EQUAL DIVISIONS

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ABSTRACT

The equal tempered scale may be divided equally into twelve, six, four, three and two equal parts. From each division, symmetrical harmonic environments may be created that sound and function in different ways than diatonic systems. Some composers use these systems exclusively, and some combine them with more traditional harmonic systems. This thesis presents ten original compositions. Each division of the octave is represented by a jazz and a chamber piece.

A brief history of equal temperament is included, followed by a chronology of the introduction of symmetrical scales and harmonic material in Western art music and jazz. The methods of several composers, all proponents of symmetry in different ways, are also examined.

ACKNOWLEDGEMENTS

I would like to thank Professors Al Henderson and Matt Vander Woude for their encouragement, guidance and wisdom. The assistance they offered in the preparation of this thesis is greatly appreciated. I would also like to acknowledge the guidance and input provided by Professors Michael Coghlan, Jay Rahn and Sundar Viswanathan. Thank you also to the Graduate Program Assistant, Tere Tilban-Rios.

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INTRODUCTION

I am intrigued by the possibilities offered by alternate harmonic systems. This thesis examines the scales and the harmonic systems derived from equally dividing the octave. Although these systems function in different ways than more familiar diatonic systems, their use greatly expands the resources of the composer and improviser.

The first two chapters briefly examine the history and application of equal divisions of the octave in Western art music and jazz. I have also included an overview of equal temperament, without which symmetrical scales and equal divisions of the octave would not be possible. I present methods used by Olivier Messiaen, Nicholas Slonimsky, Béla Bartók, and others and discuss how jazz composers and improvisers have applied equal divisions and symmetrical scales in their work.

The octave can be divided equally in five different ways. Each of the following five chapters (chapters three to seven) demonstrates the use of one equal division. Two original compositions are presented in each of these chapters, one classical and one jazz. Although these divisions generate material that can be used exclusively, all are perhaps more satisfying and useful to the composer when combined with other harmonic material. These jazz and classical compositions will reveal challenges and advantages offered in both idioms by these alternate harmonic environments.

Before I began my research, I came across the symmetrical nonatonic scale by my own devices. Experimenting with ways of expanding the symmetrical augmented scale, I combined it with an inversion of itself. After reading Messiaen's *The Technique of My Musical Language* I realized that I was not the first composer to find this scale. It is not unreasonable to believe that, since the acceptance of equal temperament, many composers, improvisers and theorists have "discovered" symmetrical scales on their own.

(See Appendix A for complete scores of the compositions.)

Chapter 1: History and Overview

The progression of harmonic systems through the cycle of fifths, the resolution of dissonance, and tonal gravity have for centuries been among the primary building blocks of Western music. These familiar asymmetric collections (major, minor and pentatonic scales as well as the modes and variants thereof) can be transposed eleven times before reproducing the original collection of notes. The asymmetry of tonal harmony contributes greatly to the versatility and dramatic richness of Western art music and jazz.

Parallel harmonic systems have also evolved through experimentation with dividing the octave into equal units, creating scales and harmonic environments by divisions of twelve, six, four, three and two. These scales and harmonic environments differ greatly from traditional tonal systems. All are defined by ambiguity and a lack of, or suspension of tonal gravity. Richard Cohn feels that "they erode the fundamental distinction between consonance and dissonance".[1] Tension and release is available through transposition but is less obvious and usually less satisfying than more traditional harmonic movement.

Most scales used in classical music and jazz are asymmetrical formations (Figure1.1).[2] In Figure 1.2 the symmetry of the hexatonic (or six-note) whole-tone scale is shown.

Figure 1.1: Asymmetry Of Major Scale

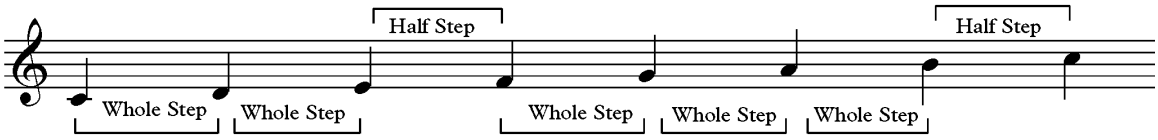
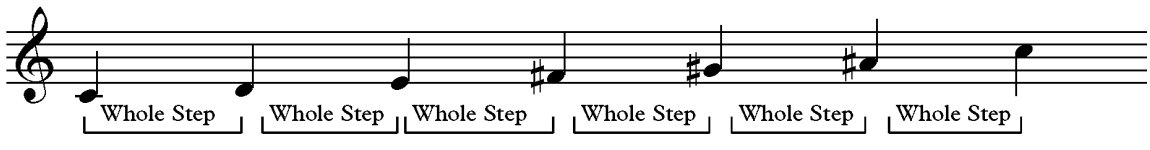


Figure 1.2: Symmetrical Whole-Tone Scale



[1] Richard Cohn, "Maximally Smooth Cycles, Hexatonic Systems, and the Analysis of Late-Romantic Triadic Progressions," *Music Analysis* 15, no. 1 (March 1, 1996): 11

[2] A whole step moves by two consecutive semitones, a half step moves one semitone.

A Brief History of Equal Temperament

Western harmonic systems, asymmetric or symmetric, are most often dependent upon the twelve note equal tempered scale. Although a detailed history of temperament is beyond the scope of my research a brief overview will aid our understanding. Equal temperament is a prerequisite for the division of the octave into twelve equal parts.

For most music cultures playing an instrument or singing "in tune" is pleasing and desirable. The definition of what is "in tune", however, can be quite different between cultures and can change dramatically over time. Our western ears have accepted equal temperament gradually over the last few centuries. It was not an easy or an obvious choice for a number of reasons, some of which I will outline below. Equal temperament did have one great advantage over other tuning systems. Stuart Isacoff explains:

> This tuning allows a musical pattern begun on one note to be duplicated when starting on any other; it creates a musical universe in which relationships between musical tones are reliably, uniformly consistent.[3]

Basic mathematical relationships make harmony and music possible. The ratios that define an octave (2:1), a fifth (3:2), a fourth (4:3), etc., were identified by the Greek philosopher Pythagoras around 530 B.C.E and cherished by the ancient Greeks. As Isacoff notes, what seemed to them "the fingerprints of the gods"[4] became problematic centuries later as music and the instruments that music was performed on became more sophisticated. Keyed and fretted instruments revealed inconsistencies when tuned using these ratios because of the fixed pitch choices they offered.

Some instruments are manufactured with fixed pitches. For example certain flutes, marimbas, xylophones and steel drums cannot be retuned. On the other hand, tuning on instruments such as the cello involves the discretion and talent of the player; an infinite number of finger placement choices lie on the neck of the instrument. Early instruments such as the lute, and harpsichord and contemporary instruments like the guitar and piano can be tuned before each performance but the fixed position of frets or keys makes tuning adjustments difficult or impossible during performance.[5]

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[3] Stuart Isacoff, *Temperament: The Idea That Solved Music's Greatest Riddle* (New York: Alfred A. Knopf, 2001),4.
[4] Isacoff, *Temperament,* 26-38.
[5] Bonnie C. Wade, *Thinking Musically: Experiencing Music, Expressing Culture*, Global Music Series (New York: Oxford University Press, 2004), 83-87.

When tuning an instrument through the cycle of fifths using a precise ratio of 3:2, the starting note will be slightly out of tune with the higher cycled incarnation (seven octaves higher) of the same note. This mathematical inconsistency is referred to as the Pythagorean or diatonic comma. Over the centuries this anomaly had been accommodated in different ways by different tuning systems. "Pythagorean "or "just" temperament, popular before the beginning of the 17th century, produced tunings with the fourths and fifths (mostly) in tune and the thirds compromised. Another system, "mean" or mean-tone temperament," popular after the 16th century produced thirds that were (mostly) in tune but the fifths and fourths were compromised. Although mean temperament allowed modulations to key areas that were three or four flats or sharps distant, remote keys were unusable. According to Stuart Isacoff "hundreds of varieties" of mean-tone temperament were created.

> In fact, a single composer might invent dozens of individual tunings-some customized to fit particular pieces, others offered as musical "flavorings" to be tried willy-nilly.[6]

Around 1691 the theorist Andreas Werckmeister introduced what became known as the well-tempered system. The well-tempered system offered a variety of tunings that allowed greater chromatic movement. Depending on the specific tuning, some of the fifths remained *pure* or perfect, while some fifths were flattened or widened. Each key area had slightly unique interval relationships, some keys more "in tune" than others, but all key areas are accessible.[7]

> … as a musical work moved from one key center to another, the shift would become blatant…Changes in a piece's scales and harmonies were now overlaid with an added expressive element: a dramatic change in the quality of sound.[8]

This change in the "quality of sound" was considered to be a good thing. Most composers and instrument makers of the time embraced and enjoyed the well-tempered system. These tunings, of course, would only apply to instruments with fixed tuning. J.S Bach intentionally named his collections of preludes and fugues in all keys the *"Das Wohltemperierte Klavier"* (The Well-Tempered Clavier) not "Das Gleichmäßig

[6] Isacoff, *Temperament*, 105.
[7] Isacoff, *Temperament*, 216.
[8] Isacoff, *Temperament*, 216-217.

Temperierte Klavier" (The Equal Tempered Clavier). The keyboard historian Stephen Bicknell writes of J.S Bach's *"The Well Tempered Clavier Book 1"*:

> These 48 pieces are designed to exhibit the full range of key-colour available from a circulating temperament, and careful examination of the texts shows that Bach varied his compositional technique according to the key he was writing in.[9]

An equal tempered tuning, in theory, produces identical relationships between the same intervals in all keys and each key would sound just as "in tune" as any other key. The reality of equal tempered tuning is of course considerably more complex. Tuners will usually *stretch* the upper and lower octaves. Jim Campbell offers an explanation in an on-line article:

> When the tuner is tuning octave intervals up the keyboard, they tune for the best sound, compromising the beat between the string fundamentals and the beat between the octave partial of the lower note to the fundamental of the upper. This produces a slightly sharp octave interval between the two strings. This slight adjust accumulates towards the high and low end. If a piano is tuned to a perfect scale top to bottom, the beats produced between partials of the high strings clash. A piano tuned with the upper and lower octaves stretched just sounds better.[10]

The idea of using equal temperament no doubt occurred earlier than the 16th century. Equal distances between each step of the chromatic scale seem a logical and obvious solution to the problems contained in other tuning systems. At least two obstacles, however, prevented it from being used: the mathematical relationships that would allow a tuning of equal distances had not yet been refined, and reluctance existed among theorists and composers to question or tamper with the Pythagorean relationships. As well, to many composers and listeners, the sound of these less than perfect intervals, already revealed in other tunings, were unacceptable.

The solution to the mathematical obstacle presented by equal temperament is revealed in China by a Ming Dynasty prince and musical theorist Chu Tsai-Yu (1536–1611) and at almost the same time in Europe by Flemish mathematician Simon Stevin (1584-1620).

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[9] Stephen Bicknell, "Temperament: A Beginner's Guide," 1997, last modified January 28,1998.http://www.albany.edu/piporg-l/tmprment.html.

[10] "The Equal Tempered Scale and Peculiarities of Piano Tuning," accessed January 5, 2016, http://www.precisionstrobe.com/apps/pianotemp/temper.html.

> Chu Tsai-Yu presented a highly precise, simple and ingenious method for arithmetic calculation of equal-temperament monochords in 1584.[11] Stevin offered a mathematical definition of equal temperament…in 1585 or later…. Both scholars worked in complete independence and without knowledge of each others work .[12]

It seems that neither of these solutions had much effect at the time. Stevin's research was lost for centuries only to be rediscovered and published in 1884.[13] Many of the great minds of the 17th and 18th centuries spent time experimenting with and debating the primacy of equal temperament. Eventually, relatively accurate mathematical and practical methods of tuning in equal temperament tuning became available.[14]

By the mid 18th century the French composer and theorist Jean – Philippe Rameau (1683-1764), discovered the advantages of equal temperament, and lobbied the French Academie Royale des Sciences for its adoption. "(Rameau's) revolutionary approach to music and theory and its artistic implications edged the next generation toward equal temperament's inevitable adoption."[15] It became obvious that equal temperament was the tuning system best suited to accommodate the expanding tastes for chromaticism and the changing needs of Western art music.[16] Although widely accepted in the 19th century, equal temperament did not become universal (as applied to Western art music) until 1917.[17] What we have today, unique to the European tradition, is a tuning system that allows incredible harmonic versatility. What we have lost with equal temperament is the individual sound and colour of each key.[18] [19] [20] [21] [22]

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[11] A monochord is one stringed instrument used for musical experimentation.
[12] Fritz A. Kuttner, "Prince Chu Tsai-Yü's Life and Work: A Re-Evaluation of His Contribution to Equal Temperament Theory," *Ethnomusicology* 19, no. 2 (May 1, 1975), 200.
[13] Kuttner, *Ethnomusicology* 19, no. 2, 167.
[14] Isacoff, *Temperament*, 171-197.
[15] Isacoff, *Temperament*, 224.
[16] It must be noted that with many instruments and the human voice the tuning of each note played or sung is in constant flux. Tuning adjustments are possible and are constantly being made. These adjustments, however, are usually made to re-align the performance with equal tempered tuning.
[17] Matthew Bribitzer-Stull, "The A♭–C–E Complex: The Origin and Function of Chromatic Major Third Collections in Nineteenth-Century Music," *Music Theory Spectrum* 28, no. 2 (2006), 172.
[18] Kyle Gann, "An Introduction to Historical Tunings," last modified September 1, 2015, http://www.kylegann.com/histune.html.
[19] Lalage Cochrane, "Equal Temperament," ed. Alison Latham, *The Oxford Companion to Music*, accessed September 1, 2015, *Oxford Music and Art Online.*
[20] Mark Lindley, "Equal Temperament," *Grove Music Online*, accessed September 1,2015, *Oxford Music and Art Online.*

History of Equal Divisions

When considering the equal division of the octave used by European and jazz traditions[23] we should be aware that other music cultures also divide the octave equally. Division of the octave into five equal parts (equi-pentatonic) and seven equal parts (equi-heptatonic) is prevalent in the music of Indonesia, South Asia, and Africa. Notable examples are discussed in the writings of Wim Van Zanten and Gerhard Kubik.[24] [25]

Kubik refers to *cents* - a method of measurement created by Alexander Ellis (1814-1890), useful for measuring musical intervals.[26] Kubik, reporting on the seven note scales of Southern Malawi, also refers to a whole-tone as a *full-tone* and a semi-tone as a *half-tone*.

> In an equi-heptatonic scale the octave is divided into seven equal parts….. They are all approximately 171 cents wide, in contrast to the full tone (200 cents) and the half tone (100 cents).[27]

With the exception of serialism, it is rare for a composer of Western art music or jazz to create a piece using *only* material derived from an equal division of the octave. In most examples these alternate scales, and the harmonic systems created from them, are employed as a way of expanding the diatonic environment. When Bartók uses the octatonic scale exclusively for three piano pieces in *Mikrokosmos Book IV* (1926-1939) these are offered as pedagogical studies.

Mediant based divisions (division of octave into three equal parts) appeared in the early nineteenth century.[28] When using mean temperament the addition of four flats (key

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[21] "Early Music Myths - Equal Temperament," last modified September 1, 2015, http://www.diabolus.org/myths/equal-temperament/equal-temperament.htm.
[22] Bicknell, "Temperament: A Beginner's Guide".
[23] Jazz has a long tradition of using notes *between* the notes of the equal tempered scale. Singers and players often bend, slide, or otherwise alter the pitch.
[24] Wim van Zanten, "The Equidistant Heptatonic Scale of the Asena in Malawi," *African Music* 6, no. 1 (1980), 107–25.
[25] Gerhard Kubik, Gerhard Kubic, And Maurice Djenda, "Ethno-Musicological Research In Southern Parts Of Malawi " *The Society of Malawi Journal* 21, no. 1 (1968), 20–32.
[26] Expressed simply, one equal tempered semi-tone is equal to 100 *cents* .An octave is equal to 1200 *cents.* -Fred Lieberman, "Working with Cents: A Survey," *Ethnomusicology* 15, no. 2 (May 1, 1971), 236–42.
[27] Kubik, Kubic, and Djenda, "Ethno-Musicological Research In Southern Parts Of Malawi ", 21.
[28] The mediant refers to the third degree of a diatonic scale. The sub-mediant refers to the sixth degree of a diatonic scale.

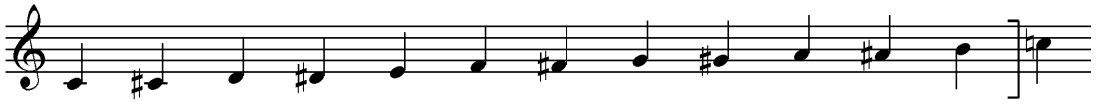
of Ab major) or four sharps (key of E major) were the furthest one could venture from the key of C major before sounding "out of tune".[29]

Matthew Bribitzer-Stull refers to this as the Ab-C-E complex and offers an extensive list of nineteenth-century compositions that move between these three keys including Schubert's *Piano Trio in Eb Major D.929*, and Liszt's *Faust Symphony S.108.* [30] [31]

The emergence of scales using equal divisions roughly coincides with the gradual acceptance of equal temperament. The names of scales formed by and derived from equal divisions of the octave can be confusing. Jazz and traditional Western art music theorists and musicians may refer to these scales by different names. The following (Figures 1.3 to 1.12) display scales derived from dividing the octave into equal parts along with different names assigned to these scales. The scales could of course begin on any note; the examples begin on C. As will be demonstrated later, interesting things happen when these scales are transposed. Scales formed from divisions into four, three and two have notes added above or below each division point – the formation of these scales will be discussed in chapter two. There are two scales generated by a division into three. There are numerous scales derived from a division into two.[32] Four of them are shown below.

Figure 1.3: Division Into Twelve Equal Parts: Chromatic Scale, Twelve Tone Scale, Dodecatonic Scale.

(All half steps)



[29] Ab is a major third below C at the sub-mediant, E is a major third above C at the mediant.

[30] Bribitzer-Stull, "The A♭–C–E Complex", 172.

[31] Michael Siciliano, "Two Neo-Riemannian Analyses," *College Music Symposium* 45, no. Journal Article (2005), 81.

[32] In addition, there are "truncated" scales - versions of Messiaen's modes with notes removed. I will be using one of these scales in my composition *Division By Two.*

Figure 1.4: Division Into Six Equal Parts: Whole-Tone Scale, Messiaen's First Mode of Limited Transposition, George Russell's Auxiliary Augmented Scale.

(All whole steps, this is a hexatonic or six note scale.)

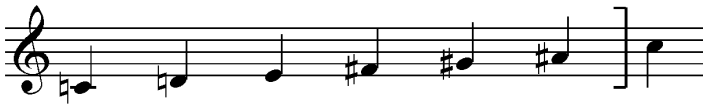


Figure 1.5: Division Into Three Equal Parts: Symmetrical Augmented Scale.

(A hexatonic scale: minor third, half, minor third, half, minor third, half.)

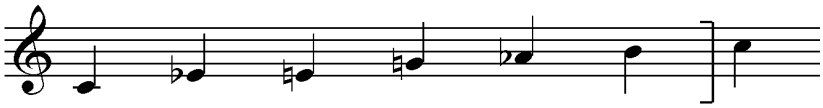


Figure 1.6: Division Into Three Equal Parts: Nonatonic Scale, Messiaen's Third Mode of Limited Transposition.

(A nine note scale (nonatonic): whole, half, half, whole, half, half, whole, half, half.)

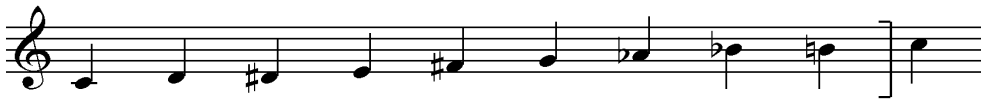


Figure 1.7: Division Into Four Equal Parts: Diminished Scale, Octatonic Scale, Rimsky-Korsakov Scale, Whole-Half Scale, Messiaen's Second Mode of Limited Transposition, George Russell's Auxiliary Diminished Blues Scale.

(An eight-note scale (octatonic): whole, half, whole, half, whole, half, whole, half.)

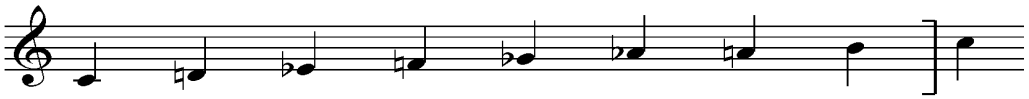


Figure 1.8: The Often-Used Mode or Alternate Version Of The Diminished Scale

(Beginning with a half step instead of a whole-step).

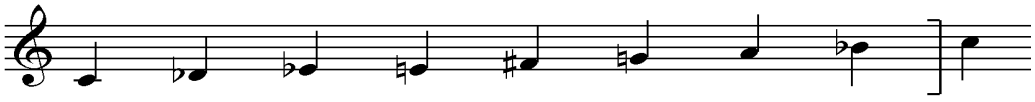


Figure 1.9: Division Into Two Equal Parts: Messiaen's Mode 4.

(An eight-note scale)

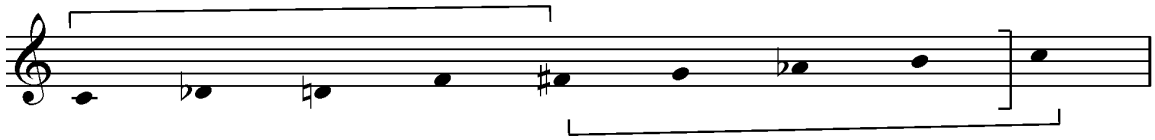


Figure 1.10: Division Into Two Equal Parts: Messiaen's Mode 5.

(A six-note scale)

Figure 1.11: Division Of The Octave Into Two Equal Parts: Messiaen's Mode 6.

(An eight-note scale)

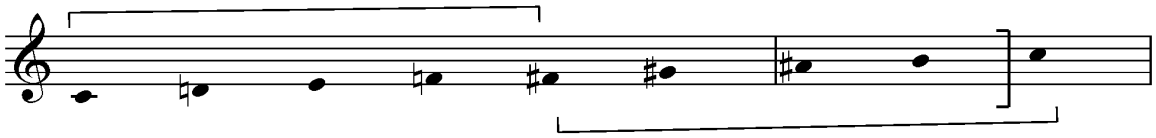
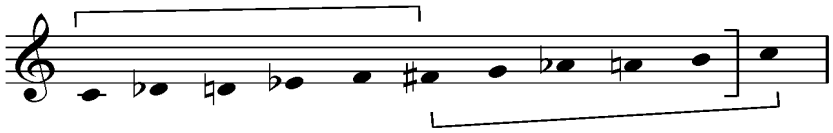


Figure 1.12: Division Of The Octave Into Two Equal Parts: Messiaen's Mode 7.

(A ten-note scale)



Equal Divisions in Jazz

Jazz did not exist in any recognizable form before the early twentieth century. Jazz was influenced by many different sources, one of which was European Classical music. The improvisers and composers listened to, and borrowed harmonic ideas freely from, the European tradition. Gunter Schuller observes:

> It should be noted here that these particular harmonic relationships had all been discovered and already developed into a distinctly recognizable new language (syntax) much earlier around the turn of the century by composers such as Debussy, Ravel …Stravinsky…Schoenberg. And Ellington had used such harmonic relationships as early as the mid thirties.[33]

It is quite possible that some jazz musicians came across these alternate scales and harmonic settings on their own; in a sense they are right there for any curious mind to harvest. Jazz composers and improvisers, as in the classical European music tradition, use these resources in combination with more traditional harmony. As early as 1927 Bix Beiderbecke was using whole-tone scales (hexatonic sets produced by division of octave by two) in his composition "In A Mist" (1927). Fletcher Henderson recorded the Coleman Hawkins composition "Queer Notions" in 1933, a composition also featuring the whole-tone scale. Duke Ellington's "Liberian Suite*"* first performed in 1947, used the whole-tone scale and a diminished whole-tone/semi-tone collection. The latter, named the "octatonic" scale years later by the theorist Arthur Berger,[34] had been in use for many years by both French and Russian composers. By the late 1940s the diminished scale was in wide use by jazz improvisers. Thomas Owens refers to the early use of this scale by Dizzy Gillespie, Charlie Parker, Oscar Peterson, John Coltrane, Stan Getz, and Dexter Gordon and notes the 1947 recording by Miles Davis of "Out of Nowhere".[35] [36]

Also by the late 1940s, jazz was no longer the "popular music" it once had been. Many adventurous jazz musicians moved away from playing only dance and show tunes and began experimenting more with non-traditional tonality. (A detailed list of jazz compositions using equal divisions and an examination of how improvisers use this material will be provided in Chapter Two.)

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[33] Gunther Schuller, *The Swing Era: The Development of Jazz, 1930-1945* (Oxford University Press, 1989), 362.
[34] Arthur Berger, "Problems of Pitch Organization in Stravinsky," *Perspectives of New Music* 2, no. 1 (October 1, 1963), 20.
[35] Thomas Owens, *Bebop: The Music and Its Players* (Oxford University Press, 1996), 76,82,89,92-93,95,106,158.
[36] Thomas Owens, *Bebop: The Music and Its Players*, 115.

Theoretical Literature

Although most contemporary theory books acknowledge the importance of symmetrical scales, few offer more than a few pages or a brief overview. The following were useful to my research.

