusion

Although I claimed at the outset of this discussion that the interval cycles can not completely explain *Feux*

*d'artifice*, the successive relationships between diatonic and cyclic elements do at least form a basis for the musical rhetoric of this prelude. From a sequential and non-structural point of view the work alternates between diatonic and non-diatonic collections, with each of its various small sections being comprised of either one or the other. The connections between these collections are often effected through the retention of common-tones and the chromatic inflection of various others--a technique discussed at some length with regard to Debussy in Chapter 2. Debussy often uses particular surface cues such as direction and register to point up these common tones. For example, consider the transformation from the opening collection to the pentatonic collection in measure 17. Debussy extracts the three descending pitches in the opening figurational pattern-- [Bb,Ab,Gb]--and uses them as the beginning of a black-key pentatonic glissando. Other examples include the transformation between the diatonic subset in measures 31-34 and the whole-tone subset in measures 35-38 (discussed above) where  $t_1$  operates on all but one pitch-class--G--which appears at the downbeat of measure 35 as a pedal point on the lowest note; and the transformation from that whole-tone subset to the six-flat diatonic collection in measures 39 and following, where the four highest pitches--[Cb,Db,Eb,F]--are used as common tones in order to shift between the two.

It is the nature of *Feux d'artifice* to present its various collections as a series of outbursts--a concatenation of seemingly unrelated pyrotechnics. This is a reasonable interpretation of the surface of the composition. However, we have also seen that Debussy--in a manner similar to Bartók--used cyclic collections not only as mere collections (the pitch-classes which make up a passage) but also as controlling factors. In *Feux d'artifice*, this is mostly restricted to the process of sequence up by semitone--a cycle of interval 1--which is an essential part of the musical language of the work. For example, the two three-note subgroups in the opening bars are related by  $t_1$ , as are the three successive diatonic subsets in mm. 29-30, and the roots of the progression in m 70, to name but a few instances. In addition, some transformations from one collection to another are effected through  $t_1$  operations on certain subsets. For example, four pitch-classes of the five-member collection in m. 34 are raised a semitone to arrive at the collection in m. 35; a similar procedure is used between the two halves of m. 44; and--in a more complex example--both ascending and descending  $t_1$  operations are used on two-pitch subsets in mm. 74-75. These procedures are hardly as systematic as those of functional tonality but they certainly are pervasive in this work, being applied to both diatonic and non-diatonic materials.

From a more structural point of view, Debussy uses the process of sequence up by semitone to develop and unite at least some elements of the work. Nothing in *Feux d'artifice* approaches the structural integrity of, say, functional tonality or serialism, and no such claim is made for the interval cycles in this work. Nonetheless, the interval cycles do generate many of the local collections and do control the movements among many of the various sections in *Feux d'artifice*.

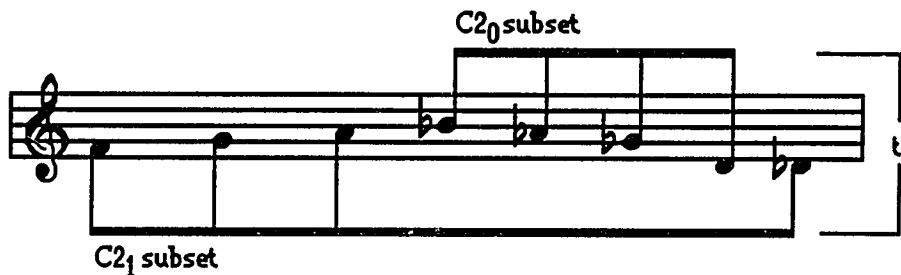
The largest such connection involves the final diatonic material--Db major--which is arrived at in measure 90 as a consequence of the cyclic material that precedes it. The material from the opening that returns in measure 88 has been altered by the addition of a single pitch--D. This pitch disturbs the original balance between the two whole-tone subsets, leaning in favor of the C<sub>20</sub> collection as shown in Example 4.23.

Example 4.23. The added pitch D leans in favor of C<sub>20</sub> in Debussy, *Feux d'artifice*, mm. 88-89.

The image shows a musical staff with a treble clef. It contains two whole-tone scales. The first scale, labeled 'C<sub>21</sub> subset', has notes C, D, E, F, G, A. The second scale, labeled 'C<sub>20</sub> subset', has notes C, D, E, F, G, Ab. The notes are connected by a line, and the two subsets are shown as overlapping whole-tone scales.

This process recalls the original imbalance presented in measures 3 and following in which D, Ab, and C punctuate the otherwise stable equilibrium between C<sub>21</sub> and C<sub>20</sub> subsets. This time, however, Debussy follows with the exact pitch-class needed to counterbalance this instability: Db. As shown in Example 4.24, Db relates to [F,G,A] as D does to [Gb,Ab,Bb]. The arrival on Db in measure 90 completes a balance between two four-member whole-tone subsets-- [D,Gb,Ab,Bb] and [Db,F,G,A]--related by t1.

Example 4.24. Db completes the second of two balanced whole-tone subsets in Debussy, *Feux d'artifice*, mm. 88-90.



Of course, this Db is separated from the previous material texturally and harmonically; it serves as the basis for a new section. Nonetheless, one can readily see how this Db area arrives as a *consequence* of the preceding material.

In addition, another larger process involving t1 relationships also validates the arrival on Db. In

retrospect--once the two- and three-note motives appear based on C in measures 92 and following--Db makes sense as the area to which these motives will resolve through the t1 process used throughout the prelude. Indeed, the motives' appearance on C is rather predictable on the basis of their earlier behavior. The first time they appear is on C in measures 27-9, and they return to C as a starting point in measures 31, 79-81, and finally 82-84. The immediate procedure following each of these statements--except that in measure 31--is transposition up by semitone. In addition, two other important presentations of these motives appear in measures 65-67 and 68-70. In both of these cases the procedure starts on C# (=Db!) and likewise moves away by ascending semitone. Thus, when the motives appear on C in measure 93, Db--now harmonically referential through its role as a pedal point--can be heard as the logical conclusion into which the motives will meld, as they do in measure 96. The relationship between the motives' initial statements on C beginning back in measure 27 and the final resolution to Db in measure 96 makes the appearance of Db in measure 90 clear as a final structural point of arrival.

