

THE AESTHETICS OF MINIMALIST MUSIC AND A SCHENKERIAN-ORIENTED
ANALYSIS OF THE FIRST MOVEMENT “OPENING” OF PHILIP GLASS’

GLASSWORKS

Chia-Ying Wu, B.Ed., M.M.

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APPROVED:

David Schwarz, Major Professor
Stephen Slottow, Committee Member
Thomas Sovík, Committee Member
Eileen Hayes, Interim Chair, Division of Music
History, Theory and Ethnomusicology
James C. Scott, Dean of the College of Music
Michael Monticino, Interim Dean of the Robert B.
Toulouse School of Graduate Studies

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Philip Glass’ *Glassworks* (1981) is a six-movement composition for two flutes, two soprano saxophones/clarinets, two tenor saxophones/bass clarinets, two French horns, violas, cellos, and the DX7 electric piano. *Glassworks* consists of six movements titled “Opening,” “Floe,” “Island,” “Rubric,” “Facades,” and “Closing.” This thesis covers the first movement “Opening.”

Repetition in musical minimalism confronts traditional prescriptive codes of tonal music and post-tonal music. While challenging the traditional codes, repetition in musical minimalism established new codes for listening to minimal music. This thesis explores the implications of these ideas.

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CHAPTER 1

INTRODUCTION

Philip Glass' *Glassworks* (1981) is a six-movement composition for two flutes, two soprano saxophones/clarinets, two tenor saxophones/bass clarinets, two French horns, violas, cellos, and the DX7 electric piano. *Glassworks* consists of six movements titled "Opening," "Floe," "Island," "Rubric," "Facades," and "Closing."¹ The thesis focuses on the first movement "Opening."²

In Chapter 2, "The Aesthetics of Minimalism," I explore the origins of minimalism in music and sketch out a brief history of the development of minimalist music. After introducing the origins and the development of minimalist music, I discuss the aesthetics of musical minimalism in terms of the prescriptive codes of music listening. On the one hand, the chapter shows that persistent repetition in musical minimalism challenges the traditional prescriptive codes for listening to tonal and post-tonal music. On the other hand, the chapter shows that persistent repetition in musical minimalism stimulates the formation of a new prescriptive code of listening to minimal music.

¹ Philip Glass, *Glassworks*, authorized photocopy supplied by Music Sales Limited in 2003 from New York: Dunvagen Music Publishers, 1982, (London: Chester Music, 2003).

² In this thesis, I shall use the following system to denote pitches and pitch classes.

Pitch Classes	C \natural	C \sharp / D \flat	D \natural	D \sharp / E \flat	E \natural	F \natural	F \sharp / G \flat	G \natural	G \sharp / A \flat	A \natural	A \sharp / B \flat	B \natural
Pitch Class Numbers	0	1	2	3	4	5	6	7	8	9	10	11
Pitches (from middle C)	c \natural ¹	c \sharp ¹ / d \flat ¹	d \natural ¹	d \sharp ¹ / e \flat ¹	e \natural ¹	f \natural ¹	f \sharp ¹ / g \flat ¹	g \natural ¹	g \sharp ¹ / a \flat ¹	a \natural ¹	a \sharp ¹ / b \flat ¹	b \natural ¹

In Chapter 3, “Harmonic Analysis of *Glassworks*, First Movement ‘Opening,’” I begin with an introduction to “minimal” tonality and fundamental structure in Glass’ “Opening.” I define my terms “harmonic loop,” and “harmonic look breaker.” In my five-level Schenkerian-oriented analysis, I investigate the operations of “harmonic loops,” “harmonic loop breakers,” and the characteristics of the fundamental structure in “Opening.”

CHAPTER 2

THE AESTHETICS OF MINIMALIST MUSIC

Origins of Minimalism

According to Otto Karolyi, *minimalism* is a term that first appeared in the 1960s.³ It was first associated with the visual arts. American painters and sculptors reduced “materials, structure, and color to their most minimal elements.”⁴ For instance, some characteristics of minimalism in visual art can be found in John McLaughlin’s painting *Untitled* (see Example 1).⁵ In the painting, the structure is limited to two rectangles, and the colors are black and green. Viewers of the painting are free to look at minute details in a field void of recognizable objects. Similar concepts of minimal choices of materials can also be found in minimalist music.

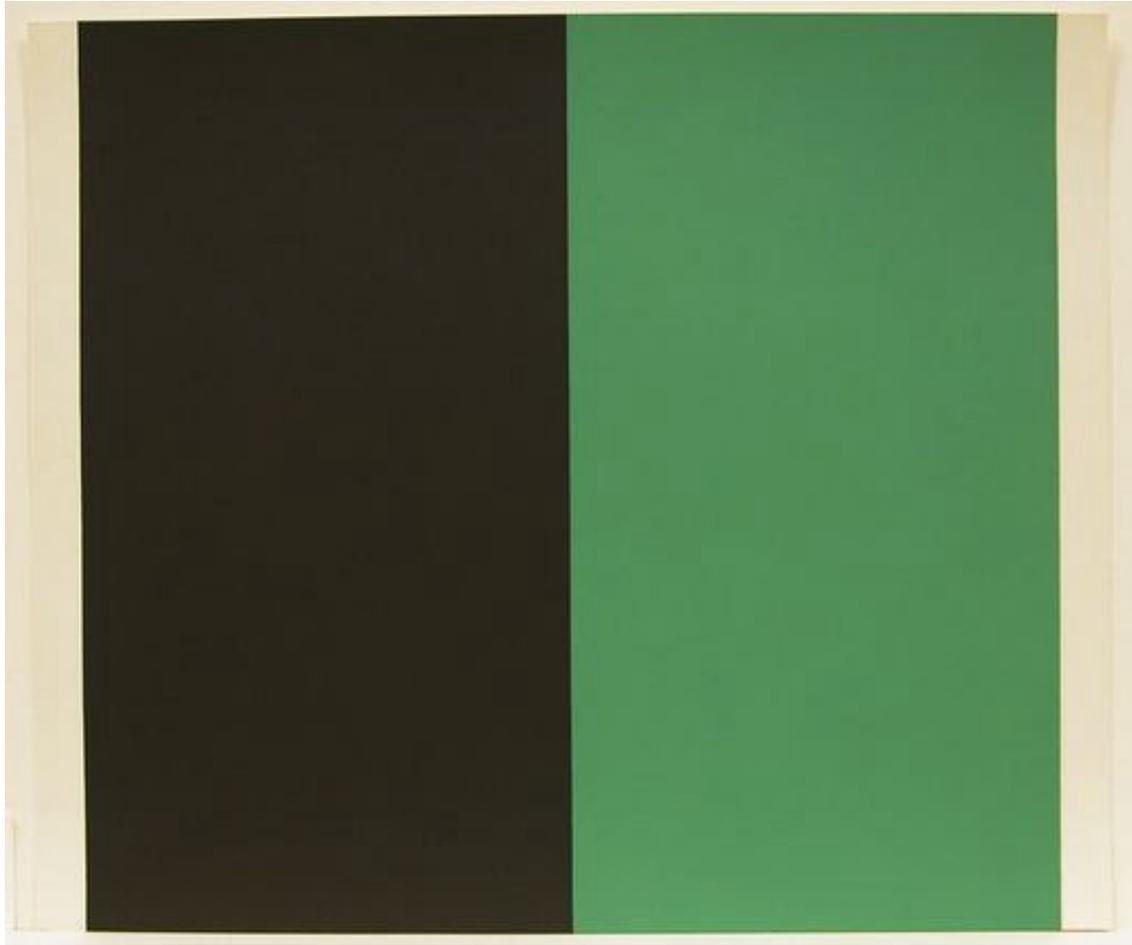
In the 1960s, young composers such as La Monte Young (b. 1935), Terry Riley (b. 1935), Steve Reich (b. 1936), Philip Glass (b. 1937), and others in the United States started to “limit themselves to the most basic musical elements.”⁶ According to Karolyi, these elementary musical elements included “a return to tonality and modality” with “minimum harmonic

³ Otto Karolyi, “The Minimalists: La Monte Young, Terry Riley, Steve Reich, Philip Glass and John Adams,” in *Modern American Music: from Charles Ives to the Minimalists*, (London: Cygnus Arts, 1996), 101.

⁴ Karolyi, 101.

⁵ John McLaughlin, *Untitled* (Los Angeles: Tamarind Lithography Workshop and, Tamarind Lithography Workshop, Inc., April 12-30, 1963), The Museum of Modern Art Online (MoMA) Collection, http://www.moma.org/collection/browse_results.php?object_id=75776 (accessed February 25, 2009). According to the MoMA web site, the reproduction of this painting *Untitled* is fair use which is permitted. The following is the definition of fair use from the MoMA web site. “Fair use of copyrighted material includes the use of protected materials for noncommercial educational purposes, such as teaching, scholarship, research, criticism, commentary, and news reporting. Unless otherwise noted, users who wish to download or print text, audio, video, image and other files from MoMA’s Website for such uses are welcome to do so without MoMA’s express permission. Users must cite the author and source of this material as they would material from any printed work; the citation should include the URL ‘<http://www.moma.org>,’” http://www.moma.org/about/about_site/index (accessed June 12, 2009).