1. Books dealing with the creation and use of scales and harmonic material derived from the equal division of the octave:

- Olivier Messiaen, *The Technique of My Musical Language* - Equal divisions produce Modes *Of Limited Transposition.* [37] Messiaen identifies scales (modes) derived from equal divisions of the octave and shows how they are used, giving examples from his own work and from the work of other composers.
- Nicholas Slonimsky, *Thesaurus of Scales and Melodic Patterns* - Slonimsky creates symmetrical scales by the addition of notes to equal divisions of the octave (as well as equal divisions of multiple octaves-).[38]
- Sylvia Kahan, In *Search of New Scales : Prince Edmond de Polignac, Octatonic Explorer*,[39] - Kahan explores the "invention" of the (then unnamed) octatonic scale in the nineteenth-century. An entire treatise, written by Prince Polignac, discussing the scale is included.
- Schoenberg, *Theory of Harmony* [40] - Written before Schoenberg defined serialism, this book hints at the breakdown of tonal harmony.
- Schoenberg, *Style and Idea*[41]- Schoenberg presents serialism.
- Gordon Delamont, *Modern Twelve-Tone Technique* - Delamont presents serial techniques for the jazz arranger and composer [42]
- Ernő Lendvai, *Bela Bartok: An Analysis of His Music* - Lendvai discusses octatonic systems used by Bartok.[43]

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[37] Olivier Messiaen, *The Technique of My Musical Language : Text with Musical Examples* (Paris: Alphonse Leduc, 2001).
[38] Slonimsky, *Thesaurus of Scales and Melodic Patterns.*
[39] Sylvia Kahan, *In Search of New Scales : Prince Edmond de Polignac, Octatonic Explorer*, Eastman Studies in Music (Rochester, NY: University of Rochester Press, 2009) .
[40] Arnold Schoenberg, *Theory of Harmony* (Faber and Faber, 1978).
[41] Arnold Schoenberg and Joseph Henry Auner, *Style and Idea: Selected Writings of Arnold Schoenberg*, 60th anniversary ed. (Berkeley: University of California Press, 2010).
[42] Gordon Delamont, *Modern Twelve-Tone Technique: An Examination of Serial Writing for the Contemporary Composer and Arranger* (New York: Kendor Music, 1973).

A great deal more literature is available by theorists and music historians that, while examining the works of specific composers or schools of music, address symmetrical scales and equal divisions

2. The following books and journal articles were especially useful:

- Taruskin, *Defining Russia Musically : Historical and Hermeneutical Essays.*[44]
- Peter Van den Toorn, *The Music of Igor Stravinsky* .[45]
- Peter Burt, *The Music of Toru Takemitsu.* [46]
- Berger, *Problems of Pitch Organization in Stravinsky.* [47]
- Guy Cappuzzo, *Pat Martino's The Nature of the Guitar: An Intersection of Jazz Theory and Neo-Riemannian Theory*.[48]
- Richard Cohn, *Introduction to Neo-Riemannian Theory: A Survey and a Historical Perspective.*[49]

Problems Of Analysis

A harmonic system created from symmetrical material does not behave in the same manner as a diatonic system. Familiar sub-dominant, dominant and tonic relationships do not exist. Understanding how these systems function has necessitated the creation of new methods of analysis. The theorist Richard Cohn recognizes the characteristics of equal divisions that prevent or inhibit standard methods of analysis: a suspension of tonal gravity, the erosion of the fundamental distinction between consonance and dissonance, not derived from the overtone series, the necessity of enharmonic equivalents, and the elimination a tonic triad.[50]

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[43] Ernő Lendvai, *Bela Bartok: An Analysis of His Music* (London: Kahn & Averill, 1971).
[44] Richard Taruskin, *Defining Russia Musically : Historical and Hermeneutical Essays*, Book, Whole (Princeton, N.J.: Princeton University Press, 1997).
[45] Pieter C. Van den Toorn, *The Music of Igor Stravinsky* (New Haven ; Yale University Press, 1987).
[46] Peter Burt, *The Music of Toru Takemitsu*, Music in the Twentieth Century (New York: Cambridge University Press, 2001).
[47] Berger, "Problems of Pitch Organization in Stravinsky."
[48] Guy Capuzzo,"Pat Martino's The Nature of Guitar" MTO 12.1, accessed September 2, 2015. http://www.mtosmt.org/issues/mto.06.12.1/mto.06.12.1.capuzzo.pdf.
[49] Richard Cohn, "Introduction to Neo-Riemannian Theory: A Survey and a Historical Perspective," *Journal of Music Theory* 42, no. 2 (October 1, 1998), pp. 167–80.
[50] Cohn, "Maximally Smooth Cycles", pp. 11-12

David Lewin, Richard Cohn, Guy Capuzzo and others employ Neo–Reimann analysis to reveal the logic and movement of symmetrical harmonic movement. Instead of traditional methods of understanding harmonic motion, transformations or *operations* between triadic structures are identified. The progression of a C major triad to an E major triad, for example, involves two *operations*: 1) lowering one note (C) to produce E minor and 2) raising one note (G) to produce E major. A detailed method of identifying these and other operations exists.

It is clear that symmetrical scales and harmonic systems were being used long before theorists or composers knew how to identify them. It was believed, for example, that Stravinsky was using pan-tonal or polytonal techniques until Arthur Berger, in 1963, identified the symmetrical whole step /half step collection as the source for much of what Stravinsky was writing.[51]

[51] Cohn, “Maximally Smooth Cycles", pp. 22-23

Chapter 2: Creation and Application

This chapter examines in detail the creation of scales, chords and harmonic environments from each equal division of the octave. Methods used by Arnold Schoenberg, George Russell, Gordon Delamont, Nicholas Slonimsky, Olivier Messiaen, Bela Bartok, and Toru Takemitsu and others will be discussed. The importance of this material to jazz composers and improvisers will also be examined.

Symmetrical Scales: Division Of Octave Into Twelve Equal Parts

Tonal harmony evolved in the nineteenth century into extended tonality. Through composers like Richard Wagner and Liszt the "logic and constructive power" of harmony had changed. Listeners came to accept the unresolved dissonances presented by Debussy and other "impressionistic" composers. Schoenberg perceived that it was time for a complete "emancipation of the dissonance" - the division of the octave into twelve equal parts. Although others were exploring serialism in the early twentieth century, Schoenberg is recognized as the first to clearly define a method. This twelve-tone technique was passed on to his students, Webern and Berg, and explored further in the twentieth century by many composers of Western art music, including Boulez, Stravinsky and Messiaen.

Schoenberg saw twelve-tone composition as a historical and aesthetic necessity. In 1908 he began composing in a new style, eventually presenting this "new procedure" in the early 1920s.[52] The technique, using a single twelve-note collection (set), has very formal prescribed methods.[53]

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[52] Schoenberg and Auner, *Style and Idea*, pp. 216-218

[53] Using Schoenberg's technique, the composer creates a sequence (*set* or *row*) of the twelve notes of the chromatic scale. These notes may be in any order but each note may only occur once in the sequence (all twelve notes of the chromatic scale are used in the twelve tone row). The character of the composition depends greatly on the composer's selection of notes. A tone row containing many fourth intervals, for instance, will produce a composition of much different character than a row containing many semi-tone intervals. The composer has available all transpositions of the created row in its *Prime* (original order), *Inversion* (each interval is inverted- for example: thirds become sixths), *Retrograde* (the row is played in reverse order), and *Retrograde Inversion* (reverse order *and* intervals inverted). This produces a total of 144 versions of the row.

Schoenberg acknowledges the severity of what he has offered:[54]

> The restrictions imposed on a composer by the obligation to use only one set in a composition are so severe that they can only be overcome by an imagination which has survived a tremendous number of adventures. Nothing is given in this method; but much is taken away.[55]

In 1959 the jazz composer and theorist George Russell presented his *Lydian Chromatic Concept of Tonal Organization* offering the jazz composer and improviser the theoretical antithesis of Schoenberg's "technique", and with that a completely different way of considering the division of the octave into twelve equal parts. [56] As Schoenberg rejects any association with the chromatic scale or a key, the tones being only related to one another, Russell offers what he calls a "tonal universe" containing not one, but *twelve* chromatic scales. Each chromatic scale is in itself a "tonal galaxy" possessing "a tonal order that is founded upon (it's own) tonic tone".[57] Each of the twelve chromatic scales is in a sense a key unto itself. It is in fact this "tonal gravity" that defines Russell's concept. Russell says of his system: "It is free of rules, laws and biases. There are no wrong notes or progressions." He strives "…to make the composer or improviser aware of the tonal and non-tonal resources of the chromatic scale".[58]

The Canadian jazz composer, educator and author Gordon Delamont, recognizes twelve tone writing as " the most important compositional development of the 20th century".[59] In his *Modern Twelve –Tone Technique* Delamont presents the formal methods created by Schoenberg but encourages the composer/arranger to be flexible with the technique. "..it is *only* a technique which, which like all others, should be regarded as a servant of the composer and not his master".[60] David Baker, the American educator, author, jazz musician and composer also recognizes the importance of twelve-tone technique:

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[54] I will examine in more detail the specifics of Schoenberg's techniques in the discussion of my own compositions using twelve tones in chapter three.
[55] Schoenberg and Auner, *Style and Idea*,234.
[56] George Russell, *George Russell's Lydian Chromatic Concept of Tonal Organization*, 4th ed. (Brookline, Mass: Concept Pub. Co., 2001).
[57] George Russell, *George Russell's Lydian Chromatic Concept,* Technical Appendix page B.
[58] George Russell, *George Russell's Lydian Chromatic Concept,* Technical Appendix page B.
[59] Delamont, *Modern Twelve-Tone Technique*, Forward page iii.
[60] Delamont, *Modern Twelve-Tone Technique*, 26.

> Of all the innovative techniques of the first three quarters of the twentieth century, perhaps the most significant is the twelve –tone technique…. The method of composition based on tone rows is pervasive and has had astonishingly swift dissemination. Few modern composers have escaped the influence of this method.[61]

Examples of twelve-tone composition include Anton Webern's *Variations For Piano,* Op. 27 (1936) and Bill Evans' "Twelve Tone Tune" (1971).[62]

Symmetrical Scales: The Division Of The Octave Into Six Equal Parts

A division of the octave by two into six equal parts produces the hexatonic (six-note) whole-tone scale. This scale contains only whole-tones. A triad built on any note of the scale will be an augmented triad. Above any note of the whole-tone scale the following intervals exists: major 2nd, major 3rd, augmented 4th, augmented 5th, and augmented 6th.[63]

Debussy's *The Sea* (1903) and *Voiles* (1909) use the inherent ambiguity of the scale to great effect. Takemitsu expanded the possibilities of this set by the addition of one semi-tone. This scale is best used in combination with other harmonic material. Art Farmer's *Whole Tone Stomp* (1970) is an unfortunate example of how unsatisfying this material can be on its own. The improvisations of Thelonious Monk, on the other hand, use the scale well in combination with more tonal material. On the recording "Body and Soul*"* from the album *Monk's Dream* (1962), Monk uses the scale conspicuously seven times.[64]

Symmetrical Scales: The Division Of The Octave Into Three Equal Parts

Further equal divisions of the octave generate increasingly larger intervals. Instead of producing a scale, a division into three equal parts yields an augmented triad. A division into four equal parts produces a diminished 7th chord, and a final division of the

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[61] David Baker, *David Baker's Advanced Improvisation: A Comprehensive Method for All Musicians*, Rev. ed., vol. 2, 2 vols. (Van Nuys, CA: Alfred Pub Co., 1990), 92.

[62] Webern was a student of Schoenberg and Evans was familiar with George Russell's *Lydian Chromatic Concept*.

[63] The augmented 4th, augmented 5th, and augmented 6th could, of course, be considered as their enharmonic equivalents: b5th, b6th and b7th

[64] The piece actually begins with a descending whole tone scale. Monk uses the scale again on the last bar of the **B**[1], the third bar of the **A**[3], the fourth bar of the **A**[4], the third and sixth bars of **A**[6] and the third bar of the final **A**.

octave by six produces the tritone. Each of these three divisions can be further augmented by the addition of other tones to produce symmetrical scales. As indicated, the division of the octave by four into three equal parts produces an augmented triad: three pitches, each a major third apart. The addition of a semitone above or below each of these tones produces the six-note *symmetrical augmented scale*. The addition of a semitone above *and* below each tone (upper and lower chromatic neighbour notes) produces a symmetrical nine-note or nonatonic scale. These formations are demonstrated in Figures 2.1, 2.2, and 2.3. The addition of a whole tone above or below each tone produces once again the symmetrical whole tone scale (shown in Figure1.4). Examples of compositions using the division of the octave into three equal parts include Liszt's *A Faust Symphony* (1857) - symmetrical augmented scale, and John Coltrane's *Giant Steps* (1959) - movement of tonal centers by major third intervals.

Symmetrical Scales: The Division Of The Octave Into Four Equal Parts

A division of the octave by three into four equal parts results in a diminished 7^{th} chord. The addition of a semi-tone above each tone generates a symmetrical eight-note scale that is also commonly referred to as the *semi-tone/tone/semitone scale*. The addition of a whole-tone above each tone merely produces a transposed version of the semi-tone addition. This scale offers a palette featuring exquisitely rich harmonic and melodic possibilities. In addition to the intrinsic symmetry, major and minor thirds and sixths, perfect fourths and fifths, major and minor seventh chords (and the extended b9, #9, #11 and 13^{th} and $b13^{th}$ chords) are all potentially present.

Examples of compositions using the diminished/octatonic scale include Bartok's *Mikrokosmos Book IV, 99,101* and *109* (1926-1939) and Jaco Pastorius's *Opus Pocus* (1976).

Symmetrical Scales: The Division Of The Octave Into Two Equal Parts

When divided by six in to two equal parts the largest equal division is produced - a tritone diad (two tones an augmented fourth or a diminished fifth apart as per notational choice). A number of different combinations of notes can be added to this division - forming a number of different scales.

Applications In Classical Music

The French composer Olivier Messiaen (1908-1992) created a distinctive musical language. In his forward to *The Technique of my Musical Language* [65] he cites such influences as "the Holy Books, birds, Russian Music…plainchant, Hindu Rhythmics, the mountains of Dauphine,…and all that evokes stained-glass window and rainbow." [66] He explains in his fanciful way his use of birdsong and palindromic (non-retrogradeable) rhythmic figures. Of specific interest is the chapter *Modes of Limited Transposition.*[67] Messiaen defines the symmetrical scales (modes) derived from equal divisions of the octave by the number of times each can be transposed before replicating itself. The major, minor and most other scales familiar to Western art music can be transposed eleven times before replicating the original pitch set. The intervallic relationships remain the same, but each transposition contains an exclusive collection of pitches. Symmetrical scales, and the harmonic material derived from these scales, replicate themselves after much smaller numbers of transpositions.[68]

> At the end of a certain number of chromatic transpositions which varies with each mode, they are no longer transposable, the fourth transposition giving exactly the same notes as the first, for example…." [69]

Messiaen orders the modes (scales) by the number of times they can be transposed. The first mode is the *whole-tone scale,* which can only be transposed once (on the second transposition the original scale is replicated). There are two whole tone scales. The second mode, the *octatonic scale*, can only be transposed twice, there are three octatonic scales. The third mode is the *nonatonic scale*, which replicates on the fourth transposition. There are four nonatonic scales (within this scale is a hexatonic collection often referred to as the *symmetrical augmented scale*). The fourth, fifth, sixth and seventh modes are, because of their similarities, considered together by Messiaen. All are symmetrical formations built upon the tritone and replicate themselves on the sixth

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[65] Messiaen, *The Technique of My Musical Language,* pp. 61 - 62.
[66] Messiaen, *The Technique of My Musical Language,* 8.
[67] Messiaen, *The Technique of My Musical Language,* 58.
[68] The division of the octave into twelve equal parts is not included as one of Messiaen's modes. This division replicates itself on each transposition.
[69] Messiaen, *The Technique of My Musical Language,* 58.

transposition. The division of the octave into twelve equal parts is not included as one of Messiaen's modes. This division replicates itself on each transposition.

Messiaen is intrigued by "the charm of impossibilities".[70] He compares the impossibility of transposing a mode beyond its limited transposition (a vertical consideration) to the impossibility of creating new rhythmic material from a palindromic non-retrogradable rhythm (a horizontal consideration). He strives to charm the listener toward a "theological rainbow".[71] The book is divided into two slim volumes: Volume 2 contains only musical examples referenced in Volume 1. Messiaen offers little to inform the genesis of these modes. The symmetrical augmented scale, a reduction of his third mode, is not considered.

By contrast, the Russian-born American Nicholas Sloninmsky (1894-1995), in his *Thesaurus of Scales and Melodic Patterns* provides a detailed methodology.[72] This 1947 reference book, while including material that has been "consecrated by usage" [73] also introduces or identifies "a great number of melodically plausible patterns that are new".[74] Much of this material is derived from the equal division of the octave. The first eighty-three pages of this work demonstrate the construction of symmetrical melodic material on each equal division of the octave. The principle tones of each division are enhanced by the addition of other tones above, below or between. Symmetry is maintained by ensuring that each principle tone is supplemented in the same manner as all other principle tones; if one principle tone is preceded by a semi-tone, for instance, *all* principle tones will be preceded by a semitone.

In the following example the simple addition, or *Interpolation*, of a semi-tone below each division point, (Figure 2.1), produces a symmetrical augmented scale (Figure 2.2). The addition of two semitones produces a symmetrical nine-note scale (Figure 2.3).

[70] Messiaen, *The Technique of My Musical Language,* 13.
[71] Messiaen, *The Technique of My Musical Language,* 63.
[72] Slonimsky, *Thesaurus of Scales and Melodic Patterns*.
[73] Slonimsky, *Thesaurus*, Introduction i.
[74] Slonimsky, *Thesaurus,* Introduction i.

Figure 2.1: Equal division of One Octave into Three Parts

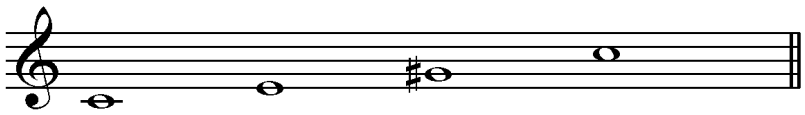


Figure 2.2: Interpolation of One Note ("x" note-head): Produces Symmetrical Augmented Scale.

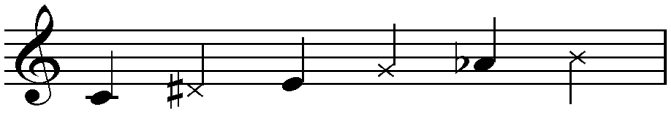
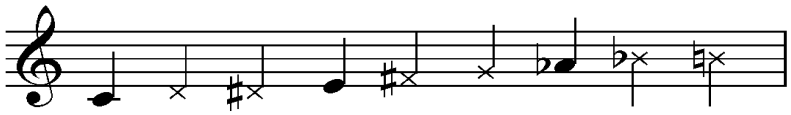


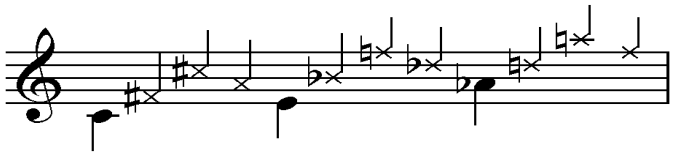
Figure 2.3: Interpolation of Two Notes ("x" note-heads): Produces A Symmetrical Nine-Note (Nonatonic)Scale



The same equal division into three parts yields complex symmetrical patterns when Slonimsky adds more tones above, below and between each principle division.

Below we see the addition of three notes (x note-heads) above the next principle tone; a process that Slonimsky refers to as *Ultrapolation* (Figure 2.4).

Figure 2.4: Ultrapolation



These melodic patterns built upon equal divisions contain notes not included in the symmetrical scales. Because the same intervals are added in the same order above (below or between) each principle tone, these patterns are also limited in their transpositions. In the examples shown below (Figures 2.5 and 2.6), the tones from the first melodic pattern

(or their enharmonic equivalent) will reoccur on the fourth transposition starting from the next principle/division tone.

Figure 2.5: First Melodic Pattern - Ultrapolation Of Three Notes Above The Principle Division Tones; C, E And Ab

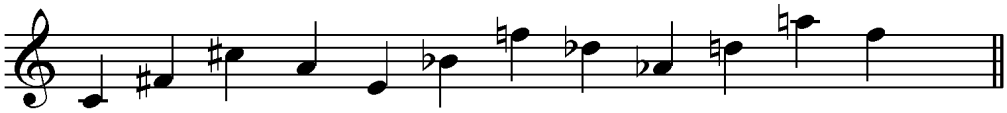
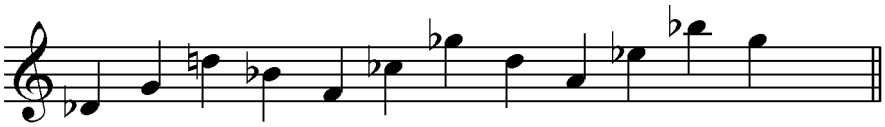
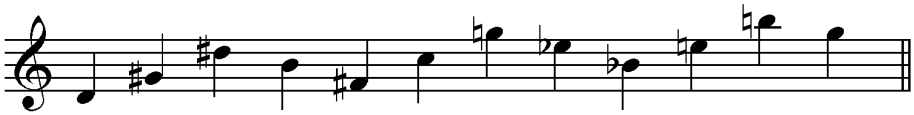


Figure 2.6: Transpositions

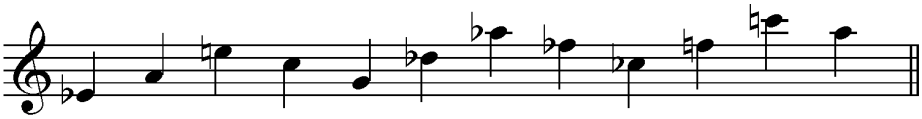
Transposition 1



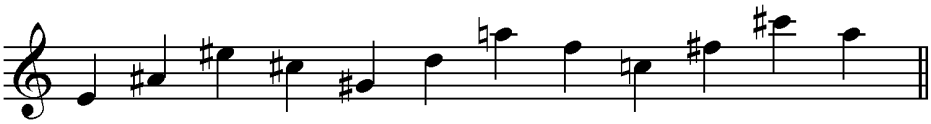
Transposition 2



Transposition 3



Transposition 4 - Same As First Melodic Pattern (Or Enharmonic Equivalent)



Slonimsky actually goes a step further and examines the equal division of multiple octaves. These expanded divisions produce the same pitch sets as the equal division of one octave. An equal division of seven octaves into twelve equal parts produces a cycle of fifths – an expanded iteration of the twelve note chromatic scale produced by the equal division of one octave into twelve equal parts. Slonimsky's influence reaches beyond

Western art music, for example John Coltrane was studied and practiced patterns from *The Thesaurus* when he composed *Giant Steps.*[75] Slonimsky's work is still regarded as a creative source for jazz improvisers and composers. Frank Zappa, who befriended the elderly Slonimsky, referred to him as "our national treasure".[76] [77]

Béla Bartók (1881-1945), the Hungarian ethnomusicologist, pianist, and composer, was influenced greatly by the works of Debussy and Stravinsky.[78] Many of his compositions use the octatonic scale. As the Hungarian theorist Erno Lendvai (1925-1993) explains, Bartók explores the relationships between the octatonic scale's resident harmonic structures and uses all three transpositions of the scale to create a larger harmonic system. Lendvai identifies an "Axis System" created by Béla Bartók.[79] Bartók expanded the idea of similar function harmony and found a functional relationship that connects a "tonic" major or minor chord to its tritone, mediant and submediant equivalent.[80] These relationships are contained within the octatonic scale. A minor is related to C major as C minor is to Eb major, and so on until the cycle repeats itself (Figure 2.7). The pitches of all these major and minor triads are contained in one octatonic collection.

If we consider the system built on C as being a tonic function, similar axes can be built on G and F –the dominant and subdominant of C.[81] There are only three octatonic scales; the systems built upon the dominant and subdominant will each produce all of their minor and major triads from one of the two remaining octatonic collections. The same relationships will apply to all tonic/subdominant/dominant axis systems regardless of the "tonic" pitch. When all three octatonic collections are employed the axis system makes available *all* major and minor triads.[82]

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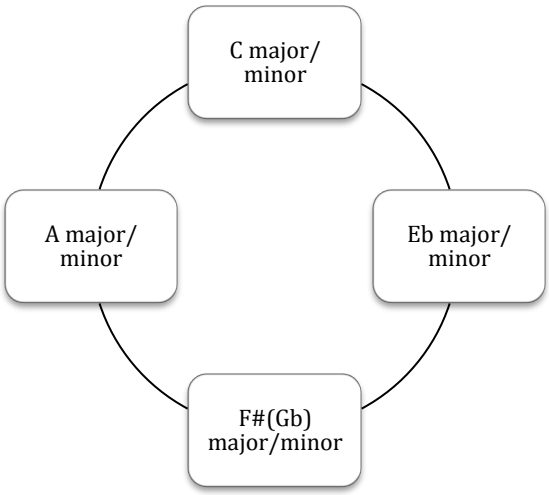
[75] Keith Waters, "'Giant Steps' and the ic4 Legacy," *Intégral* 24 (January 1, 2010), 136.
[76] "Nicolas Slonimsky," *The New Yorker*, accessed October 12, 2015, http://www.newyorker.com/magazine/1996/01/15/nicolas-slonimsky.
[77] I will be employing Slonimsky's methods in the creation of scalar and harmonic material for my compositions demonstrating the division of the octave into two equal parts.
[78] David Cooper, *Béla Bartók* (New Haven, CT, USA: Yale University Press, 2015), preface xiii.
[79] Lendvai, *Bela Bartok*.
[80] Lendvai, *Bela Bartok*, pp. 3- 10.
[81] Lendvai, *Bela Bartok*, 15.
[82] I will be employing the axis system in my jazz and chamber compositions demonstrating the division of the octave into four equal parts.

Figure 2.7: Major/Minor Relationships



The Japanese classical composer Töru Takemitsu (1930-1996) incorporated Olivier Messiaen's modes of limited transposition into his own musical language. [83] Peter Burt's *The Music Of Tōru Takemitsu* gives a detailed account of the composer's musical life.[84] The octatonic scale, Messiaen's second mode of limited transposition, "became one of the most consistent features of the composers vocabulary".[85] Takemitsu also approached the use of symmetrical scales through the lens of George Russell's *Lydian Chromatic Concept of Tonal Organization,*[86] mixing modes and adding notes.[87] Takemitsu was fond of adding a note to the whole tone collection. Burt refers to this as Takemitsu's favourite "chromatically enhanced modal collection";[88] this collection "infuses a certain density…(and a) much larger range of harmonic possibilities".[89] [90]

[83] Burt, *The Music of Toru Takemitsu,* pp. 28- 31.
[84] Burt, *The Music of Toru Takemitsu.*
[85] Burt, *The Music of Toru Takemitsu,* 32.
[86] Burt, *The Music of Toru Takemitsu,* pp. 86-87.
[87] Although Takemitsu was by no means a jazz composer, he was familiar with Russell's influential work.
[88] Burt, *The Music of Toru Takemitsu,* 107.
[89] Burt, *The Music of Toru Takemitsu,* 123.
[90] This "whole tone +1 scale" will be used in both of my compositions demonstrating the division of the octave into six equal parts.