Bartók, Suite, Op. 14, Number 2

As they do in many of Debussy's works, the whole-tone collection-type and its subsets play an important role in the

second movement of Bartók's *Suite*, Op. 14. As with Debussy's prelude, I will present details of the various cyclic collections which make up the various passages in this work, and discuss some of the connections among them.

Measures 1-30: Interactions among augmented triads, the circle of fifths, whole-tone, and chromatic cycles

The opening section of the movement is made up of concatenated augmented triads. An augmented triad [4-4-4] is inherently related to the whole-tone collection-type [2-2-2-2-2-2] since it is a subset comprising alternate pitch-classes in that larger set (see Example 4.25).

Example 4.25. An augmented triad as a subset of a whole-tone collection.

[ 4 - 4 - 4 ]

[ 2 - 2 - 2 - 2 - 2 - 2 ]

The first three measures of Op. 14, no. 2 present the following augmented triads: [4-4-4]<sub>t11</sub>, <sub>t4</sub>, and <sub>t9</sub>. Note that the distances between successive chord "roots" produce a

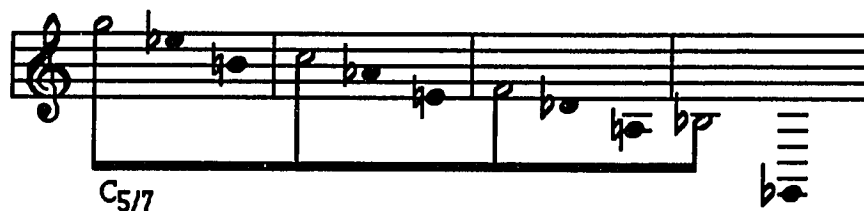
cycle of descending perfect fifths ( $[-7]$ , which is equivalent to an ascending perfect fourth  $[5]$ ) as shown in Example 4.26.

Example 4.26. The three augmented triads and their "roots" in Bartók, *Suite*, Op. 14, No. 2, mm. 1-3.



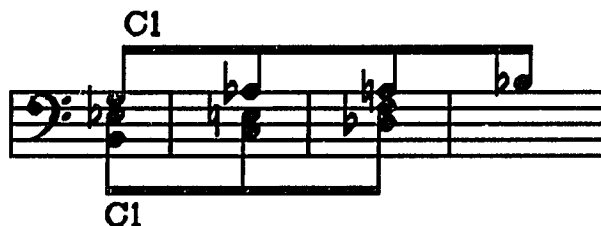
However, since the augmented triad is a completely cyclic structure, there is no reason to necessarily view its lowest pitch as root. If one were to consider each of the pitches on successive downbeats as roots, then the cycle of descending fifths continues beyond measures 1-3 [G,C,F] to measure 4 [Bb] (see Example 4.27).

Example 4.27. The cycle of descending fifths as it controls Bartók, *Suite*, Op. 14, No. 2, mm. 1-4.



But perhaps in a nontonal context the notion of root is altogether inappropriate. In any case, focussing on the lowest tones [B,E,A] or the downbeats [G,C,F,Bb] recognizes only the surface disposition of these triads in this particular context. In discussing a series of chords such as this, the voice leading is just as important as any notion of root progression. In that sense, each member of the first triad ascends by one semitone into the second triad, and each member of the second moves likewise into the third. Harmonically, the three triads create a progression controlled not by a cycle of fifths but by a cycle of semitones, one voice of which continues into measure 4, as shown in Example 4.28.

Example 4.28. The voice leading in Bartók, *Suite*,  
Op. 14, No..2, mm. 1-4 as it forms a cycle of  
semitones.



Whether viewed as a cycle of descending perfect fifths or a cycle of ascending semitones, the interval of operation (i.e. interval of sequence or transposition) in these measures is an odd-numbered one (7 or 1). In general, when operated upon by an odd-numbered interval, one whole-tone collection will yield pitches in the other whole-tone collection. This is a simple result of the fact that transposing a set of even numbers by an odd number will yield a set of odd numbers, and transposing a set of odd numbers by an odd number will yield a set of even numbers. Thus, the odd-numbered operations here produce subsets of alternating whole-tone collections as shown in Example 4.29.

Example 4.29. The alternating whole-tone subsets  
in Bartók, *Suite*, Op. 14, No. 2, mm. 1-4.

The image shows a musical score for four measures. The first measure is labeled 'C<sub>21</sub> subset' and features a treble clef staff with notes G<sub>4</sub>, A<sub>4</sub>, B<sub>4</sub><sup>b</sup>, and C<sub>5</sub>. The second measure is labeled 'C<sub>20</sub> subset' and features a bass clef staff with notes G<sub>3</sub>, A<sub>3</sub>, B<sub>3</sub><sup>b</sup>, and C<sub>4</sub>. The third measure is labeled 'C<sub>21</sub> subset' and features a treble clef staff with notes G<sub>4</sub>, A<sub>4</sub>, B<sub>4</sub><sup>b</sup>, and C<sub>5</sub>. The fourth measure is labeled 'C<sub>20</sub> subset' and features a bass clef staff with notes G<sub>3</sub>, A<sub>3</sub>, B<sub>3</sub><sup>b</sup>, and C<sub>4</sub>. The music is marked 'f marcatisissimo'.

In summation, these measures contain chords generated by cycle 4 which undergo melodic and registral sequence through cycle 5/7 (descending perfect fifths) which results in voice leading by cycle 1 and an alternation of whole-tone collections.

Measures 5-8 contain the same kind of procedures. In fact, measures 5-7 contain the exact same pitches as measures 1-3. This time, however, the fourth measure of the group contains F<sup>#</sup>, not B<sub>b</sub>, thus extending the [E<sub>b</sub>, E, E<sup>#</sup>] voice rather than the [G, A<sub>b</sub>, A] voice as shown in Example 4.30.