⁶ Robert P. Morgan, “A Return to Simplicity: Minimalism and the New Tonality,” in *Twentieth-Century Music*, (New York: W.W. Norton, 1991), 424.



Example 1: John McLaughlin's Painting *Untitled* (1963)

movements,” and “obstinate repetitions of rhythmic patterns and small diatonic melodic units.”⁷ I believe Karolyi uses the adjective “obstinate” to describe composers’s strong insistence of choosing materials on a minimal basis. Moreover, they were willing to “free the music from the accumulated weight of western conventions, [and] start again from ground zero.”⁸ To some degree, I believe that minimalism in music can be considered as a “reset” button of the musical operating system.⁹

⁷ Karolyi, 101.

⁸ Morgan, 424.

⁹ Terms other than “minimalism” are chosen by Michael Nyman, Eric Salzman, and others to describe the phenomena of minimalism in music. For example, English composer and writer Michael Nyman “first used the term ‘minimal music’ or its American derivation ‘minimalist music’” to describe the minimalism phenomena in the music

The Development of Minimalist Music

Despite the fact that Karolyi claims that the term minimalism first appeared in the 1960s, music with minimal quality can be observed in La Monte Young's works in the late 1950s.¹⁰ La Monte Young is considered "the leading figure of minimalism's earliest stage."¹¹ Karolyi claims that Young is "generally considered to be the founder of minimalism in music."¹² Young's early works focus on long sustained notes.¹³ For instance, in Young's *Trio for Strings* (1958), sustained notes can be found in violin, viola, and cello (see Example 2).¹⁴ In Example 2, in mm. 1-46, violin, viola and cello enter one by one with the order of pitch classes 1→3→2. After sustaining for about 15 measures, the voices drop out one by one with the order of pitch classes 2→3→1. On the one hand, the order of pitch class entries (1→3→2) and exits (2→3→1) is symmetrical. On the other hand, pitch class 2 is centered by pitch classes 1 and 3 (i.e. 1 2 3). Moreover, pitch d is centered by pitches c[#] and e^b (see Example 3). Meanwhile, the motivic activity in Example 2 is scaled down to a minimal level to reveal the subtle changes of single notes and chords. Instead of using long sustained notes, Terry Riley composes with melodic patterns.

of La Monte Young, Terry Riley, Steve Reich, and Philip Glass. See Michael Nyman, *Experimental Music: Cage and Beyond*, (New York: Schirmer Books, 1974), 179, and see Milos Raickovich, "Einstein on the Beach by Philip Glass: A Musical Analysis," Ph.D. diss., (City University of New York, 1994), 2-3. Alternative terms such as "trance music," "repetitive music," "pulse music," and "musical minimalism" are often associated with minimalism in music. For the terms "trance music," "repetitive music," and "pulse music," see Raickovich, 3. For the term "musical minimalism," see Eric Salzman, "Minimalism," in *Twentieth-Century Music: An Introduction* (Englewood Cliffs, NJ: Prentice Hall, 1988), 215.

Moreover, Otto Karolyi considers John Adams (b. 1947) as "only partially a minimalist," since Adams regards himself as a "romantic composer" who uses certain minimalist techniques such as "repetition of small units and strong sustain pulse" (Karolyi, 114).

¹⁰ Otto Karolyi, "The Minimalists: La Monte Young, Terry Riley, Steve Reich, Philip Glass and John Adams," in *Modern American Music: from Charles Ives to the Minimalists* (London: Cygnus Arts, 1996), 101. See the following discussion of Young's *Trio for Strings* (1958).

¹¹ Morgan, 424.

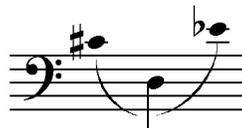
¹² Karolyi, 102.

¹³ Morgan, 424-25.

¹⁴ David Toub, "La Monte Young: *Trio for Strings* (1958)," The David-Toub Blog— David's Waste of Bandwidth, entry posted March 8, 2008, <http://homepage.mac.com/dtoub/blog/C1162157567/E20080308122050/index.html> (accessed February 25, 2009).



Example 2: La Monte Young, *Trio for Strings* (1958), mm. 1-51



Example 3: Relations among $c\sharp^1$, d , and $e\flat^1$ in *Trio for Strings*

Terry Riley, who was classmates with Young at the University of California, Berkeley, “may have been the first composer” to compose exclusively with “repeating melodic segments” in the early 1960s.¹⁵ For instance, Riley uses 53 repeating melodic segments in his composition *In C* (1964).¹⁶ The score of *In C* contains 53 melodic segments notated on a one-page ledger size paper (11" × 17") to be performed by any ensemble. These 53 segments are played consecutively with unlimited iterations. The order of melodic segments in Riley’s *In C* is predictable, while the timing of the changes of melodic patterns is less predictable. Based on these two factors, I would characterize *In C* as a quasi-chance music. On top of the 53 melodic segments, a “1/8 note pulse”

¹⁵ Morgan, 425.

¹⁶ Terry Riley, *In C* (United States: s.n., 1964).

is “played on the high C’s of the piano or on a mallet instrument.”¹⁷

In C has two features, a centricity of a certain melodic group, and the pitches within the group (see Example 4).¹⁸ In Example 4, the melodic group, which consists of e¹, f^{♯1}, g¹ and a¹, is



Example 4: Terry Riley, *In C*, Melodic Segments 22 to 26

emphasized in segments 22 to 26. Each member of the group is emphasized in turn. For example, e¹ is emphasized with five consecutive dotted quarter notes in segment 22; f^{♯1}, g¹ and a¹ are emphasized in a similar manner in segments 23, 24, 25 and 26, respectively. Riley and Steve Reich both use repeating melodic patterns, but Reich’s compositional treatment of melodic patterns is slightly different than Riley’s.

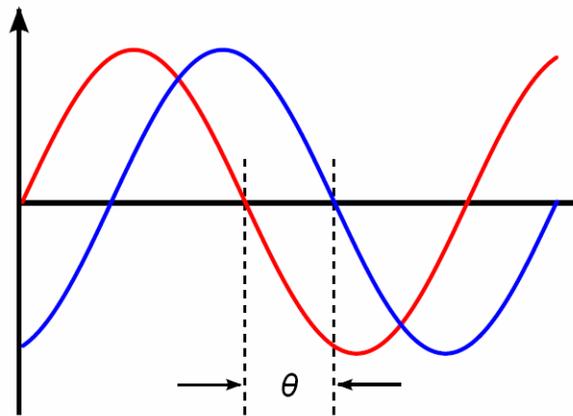
In the middle 1960s, Reich was the first to experiment with *phase shifting* in melodic patterns and instrumental works.¹⁹ In physics or acoustics, phase shifting involves a shift of phase between two identical waves (see Example 5).²⁰ In Example 5, in order to clearly show the two identical waves separating from each other, the colors red and blue are assigned to both waves. The blue wave has been fallen behind the red wave by a time interval of θ (seconds or minutes). That is to say, both waves are out of phase by a time interval of θ . If the time interval

¹⁷ Riley, “Performing Directions,” in *In C*. The pulse is not notated in the score, but mentioned in the performing directions of *In C*.

¹⁸ Riley, *In C*. Example 4 is taken from a scanned score of *In C*.

¹⁹ Morgan, 427.

²⁰ Peppergrower, “Two Sinusoidal Waves Offset from Each Other by a Phase Shift θ ,” Wikipedia Web Image made by user Peppergrower, image uploaded on February 21, 2009, http://en.wikipedia.org/wiki/File:Phase_shift.svg (accessed March 16, 2009).



Example 5: Two Waves Offset by a Phase Shift θ

continues to increase, at some point, the blue wave should be matched exactly with the red wave. In other words, both waves will be back in phase.

While phase shifting in physics or acoustics involves two identical waves, phase shifting in music includes two identical melodic patterns playing at the same tempo in the beginning, and gradually adjusting their tempi “at slightly different speeds.”²¹ Under this circumstance, the repetitions will slightly go “out of phase,” and “eventually arrive again at synchronization.”²² For instance, Reich applies the phase shifting technique in *Piano Phase* (1967) for two pianos (see Example 6).²³ In Example 6, the melodic pattern in Rehearsal Number 1 is assigned to two pianos. The pattern can be subdivided into two segments (see Example 7). In Example 7, the melodies for the right hand and left hand are shown in two staves. The melodies for the left hand are identical in Segment A and Segment B. The melody for the right hand in Segment B continues the alteration of pitch classes 1 and 6 in Segment A with a shift. That is to say, an ascending perfect fifth in Segment A becomes a descending perfect fifth in Segment B, and vice

²¹ Morgan, 427.

²² Morgan, 427.

²³ Morgan, Example XX-2, 427.

♩ = ca. 72
 Repeat each bar approximately number of times written. / Jeder Takt soll approximativ wiederholt werden entsprechend der angegebenen Anzahl. / Répétez chaque mesure à peu près le nombre de fois indiqué.

Example 6: Steve Reich, *Piano Phase*, Rehearsal Number 1 to 3

Example 7: Reproduction of *Piano Phase*, Rehearsal Number 1

versa. I shall explain how this melodic pattern works in Example 6.