The Twisted History Of The Octatonic Scale

Tracing the evolution of the octatonic scale led me to Peter Taruskin's *Defining Russia Musically.*[91] Taruskin credits Rimsky–Korsakov for his "cautious and methodical mining of the coloristic possibilities inherent in a scale with alternating whole and half steps…It defines Russia musically at the turn of the [19th] century".[92] Taruskin is referring to the end of the nineteenth century. Non-Russian composers were experimenting with this collection as well. Of particular interest is the amateur French composer Prince (Count) Edmond de Polignac (1834-1901). In her book, *In Search Of New Scales: Prince Edmond De Polignac, Octatonic Explorer* [93], Sylvia Kahan acknowledges that Polignac was not the first to use the scale, citing earlier works by Rimsky-Korsakov (Sadko, begun1861) and Musorgsky (Boris Godunov, 1874). Rimsky–Korsakov never wrote down a detailed explanation of this scale and, according to Kahan, composers at that time generally thought of the scale as a way of embellishing the diminished 7th chord [94]. Around 1879, however, Count Polignac[95] was the first to write a treatise on the then un-named octatonic scale and is the composer of " the first pervasively octatonic composition".[96]

Oddly, in 1893 another French composer and musicologist, Alexandre de Bertha introduced a paper to the Paris musical world outlining his invention of "enharmonic scales",[97] a harmonic system almost identical to that which Polignac introduced in 1879. Kahan refers to the ensuing French proprietary battle.[98] The octatonic lineage gets even more complicated. Kahan states that both Debussy and Ravel knew Polignac and were familiar with his work.

> "It is impossible to prove Polignac's influence …but what is certain is that Debussy and Ravel can be placed in the Polignac salon … therefore this indigenous source of influence cannot be ruled out"[99]

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[91] Taruskin, *Defining Russia Musically : Historical and Hermeneutical Essays*.
[92] Taruskin, *Defining Russia,* 84.
[93] Kahan, *In Search of New Scales : Prince Edmond de Polignac, Octatonic Explorer*.
[94] Sylvia Kahan, "'Rien de La Tonalite Usuelle': Edmond de Polignac and the Octatonic Scale in Nineteenth-Century France," *19th-Century Music* 29, no. 2 (November 1, 2005), 98.
[95] Kahan, *In Search of New Scales : Prince Edmond de Polignac, Octatonic Explorer*, 41.
[96] Kahan, "Rien de La Tonalite Usuelle", 99.
[97] Kahan, "Rien de La Tonalite Usuelle", 114.
[98] Kahan, "Rien de La Tonalite Usuelle", 115.
[99] Kahan, "Rien de La Tonalite Usuelle", 120.

Steven Baur, in *Ravel's "Russian "Period :Octatonicisim in His Early Works, 1893-1908,*[100] writes that the presence of the "octatonic element" in both Debussy and Ravel "is probably a matter of common sources and for these sources we must look to Liszt and the Russians."[101] It seems evident that composers and improvisers arrived at symmetrical scales and equal divisions in different ways and for different reasons. (Table 1)

Table 1: How Composers And Improvisers "Found" Symmetrical Scales and Equal Division

Reasons	**Composers**
Mathematical curiosity	Polignac
A desire to elude or erode traditional harmony	Schoenberg Bartok Debussy
Attempts to create a new musical language	Messiaen
Attempts to find a 'parallel' musical universe to be used in combination with the more familiar	Coltrane Shorter
A desire to expand scalar materials and 'tonalities' used in jazz improvisation	Hawkins, Beiderbecke et al
Equally dividing the octave to create new key areas	Richard Rogers, Jerome Kern, Coltrane, Schubert

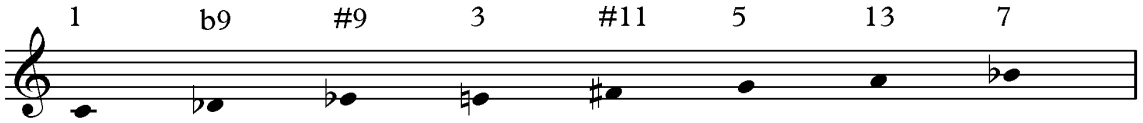
Applications in Jazz: Improvisation

The greatest presence of symmetrical material in jazz is in the improvisations of jazz musicians. Early in the history of jazz, players, by accident or design, found that the upper extensions of chords are present in scales derived from equal divisions of the octave. Figure 2.8 shows the upper extensions of a $C7^{th}$ chord present in the (semi-tone/whole-tone) diminished scale and the whole-tone scale.

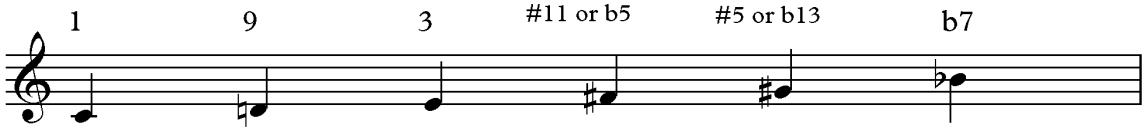
[100] Steven Baur, "Ravel's 'Russian' Period: Octatonicism in His Early Works, 1893-1908," *Journal of the American Musicological Society* 52, no. 3 (October 1, 1999), pp531–92.
[101] Baur, "Ravel's 'Russian" Period, 535.

Figure 2.8: Upper Extensions of C7th Chord Present in Diminished and Whole-Tone Scales

Diminished



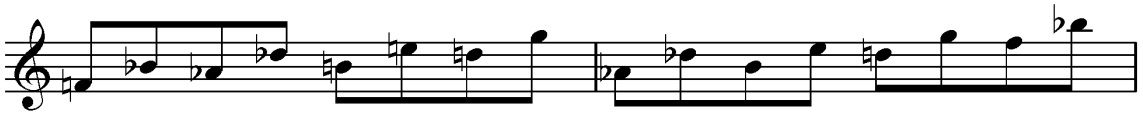
Whole-Tone



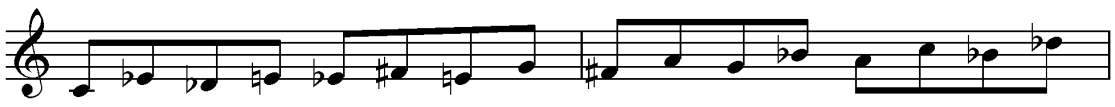
Gunther Schuller's The *Swing Era: The Development of Jazz 1930-1945* discusses how these new sounds had been incorporated into the jazz sound…that by the early 1940s there was a shift beginning in jazz towards "bitonal harmonic combinations".[102] The diminished scale in particular contains many patterns that players have incorporated into the jazz language. The examples below (Figure 2.9) demonstrate the flexible architecture of the scale by outlining some of the simple resident interval relationships. These relationships have been manipulated in countless ways; in this scale any pattern can be replicated within the scale at the minor third, tritone and major sixth intervals.

Figure 2.9: Flexible Architecture of The Diminished Scale

Diminished Scale In Fourths

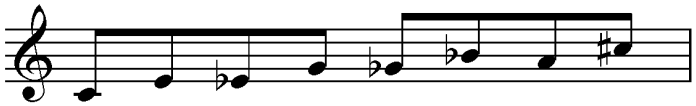


Diminished Scale In Minor Thirds

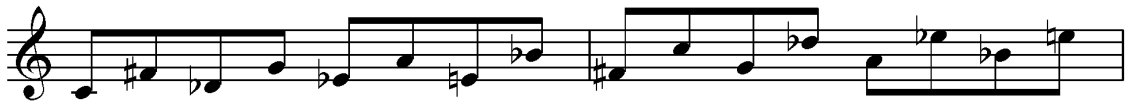


[102] Schuller, *The Swing Era*, 361.

Diminished Scale In Major Thirds



Diminished Scale Rising In Tritones



Theorist Jerry Coker devotes a chapter of *Improvising Jazz* to the diminished scale,[103] as does Scott D. Reeves' *Creative Jazz Improvisation.*[104] Patterns using only the notes of the whole-tone scale or the symmetrical augmented scale are not as common but can be found in some instructional jazz method books. In *Repository of Scales and Melodic Patterns* Yusef Lateef uses whole-tone melodies in combinations with quartal and diatonic harmony as well as using the diminished seventh chord (equal division into four) as a framework to move melodic cycles, demonstrating that symmetrical material often works well with other harmonic systems.[105] Although almost every contemporary improviser uses these scales in some way, some early innovators are worth mentioning: Coleman Hawkins for his innovative early use of diminished scales, Thelonious Monk for his eccentric whole-tone scale runs, and Oliver Nelson and John Coltrane for their studied and innovative use of equal divisions in compositions and improvisations.

Applications in Jazz: Compositions

Within the world of jazz, both composers and improvisers use scales and harmonic structures derived from the equal division of the octave. As in Western art music, it is rare to find compositions (or improvisations) using *only* symmetrical scales or harmony. Jazz players are well aware of the use of equal divisions in the harmonic structures of early American songbook standards; popular songs are still used by many jazz musicians as a framework for improvisation. In an informal survey of Canadian jazz musicians, I asked them to name jazz compositions using equal divisions of the octave. Only a few

[103] Jerry Coker, *Improvising Jazz*, A Spectrum Book (Englewood Cliffs, N.J: Prentice-Hall, 1964).
[104] Scott D. Reeves, *Creative Jazz Improvisation*, 2nd ed. (Englewood Cliffs, N.J: Prentice Hall, 1995).
[105] Yusef Lateef, *Repository Of Scales And Melodic Patterns* (Amherst, MA: Fana Music, 1981), pp. 13,146,148.

could add to the short list that I had compiled (Table 2). Evidently, equal divisions and symmetrical scales have a greater presence in improvisation and as a tool for arrangers. The reasons for this are not quite clear, jazz composers are usually also jazz improvisers. Some possible explanations:

- Many jazz compositions are created as a vehicle for improvisation - perhaps some jazz composers use more traditional diatonic content to offset, and allow harmonic space for adventurous improvisation.
- Jazz has a long tradition of reinterpreting popular songs and many jazz compositions are based on the harmonic progressions of these songs - symmetrical scales and harmonic material derived from equal divisions of the octave are almost non-existent in popular music.
- Jazz evolved from and is still deeply connected to the blues - a music defined by the movement of dominant and sub-dominant chords to a tonic.
- Jazz has a shorter history than classical music. Classical composers were experimenting with symmetrical scales and harmony before jazz existed.

One of the challenges when using symmetrical material is the avoidance of ambiguity. As discussed earlier, all symmetrical harmonic environments lack a defined sense of tonality. In Delamont's *Modern Twelve Tone Technique,* techniques are suggested to reduce the ambiguity and "wandering" inherent to twelve-tone composition.[106] These techniques can of course be applied to all material derived from equal divisions of the octave. He emphasizes the importance of building a narrative using non-harmonic, non-melodic elements of the music. Thus, for example, form, emotion, melodic shape, rhythm and all types of repetition can contribute to the unity of a composition "…too much abstraction can lead to a loss of communication".[107]

[106] Delamont, *Modern Twelve-Tone Technique*, 7.
[107] Delamont, *Modern Twelve-Tone Technique*, 7.

Table 2: Compositions That Use Equal Divisions of The Octave

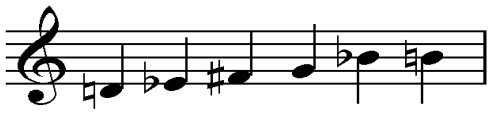
Composition	Composer	Equal Division
Take the A Train *Whole Tone Stomp* *Hilton* *Queer Notions* *In A Mist* *Spanning* *Ju-Ju* *Our Man Higgins*	Billy Strayhorn Art Farmer Red Rodney Coleman Hawkins Bix Beiderbecke Charles Tolliver Wayne Shorter Lee Morgan	Use of whole-tone scale for melodic and/or harmonic material
Have You Met Miss Jones *Till The Clouds Roll By* *Giant Steps*	Richard Rogers Jerome Kern John Coltrane	Key areas created by division of octave into three equal parts
Skating Song	Vince Guaraldi	Harmonic motion created by division of the octave into four equal parts
I Love You *Opus Pocus*	John Coltrane Jaco Pastorious	Melodic material created from diminished scale
Liberian Suite *Hoe-Down*	Duke Ellington Oliver Nelson	Use of material created from whole-tone and diminished scales
Twelve Tone Tune	Bill Evans	Melodic material created from twelve-tone row

Composers often apply equal divisions to create brief diatonic structures moving within a larger symmetrical construct - producing non-traditional harmonic movement. This application of an equal division of the octave occurs famously in the John Coltrane composition "Giant Steps*"* (1959). Rather than using scales or harmony derived from an equal division, Coltrane uses the division of the octave into three equal parts as a series of

harmonic gates. Each division of the octave briefly becomes a key area in and to itself - a position of tonal gravity generating diatonic II-V-I progressions. The equal division defines each key area. Richard Rogers uses a similar progression in the bridge of his 1937 composition "Have You met Miss Jones". Jerome Kern also divides the octave equally into three during the verse of "Till The Clouds Roll By" (1917*).*

With the additional freedom of improvisation, a piece like *Giant Steps* allows the possibility of simultaneous multiple levels of symmetry. A soloist using only the symmetrical augmented scale can create lines that satisfy the tonal requirements of the passing chords - a symmetrical scale plays over a symmetrical structure. Figure 2.10 shows the symmetrical scale that contains (enharmonically) the major (and minor) triads B, Eb, and G - the three equally divided key centers of "Giant Steps".

Figure 2.10: Symmetrical Augmented Scale Containing B, Eb and G triads



Chapter 3: *Dirty Dozen* and *Twelve of Us*

The following five chapters will present original compositions demonstrating the use of equal divisions. These divisions will be a source of scalar and harmonic material and in some cases function on a higher level - guiding form or harmonic motion. Each chapter will present a chamber music composition and a jazz composition.

The following two compositions demonstrate the use of the division of the octave into twelve equal parts. For each I impose specific rules on the composition process - rules that in different ways define a sense of order.

Composition I: *Dirty Dozen*

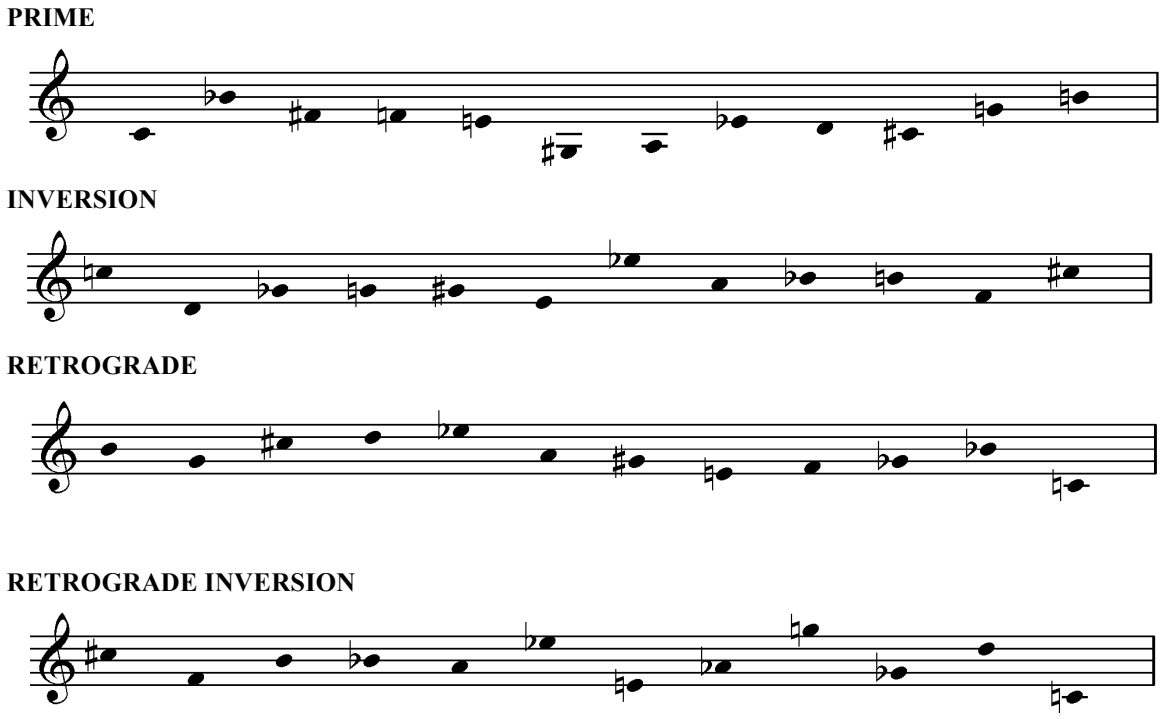
Application

Dirty Dozen is a solo classical piano piece composed using serial techniques introduced by Arnold Schoenberg. Put very simply, Schoenberg's method requires each pitch of the created twelve-note row to be played in the defined sequence order – and requires that a pitch cannot be used again until all other pitches in the row have been used. It is important to note that serialism seeks to abandon any sense of harmonic or *tonal gravity*. My intention was to adapt the "rules" laid out by Schoenberg – specifically to allow the right hand and left hand parts to independently complete tone rows if desired.

The first step in composing this piece was to create a tone row. This tone row served as the source of all melodic and harmonic material used in the composition. The tone row played the principle roll in determining the character of the composition. The row created for this composition is comprised of five semitones (half steps) combined with a variety of other intervals; when inverted, the semitone intervals form major seventh intervals. I wished to construct a row that would avoid familiar diatonic triads and melodic fragments. This row, in its *prime* or original incarnation is comprised of the following intervals (sometimes spelled enharmonically): minor 7th, major 3rd, semitone, semitone, minor 6th, semitone, tritone, semitone, semitone, tritone, major 3rd.

Figure 3.1 shows the row expressed in prime, inversion, retrograde and retrograde inversion – all forms are available to the composer in all twelve keys.[108]

Figure 3.1: Prime, Inversion, Retrograde, and Retrograde Inversion



Process

I then created a matrix built from the prime row. As can be seen in Figure 3.2, this matrix displays the prime, inverted, retrograde, and inverted retrograde rows in all twelve keys. The prime row, read from left to right, is named P0. The retrograde of prime is read from right to left and is named R0. The inversion of prime, named I0 is read top to bottom and the retrograde inversion of prime, RI0, is read bottom to top. Each of these is accompanied by eleven transpositions, (P0-P11, I0-I11, R0-R11 and RI0-RI11). The matrix provides the composer a quick reference, displaying all possible versions of the original row.

[108] Because the composer is free to place any pitch in any octave, all intervals are also available in their inverted form.

Figure 3.2: Twelve Tone Matrix created for *Dirty Dozen*

	I_0	I_{10}	I_6	I_5	I_4	I_8	I_9	I_3	I_2	I_1	I_7	I_{11}	
P_0	C	Bb	Gb	F	E	G#	A	Eb	D	C#	G	B	R_0
P_2	D	C	G#	G	Gb	Bb	B	F	E	Eb	A	C#	R_2
P_6	Gb	E	C	B	Bb	D	Eb	A	G#	G	C#	F	R_6
P_7	G	F	C#	C	B	Eb	E	Bb	A	G#	D	Gb	R_7
P_8	G#	Gb	D	C#	C	E	F	B	Bb	A	Eb	G	R_8
P_4	E	D	Bb	A	G#	C	C#	G	Gb	F	B	Eb	R_4
P_3	Eb	C#	A	G#	G	B	C	Gb	F	E	Bb	D	R_3
P_9	A	G	Eb	D	C#	F	Gb	C	B	Bb	E	G#	R_9
P_{10}	Bb	G#	E	Eb	D	Gb	G	C#	C	B	F	A	R_{10}
P_{11}	B	A	F	E	Eb	G	G#	D	C#	C	Gb	Bb	R_{11}
P_5	F	Eb	B	Bb	A	C#	D	G#	G	Gb	C	E	R_5
P_1	C#	B	G	Gb	F	A	Bb	E	Eb	D	G#	C	R_1
	RI_0	RI_{10}	RI_6	RI_5	RI_4	RI_8	RI_9	RI_3	RI_2	RI_1	RI_7	RI_{11}	

The following, Figure 3.3, shows three note and four note chords created from the prime row. It is evident that the chords produced by the row are not producing recognizable diatonic harmony.

Figure 3.3: Three and Four Note Chords from Prime

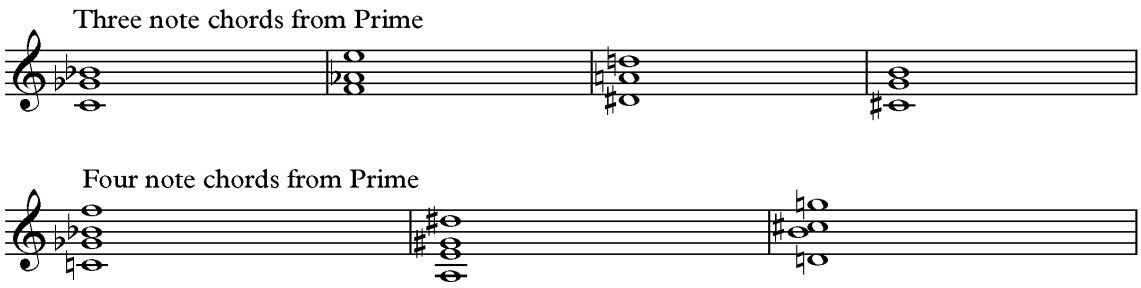
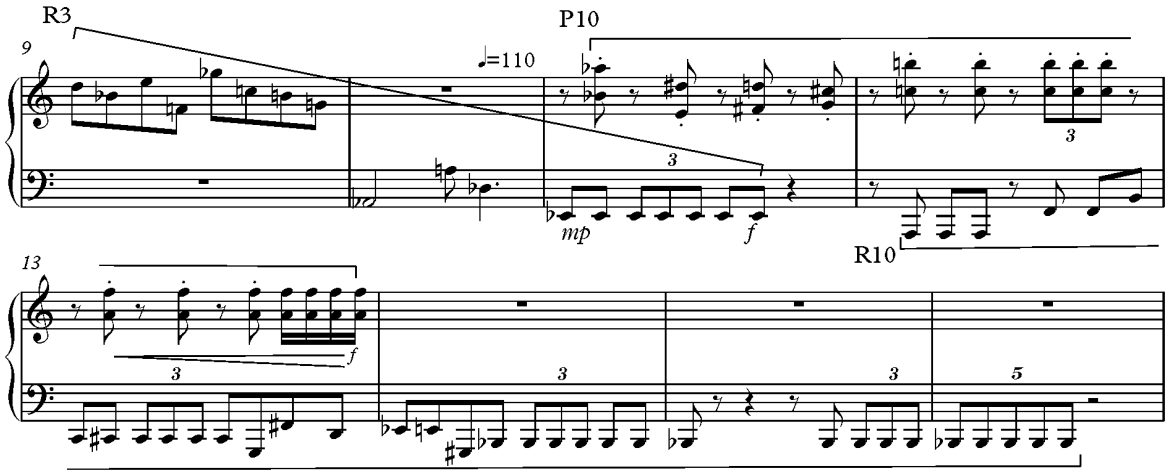


Figure 3.4 demonstrates the use of a row across two hands, followed by rows played independently by each hand. R3 (retrograde 3 from the matrix) begins in the right hand and is completed by the left, and then P10 (prime 10) begins in the right hand while R10 (retrograde 10) begins in the left hand. All twelve notes of each row are completed.[109]

Figure 3.4: Example of Rows



I have attempted to add some unity to the piece through repetition. The following are examples of repeating sequences used in *Dirty Dozen.* The sixteenth note figure in the right hand at bar 18 is copied in the left hand (Figure 3.5). Bars 18,19 and 20 are repeated beginning at bar 41.At bar 22 a repeating sequence of sixteenth notes followed by a quarter note begins (Figure 3.6). Different rhythmic levels of repetition occur beginning at bar 31 - eighth notes and sixteenths in the left hand are combined with half notes and quarter notes in the right hand (Figure 3.7).

[109] Appendix B provides a full version of the score with each row identified.