Example 4.30. The voice leading in Bartók, *Suite*,  
Op. 14, No. 2, mm. 5-8 as it forms a cycle of  
semitones.

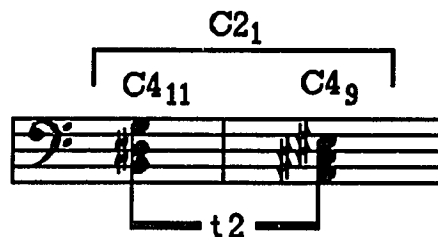


Measures 9 and following are a sequence of the opening measures, up a perfect fourth. Thus, the ascending fourth/descending fifth cycle 5/7 is operating once again, this time over an even larger structure. Measures 9-12 are an exact sequence of 1-4, but only measures 13-14 form an exact parallel to the materials in 5-8; measure 15 breaks the sequence by moving down a minor seventh from the previous measure ([F,Db,A] down to [G,Eb,Cb]) rather than the expected perfect fifth. A result of this is that the cycle of ascending semitones is also broken at this point: the voice leading to Ab moves [E,F,G(!),Ab].

These two measures (14-15) form a complete statement of one whole-tone collection, C2<sub>1</sub>. This is a unique spot in the opening sixteen measures; no other adjacent measures in that passage form a complete whole-tone collection. The fact that measures 14-15 break the original sequence derives some meaning from the way that what it forms becomes a basis for

the following group of measures (17-24). In that following passage, pairs of measures unfold complete whole-tone collections through joining successive augmented triads at the distance of a major second as shown in Example 4.31.

Example 4.31. Bartók, *Suite*, Op. 14, No. 2, mm. 17-18 as they form a complete whole-tone collection by joining augmented triads separated by a whole step.



Over measures 17-24, successive pairs of measures unfold alternate whole-tone collections as shown in Example 4.32.

Example 4.32. The unfolding of alternate whole-tone collections in Bartók, *Suite*, Op. 14, No. 2, mm. 17-24.

The image displays two systems of musical notation, each consisting of two measures. The first system is labeled with '17' in a box above the first measure, and the two measures are labeled 'C<sub>21</sub>' and 'C<sub>20</sub>'. The second system is labeled 'C<sub>21</sub>' and 'C<sub>20</sub>' above its respective measures. Each measure is shown on a grand staff (treble and bass clefs) with a piano keyboard diagram below it, illustrating the specific notes and their positions on the keyboard.

Each of those measure pairs is joined to the next by an ascending perfect fifth, forming the interval cycle shown in Example 4.33. Note that this interval cycle is the same one which generated successive measures at the opening of the movement.

Example 4.33. The cycle of interval 7 formed by alternate measures in Bartók, *Suite*, Op. 14, No. 2, mm. 17-25 (downbeat).

The image displays two systems of musical notation for piano. The first system begins at measure 17, marked with a boxed '17' above the treble clef. The second system continues the piece. Below the staves, a horizontal line represents the bass line with notes labeled: C5/7, B, F#, C#, G#, and Eb (=D#).

Just as in the opening measures, these configurations form a hierarchy of interval cycles. Each measure is a product of interval cycle 4; each pair of measures is separated by interval cycle 2; and successive pairs of measures are separated by interval cycle 7, as shown in Example 4.34. Thus, the whole-tone subset C4 is operated

upon by the even-numbered C2 yielding members within that same whole-tone collection, and then this figure is operated upon by the odd-numbered C7 which yields members from the other whole-tone collection.

Example 4.34. The hierarchy of interval cycles in  
Bartók, *Suite*, Op. 14, No. 2, mm. 17-25.

17

The image displays two systems of musical notation. The first system, starting at measure 17, consists of a treble and bass staff connected by a brace. Below the bass staff is a diagram illustrating interval cycles: C4, C2, and C5/7. The second system is a similar musical notation without the diagram below it.

Measures 25-30 bring an end to the progression by ascending perfect fifth and its concomitant alternation of whole-tone collections. These measures remain frozen on C2<sub>1</sub>

with Eb as the end of the cycle of perfect fifths which began with B in measure 17.

Measures 31-48: Semitone dyads combined  
at t5: eight-measure sequence at t5

The upbeat to measure 31 introduces a new phase of the movement. The two pitches G# and A which continue through the following measures immediately signal a shift: they are the first pitches to be sounded simultaneously and they are the first to be repeated in succession. In addition, the semitone that separates them indicates a clear break from the whole-tone character of measures 25-30, and is only suggested in the opening measures by the semitone cycle discussed above (e.g. [G,Ab,A,Bb] in mm. 1-4). This repeated note-pair [G#,A] becomes part of an accompanimental pattern in measures 33 and following. In the first eight-measure phrase (mm. 33-40), [G#,A] is joined with [C#,D] to form the accompaniment; in other words, the dyad [1-11] is combined with itself at t5. Since t5 is an inversion of t7, this also relates to the cycle 7 operations from earlier measures. The t5 relationship occurs again between measures 33-40 and 41-48: the latter is a sequence of the former down a perfect fourth. One consequence of this pattern is that the pitches in the accompaniment throughout these measures join the two cells [G#,A,C#,D] and [D#,E,G#,A]. These cells overlap to form the

collection [D#,E,G#,A,C#,D]--a pattern of dominated by semitones separated by major thirds [1-4-1-4-1-1].

The material that all of this accompanies (in measures 33 and following in the left hand) is much less obviously connected to the interval cycles. The total collection of pitch-classes in this passage forms no cyclic structure. However, there are several unifying characteristics here. For one, all of the simultaneous note-pairs form statements of interval-class 4--major thirds or their inversion, minor sixths. In addition, the cycle-5 operation found in the right hand occurs here as a melodic detail at the beginning of each four-measure group: Eb-Bb in measures 33-35 and 37, and Bb-F in measures 41-43 and 45.