In Example 6, Rehearsal Number 1, the first piano starts the melodic pattern. In Rehearsal Number 2, the second piano quietly joins the first piano with a fade-in effect, which generates a smooth voice-doubling. Near the end of Rehearsal Number 2, the second piano starts to accelerate slightly. In Rehearsal Number 3, the second piano is a note ahead of the first piano. That is to say, the two pianos are out of phase. Eventually, the two pianos will play in unison again. Since Example 6 does not show the final result of phase shifting, I will use my own hypothetical example to explain the complete process of phase shifting (see Example 8). In Example 8, A, B, and C are three musical segments in a melodic pattern played by both Voice 1

Stage 1:

Voice 1: A B C...etc.

Voice 2: A B C...etc.

Stage 2:

Voice 1: A B C A B C...etc.

Voice 2: A B C A B C...etc.

Stage 3:

Voice 1: A B C A B C A B C...etc

Voice 2: A B C A B C...etc

Stage 4:

Voice 1: A B C A B C A B C...etc

Voice 2: A B C A B C...etc

Example 8: Phase Shifting of Melodic Pattern “A B C”

and Voice 2.²⁴ Stage 1, 2, 3, and 4 represent a gradual and continuous process of phase shifting.

Stage 1 through Stage 4 shows the process of phase shifting. In Stage 1, both voices play in unison. In Stage 2, Voice 2 is a segment ahead of Voice 1. In Stage 3, Voice 2 is two segments ahead of Voice 1. Finally in Stage 4, Voice 2 is three segments ahead of Voice 1, but segment A in Voice 2 is now played together with Voice 1. In short, phase shifting is a process from in phase, to out of phase, and back in phase. Moreover, phase shifting can be understood as a continuous process from starting point, departure and return.

Since the middle 1960s, Steve Reich and Philip Glass have been “the two leading figures in the minimalist movement.”²⁵ Both Reich and Glass work with melodic patterns, but Glass had a different direction than Reich. In the later 1960s, Glass developed an additive technique in which basic melodic ideas are expanded through additive rhythmic processes.²⁶ In the process of

²⁴ Compare Example 7 with Example 8.

²⁵ Morgan, 427.

²⁶ Morgan, 431.

expanding, however, the expanded melodic idea occasionally contracts, and resets to its point of origin. For example, in Glass' *Strung Out* (1967) for amplified violin, both additive and subtractive rhythmic processes can be observed (see the scanned excerpt of *Strung Out* in Example 9).²⁷



Example 9: Philip Glass, *Strung Out* (1967), Opening Excerpt

In Example 9, the initial pentachord $[e^1, g^1, e^2, d^2, c^2]$ can be subdivided into a dyad $[e^1, g^1]$ and a trichord $[e^2, d^2, c^2]$. The pentachord can be expanded by adding an extra dyad, and subtracting c^2 from the trichord (see the hexachord following the initial pentachord). The pentachord can also be expanded by adding c^2 to the dyad, and d^2 to the trichords (see the septachord following the hexachord). The pentachord and septachord are the products of the additive process of the initial pentachord. In the second line, the septachord is contracted and reset to the initial pentachord from the first line. The pentachord in the second line is the product of the subtractive process of the septachord. That is to say, the piece revolves around the additive and subtractive processes of the initial pentachord.

Since 1975, Glass has turned his attention to stage works.²⁸ He revitalizes opera by

²⁷ Elliot Schwartz and Daniel Godfrey, "Process and Minimalism," in *Music since 1945: Issues, Materials, and Literature* (New York: Schirmer Books, 1993), Example 16.7, 331.

²⁸ Morgan, 431.

extending and reshaping it to “a more ceremonial, non-narrative, and ritualistic music theater.”²⁹ These three characteristics can often be found in Glass’ “three widely performed operas, *Einstein on the Beach* (1975), *Satyagraha* (1980), and *Akhmaten* (1983).”³⁰ For example, *Einstein on the Beach* has been known for its non-narrative structure, striking visual effects, and “epic proportions” accompanied by non-developmental, time-suspending music by Glass.³¹ *Einstein on the Beach* is shaped by continuous music and recurring visual elements instead of a “character development” or “conventional narrative.”³² Visual elements such as trains, rockets, gyroscopes and clocks are “associated with Einstein and his scientific discoveries” in an enigmatic manner.³³ All these elements are settled on a time-frame of almost five hours.³⁴ Based on the continuous music and the recurring visuals in *Einstein on the Beach*, K. Robert Schwarz considers Glass as a *maximalist*.³⁵ I believe the incorporation of minimal music and various visual effects over a vast time-frame in Glass’ *Einstein on the Beach* can be considered a departure from early minimalist music in the 1960s.

Jane Piper Clendinning claims that “early minimalist works in the 1960s have a modernist unity, and when minimalism enters its second decade (the 1970s), the diversity of elements in Reich, Glass, and Adams’s compositions led to a style sometimes referred as *maximal minimalism* in the 1980s and 1990s.”³⁶ Early minimalist works in the 1960s retain their modernist unity by integrating a single compositional technique into continuous musical repetitions. For example, Riley employs repetitions of melodic segments into *In C*; Reich applies

²⁹ Morgan, 432.

³⁰ Morgan, 431.

³¹ K. Robert Schwarz, *Minimalists* (1996, reprint, London: Phaidon, 2008), 130.

³² Schwarz, 131.

³³ Schwarz, 130.

³⁴ Schwarz, 130.

³⁵ Schwarz, 129-168.

³⁶ Jane Piper Clendinning, “Postmodern Architecture/Postmodern Music,” in *Postmodern Music/Postmodern Thought*, edited by Judy Lochhead, and Joseph Auner (New York: Routledge, 2002), 130. Clendinning does not define the term *maximal minimalism* nor state the origins of maximal minimalism.

phase-shifting technique to *Piano Phase* for two pianos; Glass introduces additive or subtractive rhythmic processes into *Strung Out*. The modernist unity of minimal music in the 1960s has been challenged by the various visual elements in Glass' *Einstein on the Beach* in 1975. I believe Glass' *Einstein on the Beach* might initiate a motion toward maximal minimalism which can be considered a manifestation of postmodernism. According to Frederic Jameson, postmodernism establishes itself "as specific reaction against the established form of high modernism."³⁷

In this section, I have discussed musical minimalism in terms of compositional techniques and modernist unity. Musical minimalism has also confronted post-tonal unity and tonal unity. In the next section, I shall explore these two kinds of unity in terms of prescriptive codes of listening.

Musical Minimalism as a Departure from Traditional Prescriptive Codes

Kivy defines a prescriptive code as "a prescription of behavior," as "a restaurant imposes a dress code on its patrons."³⁸ According to Kivy, "a prescriptive code for listening" can be understood as an aesthetic attitude.³⁹ Peter Kivy claims that minimalism has broken from the traditional prescriptive codes for listening to post-tonal and tonal music.⁴⁰

The traditional prescriptive codes of tonal music are built upon "the balance between repetition and change, between redundant and unexpected" materials in major/minor tonality.⁴¹

³⁷ Fredric Jameson, "Postmodernism and Consumer Society," in *The Anti-Aesthetic: Essays on Postmodern Culture*, edited by Hal Foster (New York: Bay Press, 1983, reprint, New York: First New Press, 1998), 111. Postmodernism can also be understood as an "effacement" of the boundaries between "high-culture and the so-called mass or popular culture" (Jameson, 112). For example, it can be said that musical minimalism contains both characteristics of concert music and vernacular music. Moreover, postmodernism has become a feature of art, architecture, literature, and even geo-political and economic structures.

³⁸ Kivy, 44.

³⁹ Kivy, 53.

⁴⁰ Kivy, 61-67.

⁴¹ Kivy, 62.

The traditional prescriptive codes of post-tonal music, such as “twelve-tone atonalism” and “total serialism” of the Princeton School, are established by fully rejecting redundancy.⁴² Musical minimalism departs from the traditional prescriptive codes of total serialism and twelve-tone atonalism by embracing musical redundancy totally.⁴³ Musical minimalism confronts the traditional prescriptive codes of tonal music by total redundancy which tips the balance in tonal music in favor of a continuum of coordinated sonorities.⁴⁴ In this section, I shall investigate the impacts of musical minimalism on the traditional prescriptive codes for listening to, and perceiving form in tonal and post-tonal music.

Kivy applies American philosopher George Dickie’s definition of the traditional descriptive codes for listening to serious music (both tonal and post-tonal).⁴⁵ Dickie claims that when one “experiences a work of art he or she must pay close attention to the features relevant to *it*.”⁴⁶ Kivy claims that the highly repetitive and lengthy features of minimal music make it more difficult for listeners to retain undivided musical concentration.⁴⁷ For example, the performance of a raga from Southern India, which may last more than eight hours, reduces some listener’s ability to pay close attention during the performance.⁴⁸ On the one hand, due to the limitation of a listener’s physical energy, one may feel exhausted after hours of concentrated listening. On the other hand, the continuous repetitions of similar musical contents may have hypnotizing effects on some audiences. Under these two circumstances, a performance exceeding eight hours may become a challenge to the traditional prescriptive code of listening.