Figure 3.5: Copied in the Left Hand

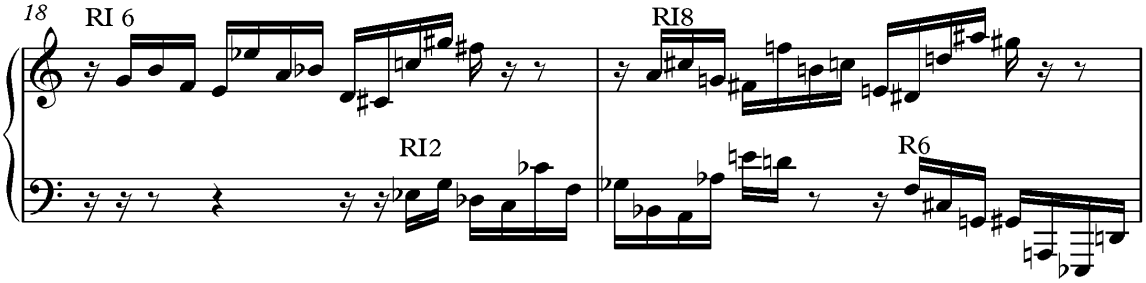


Figure 3.6: Left Hand Sequence

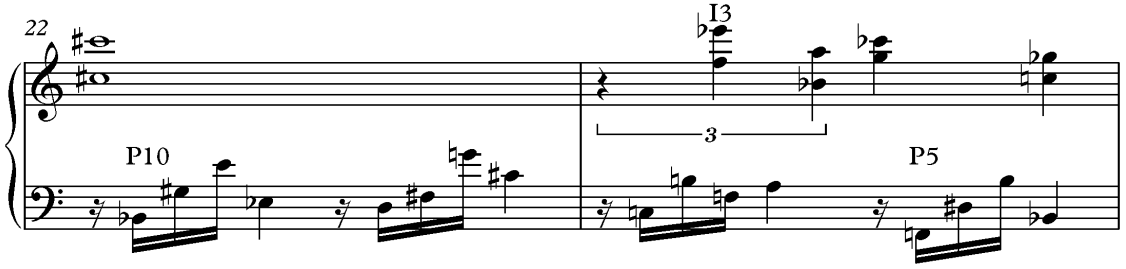
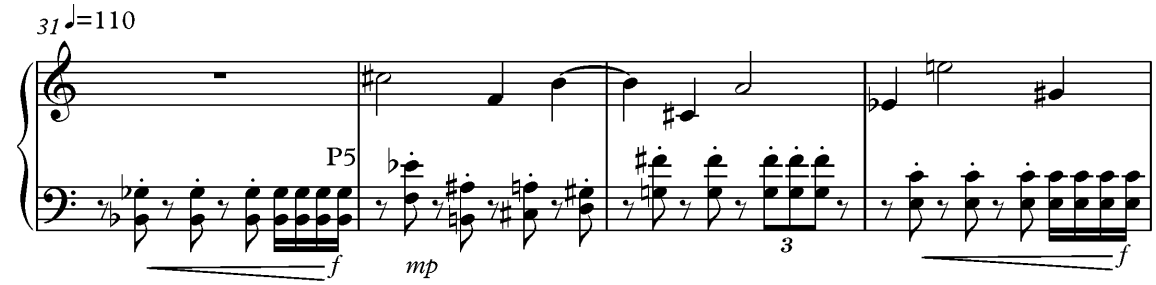


Figure 3.7: Different Rhythmic Levels



Composition 2: *Twelve of Us*

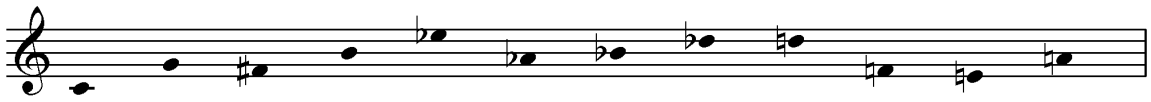
Application

While *Dirty Dozen* uses only material derived from the assigned tone row, *Twelve of Us* uses material derived from two different tone rows, briefly includes non-row material and seeks to establish a feeling of tonality. As noted earlier, George Russell's *Lydian Chromatic Concept* offered to free the composer by making the "tonal galaxy" of the chromatic scale available. This piece seeks to capture that freedom while establishing a sense of tonal gravity. This piece was written for a jazz ensemble comprised of trumpet,

trombone, tenor sax, baritone sax, piano, electric piano, bass and drums. The form is **AABA**; the **B** section is extended and includes a solo section.The tone rows created for this piece were designed to be more consonant. One row (Figure 3.8) provides material for the **A** section while the **B** section is built from the second row (Figure 3.9) the matrix for each row is also shown.

Figure 3.8: Row 1 and Matrix

Row 1

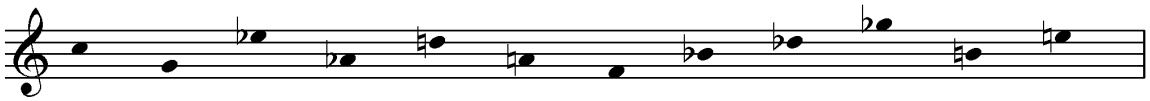


Matrix

	I_0	I_7	I_6	I_{11}	I_3	I_8	I_{10}	I_1	I_2	I_5	I_4	I_9	
P_0	C	G	F#	B	Eb	Ab	Bb	Db	D	F	E	A	R_0
P_5	F	C	B	E	Ab	Db	Eb	F#	G	Bb	A	D	R_5
P_6	F#	Db	C	F	A	D	E	G	Ab	B	Bb	Eb	R_6
P_1	Db	Ab	G	C	E	A	B	D	Eb	F#	F	Bb	R_1
P_9	A	E	Eb	Ab	C	F	G	Bb	B	D	Db	F#	R_9
P_4	E	B	Bb	Eb	G	C	D	F	F#	A	Ab	Db	R_4
P_2	D	A	Ab	Db	F	Bb	C	Eb	E	G	F#	B	R_2
P_{11}	B	F#	F	Bb	D	G	A	C	Db	E	Eb	Ab	R_{11}
P_{10}	Bb	F	E	A	Db	F#	Ab	B	C	Eb	D	G	R_{10}
P_7	G	D	Db	F#	Bb	Eb	F	Ab	A	C	B	E	R_7
P_8	Ab	Eb	D	G	B	E	F#	A	Bb	Db	C	F	R_8
P_3	Eb	Bb	A	D	F#	B	Db	E	F	Ab	G	C	R_3
	RI_0	RI_7	RI_6	RI_{11}	RI_3	RI_8	RI_{10}	RI_1	RI_2	RI_5	RI_4	RI_9	

Figure 3.9: Row 2 and Matrix

Row 2



Matrix

	I_0	I_7	I_3	I_8	I_2	I_9	I_5	I_{10}	I_1	I_6	I_{11}	I_4	
P_0	C	G	Eb	Ab	D	A	F	Bb	Db	Gb	B	E	R_0
P_5	F	C	Ab	Db	G	D	Bb	Eb	Gb	B	E	A	R_5
P_9	A	E	C	F	B	Gb	D	G	Bb	Eb	Ab	Db	R_9
P_4	E	B	G	C	Gb	Db	A	D	F	Bb	Eb	Ab	R_4
P_{10}	Bb	F	Db	Gb	C	G	Eb	Ab	B	E	A	D	R_{10}
P_3	Eb	Bb	Gb	B	F	C	Ab	Db	E	A	D	G	R_3
P_7	G	D	Bb	Eb	A	E	C	F	Ab	Db	Gb	B	R_7
P_2	D	A	F	Bb	E	B	G	C	Eb	Ab	Db	Gb	R_2
P_{11}	B	Gb	D	G	Db	Ab	E	A	C	F	Bb	Eb	R_{11}
P_6	Gb	Db	A	D	Ab	Eb	B	E	G	C	F	Bb	R_6
P_1	Db	Ab	E	A	Eb	Bb	Gb	B	D	G	C	F	R_1
P_8	Ab	Eb	B	E	Bb	F	Db	Gb	A	D	G	C	R_8
	RI_0	RI_7	RI_3	RI_8	RI_2	RI_9	RI_5	RI_{10}	RI_1	RI_6	RI_{11}	RI_4	

In Row 1, three ½ step intervals (Figure 3.10) are combined with four intervals outlining a 4^{th} or 5^{th} (Figure 3.11).

Figure 3.10: 1/2 steps

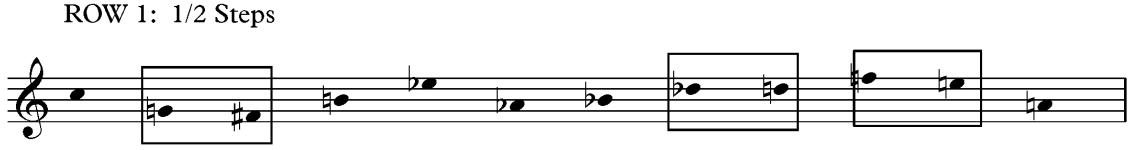
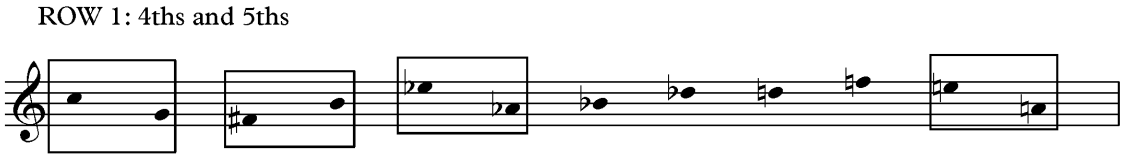


Figure 3.11: 4ths and 5ths



In Row 2 there are seven intervals outlining a 4th or 5th (Figure 3.12) and as shown in (Figure 3.13) two major 7th chords are defined followed by a sequence of 4ths and a fifth.

Figure 3.12: Row 2 Intervals

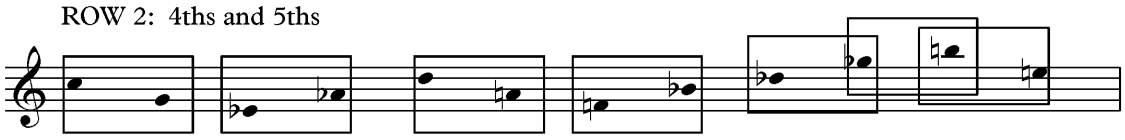
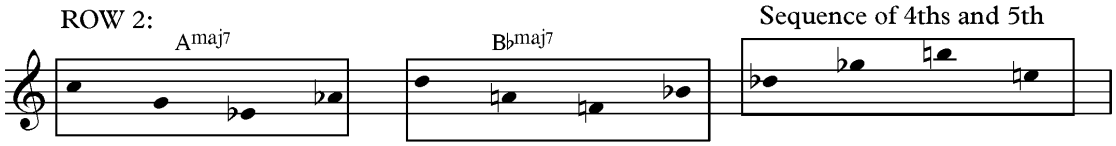


Figure 3.13: Row 2 Sequence



Process

The first sixteen bars of **A** are built simply from the prime of Row 1. The bass plays the row over eight bars then repeats, while the piano expresses the row as four notes chords. The trumpet melody outlines some, but not all, notes of the row. I have used rhythmic and harmonic motion to build toward a dominant function at bar 24 – a dominant that returns us to a tonality of C Lydian when the repeat is taken, or an ambiguous C Minor when moving on to the **B** section at bar 32. At Bar 17, four note chords are built upon a retrograde inversion of the prime row (RI-0) patterned rhythmically as a whole note followed by two half notes. This pattern repeats with a

transposition to retrograde inversion eleven (RI-11). Tension is increases by compressing the previous two bar phrases - now expressed by retrograde inversions six and three (RI-6 and RI-3). Figure 3.14 shows this motion in the piano part, beginning at bar 17, and the versions of Row 1 that are used. Note that all twelve notes of the row are expressed in each grouping. This irregular seven bar phrase is followed by a dominant function on bar 24 that holds for eight bars - expressed by two chords outlining different extensions of a G7th chord. These two chords are derived from another equal division of the octave - the octatonic scale. The 7^{th}, b9, and b5 are provided by Db/G and the b9, 3^{rd} and 13^{th} by E/G (Figure 3.15). Tone Row 2 is introduced by the bass and left hand piano at bar 32. Once again the tone row is expressed in prime form over eight bars. This time the bass repeats the pattern thirteen times, each time supporting different realizations of the tone row.

The thirteen iterations are as follows:

1. Piano and Bass play prime of Row 2 (P-0).
2. Trumpet plays a melody expressing retrograde inversion one (RI-1).
3. Tenor sax joins trumpet, harmonizing melody with retrograde eight (R-8).
4. Trombone joins above harmonization with retrograde inversion eleven (RI-11)

5,6,7. Electric piano plays chords from prime one (P-1) while piano solos using material from same row.

8 ,9, 10. Horns reproduce pattern played by electric piano using prime three (P-3).

11. Transition - electric piano plays figure expressing retrograde eleven (R-11), followed by tenor answering with retrograde nine (R-9).
12. Electric piano repeats figure, trumpet and baritone sax answer with prime eight (P-8).
13. Bass repeats figure one more time.

The piece returns to the beginning and the first tone row, concluding with a feeling of suspension on the dominant function.

Figure 3.14: Piano Motion Bar 17-23

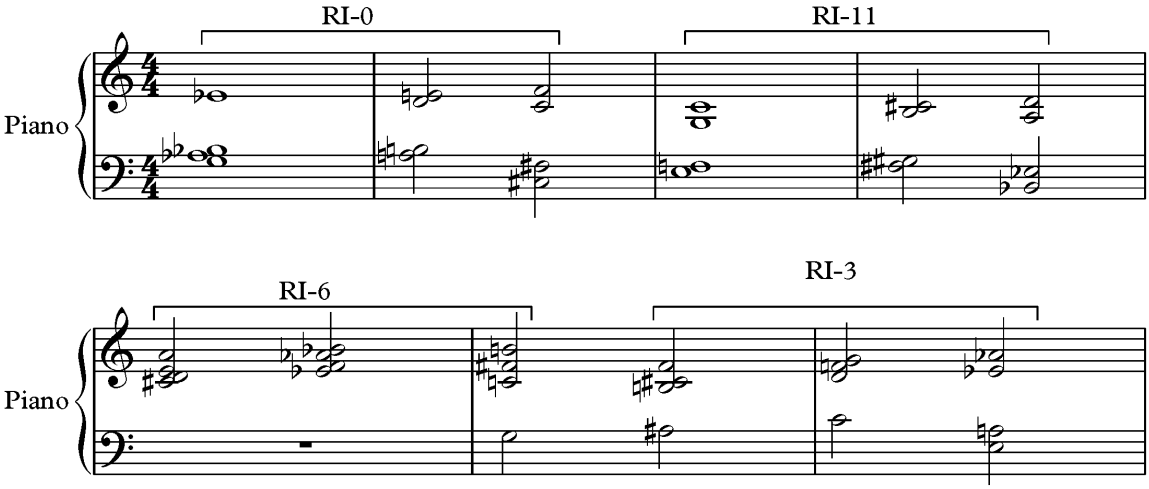
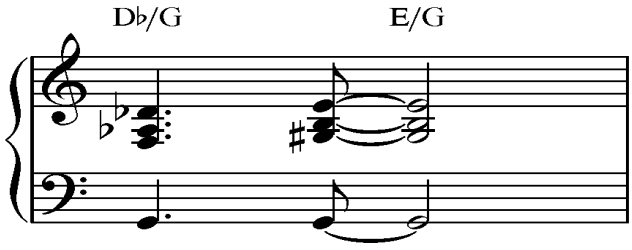


Figure 3.15: Dominant Function Bar 24



Chapter 4: *Six Degrees of Separation* and *La Tuta Vero*

With the exception of one piece presented in Chapter Seven - *Division By Two,* all compositions presented in this and the following chapters combine material derived from an equal division of the octave with a significant amount of other harmonic material. In some of the compositions, the choice of harmonic material may vary from section to section. In some sections material derived from an equal division may not be used. In others, adding chords or specific pitches from outside the current scale alters or expands the available harmonic or melodic choices. As a result of the frequent shifts in tonality and the inherent ambiguity of much of this material, there will be instances when the spelling of a chord or scale tones will involve enharmonic equivalents.

The next two compositions use the hexatonic (six-note) whole-tone scale (Figure 1.4). As shown earlier, this scale can only be transposed one time - any further transpositions will replicate one of the two versions of the scale.

Composition 3: *Six Degrees of Separation*

Six degrees of Separation is composed for a small chamber ensemble comprised of bass flute, oboe, glockenspiel, vibraphone, piano and four cellos.

Application

The piece is divided into three short sections - **A**, **B** and **C**. During **A** (Bars 1- 28) all material is drawn form the two whole-tone scales. During **B** (Bars 29-44) an extra note, one half step away form one of the scale tones is added – creating a seven-note or *heptatonic* scale. As shown in Figure 4.1, this extra note changes as the harmony changes. During **C** (Bars 45-57) C# is added to the whole-tone scale (C, D, E, F#, G#, A#) - producing when voiced from F# the suggestion of an F# Lydian scale with a b7 and b6 (Figure 4.2). The **A** section gives a feeling of floating or ambiguity. The **B** section, with the added note changing as the harmony changes, has a sense of searching. The **C** section, with the added note now being fixed, has a feeling of resolution.

Figure 4.1: Added Note Changes As Harmony Changes During B

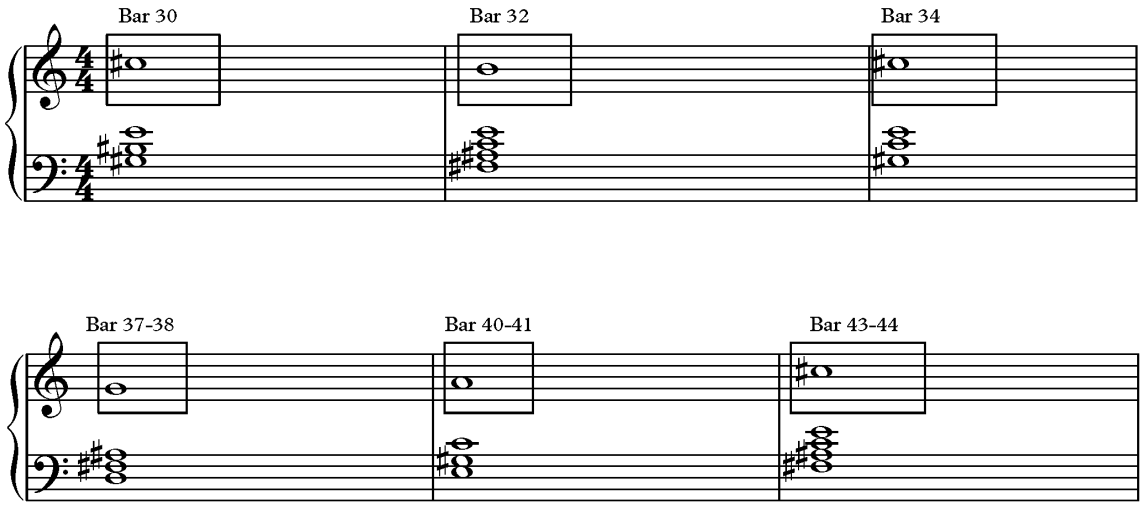
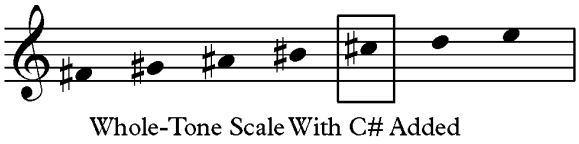


Figure 4.2: F# Lydian Scale with b6 and b7



Process

The interval of a seventh is outlined initially by the piano, while the ambiguity of the scale is reinforced by the bass flute and oboe melody. As the section continues the seventh intervals are derived from different transpositions of the whole-tone scale. The melody gains more definition as it crosses between the two scales (Figure 4.3). Motion increases towards the end of the section. During **B** the glockenspiel is used to outline the notes being added to the scale. The texture created by the sparse vibraphone, glockenspiel and piano orchestration in combination with the falling woodwind figures adds to sense of lonely searching. As the piano establishes a sense of arrival at **C**, the vibraphone and glockenspiel join the woodwinds. With the addition of the C# to the whole-tone collection the melody takes on the character of an F# Lydian scale – falling from the fifth (C#) to the tonic (F#) then rising to the third (A#). (Figure 4.4)

Figure 4.3: Melody Changes Over Shifting Harmony

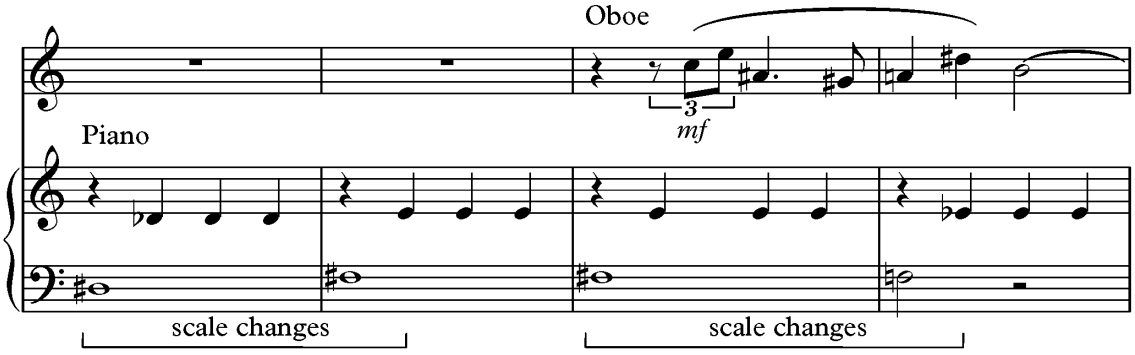
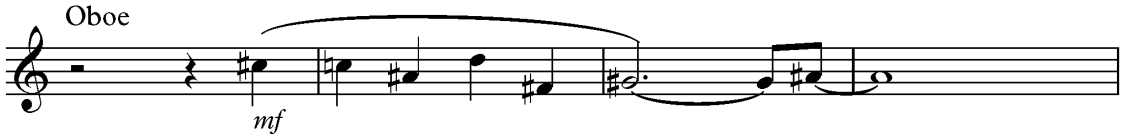


Figure 4.4: Addition of C#



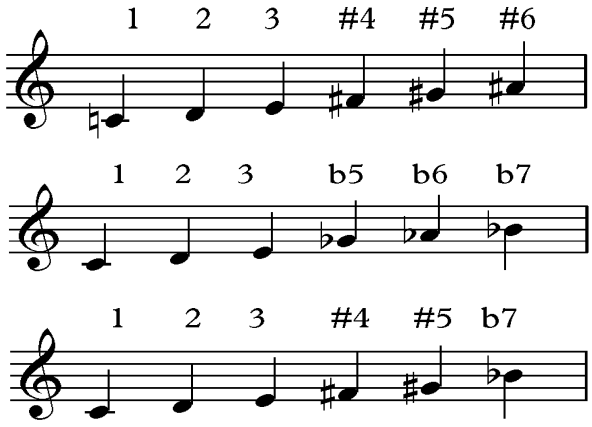
Composition 4: *La Tuta Vero*

La Tuta Vero (Esperanto: The Whole Truth) is a jazz composition written for trumpet, tenor saxophone, piano, bass and drums.

Application

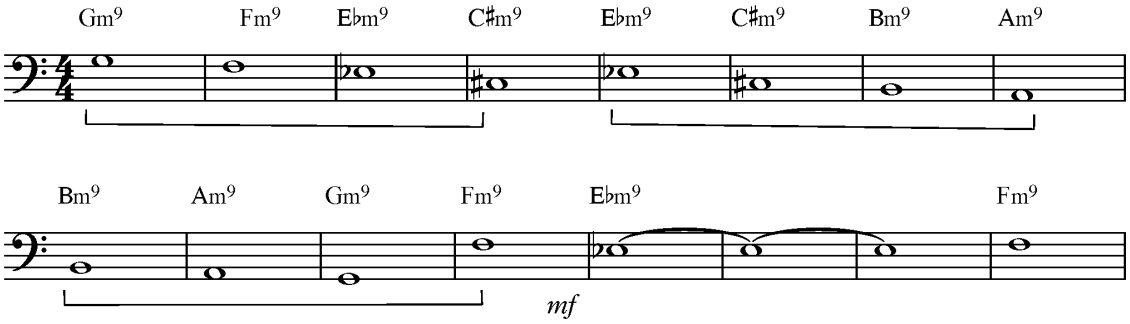
The production of chords derived from the whole-tone scale, particularly in jazz, brings up the question of spelling. In traditional diatonic harmony, chords would be produced by stacking chord tones in thirds above a given scale step. There are a few different ways that that a whole-tone scale starting on C can be spelled. Each spelling omits a scale degree, in the first there is no 7^{th}, the second there is no 4^{th}, in the third there is no 6^{th}. All three of these spellings of course *sound* identical (Figure 4.5).

Figure 4.5: Alternate Spelling of Intervals



The whole-tone scale has been used in two different ways in this piece. The first sixteen bars of the piece (**A**) draw on one transposition of the scale for all harmonic material. The following sixteen bar section (**B**) uses the whole tone scale as a framework on which to impose harmonic movement - minor 9th chords descend in steps defined by the scale as shown in Figure 4-6. There are four descending whole-tone steps, defined by the root movement, in each grouping. When the set of four steps completes, the pattern backs up two steps and begins again until resting on the Ebm9 chord.

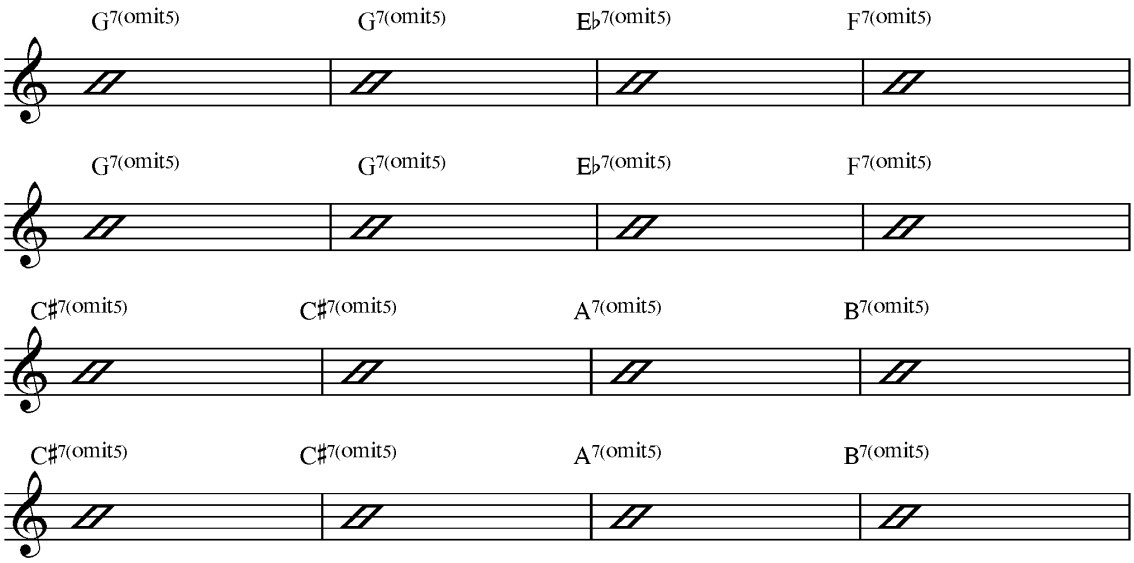
Figure 4.6: Minor 9th Chord Motion Bars 17-32



Process

For this composition I use chords built vertically on each scale degree of the whole-tone scale. The first sixteen bars are built harmonically on parallel 7th chords (with the fifth omitted). A four bar pattern repeats, transposes within the same scale, and then repeats again (Figure 4.7).