#### Measures 49-56: Retransition

Measures 49-56 act as a retransition, using segments of the chromatic scale in separate voices, such as [A#,B,B#,C#] in the bass.

#### Measures 57-64: Semitone cycles

This leads to measures 57 and following, which return to material like that at the opening. Measures 57-64 present a texture like that in measures 1 and following, yet now each measure contains only one pitch-class. Nonetheless, the cycle of semitones controls these measures as well. Measures

57-60 present a descending cycle of half steps from E down to C# as shown in Example 4.35.

Example 4.35. The descending cycle of semitones in  
Bartók, *Suite*, Op. 14, No. 2, mm. 57-60.

57

*ff marcatisissimo*

C1 descending

The following four measures, 61-64, move in the opposite direction through the same cycle from F up to G# as shown in Example 4.36.

Example 4.36. The ascending cycle of semitones in  
Bartók, *Suite*, Op. 14, No. 2, mm. 61-64.

61

*p*

C1 ascending

Measures 65-71: Cycle 7.

cell z, and cycle 1

The music in measures 65 and following makes a return to the cycle 7 operation and injects some new relationships as well. From downbeat to downbeat in measures 65-68 the pitch-classes are related by ascending perfect fifths (cycle 7) as shown in Example 4.37.

Example 4.37. The cycle of interval 7 as it generates mm. 65-68 from Bartók, *Suite*, Op. 14, No.

2.

The musical score consists of two staves (treble and bass clef) and a chord diagram below. A box labeled '65' is positioned above the first measure. The first measure is marked with a forte (*f*) dynamic. The second and third measures are marked with fortissimo (*ff*). The score shows a sequence of notes in the right hand and bass notes in the left hand, with a tritone interval highlighted in the first three measures. A chord diagram for C5/7 is shown below the first measure.

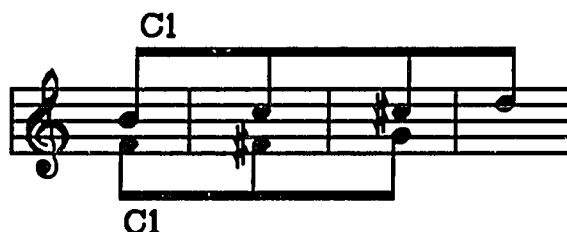
Indeed, each of the first three measures of this group is part of a sequence by perfect fifths. The contents of each of those measures (a tritone), when concatenated in such a manner, produces two overlapping statements of cell Z (see Example 4.38).

Example 4.38. The statements of cell Z produced in  
Bartók, *Suite*, Op. 14, No. 2, mm. 65-67.

The image shows a musical score for two staves (treble and bass clef) with a grand staff brace on the left. A box labeled '65' is positioned above the first measure. The treble staff contains a sequence of notes: a whole note G4, a quarter note A4, a quarter note B4, and a quarter note C5. The bass staff contains a sequence of notes: a whole note F3, a quarter note G3, a quarter note A3, and a quarter note B3. A large bracket labeled 'cell z C66,7/0,1' spans the second and third measures of both staves. A smaller bracket labeled 'cell z C65,6/11,0' spans the first measure of both staves. Below the bass staff, there are three vertical stems with horizontal lines, representing a simplified notation of the bass line notes.

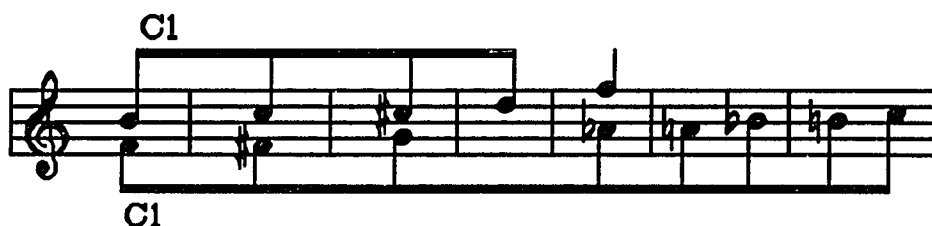
Another process which transpires in measures 65 and following involves a cycle of semitones once again. In a manner similar to that in the opening measures of the movement, the voice leading from measure to measure produces parallel chromatic lines: [F, F#, G] and [B, C, C#, D] as shown in Example 4.39.

Example 4.39. The parallel ascending cycles of semitones in Bartók, *Suite*, Op. 14, No. 2, mm. 65-68.



The [F, F#, G] line continues in measures 69-71, arriving on C in measure 71. This entire line is shown in Example 4.40.

Example 4.40. The ascending cycle of semitones in Bartók, *Suite*, Op. 14, No. 2, mm. 65-71.



Pitch-class C is an important point of arrival--it forms the pedal point for all of measures 73-122.

Measures 73-80: The five-flat  
diatonic collection segmented into  
whole-tone and symmetrical subsets