⁴² Kivy, 62. I believe Kivy uses the term “twelve-tone atonalism” to describe the atonal quality within twelve-tone compositions.

⁴³ Kivy, 62.

⁴⁴ Kivy, 62.

⁴⁵ Kivy, 55.

⁴⁶ George Dickie, “The Myth of the Aesthetic Attitude,” *American Philosophical Quarterly* Vol. 1, no. 1 (January, 1964): 56-65.

⁴⁷ Kivy, 65.

⁴⁸ Kivy, 65.

According to Peter Kivy, internal repetition in tonal music of the 17th, 18th, and 19th century (also known as music of the common-practice era) creates expectation of musical ideas (such as motives or passages) “within a reasonable period of time.”⁴⁹ For example, internal repetitions of a musical composition from the common-practice era make us aware of the musical form, one of the identifiers of the piece. For example, the recurring A section in Mozart’s “Romanze” from *Eine Kleine Nachtmusik*, K. 525, reminds the audience of the characteristics of rondo (see Example 10).⁵⁰ In Example 10, the recurring A Sections are shown in brackets, other sections are shown without brackets. The return of a complete A Section or materials from A Section are distinguished from other contrasting sections, Section B, Section C and Coda. That is to say, the repetitions of the A Section confirm the form of rondo, A-B-A-C-A-Coda, in Mozart’s “Romanze.” If this movement by Mozart were composed in a minimalist style, the contrasting B, C and Coda sections would most likely be eliminated. As a result, the “intended effects” of repeating A sections in the rondo form would not exist.⁵¹ In other words, the repetitions within minimal music affect the audience’s expectation of a musical form.

Musical Minimalism as an Establishment of New Prescriptive Codes

While breaking the traditional codes, I believe musical minimalism also creates a new prescriptive code for listening. Some of the compositional designs in minimal music may make some audiences turn their attention to the process of the composition instead of the product. The very slight (or slow) changes rhythm, texture, harmony, (or motive) changes become “the main

⁴⁹ Kivy, 63.

⁵⁰ Free-scores.com, “Free sheet music : Mozart, Wolfgang Amadeus - Eine Kleine Nachtmusik, K. 525 (String Quartet : Score, Violin I, Violin II, Viola, Cello),” Free sheet music website, <http://www.free-scores.com/download-sheet-music.php?pdf=1588> (accessed February 25, 2009).

⁵¹ Kivy, 63-4.

ROMANZE A Section

Andante

The first system of the musical score for the Romanze A Section. It consists of three staves: a treble clef staff for the violin, an alto clef staff for the viola, and a bass clef staff for the cello and double bass. The music is in 3/4 time and begins with a piano (*p*) dynamic. The first staff features a melodic line with slurs and accents, while the lower staves provide harmonic support with sustained notes and rhythmic patterns. A forte (*f*) dynamic marking appears in the middle of the system.

The second system of the musical score. It continues the three-staff arrangement. The first staff shows a melodic line with a crescendo (*cresc.*) marking. The lower staves continue their harmonic accompaniment. A piano (*p*) dynamic marking is present in the middle of the system.

B Section

The third system of the musical score, starting at measure 12. It features the same three-staff layout. The first staff begins with a fortissimo piano (*fp*) dynamic. The music continues with melodic and harmonic development. A piano (*p*) dynamic marking is used in the middle of the system.

The fourth system of the musical score, starting at measure 18. It continues the three-staff arrangement. The first staff shows a melodic line with a forte (*f*) dynamic. The lower staves provide harmonic support. A piano (*p*) dynamic marking is present in the middle of the system.

The fifth system of the musical score, starting at measure 23. It continues the three-staff arrangement. The first staff shows a melodic line with a forte (*f*) dynamic. The lower staves provide harmonic support. A piano (*p*) dynamic marking is present in the middle of the system.

Example 10: Mozart, *Eine Kleine Nachtmusik*, K. 525, "Romanze"

A Section

Musical score for measures 28-34. The score is written for four staves: Treble, Alto, Tenor, and Bass. It features a complex rhythmic pattern with many sixteenth and thirty-second notes. A dynamic marking of *f* (forte) is present at the end of the section.

C Section

Musical score for measures 35-39. The score is written for four staves. It features a complex rhythmic pattern with many sixteenth and thirty-second notes. Dynamic markings include *f* (forte) and *p* (piano).

Musical score for measures 40-43. The score is written for four staves. It features a complex rhythmic pattern with many sixteenth and thirty-second notes. Dynamic markings include *fp* (fortissimo piano).

Musical score for measures 44-47. The score is written for four staves. It features a complex rhythmic pattern with many sixteenth and thirty-second notes. Dynamic markings include *fp* (fortissimo piano).

A Section

Musical score for measures 48-54. The score is written for four staves. It features a complex rhythmic pattern with many sixteenth and thirty-second notes. Dynamic markings include *f* (forte).

Example 10 (Continued)

52

57

62

68

p *f* *cresc.* *p* *f* *cresc.* *p* *f* *cresc.* *p* *f* *cresc.*

Coda

Example 10 (Continued)

event” in minimal music.⁵² For example, in the opening segment of Philip Glass’ *Strung Out* (see Example 9), the five pitches e^1 , g^1 , e^2 , d^2 , and c^2 remain for two lines. After the second line,

⁵² Timothy A. Johnson, “Minimalism: Aesthetic, Style, or Technique?” *The Musical Quarterly* Vol. 78, no. 4 (Winter 1994): 744.

any addition or subtractions to these pitches will become a main event in the piece. Secondly, due to the minimal choice of materials, some audiences may turn their attentions to the process instead of product. In Glass' *Strung Out* (see Example 9), since the number of pitches is reduced down to five, some audience will turn their attentions to other factors such as the changes of figurations.⁵³

Moreover, the quasi-chance quality built within the repetitions of melodic patterns may direct attentions of some audiences to the process instead of product.⁵⁴ In Riley's *In C*, the iterations of the 53 melodic segments is not notated in the score. Instead, the iterations are decided by the performers during live performances. Since the iterations may be different from time to time, a performance (a product) of *In C* is less predictable for some audiences. When the product of *In C* is difficult to expect or comprehend, some audiences might turn their attentions to the changes (the process) among different melodic segments of *In C*.

In minimal art, for instance, John McLaughlin's Painting *Untitled* (see Example 1) does not resemble any known object, due to its minimal choice of materials. His painting turns the viewers' attentions to the painting's basic building blocks, color and shape. That is to say, in the new prescriptive code of minimal music, the process plays a more significant role than the product.

⁵³ Also see my discussion on *Strung Out* in "the Origins of Minimalism."

⁵⁴ Also see my discussion on quasi-chance quality of Riley's *In C* in "the Origins of Minimalism."

CHAPTER 3

HARMONIC ANALYSIS OF *GLASSWORKS*, FIRST MOVEMENT “OPENING”

Traditional Tonality and “Minimal” Tonality

Traditional Tonality in Schenkerian Analysis

One of the purposes of the Schenkerian analysis of tonal music from the common practice era is to assist us “to hear through the musical surface to the remoter structural levels and ultimately to the tonic (major/minor) triad itself.”⁵⁵ Synchronically speaking, the analytical processes of Schenkerian analysis provide a full view for analysts to seek a deep structure of the composition at one time. For example, a national interstate map can provide a full view of the interstate highway system for a driver or traveler at one glance. Diachronically speaking, the analytical processes of Schenkerian analysis give analysts opportunities to foresee a deep structure when the music progresses. For instance, when traveling on an interstate, drivers or travelers may relate their current position to a national interstate map.

In the realm of Schenkerian analysis, traditional tonality is often established within three types of fundamental structures. All three types of fundamental structures have their own fundamental lines over a harmonic framework I-V-I.⁵⁶ While those structures are widely known and understood, I diverge from them later in this chapter. Thus, I recapitulate them here in the

⁵⁵ Joseph N. Straus, “The Problem of Prolongation in Post-tonal Music,” *Journal of Music Theory* Vol. 31, no. 1 (Spring 1987): 1.

⁵⁶ Cadwallader and Gagné, 102-10 and 114-18. According to Cadwallader and Gagné, a fundamental structure includes a bass arpeggiation and a fundamental line. Bass arpeggiation indicates the motion of the bass line of a background level graph. The bass line arpeggiates the tonic triad “by moving from the root to the upper fifth and back again.” (Cadwallader and Gagné, 107). A fundamental line “refers to the descending stepwise upper voice of the fundamental structure.” (Cadwallader and Gagné, 108).

interests of clarity.

The first type of fundamental structure has a descending fundamental line starting with $\hat{3}$. Allen Cadwallader and David Gagné present the basic formation of this fundamental structure below (see Example 11).⁵⁷

Example 11: Basic Formation of Fundamental Structure Starting from $\hat{3}$

In Example 11, the fundamental line $\hat{3}-\hat{2}-\hat{1}$ is established over a harmonic framework I-V-I, and the fundamental structure starting from $\hat{3}$ can be reduced to the tonic triad.