Figure 4.7: Harmonic Motion In First Sixteen Bars



The melody and bass line of **A** (the foreground and background) are both created from the whole-tone scale. The roots of all chords, representing the middle ground, are also derived from the same whole-tone scale. Interest is created by the illusion of change and by the angular shape of the melodic figures.

In the following sixteen bars, the harmonic material changes from bar to bar. The whole-tone scale provides the roots for a sequence of minor 9th chords. The trumpet melody plays the ninth of each chord and resolves it to the root or the seventh. The tenor sax answers the trumpet by playing the fifth followed by the third of each chord. This melodic and background material outlines the chord tones of the descending minor 9th chords *and* defines both whole-tone scales. Figure 4.8 shows this double function as it occurs in bars 17-22. Bars 33 to 64 are a solo section (**C**, and **D**). The harmonic material from the first thirty-two bars is repeated. The trumpet solo draws upon one whole-tone scale for the first sixteen bars and the Dorian scale of each minor 9th chord for the following sixteen bars. The solo is followed by a repeat of the first thirty-two bars .The concluding Bma9#11 chord could be considered a hybrid of the minor 9th sound of the **B** section combined with the augmented 4th of the whole-tone scale (Figure 4.9).

Figure 4.8: Bars 17-20

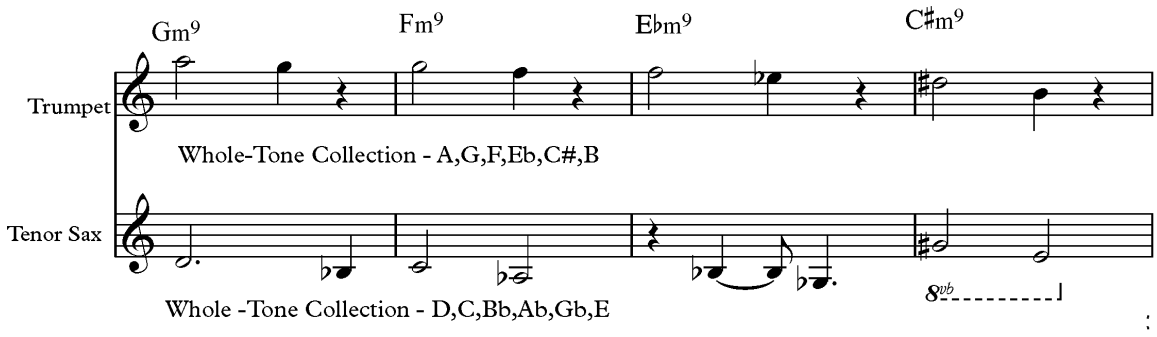
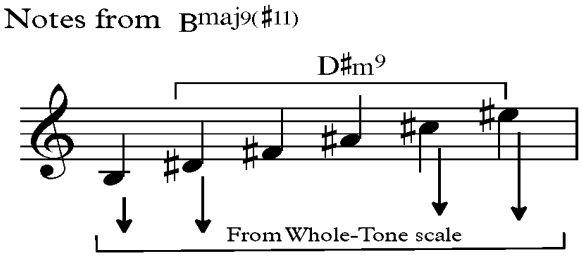


Figure 4.9: Bma9#11 As A Hybrid



Chapter 5: *Octogram* and *The Eighth Day*

Octogram and *The Eighth Day* are original compositions featuring the use of a division of the octave into four equal parts. Both use the eight-note octatonic scale in combination with other harmonic material.

When the octave is divided equally into twelve or six equal parts, scales are produced. The collections of tones produced by dividing the octave into four, three and two equal parts, however, are less scalar in nature. In each of the following divisions of the octave an additional step is required to produce scales. A division into four equal parts produces a diminished seventh chord. A division into three equal parts produces an augmented triad and into two equal parts - a tritone. As demonstrated in Chapter Two, additions of other tones can be made above or below these tones that produce *symmetrical cells* which, when combined, produce symmetrical scales. The remaining compositions will be using scales created in this manner.

Composition 5: *Octogram*

Octogram is a chamber piece written for piano, Bb clarinet and cello. It is divided into five sections (ABCDE).

Application

The first few bars of *Octogram* demonstrate the interplay between octatonic and minor scales that will define this piece. During the faster **A** and **B** sections the harmony moves back and forth between minor and octatonic functions not really settling on either. In section **A** the movement happens each bar (Figure 5.1), while in section **B** the first eight bars are derived from an octatonic scale then a shift to minor occurs. The slower **C** section is all derived from octatonic material. Section **D** serves to transition with octatonic material back to the interplay with minor harmony that occurs again at section **E**. In this piece I use a number of harmonic structures that are characteristic of the octatonic scale. Each transposition of the scale contains four major triads voiced a minor third apart. Combining these triads in different ways or moving between them over a pedal tone provides rich dissonant textures. Because of their relationship to each other, and the inherent ambiguity of the symmetrical scale from which they are derived, they are

able to suspend movement - to float in a sense between tension and resolution. The piece begins with the combination of a Gb triad over a C triad with the third omitted (Figure 5.2) and ends with Gb triad over C.

Figure 5.1: Minor to Octatonic (Diminished) Motion at A

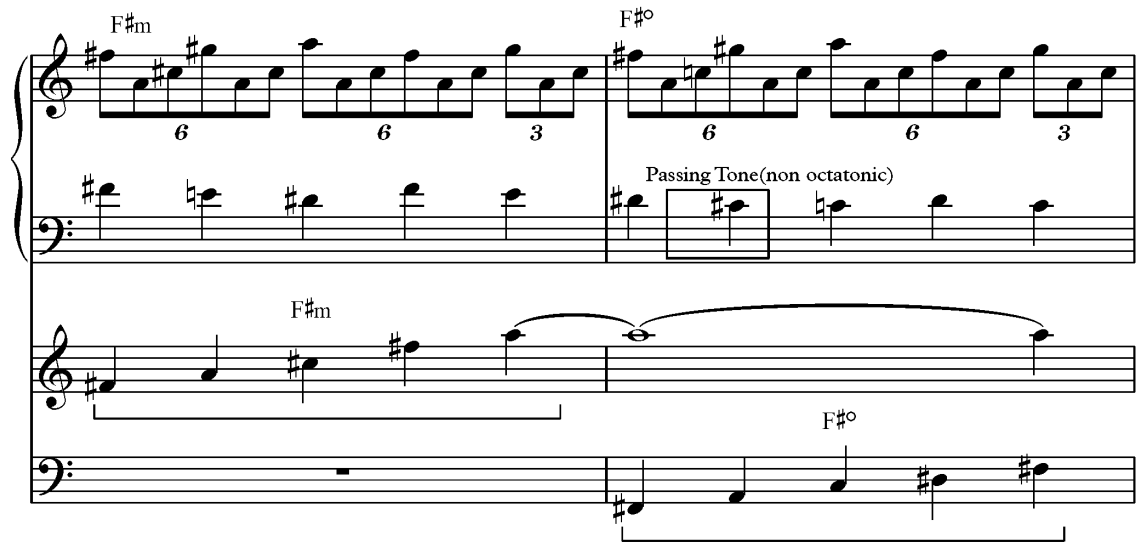
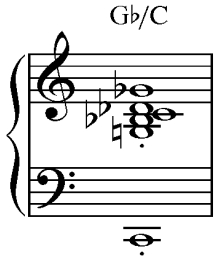


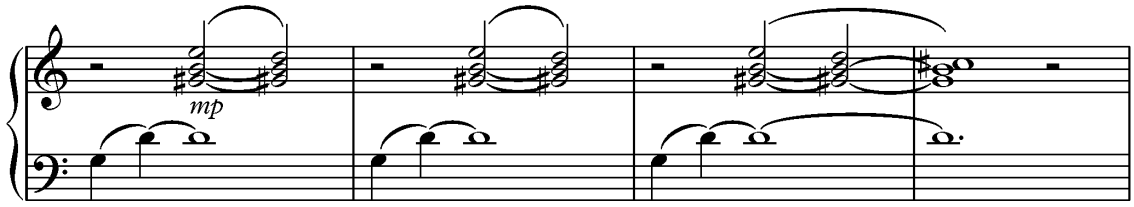
Figure 5.2: Opening Chord



At section **C**, a repetition of collapsing first inversion E major triads are used during the first four bars. [110] This is followed in the next four bars by collapsing second inversion F# major triads. Figure 5.3 shows the collapsing first inversion triads - all notes in the right and left hand of the piano part are from the same octatonic collection (G, G#, A#, B, C#, D, E, F).

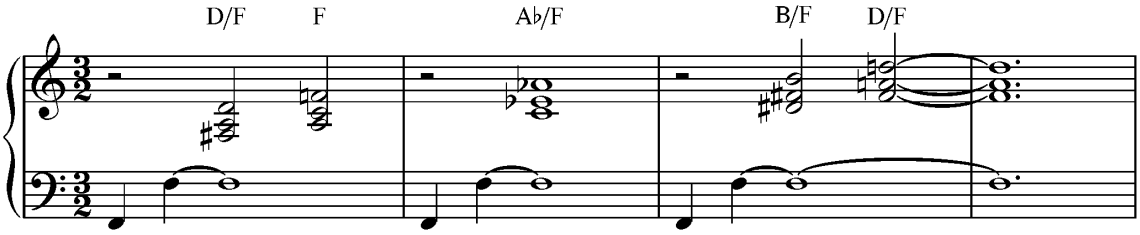
[110] The top note of both the first and second inversion triads falls to the closest octatonic scale tone.

Figure 5.3: Collapsing First Inversion Triad at Section C



A transition begins at bar 67 using parallel first inversion chords - again, all derived from one octatonic collection - F, Gb, Ab, A, B, C, D, Eb (Figure 5.4).

Figure 5.4: Parallel Chords



Process

Strident piano chords supported by cello open the piece, followed by a shifting minor/diminished piano figure. At Section **B** the diminished scale is outlined by the left hand of the piano. Eight bars of diminished harmony give way to a brief release in E minor. The clarinet rises and falls through the minor, and then at bar 26 another equal division of the octave comes into play. The E minor triad moves up in major thirds, finally resolving back to E minor in bar 29. The first sixteen bars of section **B** repeat transposed down a major second. The clarinet steps through the octatonic scale beginning at bar 31, the cello arpeggiates a D minor triad and falls through the minor scale. Once again, in the piano part, minor triads rise in major thirds – this time coming to an abrupt halt at bar 46. Figure 5-5 shows a reduction of the first sixteen bars of section **B**, concluding with the rising minor chords. Figure 5.6 shows a reduction of the second sixteen bars of section B - the same material transposed down a major second.

Figure 5.5: First Sixteen Bars of B

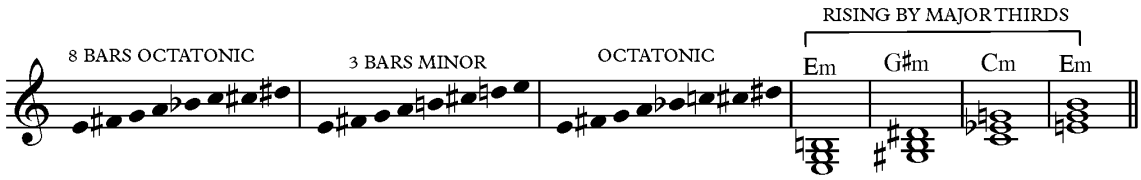
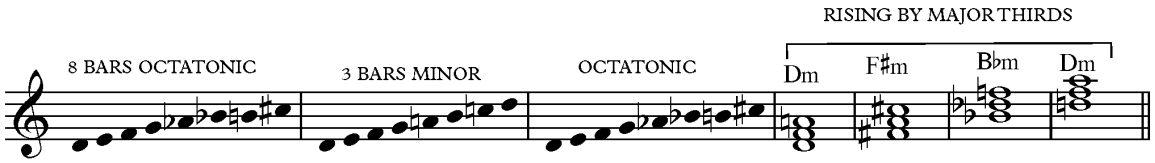
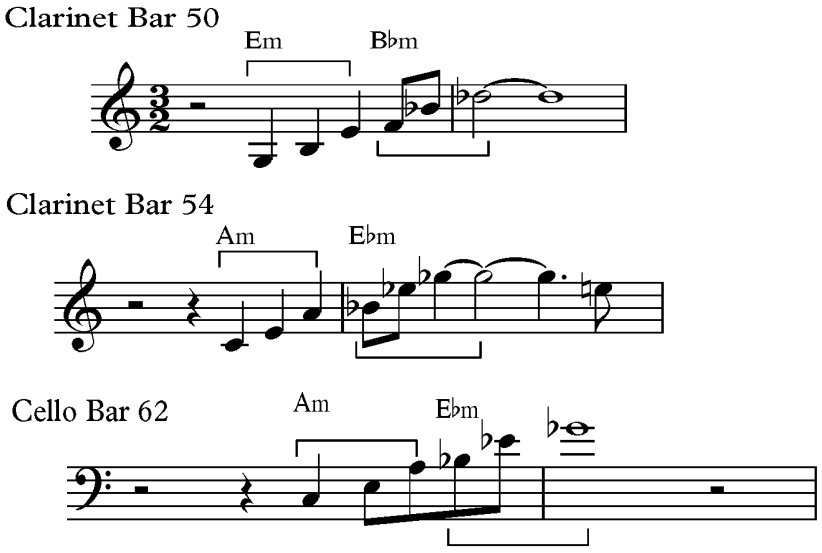


Figure 5.6: Second Sixteen Bars of B



The slower section **C** is preceded by a restatement of the opening chord, this time re-voiced and transposed up a major second. Rising lines in both the clarinet and cello parts outline the octatonic collection; a first inversion minor triad is followed by a second inversion minor triad (Figure 5.7).

Figure 5.7: Rising Minor Triads From Octatonic Collection at C



During **C** a *Bartók Axis* is used, similar to what was described on page 24.The G octatonic collection (1/2-step/whole-step) is considered to serve a tonic function (bars 50 -53). The C collection (bars 54-57) serves a sub-dominant function while the F collection, which is identical to the D collection, plays a dominant function (bars 66-74).

At **D** an eight bar transition section leads to a recapitulation at **E.** Once again the chords shift back and forth between minor and diminished. During the final flourish beginning at bar 91 minor triads expand, in contrast to the collapsing triads used during **C.** Note how these expanding triads are emphasized further by moving briefly through a cycle of fourths (bars 91-94). *Octogram* concludes with an echo of the introductory Gb/C chord, from the C octatonic collection (1/2-step/whole-step).

Composition 6: *The Eighth Day*

The Eighth Day is a jazz composition written for piano, bass, drums, trumpet and tenor saxophone featuring use of the octatonic scale. Most jazz musicians refer to the octatonic scale as the diminished scale. The 1/2–step/whole-step collection lends itself well to dominant function harmonies and the blues. Each transposition of the scale, in addition to containing the notes of four dominant 7^{th} chords, also provides the b9, #9, #11 and 13^{th} of each 7^{th} chord. Improvisers, when playing over a diminished chord, often use the whole-step/1/2-step mode of the scale. It is rare, however, to find jazz compositions using the diminished scale exclusively. Jazz composers and improvisers have historically used the diminished scale to extend tonic based harmonic systems not to replace them.

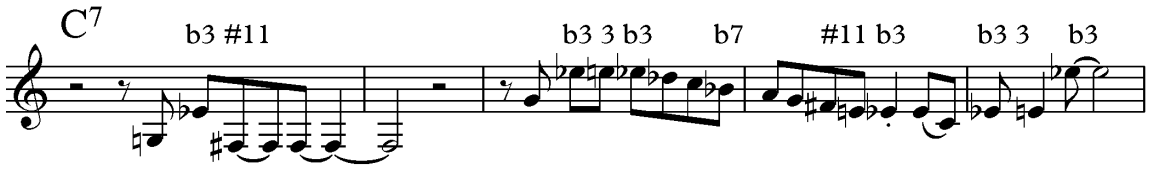
Application

The Eighth Day uses the diminished scale in three different ways. Beginning at **A,** it combines the blues structure and a *Bartok Axis*. This is similar to the approach used in *Octogram,* each of the three possible diminished scales are assigned a tonic, sub-dominant, and dominant function. Through **B** and **C** one diminished scale is used for the bass line and the interacting piano, trumpet and tenor saxophone figures. The solo section at **D** rather than using diminished scale material or harmony**,** moves suspended chords through the framework of a diminished 7^{th} chord.

Process

The **A** section is constructed as a twenty-four bar extended blues form. The bass defines the tonic (C), sub-dominant (F), and dominant (G) positions. Figure 5.8 illustrates the notes contained in the diminished scale that are contributing to the blues sound of the melody as played by the tenor sax and piano, bars 9-14. All notes played are from the C diminished 1/2–step /whole-step collection. As the bass and melody move through the sub-dominant and dominant functions the diminished scale being used shifts accordingly.

Figure 5.8: Melody Bars 9-14, Blue Notes Within Diminished Scale



B takes advantage of the resident dominant 7th chords within *one* diminished collection. The bass outlines the root, seventh, and fifth of C7th, Eb7th, F#7th, and A7th over sixteen bars. This pattern repeats through **C** as the piano, trumpet and tenor sax pass diminished lines back and forth (Figure 5.9). Every four bars, as in **B**, the bass outlines a new 7th chord. Each new 7th chord has a different relationship to the notes being played by the piano, trumpet and sax, illustrated using the first short melodic phrase at **C** (Figure 5.10). The diminished scale is not used during the solo section at **D.** The soloist is improvising over suspended chords. These chords are referencing the division of the octave into four equal parts by moving down a minor third each time a change of chord occurs - outlining by root motion the diminished 7th chord. After the solo a repeat of **A** leads to the coda. A bright ensemble leap of a major seventh is followed by the concluding chord, from the C 1/2 –step/whole-step collection - a C triad combined with an F# triad.

Figure 5.9: Diminished Lines at C

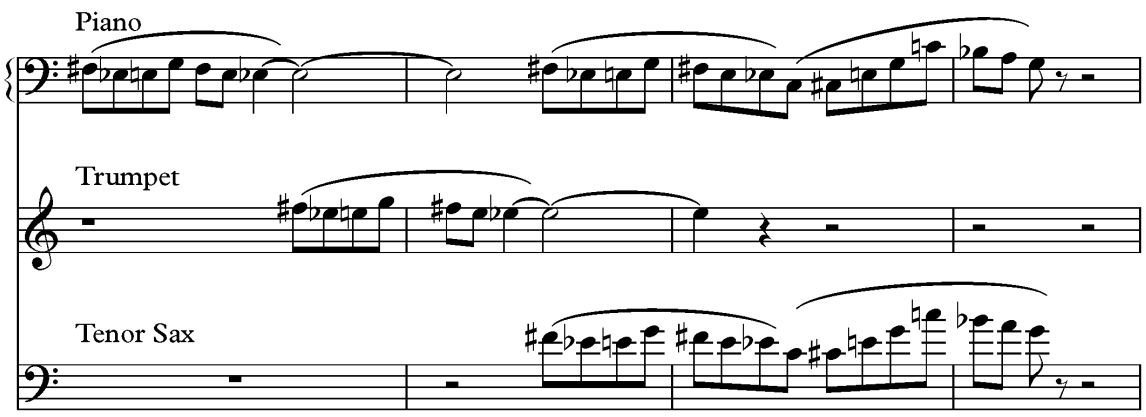
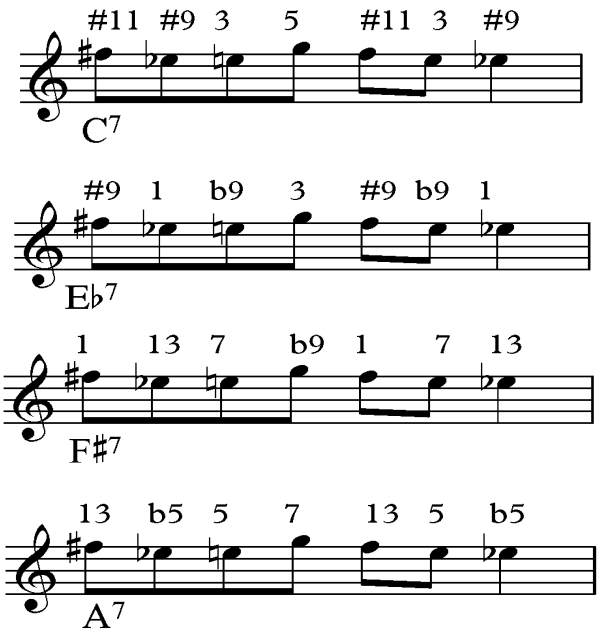


Figure 5.10: As The Bass Changes, The Relationship To The Melody Changes



Chapter 6: *Chamber Three* and *Smoke and Mirrors*

There are two symmetrical scales (see pages 20-21) that can be created by additions to the augmented triad created by a division of the octave into three equal parts - a nonatonic (nine–note) and a hexatonic (six-note) scale. *Chamber Three* and *Smoke and Mirrors* make use of the hexatonic scale (often referred to as the symmetrical augmented scale).

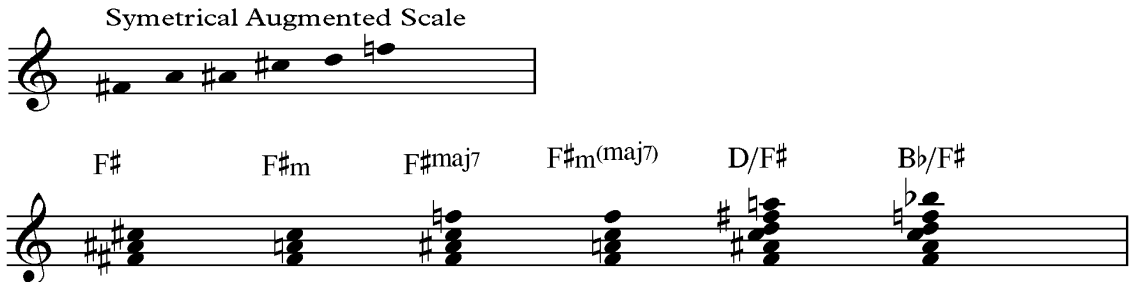
Composition 7: *Chamber Three*

Chamber Three is a chamber music piece composed for oboe, bass flute, vibraphone and piano. This composition is divided into two 6/4 sections (**A** and **B**), a slightly faster 7/4 section (**C**), and a return to the beginning 6/4 material (**D** and **E**).

Application

The symmetrical augmented scale contains minor and major triads as well as minor-major 7^{th} chords and major 7^{th} chords. Moreover, the combinations of triadic forms add rich extended chords to the harmonic palette. Figure 6.1 shows some of the harmonic structures built from one transposition of the symmetrical augmented- chords built from F#. This transposition of the scale would yield similar structures built from A# (Bb) and D.

Figure 6.1: Scale and Harmonic Structures

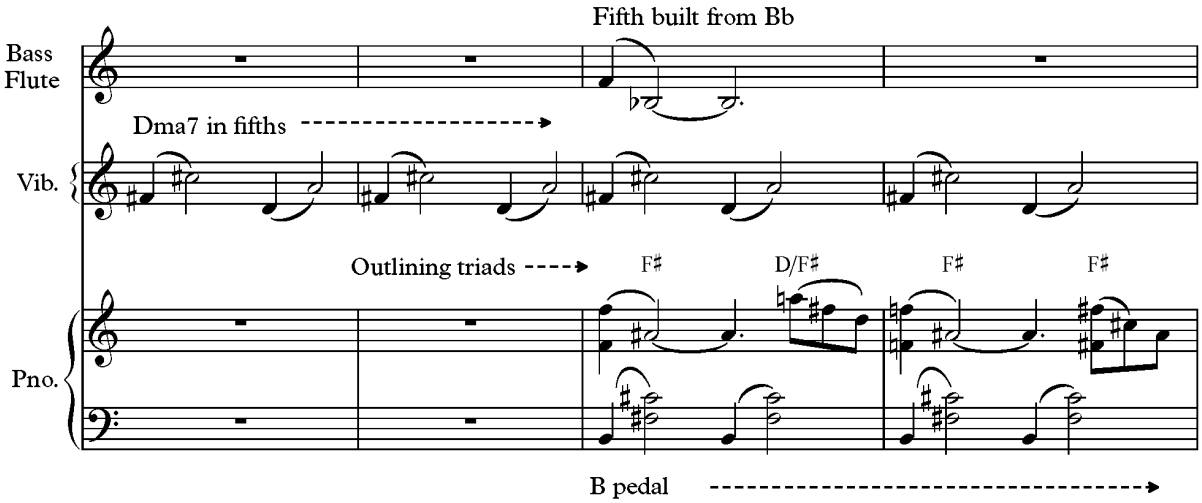


With the exception of a transition section (**D**) that *only* uses the symmetrical augmented scale, sections **A, B, C** and **E** all combine harmonic and melodic material from this scale (or a transposition of this scale) with other harmonic material.

Process

Much of the thematic material in *Chamber Three* uses the interval of a fifth or outlines resident symmetrical augmented scale triads - familiar tonal structures from a non- harmonic environment. This serves as a way to connect this material with other more tonal structures. The piece begins with a D major 7th chord played in broken fifth intervals by the vibraphone. In bar three, additional elements of the symmetrical augmented scale are added as fifths and triads (Figure 6.2).