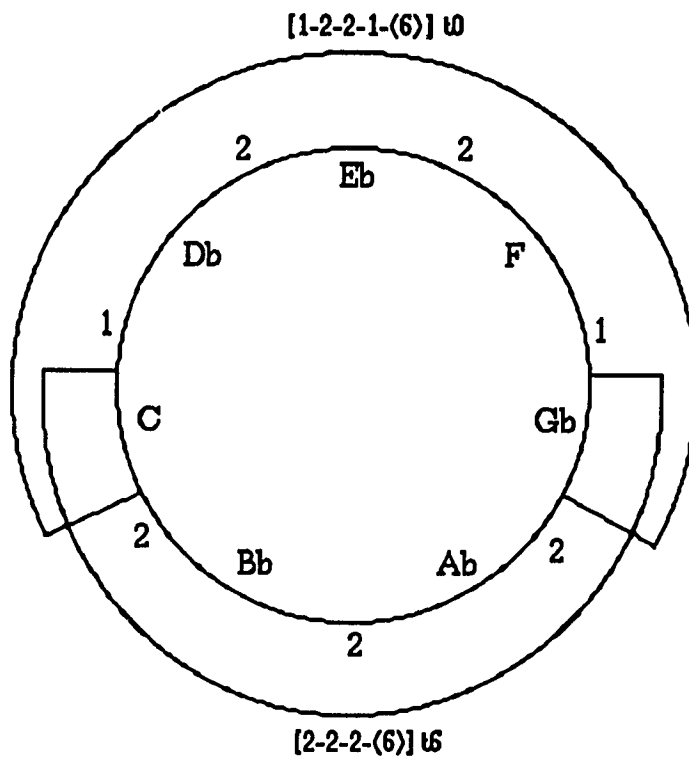
There is a short passage from measure 73 through measure 80 in which the C is embellished by grace notes. The first three of these grace-note groups when joined with the C form the whole-tone segment [Gb,Ab,Bb,C]. The last grace-note group (in measure 80) adds [Db,Eb,F,G] to these pitch-classes, resulting in the five-flat diatonic collection [C,Db,Eb,F,Gb,Ab,Bb]. The pitches in the right hand in measures 73-79 conform to this, with the exception of Cb which conflicts with the C in the left hand. However, because C functions as a pedal point and because Cb is placed on the weak third beat, the C acts as a referential pitch-class in this passage. This interpretation is also supported by the change which takes place for the final statement of the of the right-hand figure in measure 80, where Cb is replaced by Db.

Note that in measures 73-80 Bartók has partitioned the diatonic collection into two subsets which overlap at pitch-class C, and that the partitioning results in an extraction of the whole-tone subset [Gb,Ab,Bb,C] [2-2-2-(6)]t6 and the symmetrical subset [C,Db,Eb,F,Gb] [1-2-2-1-(6)]t0 as shown in Example 4.41.

Example 4.41. The five-flat diatonic collection partitioned into one whole-tone and one symmetrical subset.

The musical notation shows a five-flat diatonic collection (B-flat major) on a bass clef staff. The notes are B-flat, C, D-flat, E-flat, F, G-flat, and A-flat. The collection is partitioned into two subsets:

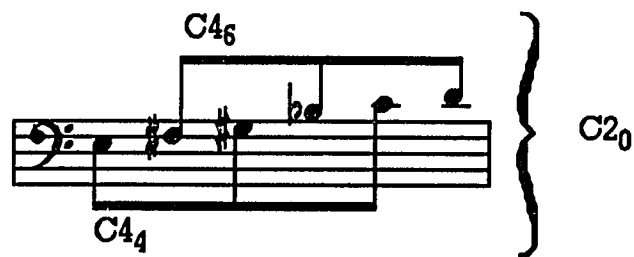
- The lower subset, labeled  $[2 - 2 - 2 - (6)] \text{t}5$ , consists of the notes B-flat, C, and D-flat.
- The upper subset, labeled  $[1 - 2 - 2 - 1 - (6)] \text{t}0$ , consists of the notes E-flat, F, G-flat, and A-flat.



Measures 81-122: Whole-tone collection  
formed from two augmented triads

The whole-tone subset [Gb,Ab,Bb,C] is important at this point in the movement because it becomes part of the whole-tone collection  $C2_0$  which forms the basis of the following section, measures 81-122. In this next passage, as in earlier ones (mm. 14-15 and 17-30), two augmented triads are joined at the interval of a major second to produce a complete whole-tone collection. As shown in Example 4.42, the ostinato pattern in this section joins the triads [F#,Bb,D] and [E,G#,C], producing [E,F#,G#,Bb,C,D,E] or  $C2_0$ .

Example 4.42. The augmented triads [F#,Bb,D] and [E,G#,C] as they form  $C2_0$  in Bartók, *Suite*, Op. 14, No. 2, mm. 81-121.



Measures 86-107: Melodic materials from  $C2_0$

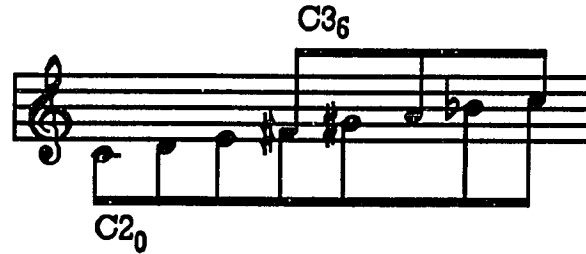
The melodic materials in measures 86-107 are also part of the whole-tone collection  $C2_0$ , with the exception of some of the grace notes: Eb in measures 86 and 88-90; E# in measures

92 and 94; and the E# and G in measures 96 and 102. These embellishments leave essentially undisturbed and perhaps even enhance the whole-tone structure of this passage.

Measures 108-16: The added pitch A forms  
a diatonic subset and a diminished triad

In measures 108-16, the sixteenth-note figures include the pitch A which does not belong to  $C2_0$ . This note appears only four times and only as a short note in a weak metric position. However, it is important to note two of its functions outside of the whole-tone structure in these measures. First, the pitches in the right hand, when joined by A here, form a segment of the three-sharp diatonic collection: [D,E,F#,G#,A]. Second, the A is always stated with pitch-classes F# and C, creating the diminished triad [F#,A,C]--a  $C3$  subset [3-3-6]. Thus, the whole-tone collection  $C2_0$  is hybridized by the addition of  $C3_0$  in the manner shown in Example 4.43.

Example 4.43.  $C3_0$  and  $C2_0$  as they join in Bartók,  
*Suite, Op. 14, No. 2, mm. 108-116.*



Measures 123-30: Return to augmented triads

The augmented triads in the accompaniment become the means of retransition to material like that at the opening. In measures 123 and following, the descending triad D, B $\flat$ , G $\flat$  that began the ostinato in measure 81 now begins a series of augmented triads which alternate whole-tone cycles. Whereas the augmented triads were concatenated at the distance of a descending perfect fifth at the beginning, this time the interval of sequence is a descending major sixth (interval-class 3--a minor third in inversion). Two characteristics remain: (1) there is still a semitone between the last pitch in each augmented triad and the first pitch in the next, but this time the semitone descends rather than ascends (e.g. G $\flat$  to F in measures 123-24); and (2) the successive augmented triads still form cycles of semitones in their voice leading, once again descending rather than ascending as shown in Example 4.44.