The second type of fundamental structure has a descending fundamental line starting with $\hat{5}$. Cadwallader and Gagné present the basic formation of this fundamental structure below (see Example 12).⁵⁸ In Example 12, the fundamental line $\hat{5}-\hat{4}-\hat{3}-\hat{2}-\hat{1}$ is established over a harmonic framework I-V₇-I-V-I (or simply I-V-I), and the fundamental structure starting from $\hat{5}$ can be reduced to the tonic triad.

The third type of fundamental structure has a descending fundamental line starting with $\hat{8}$. Fundamental structures with a $\hat{8}$ fundamental line are rare.⁵⁹ Cadwallader and Gagné present the basic formation of this fundamental structure below (see Example 13a and 13b).⁶⁰

⁵⁷ Cadwallader and Gagné, Example 5.12, 116. This is an exact example scanned from Cadwallader and Gagné's book.

⁵⁸ Cadwallader and Gagné, Example 5.13, 116.

⁵⁹ Cadwallader and Gagné, 118.

⁶⁰ Cadwallader and Gagné, Example 5.15, 118. This is an exact example scanned from Cadwallader and

Example 12: Basic Formation of Fundamental Structure Starting from $\hat{5}$

Example 13a and 13b: Basic Formations of Fundamental Structure Starting from $\hat{8}$

In Example 13a and 13b, there are two possible basic formations of fundamental structure starting from $\hat{8}$. In Example 13a, the descending fundamental line starting from $\hat{8}$ is established over I-V-I. The eighth-note stem with flags indicate that the chord I_6 under $\hat{5}$ is designated as an intermediate chord to the dominant chord under $\hat{2}$.⁶¹ $\hat{7}$, $\hat{6}$, $\hat{4}$, and $\hat{3}$ are passing tones. In Example 13b, $\hat{7}$ and $\hat{4}$ become chord tones of V and IV while $\hat{6}$ and $\hat{3}$ are still passing tones.

Gagné's book.

⁶¹ Cadwallader and Gagné, 357. Cadwallader and Gagné point out the various functions of stems with flags (or flagged stems) in the appendix section of their book.

The curly-shaped slur that connects the bassline c^1 , f^1 , and g^1 under $\hat{5}$, $\hat{4}$, and $\hat{2}$ indicate the connection of the tonic, predominant chord (IV) and the dominant.⁶² Since the dominant is given more structural weight than the predominant, the fundamental structure is established over I-V-I-V-I (or simply I-V-I). Moreover, both complete basic formations of fundamental structure starting from $\hat{8}$ can be reduced to the tonic triad by reducing the arpeggiated bass line and passing tones in the treble staff.

The three basic types of fundamental structures at the background level in tonal music all have a descending fundamental line over a harmonic framework I-V-I. They can all be traced back to the tonic triad. These are the basic criteria that define tonality in common-practice music. I shall modify these assumptions as they relate to Glass' "Opening" of *Glassworks* in particular in the coming pages.

"Minimal" Tonality in Glass' "Opening"

"Minimal" tonality in Glass' "Opening" is established within a "minimal" fundamental structure. Unlike the fundamental structure in tonal music, the "minimal" fundamental structure is not established over a harmonic framework I-V-I. Instead, it is established over a prolonged F minor triad and the note f^1 . Moreover, in the "minimal" fundamental structure, the "minimal" fundamental line does not descend (see Example 14). In Example 14, the "minimal" fundamental structure is established over a prolonged tonic triad of F minor via the $\frac{5}{3}$ - $\frac{6}{4}$ neighboring motion.⁶³ The second $\frac{6}{4}$ can be understood as an incomplete neighboring motion following by f^1 in the treble without a bass note, upper third and fifth. The fundamental line remains on $\hat{5}$. I shall comment on the significance of this detail later.

⁶² Cadwallader and Gagné does not provide a specific term for the curly-shaped slur.

⁶³ Movement I "Opening" is not assigned to a specific key or mode. A certain degree of harmonic ambiguity can be found in this movement. That is to say, there can be readings other than F minor. I will elaborate the harmonic ambiguity of this movement in the later part of this chapter.

(mm. 1-28) × 2

1 28 1 28 third iteration

f: $i \begin{matrix} 5- \\ 3- \end{matrix} \quad \begin{matrix} 6 \\ 4 \end{matrix} - \begin{matrix} 5 \\ 3 \end{matrix} - \quad \begin{matrix} 6 \\ 4 \end{matrix}$

$i \quad (V \frac{6}{4} / bVII)$

Example 14: The “Minimal” Fundamental Structure of “Opening”

I believe that the minimal fundamental structure of “Opening” (Example 14) can be traced to the tonic chord of F minor (see Example 14 and Example 15). In the following two examples, I show in a concise form the kinds of conclusions I shall draw. Example 15 resembles

(mm. 1-28) × 2

1 28 third iteration 1 28 1 28 third iteration

f: i

becomes f: $i \begin{matrix} 5 \\ 3 \end{matrix}$

and

f: $i \begin{matrix} 5- \\ 3- \end{matrix} \quad \begin{matrix} 6 \\ 4 \end{matrix} - \begin{matrix} 5 \\ 3 \end{matrix} - \quad \begin{matrix} 6 \\ 4 \end{matrix}$

$I \quad (V \frac{6}{4} / bVII)$

Graph from Example 14

Example 15: The Origin of the Fundamental Structure of Movement I “Opening”

the graphs in Example 11 and 12. Cadawallader and Gagné claim that a fundamental structure of tonal music can be reduced to the tonic triad. However, the reduction procedures in Example 11 and 12 are different than Example 15. In Example 11 and 12, the bass arpeggiation and passing tones are reduced. In Example 15, the $\frac{5}{3}$ - $\frac{6}{4}$ neighboring motions and the note f^1 are reduced. Therefore, the “minimal” fundamental structure in Example 15 can be also reduced to the tonic triad of F minor.

In this chapter, I shall continue to discuss the term “harmonic cycle,” and my terms “harmonic loop” and “loop breaker,” and their operations in the “minimal” fundamental structure of “Opening.” I shall explore the process of the fundamental structure by showing my five-level analysis. Moreover, I shall show harmonic ambiguities conveyed by the fundamental structure.

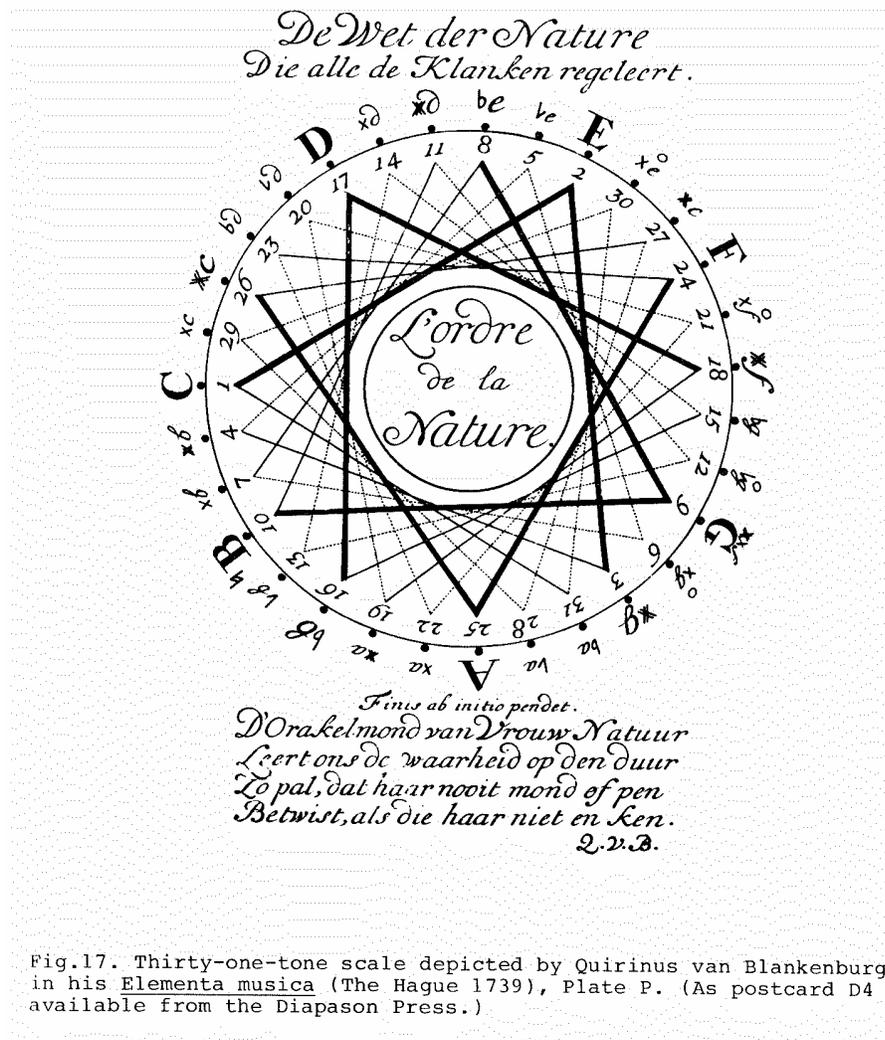
Harmonic Cycle, Harmonic Loop, and Loop Breaker

The Origins of Harmonic Cycle

Evan Jones uses the term “harmonic cycle” to analyze the recurring chords in Philip Glass’ *Glassworks*, third movement “Island.”⁶⁴ However, Jones is not considered the inventor of the term “harmonic cycle.” I posted a message inquiring about the origin of the term at the SMT-Talk online message board on Sep. 23, 2008. According to David E. Cohen’s response of Sep. 24, 2008, “an early (if not the first use) of the term is by Dutch mathematician and physicist Christiaan Huygens.” For further study on the term, Cohen recommends Huygens’s book *Le cycle harmonique*.⁶⁵ According to Huygens, a harmonic cycle refers to his tuning and

⁶⁴ Evan Jones, “The ‘Content and Flavor’ of Philip Glass’s Harmonic Cycles,” First International Conference on Music and Minimalism, Bangor University Wales, United Kingdom, August 31, 2007. Evan Jones’ paper can be obtained by contacting him via email <ejones@fsu.edu>. I thank Dr. Jones for sharing his paper.