Figure 6.2: A section Bars 1- 4

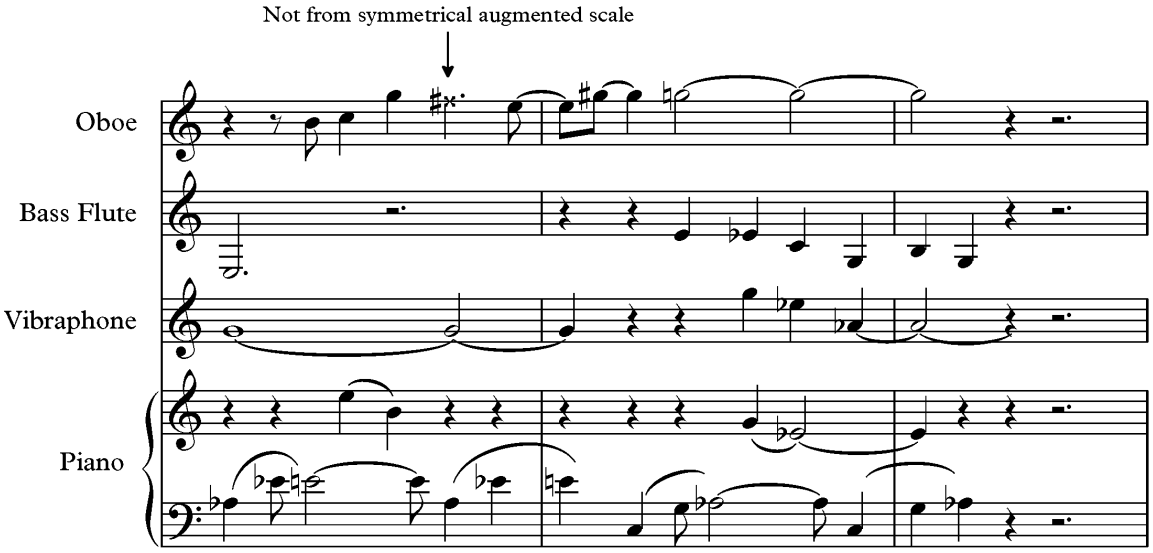


In **A**, a four bar statement using the symmetrical augmented scale is followed a tonal sequence of fifths descending, combined with a melody of rising fifths. Root motion descends a major third, then rises a fourth to repeat the sequence two more times. There is a feeling of cadence as the G Lydian tonality of bar 11 falls into the F# major of bar 12 that begins section **B**. Two bars of symmetrical augmented material move quickly to two bars of A lydian and two bars of C lydian. Parallel second inversion triads follow descending in whole steps through a *diminuendo*.

Section **C** begins with a new time signature, tempo, and transposition of the symmetrical augmented scale that was used in sections **A** and **B**. A feeling of suspension is established, reinforced by the interplay of the oboe and the bass flute (Figure 6.3). Note also the addition of an extra note from outside the scale in bar 25.With the exception of

this one note, all material from this eight bar segment of **C** is derived from the symmetrical augmented scale.

Figure 6.3: Oboe and Bass Flute Lines, C bars 25-27



C concludes by moving twice through the following sequence of chords: Cm9, Gbma7#11, Bbm9, Ema7#11.This progression, using tonal chords with non - traditional root movement, gives a sense of resolution to the preceding eight bars without moving to a tonal cadence.

D serves as a transition using the fifth intervals established earlier - within the floating harmonic environment of the symmetrical augmented scale. Figure 6.5 shows the use of these fifths as well as the imitative interaction between the oboe and bass flute. All material in this brief section is derived from another transposition of the scale (Figure 6.4).

Section **E** brings a repeat of thematic material from **A**, transposed up a minor third. At bar 48 a return is made to the original key with the G Lydian at bar 52 resolving once again to an F#. This time, to conclude the piece, a descending sequence moves through harmonic structures and fifth intervals that were established in section **A** (Figure 6.6).

Figure 6.4: Transposition of Scale used at D

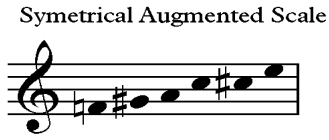


Figure 6.5: Fifth Intervals and interaction, D bars 39-41

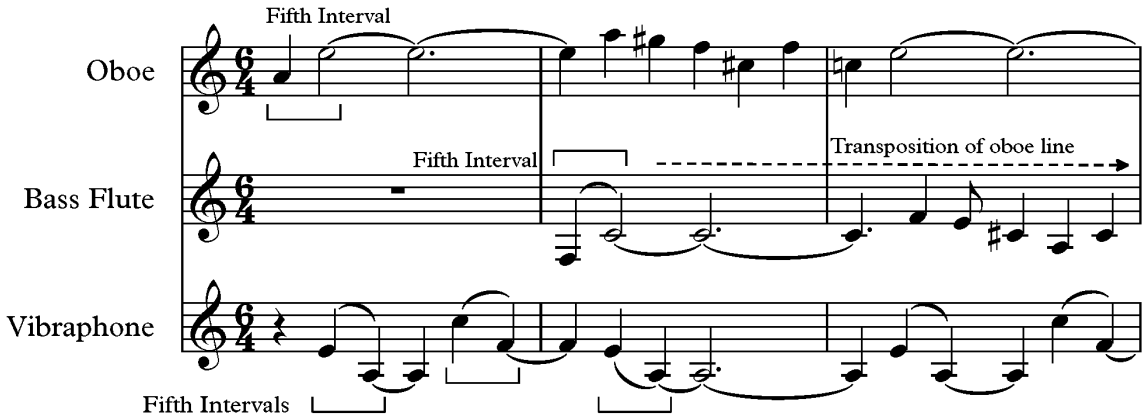
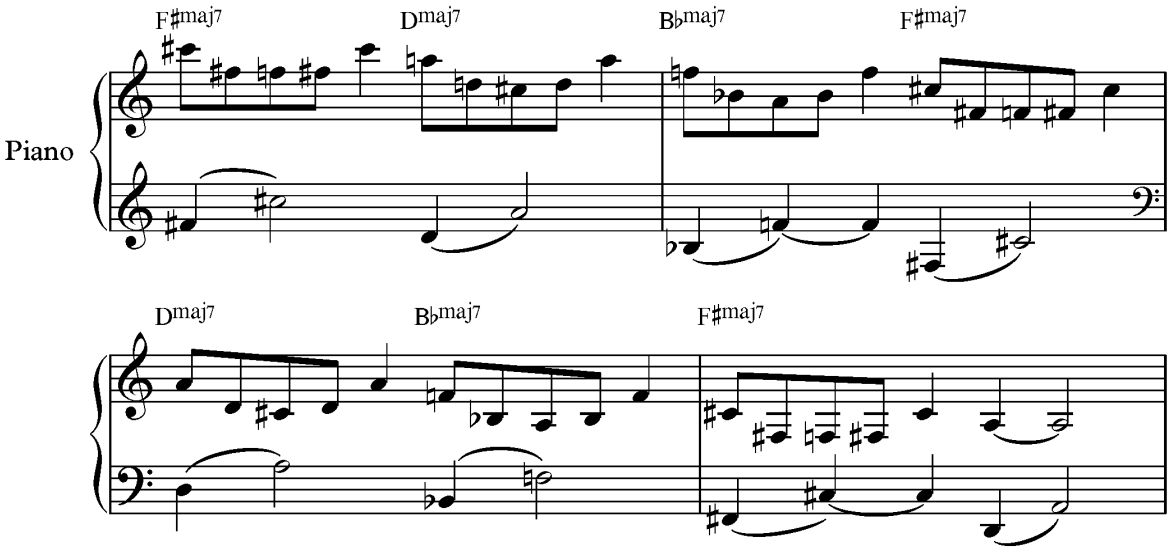


Figure 6.6: Bars 53-56 of E



Composition 8: *Smoke and Mirrors*

Smoke and Mirrors is jazz composition written for alto flute, trumpet, alto sax, bass clarinet, vibraphone, electric piano (Rhodes), piano, bass, and drums. This piece is written in 6/8. Unlike the other compositions in this collection, *Smoke and Mirrors* was created as a piece of *program* music - with the intention of portraying a visual idea.

Application

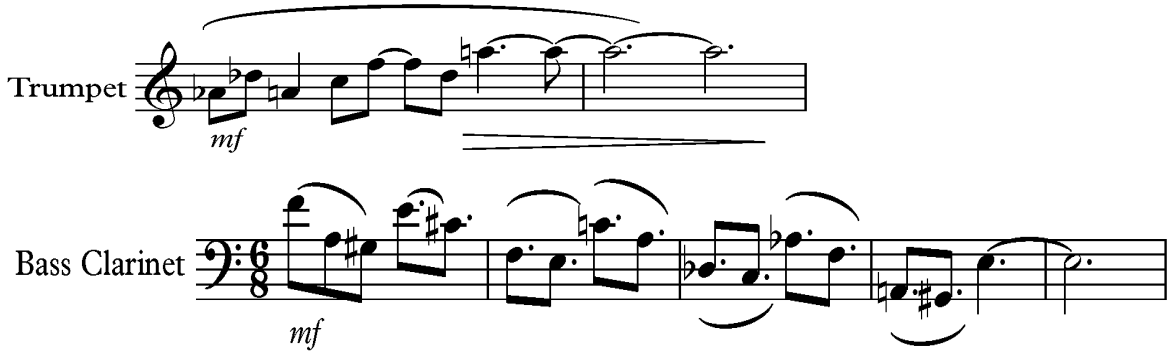
Smoke and Mirrors uses material from the symmetrical augmented scale in the **A** section. The floating ethereal quality of the music within this section suggests the "smoke" of the title. The form – **A B A** – represents, perhaps, an act of magic: we are distracted by the "smoke" (**A**), something magical appears (**B**), and then disappears (**A**). Figure 6.7 displays the symmetrical scale used in parts of this composition.

Figure 6.7: Scale used in *Smoke and Mirrors*

Process

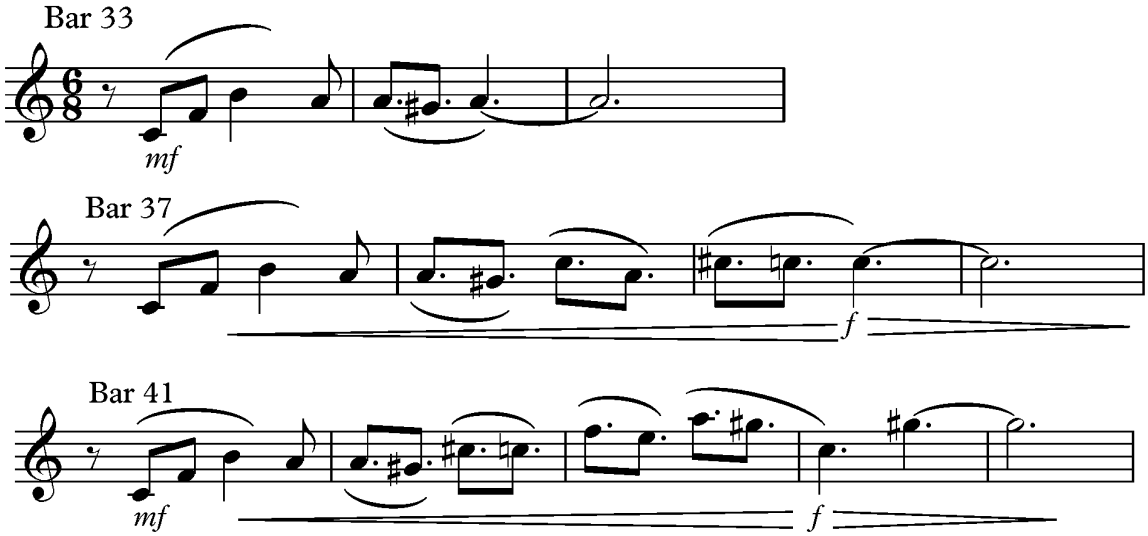
To begin the piece, a mid-range pedal tone is established by the electric piano. Rising and falling lines, melodic material drawn primarily from the symmetrical augmented scale, represent curls of smoke drifting in the air (Figure 6.8).

Figure 6.8: Rising and Falling in Section A



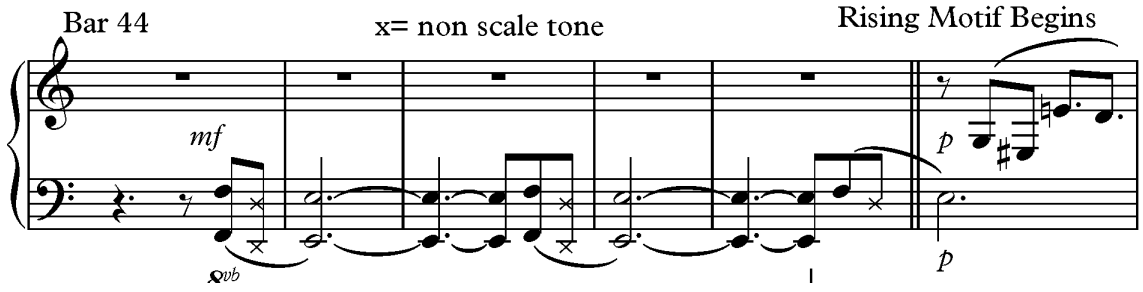
One chord from outside of the resident triad collection of the scale is used in bar three. The piece drifts, and then with a rising motif beginning at bar12, builds and modulates. However, the expected release (or reveal) does not happen, the piece returns to the mid-range pedal on F. The curling, floating motifs from the beginning have returned. This time, the rising modulating motif is preceded by another more focused passage. Built again from the symmetrical augmented scale, the lines increase in length as they repeat-rising to a high G# in bar 44 (Figure 6.9).

Figure 6.9: Expansion Of Melody Bars 33-44



Also at bar 44 the bass instruments prepare the building section that follows by enclosing the low E three times, departing slightly from the scale (Figure 6.10).

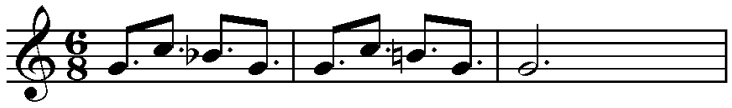
Figure 6.10: Enclosing the Low E



As the third repeat of this figure completes, the rising motif begins again, this time the build is rewarded by the arrival at **B.**

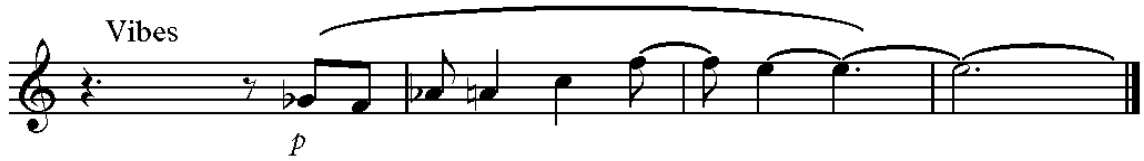
The harmonic and melodic material used for **B** is not derived from the symmetrical augmented scale, but the melody echoes the ambiguity of the symmetrical augmented scale shifting from Bb to B natural - minor to major third (Figure 6.11).[111]

Figure 6.11: Melody at B



The B section concludes with a sequence of chords beginning at bar 89. Note that the contrary motion of the bass and melodic lines, unlike the contrary motion used in **A,** are rhythmically conjunct. A return is made to bar 22. The symmetrical augmented scale brings us again to the building motif - this time bringing the piece to a close. As the final F is sustained the vibraphone plays a concluding figure from the scale, a final whiff of smoke ascends (Figure 6.12).

Figure 6.12: Final Rising Figure



[111] The resident triads and 7th chords of the symmetrical augmented scale can be either major or minor.

Chapter 7: *Division by Two* and *Then Add Red*

Division by Two and *Then Add Red* are original compositions using a division of the octave into two equal parts. This provides a number of choices for the creation of scalar and harmonic material.[112] Two additional tones are added to this division - creating for each composition a different six-note scale.

Composition 9: *Division By Two*

Division By Two is a chamber piece with an **AB** structure composed for flute, bass flute, oboe, vibraphone, glockenspiel, and piano.

Application

Using Slonimsky's method of adding tones above or below equal division points, a symmetrical six-note scale has been created (C, D, F, F#, G#, B). Figure 7.1 shows how the scale was created by the addition a semi-tone below each note of the tritone, followed by the addition of a whole-tone above each note of the tritone. A final "working version" of the scale beginning from the note C is shown in Figure 7.2. This scale is a six-note version of Messiaen's "Mode 6" (Figure 7.3).[113]

Figure 7.1: Creation Of Scale

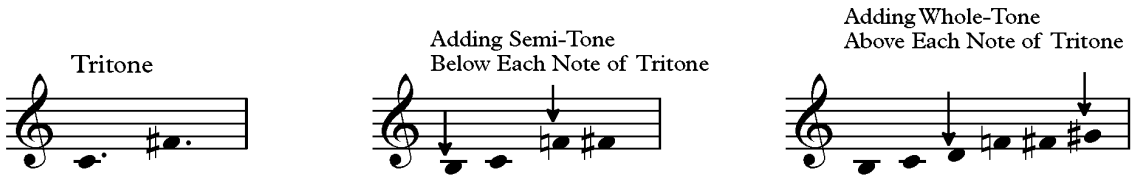
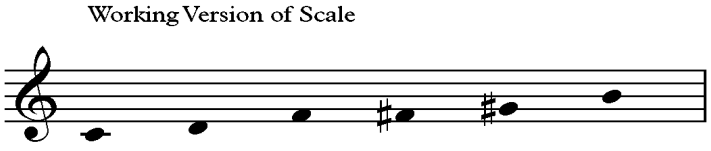
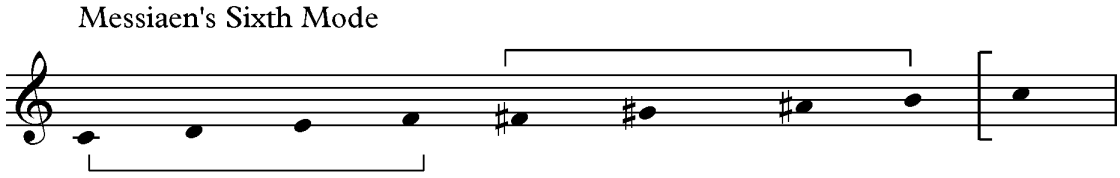


Figure 7.2: Scale Voiced from C



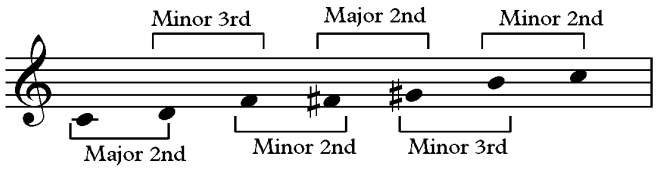
[112] Page 20 outlines what Messiaen refers to as the *Fourth, Fifth, Sixth and Seventh modes of Limited Transposition*. All are symmetrical formations built upon the tritone and replicate themselves on the sixth transposition.
[113] Messiaen, *The Technique of My Musical Language*, Examples, 53.

Figure 7.3: Messiaen



The following (Figure 7.4) show the intervallic relationships between consecutive steps of this scale.

Figure 7.4: Consecutive Intervals

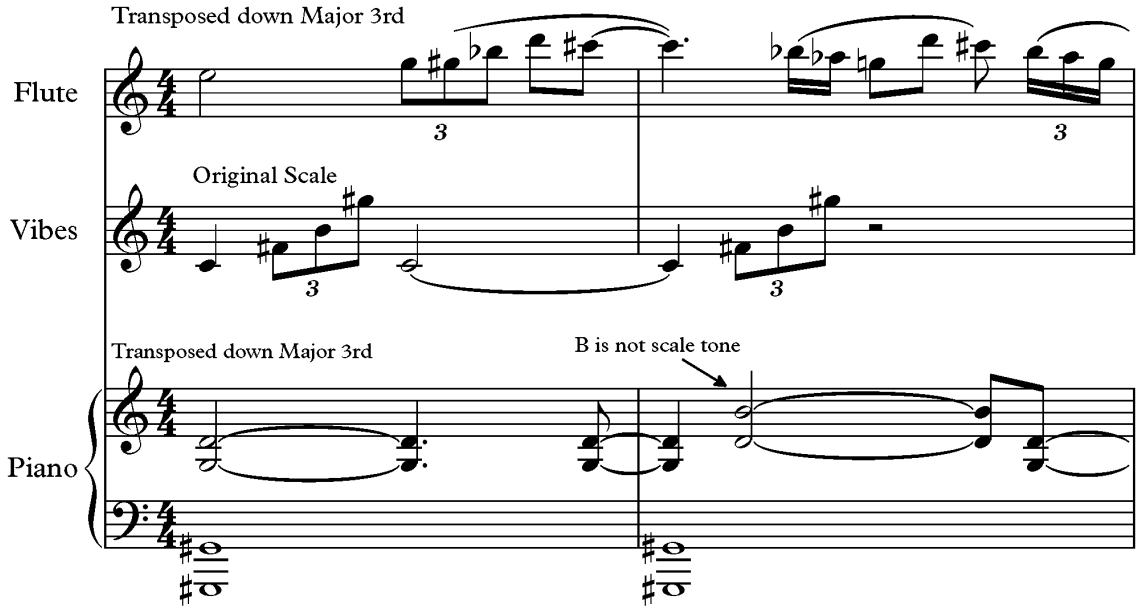


Process

Division by Two is comprised of two sections - **A** and **B**. Both sections use material derived from the created scale and its transpositions - only slight additions or alterations are made.

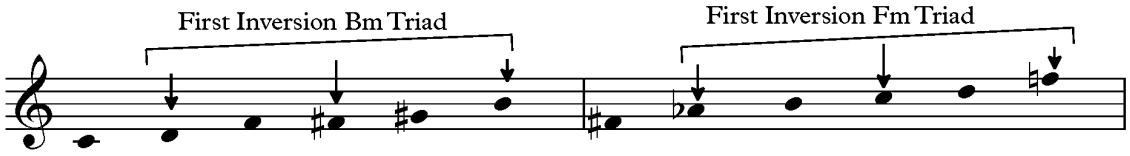
The **A** section begins with the vibraphone playing an ostinato figure with a melody played by the bass flute. The oboe joins, repeating the bass flute melody up an augmented fourth - but remaining in the same transposition of the scale. The piano joins with harmonic material transposed down a major third. The addition of a B natural, a non-scale tone, in the piano part combined with the original transposition of the scale in the vibraphone part creates new harmonic interest. Figure 7.5 shows the combination of these elements at bars 17 and 18.

Figure 7.5: Bars 17-18, Combination of Two Transpositions of Scale



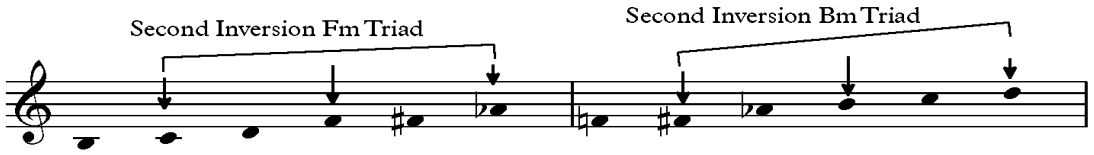
Section **B** creates the illusion of departing from the scale by quickly moving between different transpositions. Melodic *cells* are created from the scale - first by identifying resident first inversion minor chords. Figure 7.6 shows the two minor chords present within the original version of the scale –the second bar of the figure shows the same scale beginning on the F# with enharmonic adjustments.

Figure 7.6: Deriving B material



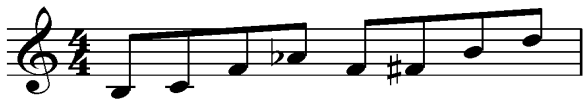
Scale material is then shifted to identify second inversion triads as shown in Figure 7.7. This is the same scale starting from a B and an F.

Figure 7.7: Shifting



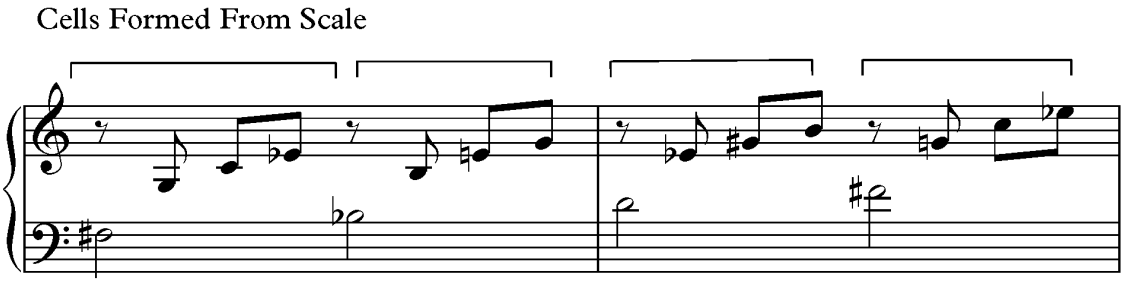
These triads are extracted and combined with the first note of the shifted scale to form the following cells (Figure 7.8).

Figure 7.8: Extracted Cells



These cells are used in the piano line that begins **B** at bar 23. The cells are now separated from the scale and attached to an ascending major third sequence. The original scale material has been fragmented and is being transposed with each repetition of the cell (Figure7.9).

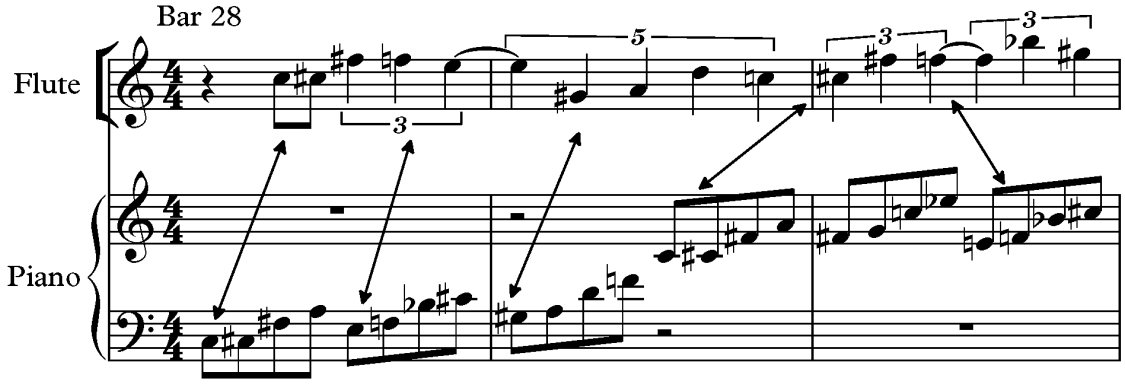
Figure 7.9: Repetition of Melodic Cells



The piano part continues using variations of these formations throughout **B** while the melodic instruments play fragments of the cells that are rising and falling in the piano part. Note the shifting relationship between the flute melody at bar 28 and the piano. The

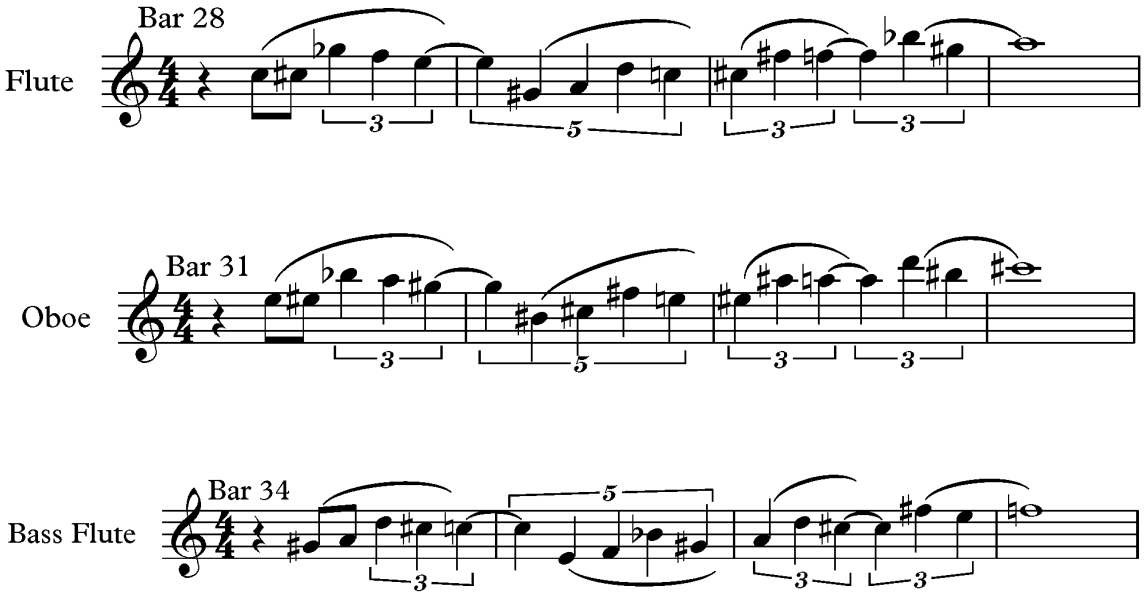
roaming melody is built from bits and pieces of the accompaniment - adding tension and motion by being slightly out of sync with the changing cells (Figure 7.10).