Measures 131-38: Sequence of  
[G,Ab,B,C] at the tritone

The next group of measures (131-38) introduces a slightly different pattern of pitch-classes. Measures 131-34 present the segment [G,Ab,B,C] [1-3-1-(7)]t7, which is a four note segment of the augmented scale [1-3-1-3-1-3]. If carried out to its completion in this context, it would yield the pitch-classes [G,Ab,B,C,D#,E]. However, that is not the case here. The pattern [G,Ab,B,C] from measures 131-34 undergoes a sequence at the interval of a tritone in measures 135-38, yielding [C#,D,E#,F#]. The F# is supplied by the first pitch in the grace-note group in measure 138 or by the F# in measure 134. I say "or" because it depends upon whether one's premise in this case is the sequence which takes place rhythmically, metrically, and registrally at the surface level of the composition, or if it is the sequence of *pitch-classes* which creates a larger collection through the combination of two smaller ones with identical interval content (i.e. transpositional combination). In the former case, the F# in measure 134 does not belong; one must look for it in measure 138 where it is missing on the downbeat and only supplied at best by the grace note F#. In the latter case, the F# in measure 134 is part of the larger collection [G,Ab,B,C,C#,D,E#,F#] which is a product of combining [G,Ab,B,C] [1-3-1-(7)]t7 with itself at the interval of a tritone. The interval series of this larger collection is

thus [1-3-1-1-1-3-1-1]t7, but its segmentation into [1-3-1-(7)]t7 and [1-3-1-(7)]t1 is significant both to this study in general and to the pitch structure of this passage in particular. See Example 4.46 for a graphic representation of this process.

Example 4.46. The collection [1-3-1-1-1-3-1-1]t7 as a product of combining [1-3-1-(7)] with itself at t7 and t1.

The diagram shows a musical staff with a treble clef. Above the staff, a bracket labeled 't6' spans the first six notes. Below the staff, two brackets labeled '[ 1 - 3 - 1 - (7) ]' are positioned above the first three and last three notes of the t6 segment. Below the staff, a single bracket labeled '[ 1 - 3 - 1 - 1 - 1 - 3 - 1 - 1 ]' spans the entire eight-note sequence. The notes on the staff are: G4 (fingering 1), Bb4 (fingering 3), A4 (fingering 1), B4 (fingering 1), C5 (fingering 1), B4 (fingering 3), A4 (fingering 1), G4 (fingering 1).

Measures 139-42: Cell z

The next four measures (139-42) form overlapping statements of cell Z in a manner similar to that in measures 65-67. The formations are highlighted in Example 4.47.

Example 4.47. The statements of cell Z produced in  
Bartók, *Suite*, Op. 14, No. 2, mm. 139-42.

138

1 *ff*

cell z  
C6<sub>4,5/10,11</sub>

cell z  
C6<sub>3,4/9,10</sub>

cell z  
C6<sub>2,3/8,9</sub>

Measures 147-54: Semitone dyads  
undergo t5 and C2 operations

After a short transitional passage in measures 143-46, a new section begins which has some ties to earlier measures and introduces some new material as well. This section starts in measure 147 and makes use of the semitone dyads first found in measures 31 and following. In measures 147-54, the right hand makes use of the dyads [F#,G] and [B,C]-- another case of operation by t5, this time one whole step lower than in measures 33 and following. This cell, [F#,G,B,C] [1-4-1-(6)]t6 is moved by sequence several times so that it appears at four different pitch levels altogether:

t6 in measures 147-54; t8 in measures 155-56; t10 in measures 157-58; and t0 in measures 159 and following. The succession of even-numbered transposition levels clearly shows an operation across a whole-tone collection. In simpler terms, the cells move up by whole step for each sequence. See Example 4.48 for a condensed representation of this process.

Example 4.48. The whole-tone sequence of [1-4-1-(6)] in Bartók, *Suite*, Op. 14, No. 2, mm. 147-162.

[1-4-1-6]t6 [1-4-1-6]t8 [1-4-1-6]t10 [1-4-1-6]t0

During this same passage, the left hand contains dyads comprised of tritones. The first is [C,F#] in measures 147-54; the second [Bb,E] in measures 155-56; the third [Ab,D] in measures 157-58; and the fourth [G,C#] in measures 159-62. This sequence moves down by whole step for the first three statements, but changes the pattern to a half step for the last move from [Ab,D] to [G,C#]. In general, these dyads move in opposite direction from the right-hand dyads, and do so in perfect symmetry for the first three statements in

measures 147-158. Example 4.49 shows a simplified representation of this process.

Example 4.49. The two diverging sequences in  
Bartók, *Suite*, Op. 14, No. 2, mm. 147-162.

The image shows a simplified musical notation for two diverging sequences. It consists of two staves, both labeled 'C2'. The top staff is in a treble clef and shows an ascending sequence of notes: C4, D4, E4, F4, G4, A4, B4, C5. The bottom staff is in a bass clef and shows a descending sequence of notes: C4, B3, A3, G3, F3, E3, D3, C3. The notes are connected by lines, indicating a continuous sequence.

Measures 163-74: Return to mm. 33-56 and  
descending C1 and C2; dyads continue,  
now under ascending C1 operation

The semitone dyads in the right hand continue into the next section, wherein the original material that they accompanied in measures 33 and following returns. This section begins like a restatement of that earlier section transposed down a minor third, until measure 169 where the left hand breaks the restatement by beginning a new process-- downward motion by interval cycle. Specifically, in the lowest voice the downbeats form the descending whole-tone



Example 4.52. The diverging voices in Bartók,  
*Suite, Op. 14, No. 2, mm. 168-174.*

The image shows two staves of musical notation. The top staff is labeled 'C2' and the bottom staff is labeled 'C1'. Both staves are in treble clef. The top staff contains a sequence of notes with various accidentals (sharps, flats, and double sharps) and a slur over the first three notes. The bottom staff contains a sequence of notes with various accidentals (sharps, flats, and double sharps) and a slur over the first three notes. The notation illustrates diverging voices in Bartók's Suite, Op. 14, No. 2, measures 168-174.