⁶⁵ Christiaan Huygens, *Le cycle harmonique (Rotterdam 1691): Novus cyclus harmonicus (Leiden 1724)*, edited with Dutch and English translations by Rudolf Rasch (Utrecht: Diapason Press, 1986).



Example 16: Huygens's Harmonic Cycle

temperament system instead of the recurrences of chords (see Example 16).⁶⁶ In Example 16, Quirinus van Blankenburg depicted Huygens's tuning system as the thirty-one-tone scale within a cycle.⁶⁷ In Huygens's system, an octave can be divided into 31 tones, and the intervallic relations among them can be presented in a cycle. In short, Huygens's harmonic cycle can be understood as a cycle of intervallic relations. In the following, I shall show how Evan Jones'

⁶⁶ Huygens, 103.

⁶⁷ Huygens, 105.

applies the term “harmonic cycle” to his analysis of the third movement “Island” of *Glassworks*.

Evan Jones’ Use of Harmonic Cycles

Evan Jones uses the term “harmonic cycle” to describe a succession of recurring chords and his idea of an “upward diatonic drift” in Philip Glass’ *Glassworks*, third movement “Island.”⁶⁸ See the scanned example of Jones in Example 17 for the operations of harmonic cycle and upward diatonic drift.⁶⁹ In Example 17, Jones uses an alto clef and a “diatonic lattice” to describe the operations of harmonic cycles and the upward diatonic drift in the movement “Island.” According to Jones, a diatonic lattice consists of seven strata which are comparable to the seven scale degrees.⁷⁰ Jones follows the convention of denoting pitch class 10 and 11 with letters A and B. Finally, the apparent vertical order of chord tones does not reflect their registral order in the music.⁷¹

Jones considers the recurring successions of chords in the movement “Island” as a harmonic cycle.⁷² In Example 17, the first two chords are repeated four times, and the rest of the movement is played once. When the last chord is played, the movement is again played from the beginning. Since the way the chords operate resembles a cycle, Jones claims that the chords form a harmonic cycle.

Jones claims that diatonic drift happens between the last chord of the harmonic cycle and the return of the first chord of the harmonic cycle in the movement “Island.”⁷³ In Example 17,

⁶⁸ Evan Jones, “The ‘Content and Flavor’ of Philip Glass’s Harmonic Cycles,” First International Conference on Music and Minimalism, Bangor University Wales, United Kingdom, August 31, 2007. Evan Jones’ paper can be obtained by contacting him via email <ejones@fsu.edu>. I appreciate Dr. Jones for sharing his paper. His paper consists of a text-only handout, a musical example handout, and a CD of audio examples.

⁶⁹ Jones, “Content and Flavor,” Musical Example Handout, Example 10, P. 4.

⁷⁰ Jones does not provide reasons for using the terms “diatonic lattice” and “stratum” in his paper.

⁷¹ Jones, “Content and Flavor,” Musical Example Handout, 1.

⁷² Jones, “Content and Flavor,” 6.

⁷³ Jones, “Content and Flavor,” 6.

Example 10. Upward diatonic drift in the harmonic cycle from *Glassworks* (1981), mvt. 3 ("Island").

Diatonic drift can be observed by comparing the position of the first chord of the cycle to its position upon the repeat of the cycle. (See points marked *.)

Example 17: Jones' Example of Philip Glass' *Glasswork*, Third Movement "Island"

Jones places a diatonic lattice under his musical example to show the diatonic drift in the movement. In the diatonic lattice of Example 17, pitch classes 6 and 5 share the first stratum from the top; pitch class number 5 and 4 shares the second stratum; pitch class number 4, 3, and 2 shares the third stratum; pitch class number 1 and 0 shares the fourth stratum; pitch class numbers 0 and B shares the fifth stratum; pitch class number A and 9 shares the sixth stratum; and pitch class numbers 9 and 8 shares the seventh stratum. In each stratum, the presence of a pitch class can be retained by repetition (5-5-5...), or moving between itself and its lower neighbor pitch class (4-3-4). After the pitch classes 4, 2, B, 8, the return of the initial pitch classes 5, 4, 0, and 9 is exactly a stratum higher than its first appearance in the movement (see the two asterisks marked by Jones in Example 17). Jones designates the upward shift of pitch classes 5, 4, 0, and 9 in the diatonic lattice as an upward diatonic drift.

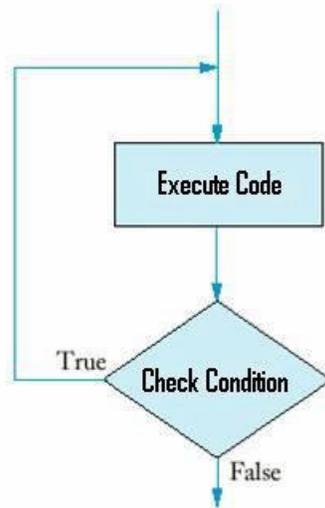
I believe that there is a problem in Jones' diatonic lattice. The lattice is not aligned properly with the musical example which makes Jones' example difficult to read. For example, pitch classes 5, 4, 0, and 9, and pitch classes 5, 3, 0, and 8 do not need to be repeated in the diatonic lattice. Jones can simply add a "× 4" after two classes and realign the rest of the pitch classes according to their pitches in the chords on the alto clef. The realignment would more easily enable readers to observe the relations among pitches in the chord and pitch classes on the lattice.

Jones regards the operation of the chords in "Island" (Example 17) as a harmonic cycle. I believe the operation can also be described as two small harmonic loops within a big harmonic loop. I shall explain my term harmonic loop below.

Do-while Loop and Its Loop Breaker in Computer Programming

The operation of harmonic loops in "Island," and the operation of a harmonic loop and its

loop breaker in “Opening” resembles the operation of a *do-while loop* in computer programming (see Example 18).⁷⁴



Example 18: A Do-while Loop Chart

In Example 18, the do-while loop is programmed to *do* a check on the condition programmed in the loop, *while* executing the code. The condition in the loop is often referred to the times of execution in the loop. If the loop designer programmed the loop to execute eight times, the condition would be less than nine times. If the number of execution times were smaller than nine at the condition check-point, the condition would stay “true,” and the loop would continue. If the number of execution times reached nine, the condition would become “false,” and the loop would end, or move on to other tasks such as a new loop or a non-looping task. That is to say, if the number of execution times reached nine, the condition checkpoint would function as a *loop breaker* of the do-while loop.

⁷⁴ Man Kwun Chiu, “COMP 201 Java Programming Lab 1 Summer 2007,” COMP 201 Java Programming Lab 1 Course Website at the Hong Kong University of Science and Technology, last modified on June 20, 2007, <http://course.cs.ust.hk/comp201/2007summer/users/chiumk/labs/lab1/lab1.html> (Accessed on March 22, 2009). According to Chiu, There are three main types of loops in computer programming, *while loop*, *do-while loop* and *for loop*.

Harmonic Loops and Its Loop Breakers in Glass' "Island" and "Opening"

According to the definition of harmonic loop above, instead of hearing a harmonic cycle in Glass' "Island," I hear two small harmonic loops within a big harmonic loop in Glass' "Island" (see Example 19).

Loop C

The image shows a musical staff with a treble clef and a key signature of one flat (B-flat). The staff contains a sequence of chords. A bracket labeled 'Loop A' encompasses the first two chords, which are repeated four times, indicated by a '4' and an 'x' below the staff. A second bracket labeled 'Loop B' encompasses the remaining chords. A large bracket labeled 'Loop C' encompasses the entire sequence from the start of Loop A to the end of Loop B. The notation includes various chord symbols and accidentals.

Example 19: Harmonic Loops in Glass' "Island"

Example 19 is adapted from Jones' example in Example 17. In Example 19, the first two chords that are repeated four times can be designated as a small harmonic loop, Loop A. The rest of the movement can be designated as the second harmonic Loop B. Loop A is designated to execute the two chords four times, and move on to Loop B. In other words, Loop A is broken after its fourth iteration and proceeds to Loop B. Loop A returns when Loop B is completed. Loop C contains the operation of Loop A and Loop B.