Figure 7.10: Fragmentation of Cells



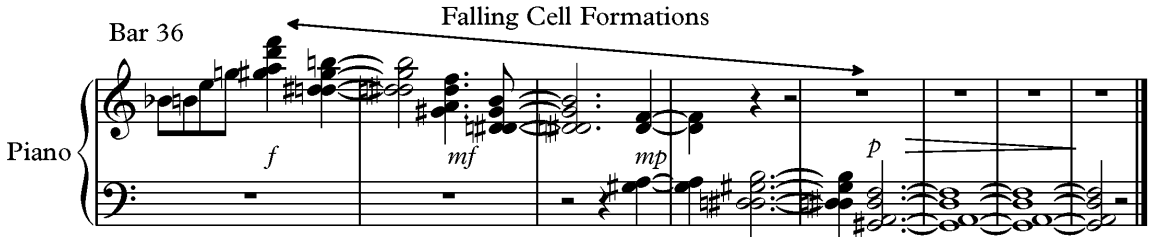
The melody is passed between the woodwinds; each repetition is transposed up a major third. Figure 7.11 shows the transpositions of the melody played by each woodwind.

Figure 7.11: Woodwind Melody Bars 28- 37



The eighth-note piano motion comes to a stop on beat three of bar 36. Motion in the other instruments decrease. The piano cells are collapsed into chords and the chords descend though a *diminuendo* (Figure 7.12) to the conclusion of the piece.

Figure 7.12: Collapsed Cells



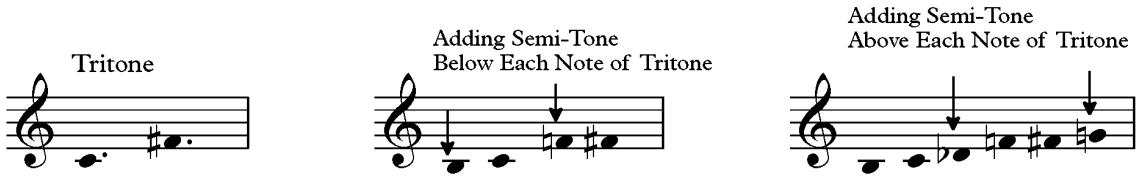
Composition 10: *Then Add Red*

Then Add Red is a jazz composition written for trumpet, tenor saxophone, piano, bass, and drums. This piece, written in 6/4, has a slightly altered repeating melody (**A** and **B**), a brief interlude (**C**), a solo section (**D**), and a recapitulation (return to **A** and **B**).

Application

Then Add Red also uses Slonimsky's method of adding tones above or below equal division points.. Figure 7.13 shows the formation of a symmetrical six-note scale by the addition of a semi-tone below and above each of the two division of the tritone.

Figure 7.13: Genesis of Scale for *Then Add Red*



Messiaen identifies this collection of notes as "Mode 5" (Figure 7.14).[114] Figure 7.15 shows the consecutive intervals of this scale. There are no major 2nd steps in this scale

Figure 7.14: Working Version of scale/Mode 5

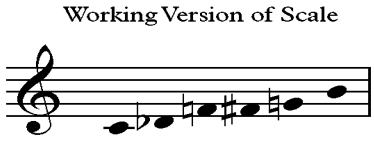
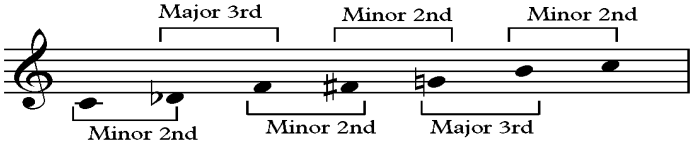
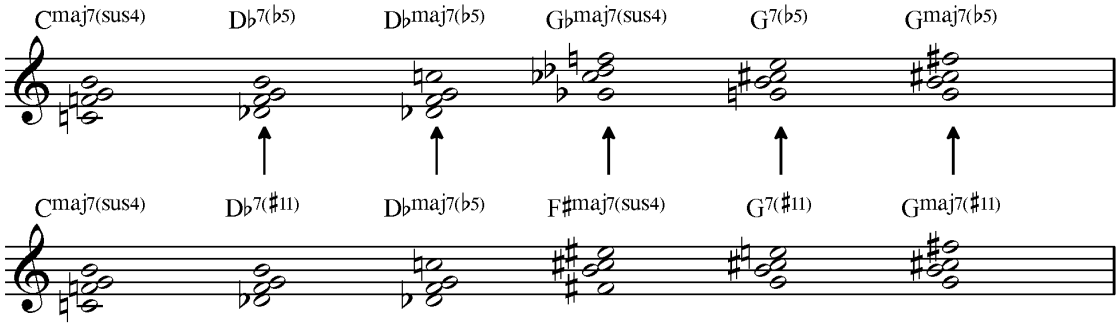


Figure 7.15: Consecutive Intervals



For this composition the suspended major 7th and the dominant 7th b5 chords are favoured. Figure 7.16 shows chords built on selected degrees of the scale shown in Figure 7.15. Both a major 7th and a dominant 7th chord can be built above the second and fifth degrees of this scale. Note that the ambiguous nature of the scale presents the question of enharmonic equivalents. As shown below in Figure 7.16, the F# maj7 (sus4) chord could be considered to be a Gb maj7 (sus4) or the flattened fifths on the Db and G chords could be considered augmented elevenths.[115]

Figure 7.16: Same Chords, Different Spellings



[114] Messiaen, *The Technique of My Musical Language*, 53.
[115] To facilitate easier reading, it is common practice in jazz to use enharmonic equivalents.

Process

Then Add Red begins with a 4 bar introduction that moves between the two resident major 7(sus4) chords of the scale – C maj7 (sus4) and F# maj7 (sus4). The ambiguous tonality is continued in the **A** section - a simple eight bar sequence that could be in C major or F# major resolves to a Gmaj7 (b5)/F#. The interaction between the trumpet melody and the background line reinforces the disguised tonality (Figure 7.17).

At **B** the material introduced in **A** repeats, this time with the trumpet playing the background line and tenor sax playing the melody. At bar 21 a modulation up a major third occurs as the trumpet and tenor sax play a transitional unison figure. This two bar figure outlines all of the notes of this new transposition of the scale (Figure 7.18).

Figure 7.17: Interaction at A, Bars 5-9.

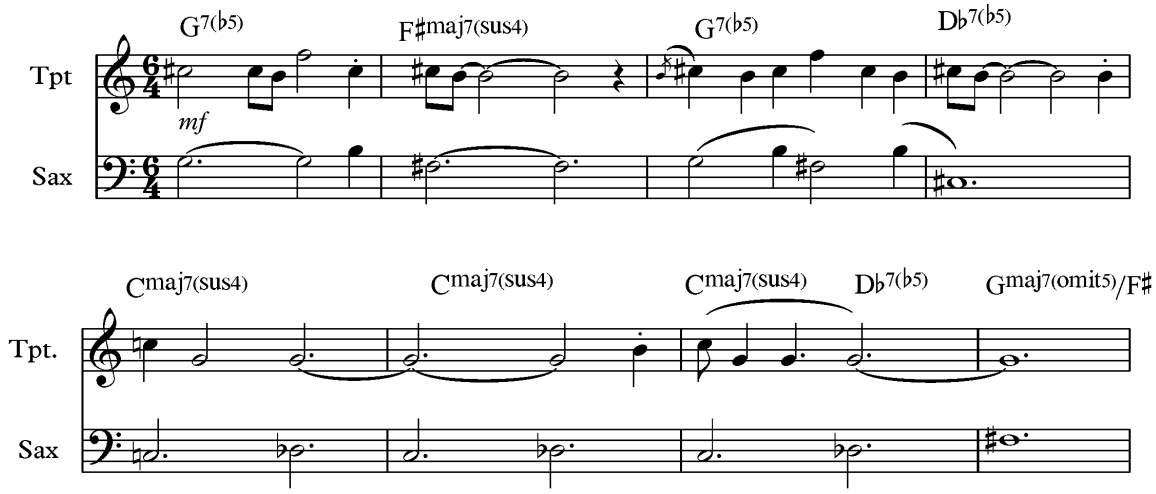
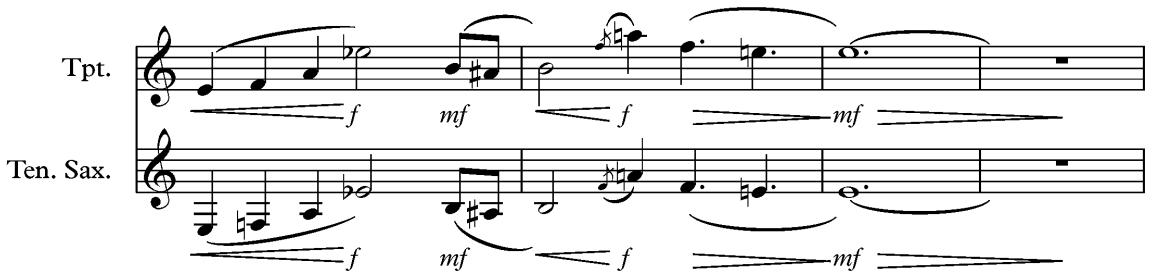
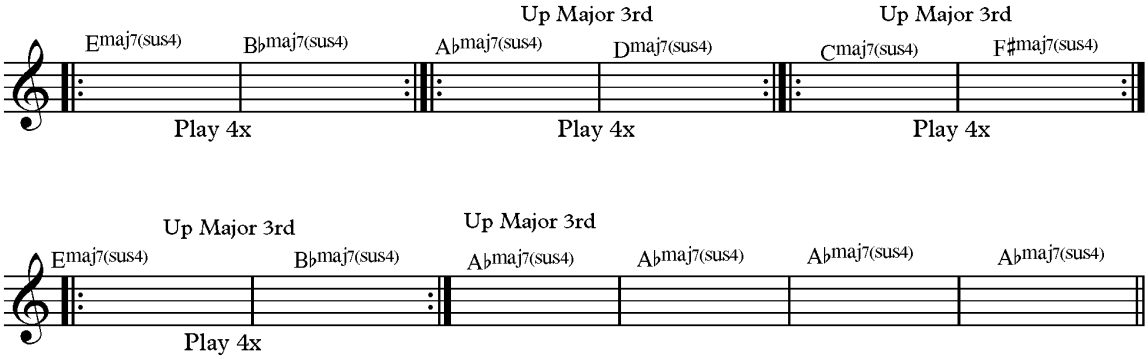


Figure 7.18: Bar 21-24, Outlining All Notes of New Transposition of Scale



Before the solo section begins there is an interlude at **C**. This eight bar section serves to establish the harmonic pattern that will continue through **D.** Throughout these sections the harmonic structure is shifting between the resident major 7(sus4) chords of different transpositions of the scale. Every eight bars a transposition is made up a major third. At the end of the solo the Ab major 7(sus4) holds for an extra four bars - creating a feeling of resolution (Figure 7.19).

Figure 7.19: Harmonic Motion In The Solo Section.



On the recapitulation, **A** and **B** take us again to the unison line and transposition at bar 21, this time the coda takes us to a concluding statement of the tritone division (Figure 7.20).

Figure 7.20: Final Tritone Statement

Conclusion

We are satisfied by tension and release in music - the movement from the dissonant to the consonant. Moreover, we are thrilled, moved, and challenged by the unexpected. Strict symmetry, in form, rhythm, harmony, melody or any of the variable elements of music, creates the predictable. With the exception of serialism, composers of Western art music and jazz, as well as jazz improvisers use equal divisions most often, and most effectively, in combination with other more diatonic harmonic systems. The results of the combinations, whether demonstrated in books by Olivier Messiaen and Yusef Lateef, jazz solos by Coleman Hawkins and John Coltrane, or compositions by Ravel and Stravinsky are often intriguing, sometimes exhilarating and always interesting.

When writing for chamber ensemble the composer's intent is usually clearly presented in the score. Using this harmonic material for jazz composition, however, presented challenges. Jazz, by its nature, provides more freedom for the player/improviser. When composing for jazz ensemble, if chords are not spelled and played correctly, the intended harmonic effect is compromised. This is true, of course, in traditional diatonic harmony, but when unfamiliar harmonic systems and scales are introduced, specific directions regarding scale and note choices should be provided. The freedom of jazz can still be present but the boundaries must be well defined.

Symmetrical scales and the harmonic environments they produce offer subtle tonal colourings. These materials can be crafted to provide unique and satisfying melodic and harmonic movement. With the jazz and chamber compositions presented in this thesis, I hope to have demonstrated how these parallel harmonic environments, ambiguous and perhaps unsatisfying alone, are capable of adding new depth and interest when used in tandem with more traditional diatonic harmony.

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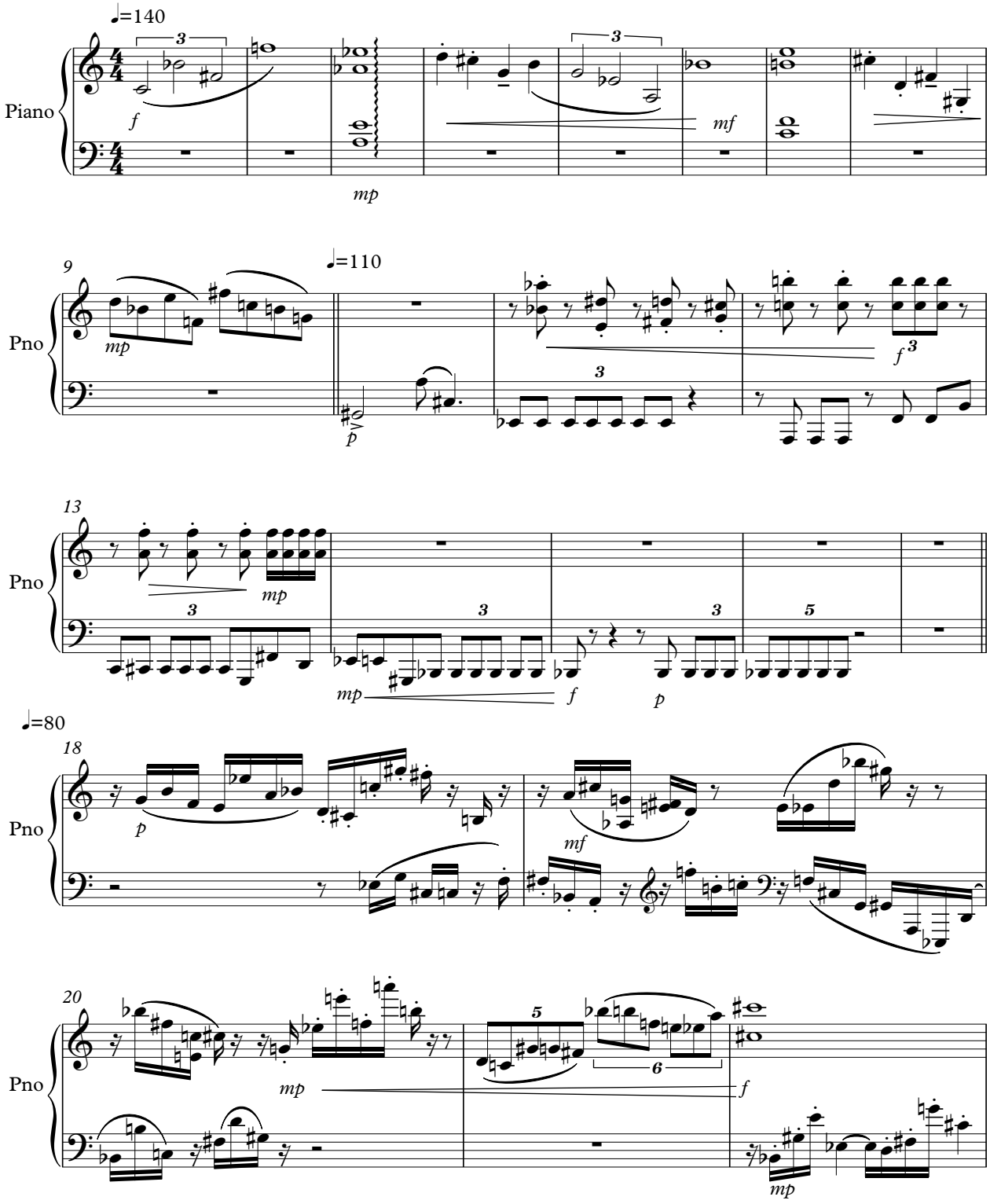
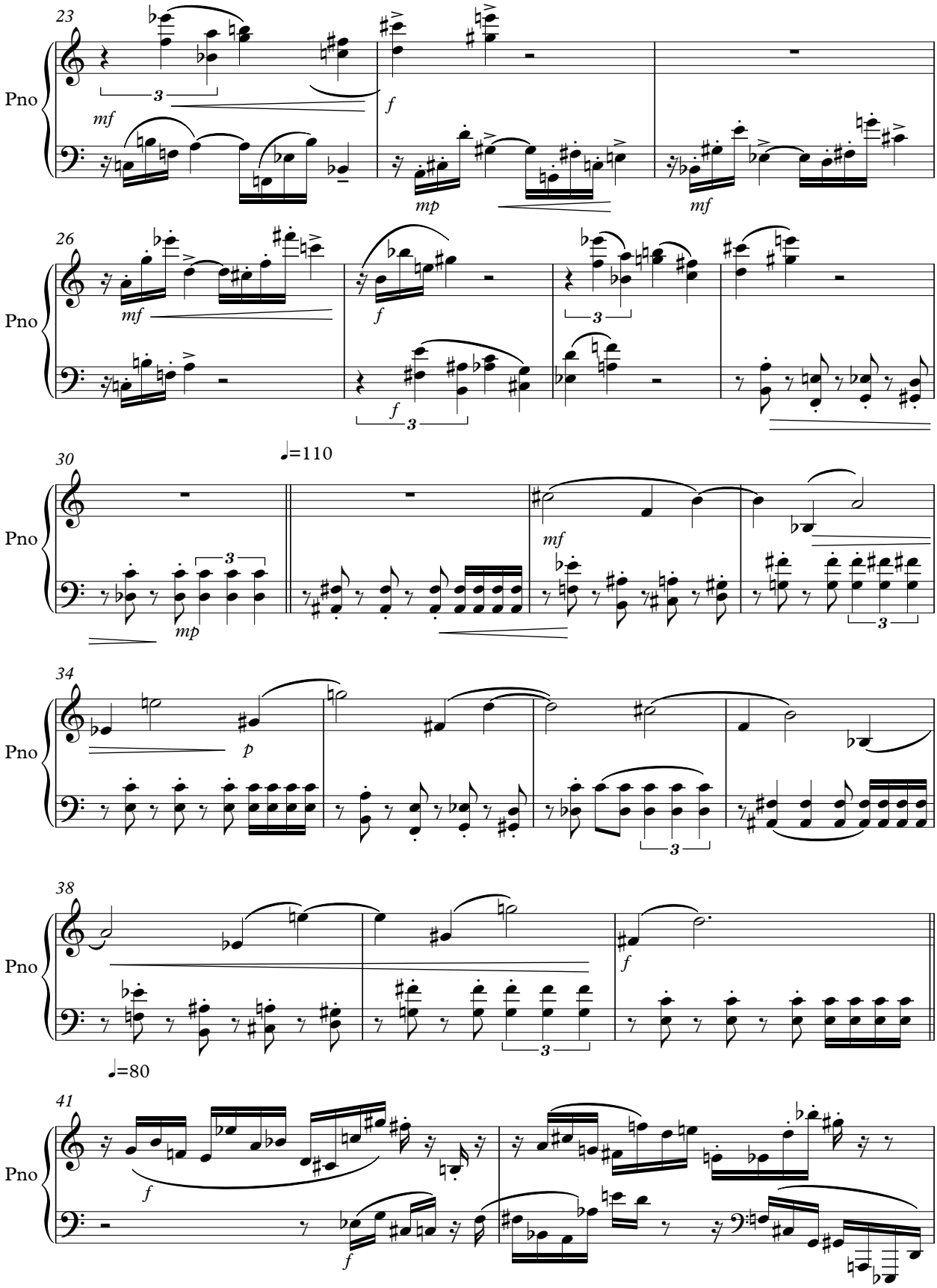
APPENDIX A: SCORES