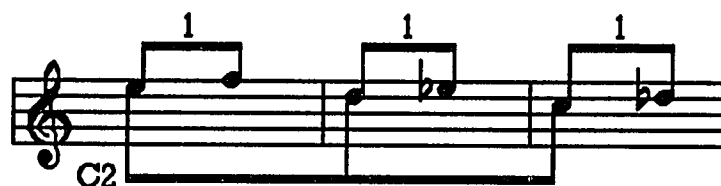
Measures 175-79: Diatonic materials

The progression of diverging cycles breaks between measures 174 and 175. In measure 175 and following, the pitch-class content suddenly becomes diatonic and the diverging voices move onward through the one-sharp collection to measure 179. Even one measure into the next section of the work, the F-natural in measure 180 does not disturb the diatonicism greatly; it merely suggests a shift to the white-key collection.

Measures 180-87: Return to materials like  
the opening: half- and whole-step patterns

But measure 180 does begin another phase of the composition. The brief appearance of diatonicism is over; cyclic progression reappears. Once again, patterns of whole and half steps occur as shown in Example 4.53.

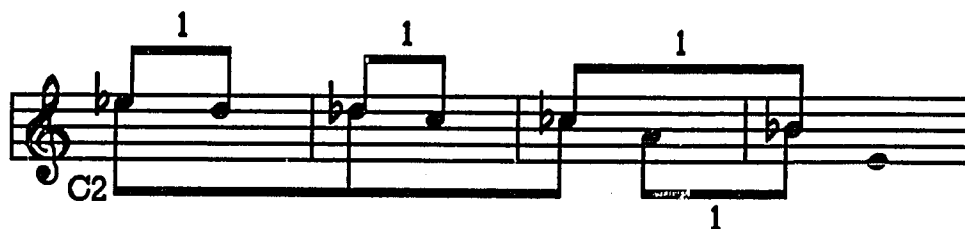
Example 4.53. The patterns of whole and half steps in Bartók, *Suite*, Op. 14, No. 2, mm. 180-82.



The pitches in the four-measure group from 180 through 182 also form a segment of the chromatic cycle [C,Db,D,Eb,E,F], thus offering an explanation for the Gb in measure 183 as the newest, highest pitch in this cycle.

Measures 184-87 form half- and whole-step patterns as well, as shown in Example 4.54.

Example 4.54. The patterns of whole and half steps  
in Bartók, *Suite*, Op. 14, No. 2, mm. 184-87.



These four measures, as the previous four, form a segment of the chromatic cycle, in this case [A, Bb, Cb, C, Db, D, Eb, E]. Also as in the previous four measures, the final pitch in the passage is interpreted as a result of adding one semitone above the other pitches.

Measures 186-223: Alternation  
between whole-tone collections

Measures 186-87 end this eight-measure group, but also begin a new process of alternation between the two whole-tone collections. The dyad [Cb, A] in measure 186 and the augmented triad [Cb, Eb, G] in 188 and 190 are subsets of C<sub>21</sub>, whereas the dyad [Bb, E] in measures 187 and 189 is a subset of C<sub>20</sub>. The Bb and E return in measures 191-206, although they are coupled with a complete statement of C<sub>21</sub> in the melody [Eb, F, G, A, Cb, Db] and bass notes [Db, G] in measures 194-203. This creates a conflict between the continuation of [Bb, E] as a subset of C<sub>20</sub> and the other voices which form C<sub>21</sub>.

However, as the melody continues in measures 204-206, it breaks momentarily from the whole-tone pattern, and this is immediately followed by the [Cb,Eb,G] triad in 207-211 which marks a clear return to C<sub>21</sub>. Measures 211-16 continue the alternation. In a threefold repetition of the two opening measures of the movement, they present two augmented triads at the distance of a perfect fifth. These triads, [B,Eb,G] and [E,Ab,C], are subsets of C<sub>21</sub> and C<sub>20</sub> respectively.

Finally, the last passage of the movement alternates between measures containing [A,Cb] and those containing [Bb]. This also continues the whole-tone alternation, with [A,Cb] as a subset of C<sub>21</sub> and [Bb] as a single representative of C<sub>20</sub>. Note the similarity to measures 186-87 which began this final process of alternating whole-tone collections. The entire passage from measure 186 through the end is summarized in Example 4.55.

Example 4.55. The alternation of whole-tone collections in Bartók, *Suite*, Op. 14, No. 2, mm. 186-223.

### Conclusion

As in Debussy's *Feux d'artifice*, we now see that the interval cycles play a fundamental role in the pitch organization of the second movement from Bartók's *Suite*, Op. 14. If the preceding commentary requires less discussion than that related to *Feux d'artifice*, it is only because this particular work of Bartók is more straightforward in its use of the interval cycles, less encumbered with tonal implications. Most of the passages in Op. 14, No. 2 are clear and obvious products of the interval cycles.

Once again, there is no large structural role played by the interval cycles in coordinating relationships among all the sections of the work. However, no other systematic approach comes as close to explaining the various collections and their successive connections.

## CHAPTER VI

### CONCLUSION

In discussing at the outset of this dissertation the affinity between Bartók and Debussy, I contended that certain principles of pitch organization lie at the heart of a community of practice between the two composers. I have shown that the interval cycles and related collections operate in local and structural roles in the music of both composers, and that many of those roles are quite similar. I have also shown that some uses of the interval cycles are peculiar to the music of Debussy and are characteristic of his praxis.

Much research on Bartók has already centered on his use of the interval cycles. As I noted in the Introduction, earlier studies such as those by Perle and Treitler and the more recent writings of Antokoletz and Cohn--among others--have investigated Bartók's use of the interval cycles. In this study, I have sought to add to this body of knowledge about Bartók in two ways: (1) by drawing direct parallels between Bartók's practice and that of Debussy, and (2) by

investigating more fully Bartók's earlier music composed while Debussy was still living.