After introducing how harmonic loops and loop breakers function in the third movement "Island" of Glass' *Glassworks*, I shall provide a brief overview of "Opening" (see the scanned score of "Opening" in Example 20). In Example 20, the rhythmic structure consists of hemiolas over long sustained notes in the bass. The hemiolas make each measure sound as if it were in a time signature of $\frac{6}{8}$ with two dotted quarters per measure, or a $\frac{2}{2}$ time signature with two half notes. The figuration in the right hand in "Opening" is similar to the right hand figuration in Reich's *Piano Phase*. Compare Example 7 and Example 21. In Example 7, the melody for the right hand in Segment B is shifted from the right hand melody in Segment A. In Example 21, the

2

NO.1 Opening for Piano

Concert Score

1 2 3 PHILIP GLASS

♩ = 96

con Ped

4 5 6

7 8

9 10 11

12 13 14

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Example 20: Philip Glass' *Glassworks*, First Movement "Opening"

15 16 3

17 18 19

20 21 22

23 24 25

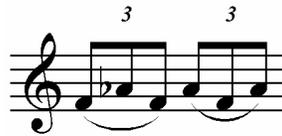
26 27 28

p subito

D.C. al Fine

Add French Horn 2 Last Time

Example 20 (Continued)



Example 21: The Figuration in the Right Hand in “Opening”

second triplet is also shifted from the first triplet. That is to say, an ascending minor third becomes a descending minor third, and vice versa.

In Example 21, the last iteration of m. 28, the added note f^1 in French Horn 2 and the piano part are sustained and connected to the second movement “Floe” (see Example 22). In the

NO. 2 FLOE Philip Glass

4 ♩ = 100

1 (Solo)

Horn 2

(Pno Ped.)
(Held from No. 1)

2 x2

Hn 1

mp

Hn 2

* (Pno Ped. off)

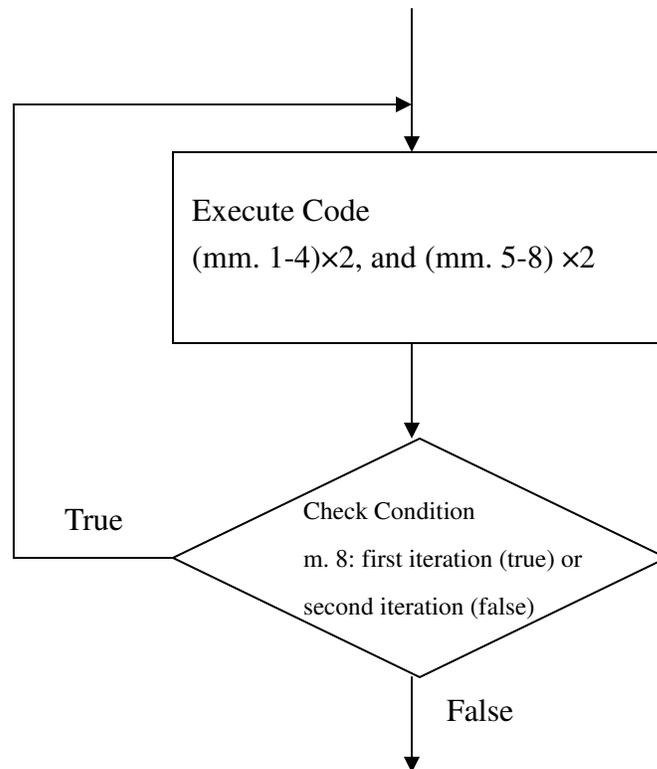
Example 22: Philip Glass’ *Glassworks*, Second Movement “Floe,” mm. 1-8

recording of “Opening” by the Philip Glass Ensemble, the note f^1 in French Horn 2 in the last iteration of m. 28 is the last heard note in “Opening,” and a link to the second movement “Floe.”⁷⁵ In the second movement, the note f^1 continues as a part of a bass line under a sustained

⁷⁵ Philip Glass, *Glassworks*, directed by Michael Riesman, performed by Philip Glass Ensemble. SK 90394

note a¹.

After providing an overview of “Opening,” I shall explore the repetitions of chords in “Opening” in terms of the operation of a do-while loop (compare Example 23, Example 18, and Example 20).



Example 23: Repetitions of Chords in “Opening,” mm. 1-8

In Example 23, the loop operation represents the repetitions of chords in mm. 1-8 (see Example 19). The loop is programmed to execute the code in which mm. 1-4 and mm. 5-8 are played twice. While executing the code, the loop is programmed to do a condition check. If the first iteration of m. 8 is played, the condition stays true, and the loop continues. If the second iteration of m. 8 is played, the condition becomes false, and the loops moves on to m. 9. In other words,

Sony Classical. CD. 2003.

the second iteration of m. 8 is considered as a loop breaker. I regard the loop operation of chords in Example 19 as a harmonic loop, and the loop breaker at the condition checkpoint as a harmonic loop breaker.

In the first movement “Opening” of Philip Glass’ *Glassworks*, I hear three small harmonic loops (Loop 1, Loop 2, and Loop 3), and Link 1 constituting a big harmonic loop (Loop 4) with a link to the second movement (see Example 24). In Example 24, each whole note in the sketch represents a rhythmic value of one measure in the score. Each bracketed number represents the order of the eleven harmonic segments in the movement.

In Loop 1, there are three segments. Mm. 1-4 (segment [1]) and 1st iteration of mm. 5-8 (segment [2]) are identical. The former is played twice, and the later is played once and followed by the second iteration of mm. 5-8 (segment [3]). By the end of the second iteration of mm. 5-8, Loop 1 Breaker is applied to terminate Loop 1, and proceeds to Loop 2.

Loop 2 and Loop 2 Breaker operate in a similar manner as Loop 1 and Loop 1 Breaker. In Loop 3, mm. 21-23 (segment [7]) and mm. 17-20 (segment [8]) are the same. The former is played twice, and the later is followed by Loop 3 Breaker which terminates Loop 3 and leads to Link 1 (mm. 25-28, segment [9]).

After the second and third iteration of Loop 1, 2, and 3, only mm. 25-27 (segment [10]) of Link 1 are played. The third iteration of m. 28 (segment [11]) becomes Loop 4 Breaker which terminates Loop 4, the big loop that contains three loops and Link 1. Loop 4 Breaker leads to the link to the second movement “Floe.”

Having sketched out the harmonic loop operations in “Opening,” I shall now investigate the harmonic operations within each harmonic loop (see Example 25). Example 25 is a chord-oriented analysis with emphasis on chord qualities (i.e. major/minor triad) and inversions. In Loop 1, the recurring chords moves among F minor triad, via E \flat major triad with an added

[1] mm. 1-4 × 2; [3] mm. 5-8 2nd iteration; [4] mm. 9-12 × 2; [6] mm. 13-16 2nd iteration
 [2] mm. 5-8 1st iteration [5] mm. 13-16 1st iteration

[7] mm. 17-20 [8] mm. 21-24 [9] mm. 25-28 [11] mm. 28 3rd iteration
 Loop 3 Breaker [10] mm. 25-27 Loop 4 Breaker Link to Mov. II

Loop 1 Loop 2
 Loop 3 Link 1
 Da Capo Twice

Example 24: Harmonic Loops in the First Movement “Opening”

sixth above the root (denoted as $E_b^5_{3+6}$), to a D_{b7} chord with g and b_b as unresolved suspensions. In the second iteration, the D_{b7} chord is replaced by a c^4_2 as the Loop 1 Breaker. The chords in Loop 2 suggest a local key area E-flat major (see Example 26). In Example 26, the chords in Loop 2 suggest a harmonic motion from ii-V-vi to ii-V-I. In Loop 3, the chords mainly move among a B-flat major triad, a B-flat major-minor seventh chord (or dominant seventh chord), and an A-flat major triad. In m. 20, b_b is an incomplete upper neighbor note of a_b , while in m. 24, b_b becomes an upper neighbor note of a_b . In Link 1, g^5_3 leads back to an F minor chord (with root only) via B-flat major triad.

[1] mm. 1-4 × 2; [3] mm. 5-8 2nd iteration [4] mm. 9-12 × 2; [6] mm. 13-16 2nd iteration
 [2] mm. 5-8 1st iteration [5] mm. 13-16 1st iteration

Loop 1 Loop 2

Loop 1 Breaker Loop 2 Breaker

SUS

f_3^5 - $E_b_{3+6}^5$ D_{b7} f_3^5 - $E_b_{3+6}^5$ c_2^4 f_4^6 B_{b3-4}^5-6 c_4^6 f_4^6 B_{b3-4}^5-6 E_{b6}

(E_{b4}^6) (E_{b4}^6)

[7] mm. 17-20 [8] mm. 21-24 [9] mm. 25-28 [11] mm. 28 3rd iteration
 [10] mm. 25-27

Loop 3 Link 1 Link to Mov. II

Loop 3 Breaker Loop 4 Breaker

Da Capo Twice

IUN UN

B_{b4}^6 B_{b3}^4 A_{b3}^5 A_{b6} B_{b4}^6 B_{b3}^4 A_{b3}^5 A_{b3}^5 g_3^5 - B_{b3}^4 B_{b4}^6 -

Example 25: Harmonic Analysis of the First Movement “Opening”

Kyle Gann claims that the use of tonality in minimal music is free from “goal-oriented European association[s].”⁷⁶ I consider the occurrences of parallel fifths, “consonant” $\frac{6}{4}$ chords,

⁷⁶ Kyle Gann, “A Forest from the Seeds of Minimalism: An Essay on Postminimal and Totalist Music,” paper written for a program of 1998 Minimalism Festival of the Berliner Gesellschaft für Neue Musik, retrieved from Kyle Gann’s Homepage, <http://www.kylegann.com/postminimalism.html> (accessed March 25, 2009).