Of course, both of these are open-ended pursuits. The earlier chapters of this dissertation draw a number of interesting parallels between the two composers' use of the interval cycles. There are, no doubt, more to be found. And all of the preceding examples of Bartók's practice have been taken from earlier works, thus adding particularly to our knowledge about that period in his career.

The most comprehensive analysis of Bartók's music presented here has been in Chapter IV--of the second movement from the *Suite*, Op. 14. The interval cycles play an essential role in this work: they form the basis for most of the surface-level collections and underlie many of the voice-leading and foreground structural events.

For instance, the pitch-class collections that comprise the three-note groups at the opening and in similar passages are statements of C4. These groups are combined or extended in passages such as mm. 17-18ff., 81ff., and 97ff. to form C2 collections. The voice leading in passages such as the opening and mm. 168-74 is often generated by C1. Structural connections--at least those just beneath the foreground level--are often controlled by C2 (e.g. mm. 168-74) or C5/7 (e.g. mm. 1-4; mm. 17-25, alternate downbeats).

It should be clear by this point that the interval cycles are the principles of pitch organization in Bartók's *Suite*,

Op. 14, No. 2. Any connection to circle-of-fifths tonality would seem procrustean in the face of cyclic explanations of this movement.

I also stated in the Introduction to this dissertation that Debussy's celebrated use of the whole-tone collection-type is merely a specific case of a much more general practice. I have shown throughout this study that Debussy uses other interval cycles in a similar manner and just as pervasively as he does the whole-tone collection-type

In general, it has been my intention here to illuminate Debussy's compositional choices in terms of collections. I have shown how collections based on the interval cycles play an important role in his works. They appear frequently, and account for a vast amount of the nondiatonic materials he chose to include in various pieces.

With particular regard to *Feux d'artifice*, the interval cycles are intrinsic to the fabric of the composition. *Feux d'artifice*--among its other traits--is about the interval cycles. This is not to discount the importance of traditional tonal elements in Debussy's music. Throughout Debussy's oeuvre tonal elements play a role, even in a work such as *Feux d'artifice*. Nonetheless, there are specific passages and compositional devices which are either best explained or can only be explained by the interval cycles. For example, one can readily see that the pitch structures of

passages such as measures 1-16 or measures 35-38 are related much more directly to the interval cycles than to the circle-of-fifths tonal system.

In addition, I have shown how the interval cycles serve to connect some of the diatonic materials to one another. I have also demonstrated the connections between diatonic and interval-cycle generated collections, many of which are made through the strategic displacement of one or a group of pitch-classes, often with registral or pitch-cell connections pointing up the common tones.

Related to the above is my observation regarding the transformations of the two- and three-note motives: they appear in diatonic settings until measures 35-38, where they are altered to conform to a whole-tone background. This seems to me an indication that Debussy treated the whole-tone collection-type on a footing equal to that of the diatonic collection. To state the case more strongly, he viewed both diatonic and whole-tone collections as precompositional and normative matrices against which musical materials may be projected. This is similar to Perle's view of a comparable passage in Schoenberg's Opus 11, No. 1; I quote extensively from Perle's discussion:

In the traditional tonal system every simultaneity and every progression is referable to a single type of chord structure, the triad, and to the complex of functional relations postulated in the concept of a "key center." There are no precompositional principles that comparably regulate simultaneity and progression in atonal music. . . . The term "reflexive reference" has been suggested to

describe an analogous situation in modern poetry: "Since the primary reference of any word-group is to something inside the poem itself, language in modern poetry is really reflexive."<sup>38</sup> . . . As in modern poetry, "reflexive reference" is entirely relevant and sufficient only as an explanation of an ideal, rather than an actual, musical condition. The existence of something that we identify as the "Tristan chord" suggests that in tonal music, too, it sometimes happens that "the primary reference of [a given chord] is to something inside the [composition] itself;" in atonal music, on the other hand, there may be normative and precompositional, as well as reflexive, referential elements. . . . In Schoenberg's Opus 11, No. 1, the initial thematic idea (ex. 67) is varied in contour and relative pitch content upon its first restatement (ex. 68). Every such variant in a tonal composition may be explained in terms of its harmonic meaning--a change in mode, a sequential shift that revises functional implications, and so on. A similarly non-reflexive explanation applies to example 68. A thematic idea that specifically appertains to the given composition is restated in terms of a general type of pitch-class collection.

## EXAMPLE 67

Mässige Schoenberg, Op. 11, No. 1

## EXAMPLE 68

Ibid.

Bars 9-10 unfold a five-note segment of one of the two whole-tone cycles plus one "odd," or "dissonant," note; the latter anticipates the change of harmony in bar 11 to a four-note segment of the alternative whole-tone cycle and "resolves" to the "missing" note of the first whole-tone cycle. . . . An economical way of describing [this] would be to say that the given passage is "in the whole-tone trope" (ex. 69).

## EXAMPLE 69



<sup>38</sup>Joseph Frank, *Spatial Form in Modern Literature*, in *Criticism: The Foundations of Literary Judgement*, ed. by Kark Schorer et al. (New York, Chicago, Burlingame: Harcourt, Brace and Wold, 1958), p. 383.<sup>1</sup>

Similarly, in *Feux d'artifice*, "a thematic idea [the two- and three-note motives] that specifically appertains to the given composition is restated in terms of a general type of pitch-class collection [once again, the whole-tone collection-type]." One can generalize that both Debussy and Bartók viewed as normative and precompositional the collections related to the interval cycles discussed in this dissertation.

\* \* \*

<sup>1</sup>Perle, *Twelve-Tone Tonality*, 162-63.

It is obvious that both Bartók and Debussy made use of the interval cycles during the first two decades of this century. With Debussy's passing, Bartók continued to use the cyclic procedures described by Antokoletz, Cohn, and others. Still, this early period remains as a time of exploration, experimentation, and shared practice.

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