[4] mm. 9-12 × 2; [6] mm. 13-16 2nd time
 [5] mm. 13-16 1st time

Loop 2

Loop 2 Breaker

Eb: ii₄⁶ V₃₋₄⁵⁻⁶ vi₄⁶ ii₄⁶ V₃₋₄⁵⁻⁶ I₆

Example 26: Local Key Area E-flat Major in Loop 2

and the absence of leading tones of F minor in Glass’ “Opening” as departures from goal-oriented European tonal music. In Example 26, the parallel fifths between f-c¹ in f₃⁵, and eb¹-bb¹ in Eb₃₊₆⁵ can be found in mm. 2-3 and mm. 5-7. The parallel fifths in both places challenge traditional voice leading in tonal music.⁷⁷ In mm. 9-13, the insertion of c₄⁶ between Eb₄⁶, and the return of f₄⁶ in mm. 9 and 13 makes Eb₄⁶ no longer a dissonant neighboring ₄⁶ chord to both f₄⁶ in mm. 9 and 13. Instead, Eb₄⁶ is a “consonant” ₄⁶ chord. The uses of Eb in “Opening” soften the tonal security of F minor, since Eb is a subtonic tone to F, not a leading tone (E₃) to F.

The chord analysis of “Opening” in Example 26 shows ambiguous internal harmonies in the work. In Example 26, mm. 1-16, the F minor triad can be considered a local chord center due to the frequent returns to f₃⁵ and f₄⁶. In mm. 17-28, the B-flat major triad can be considered local

⁷⁷ Joseph N. Straus, “Centricity, Referential Collections, and Triadic Post-Tonality,” in *Introduction to Post-Tonal Theory*, 3rd ed. (Upper Saddle River, NJ: Pearson Prentice Hall, 2005), 130. Straus claims that the voice leading of tonal music follows certain norms including the avoidance of parallel perfect consonances.

chord center due to the frequent returns to $B\flat_4^6$. In Example 14, the F minor triad is prolonged over a $\frac{5}{3}-\frac{6}{4}$ neighboring motion. The prolongation of the F minor triad opens up at the end of the movement pointing to the subtonic harmony $E\flat$.

In the next two sections, I shall incorporate the ideas of harmonic loops and harmonic loop breakers to minimal fundamental structures of “Opening.” I shall present a step-by-step analysis of “Opening” to find possible minimal fundamental structures of “Opening.” Moreover, I shall investigate how “minimal” tonality contributes to some possible fundamental structures of Glass’ “Opening.”

Five-level Harmonic Analysis and the Fundamental Structures of “Opening”

Five-level Harmonic Analysis

I believe a five-level harmonic analysis is an approach to understand the operation of harmonic loops, “minimal” tonality, and multiple minimal fundamental structures of “Opening” (see Example 27). In Example 27, each level in the sketch represents different analytical views. At Level 1 each whole note in the sketch represents a rhythmic value of one measure in the score of “Opening” (see Example 20 for the score). Level 2 indicates a one-quarter rhythmic diminution of Level 1. For example, a whole note at Level 1 becomes a quarter note at Level 2. The diminution makes the prolongation among adjacent measures easier to show. For example, c^2 is prolonged from m. 2 to m. 4. The prolongation of c^2 is shown more clearly at Level 2 than Level 1. Level 3 is a foreground graph based on Level 2.

From Level 3 to Level 5, the rhythmic values in the sketch are no longer real rhythmic values in the score or diminutions from their original values in the score (see Example 20). For example, a half note at Level 1 represents the true value of that note. A half note at Level 2

[1] mm. 1-4 × 2 [3] mm. 5-8 2nd iteration [4] mm. 9-12 × 2 [6] mm. 13-16 2nd iteration
 [2] mm. 5-8 1st iteration [5] mm. 13-16 1st iteration

Level 1

Loop 1 Loop 1 Breaker Loop 2 Loop 2 Breaker

f: i ⁵/₃ -

Level 2

f: i ⁵/₃ -

Level 3

f: i ⁵/₃ -

Level 4

f: i ⁵/₃ -

Level 5

f: i ⁵/₃ -

Example 27: A Five-level Analysis of the First Movement “Opening”

[7] mm. 17-20

[8] mm. 21-24

[9] mm. 25-28

[11] mm. 28 3rd iteration

Loop 3 Breaker

Link 1

Loop 4 Breaker

Level 1

Level 1 musical notation showing chords and melodic lines. Annotations include "Loop 3", "Link 1", and "Loop 4 Breaker". A "Da Capo Twice" instruction is present below the staff, and an upward arrow indicates a "Link to Mov. II".

Level 2

Level 2 musical notation showing a melodic line. A "Da Capo Twice" instruction is present below the staff. The dynamic marking *f* and the chord symbol $\frac{6}{4} (V_{4/b}^{6} VII)$ are also shown.

Level 3

Level 3 musical notation showing a melodic line. A "Da Capo Twice" instruction is present below the staff. The dynamic marking *f* and the chord symbol $\frac{6}{4} (V_{4/b}^{6} VII)$ are also shown.

Level 4

Level 4 musical notation showing a melodic line. A "Da Capo Twice" instruction is present below the staff. The dynamic marking *f* and the chord symbol $\frac{6}{4} (V_{4/b}^{6} VII)$ are also shown.

Level 5

Level 5 musical notation showing a melodic line. A "Da Capo Twice" instruction is present below the staff. The dynamic marking *f* and the chord symbol $\frac{6}{4} (V_{4/b}^{6} VII)$ are also shown.

f

$\frac{6}{4} (V_{4/b}^{6} VII)$

Example 27 (continued)

denotes a value of two whole notes in Level 1. Half notes at Level 3, 4 and 5 stand for a prolonged chord over different measures. From Level 3 to Level 5, the prolonged half notes no longer indicate its true or diminished rhythmic values from the score.

At Level 3, the dotted slurs indicate prolongations between nonadjacent chords. At Level 4, only the prolonged chords are shown. At Level 5, the background level, a possible reading of a minimal fundamental structure of “Opening” is established over an F minor triad in F minor.

Three Possible Fundamental Structures of “Opening”

The “minimal” fundamental structure of “Opening” is not built over a descending fundamental line, and not over a harmonic framework I-V-I. According to the score of *Glassworks*, Philip Glass does not assign a key or mode to the first movement “Opening.” See Example 20. Moreover, the “minimal” tonality in “Opening” suggests three possible fundamental structures.

In Example 27, Level 5, a possible minimal fundamental structure of “Opening” over an F triad is shown in Example 28. In Example 28, the 28-measure long harmonic Loop 4 prolongs the F minor triad via the $\frac{5}{3}-\frac{6}{4}-\frac{5}{3}$ neighboring motion. Loop 4 is repeated two times where $\frac{6}{4}$ is a part of a neighboring motion. However, at the third iteration of m. 28, Loop 4 Breaker breaks Loop 4, and Loop 4 precedes to f^1 , the root of F minor triad. The $\frac{6}{4}$ in Loop 4 Breaker functions as a loop breaker of computer programming. The $\frac{6}{4}$ in Loop 4 Breaker is an incomplete $\frac{5}{3}-\frac{6}{4}$ neighboring motion. The fundamental structure in Example 29 originates from the F minor tonic triad at the beginning of the piece.

In Example 26, Loop 2 of “Opening” is locally centered in E-flat major. If Glass decided to develop the rest of the movement in E-flat major, a fundamental structure could be in E-flat major (see Example 29). In Example 29, the reading of a fundamental structure of “Opening” in

awaiting further development in the following movements of *Glassworks*.

1 28 1 28 third iteration addition

$E_b:$ ii $\overset{5}{-}$ $\overset{6}{-}$ $\overset{5}{-}$ $\overset{6}{-}$ V I
 $\underbrace{\hspace{10em}}$
 ii

Example 29: Reading of Movement I “Opening” in E-flat Major

1 28 1 28 third iteration addition

$A_b:$ vi $\overset{5}{-}$ $\overset{6}{-}$ $\overset{5}{-}$ $\overset{6}{-}$ IV V I
 $\underbrace{\hspace{10em}}$
 vi

Example 30: Reading of Movement I “Opening” in A-flat Major

CHAPTER 4

CONCLUSION

The study of prescriptive codes in musical minimalism motivates new research in musical perception and their applications to the study of music. The investigation of fundamental structure of Glass' *Glassworks* "Opening" contributes to our understanding of works of twentieth and twenty-first century music using post-Schenkerian analysis. The research of "minimal" tonality in Glass' "Opening" contributes to new insights into treatments of tonality in twentieth and twenty-first century music. The examination of the functions of harmonic loops and harmonic loop breakers in "Opening" contributes to further considerations of applications of automation and artificial intelligence in twentieth and twenty-first century music.

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