Dirty Dozen

Doug Wilde©2015

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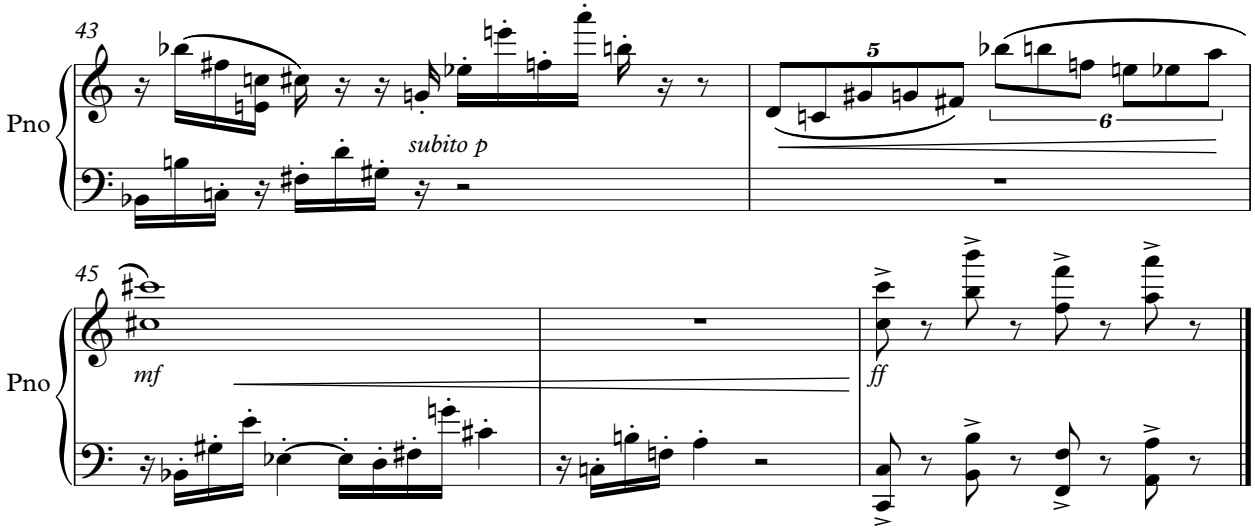
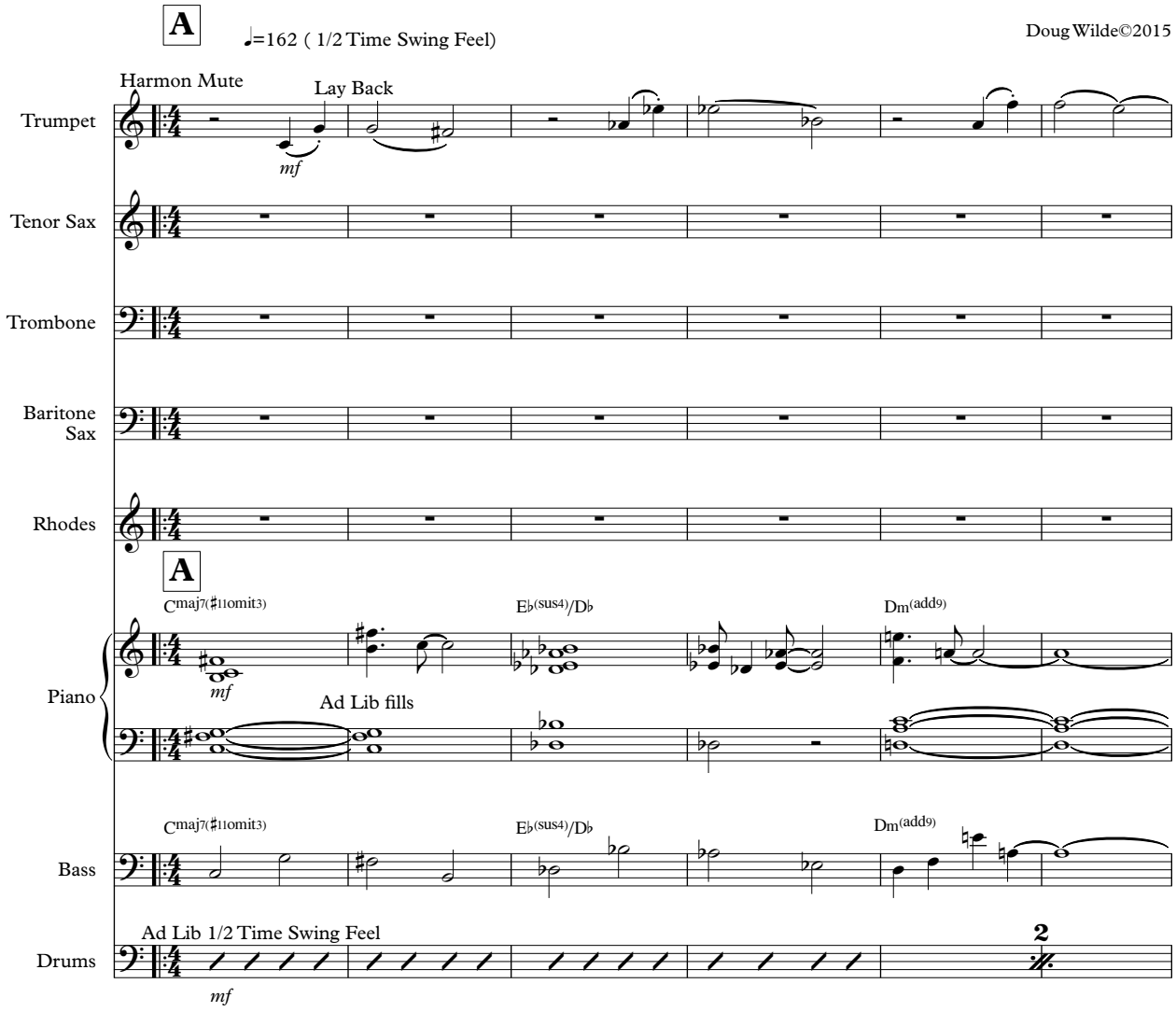
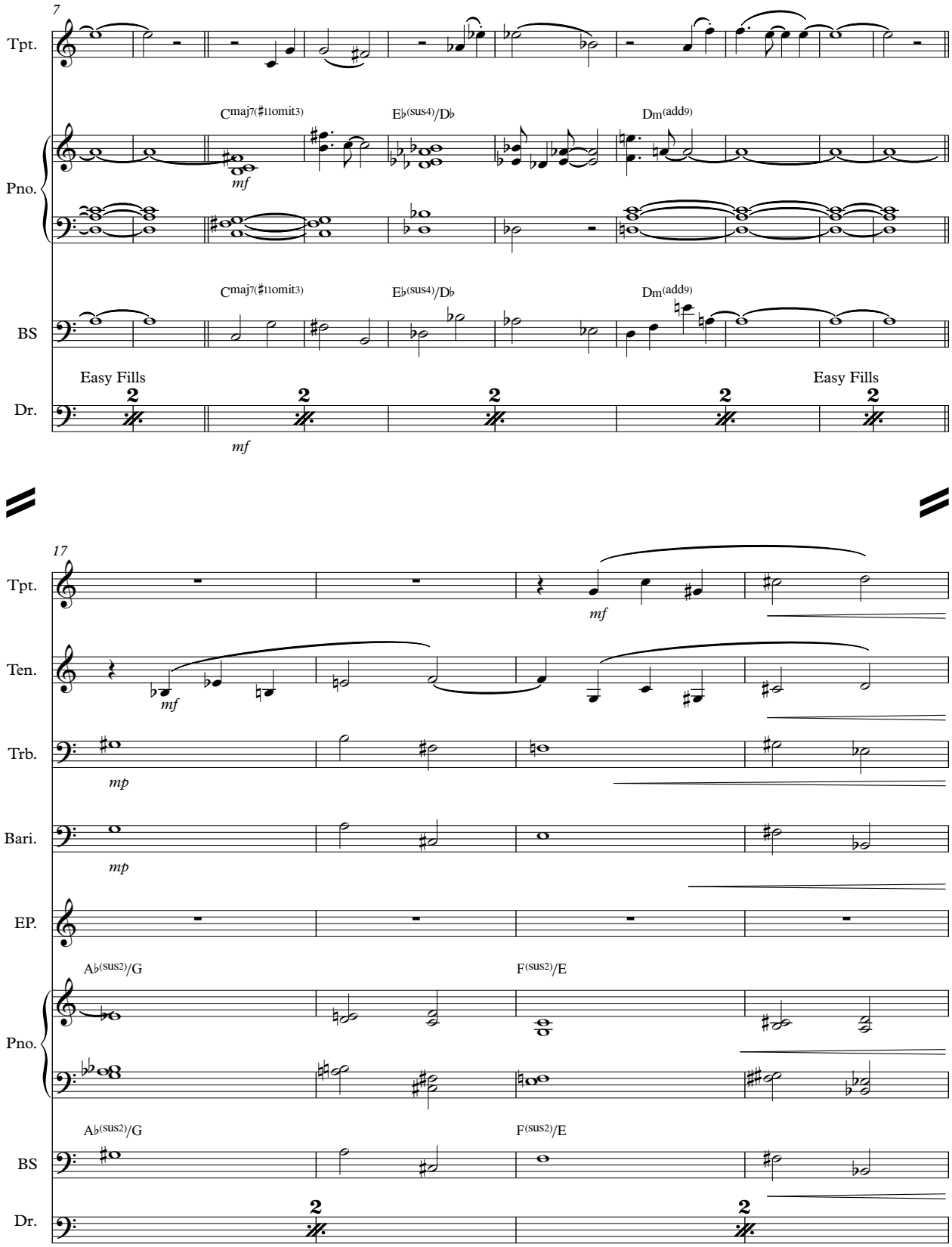
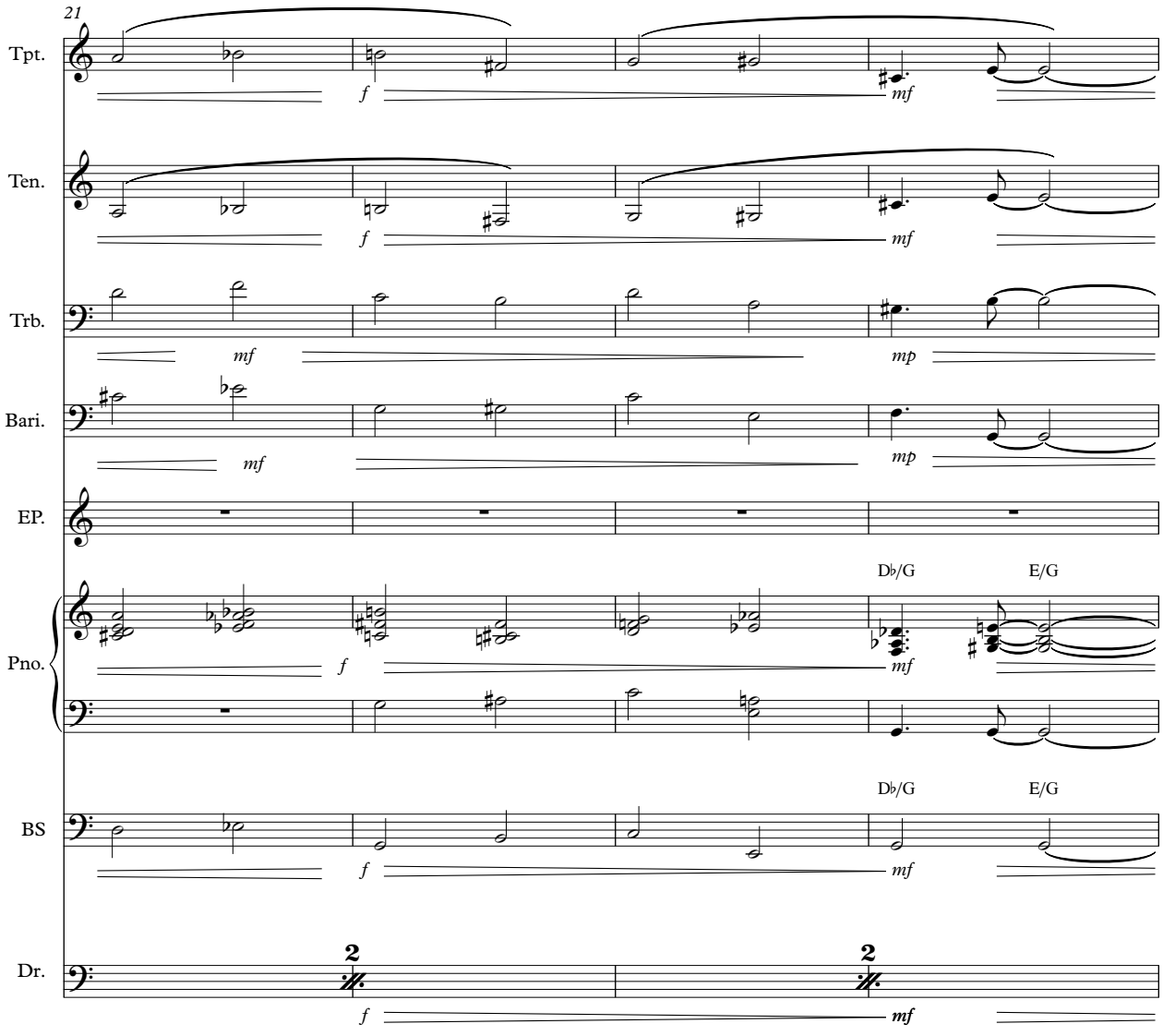
Pno
mf
f
mp
mf
26
Pno
mf
f
f
3
3
30
Pno
♩=110
mp
mf
3
3
34
Pno
p
3
38
Pno
f
3
♩=80
41
Pno
f
f

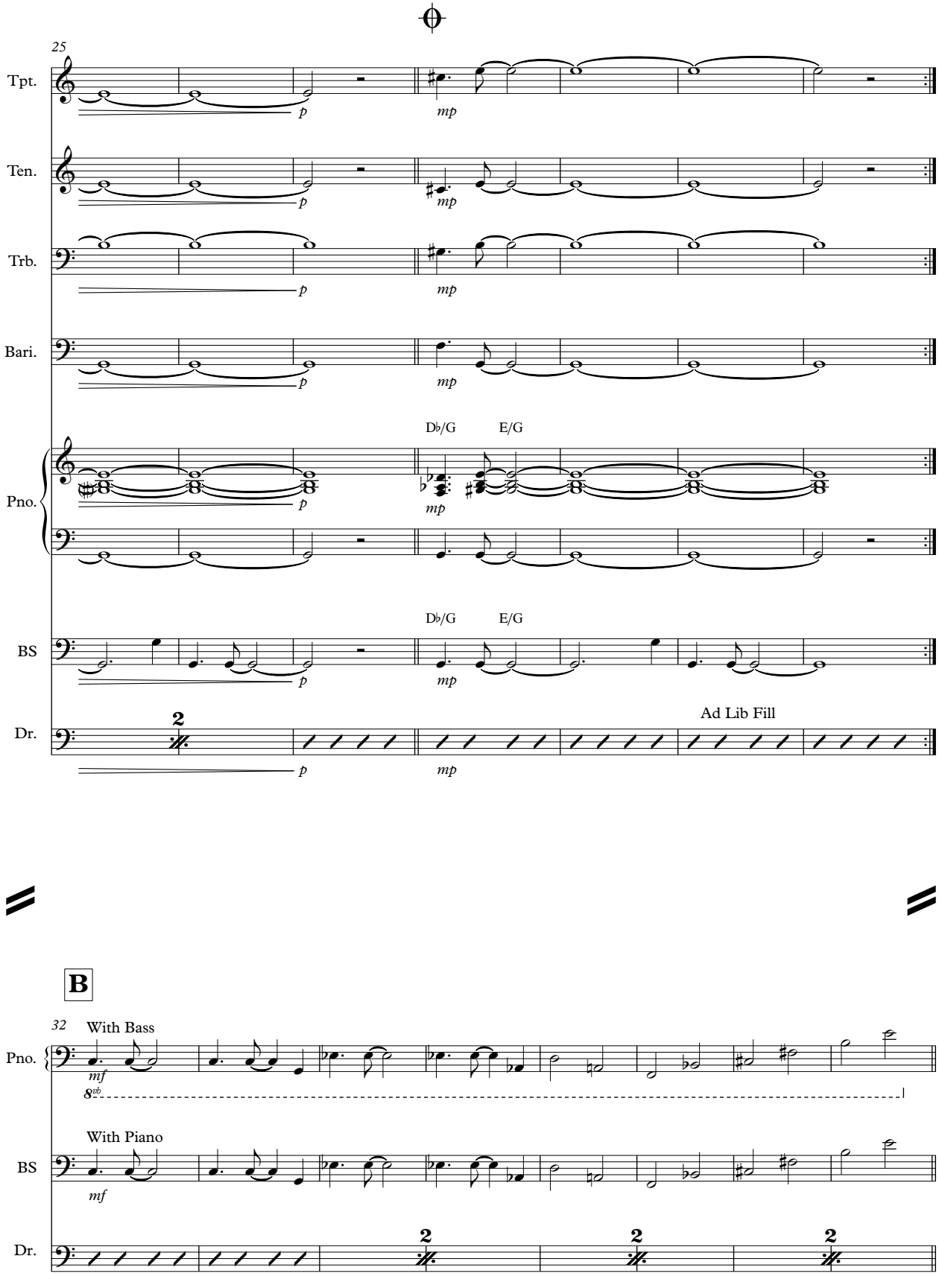

43
Pno
subito p
5
6
45
Pno
mf
ff

Twelve of Us

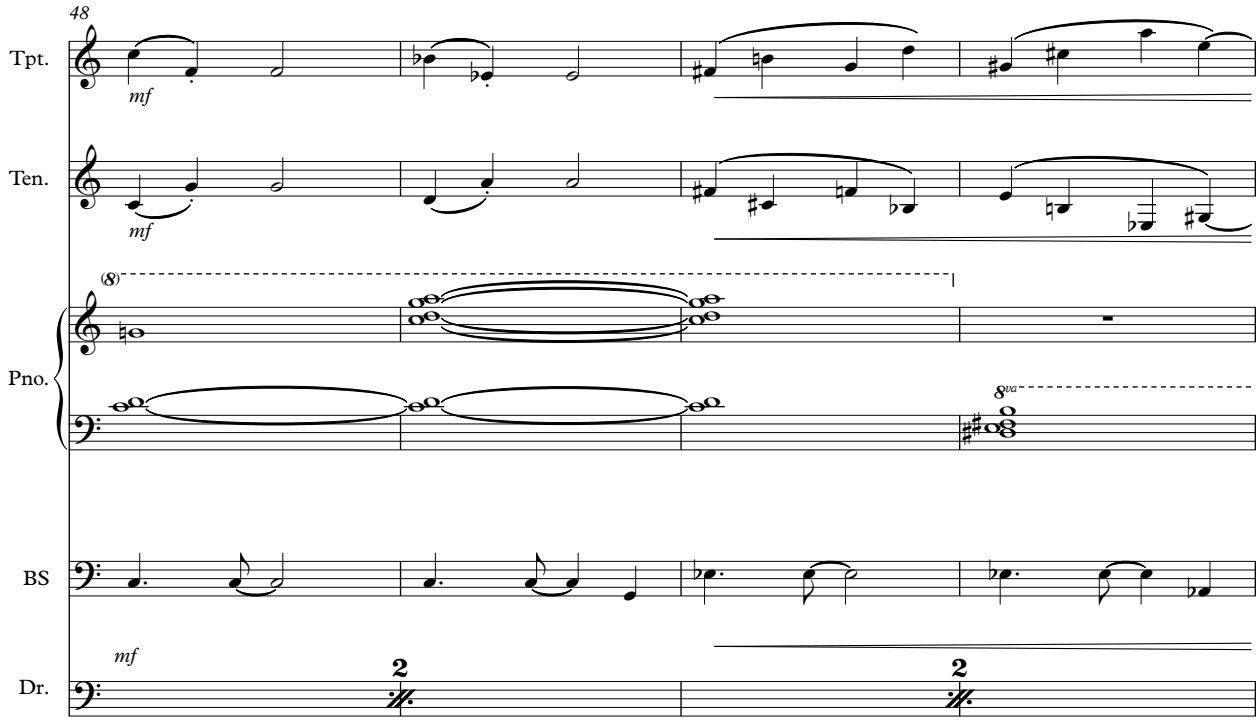

A
♩=162 (1/2 Time Swing Feel)
Doug Wilde©2015
Harmon Mute
Lay Back
Trumpet
mf
Tenor Sax
Trombone
Baritone Sax
Rhodes
A
Cmaj7(♯11omit3)
E♭(sus4)/D♭
Dm(add9)
Piano
mf
Ad Lib fills
Cmaj7(♯11omit3)
E♭(sus4)/D♭
Dm(add9)
Bass
Ad Lib 1/2 Time Swing Feel
2
Drums
mf

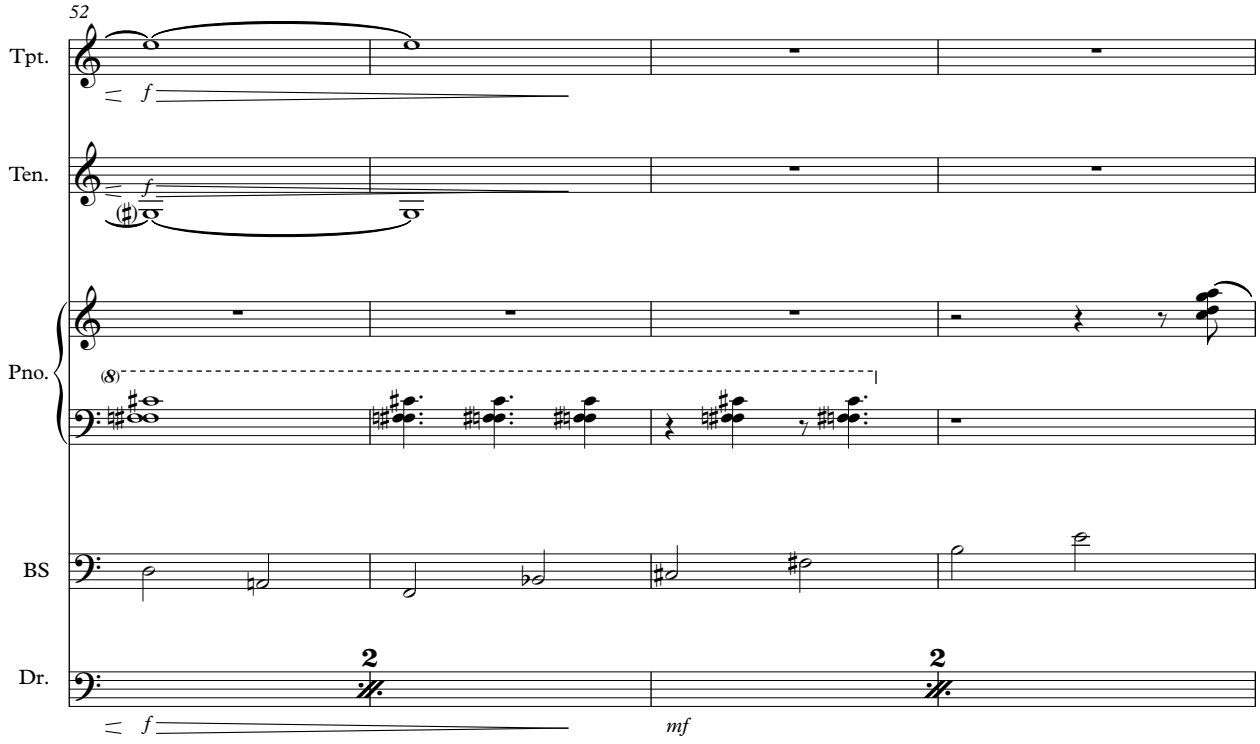

7
Tpt.
Pno.
BS
Dr.
Cmaj7(♯11omit3)
E♭(sus4)/D♭
Dm(add9)
mf
Easy Fills
17
Ten.
Trb.
Bari.
EP.
mp
A♭(sus2)/G
F(sus2)/E


21
Tpt.
Ten.
Trb.
Bari.
EP.
Pno.
BS
Dr.
f
mf
mp
Db/G
E/G
2


25
Tpt.
Ten.
Trb.
Bari.
Pno.
BS
Dr.
p
mp
D♭/G
E/G
2
Ad Lib Fill
B
32
With Bass
With Piano
mf
8vb


40
Tpt.
mf
f
8va
Floating
Pno.
mp
BS
Dr.
2
mp


48
Tpt.
mf
Ten.
mf
(8)
Pno.
8va
BS
mf
Dr.
2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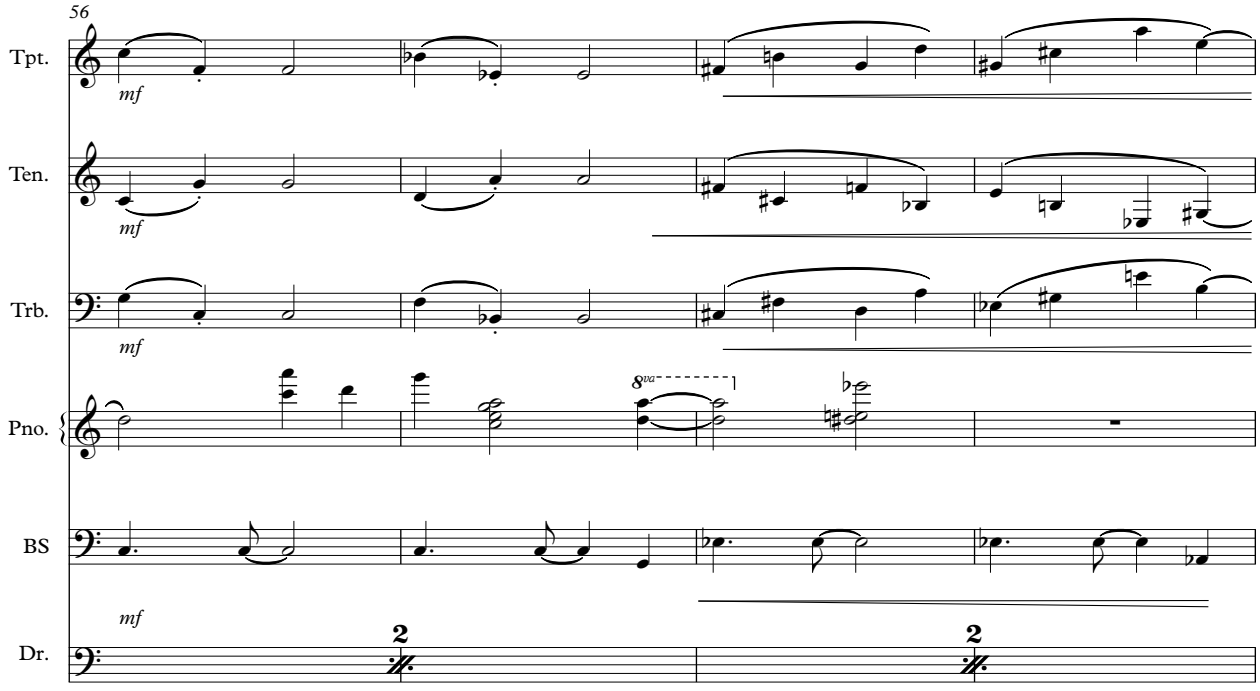
Tpt.
Ten.
Pno.
BS
Dr.
f
f
(8)
2
2
f
mf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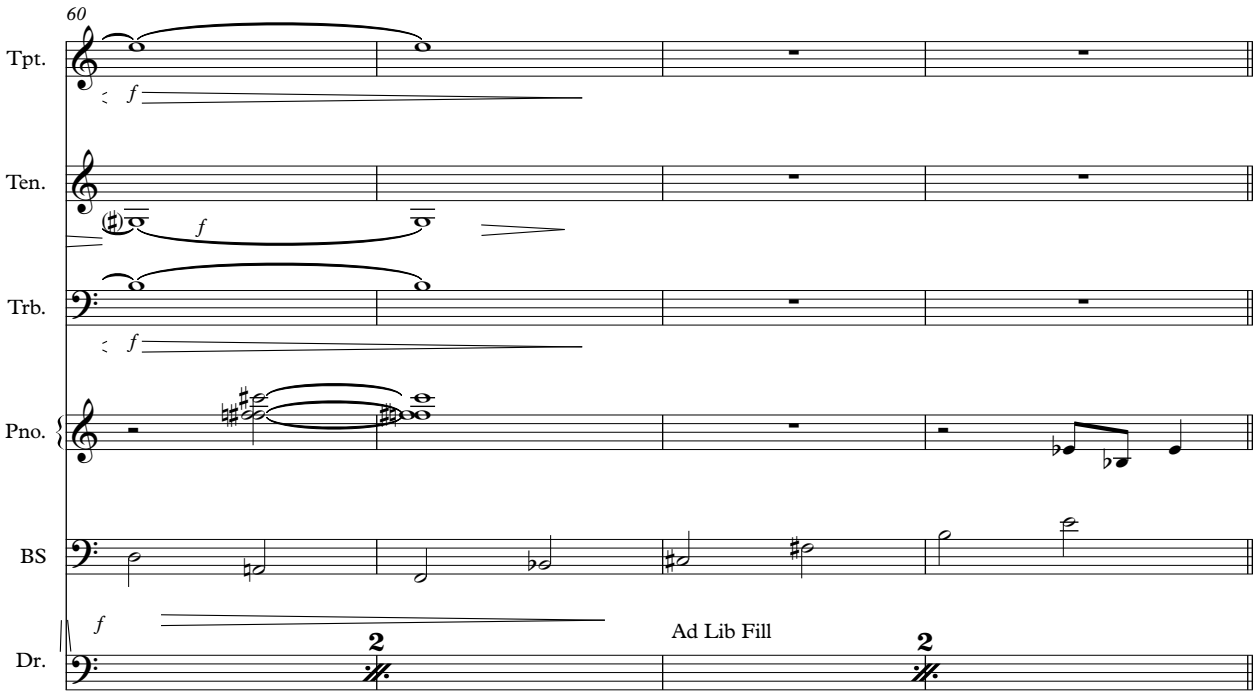
Ten.
Trb.
Pno.
BS
Dr.
mf
mf
mf
8va
mf
2
2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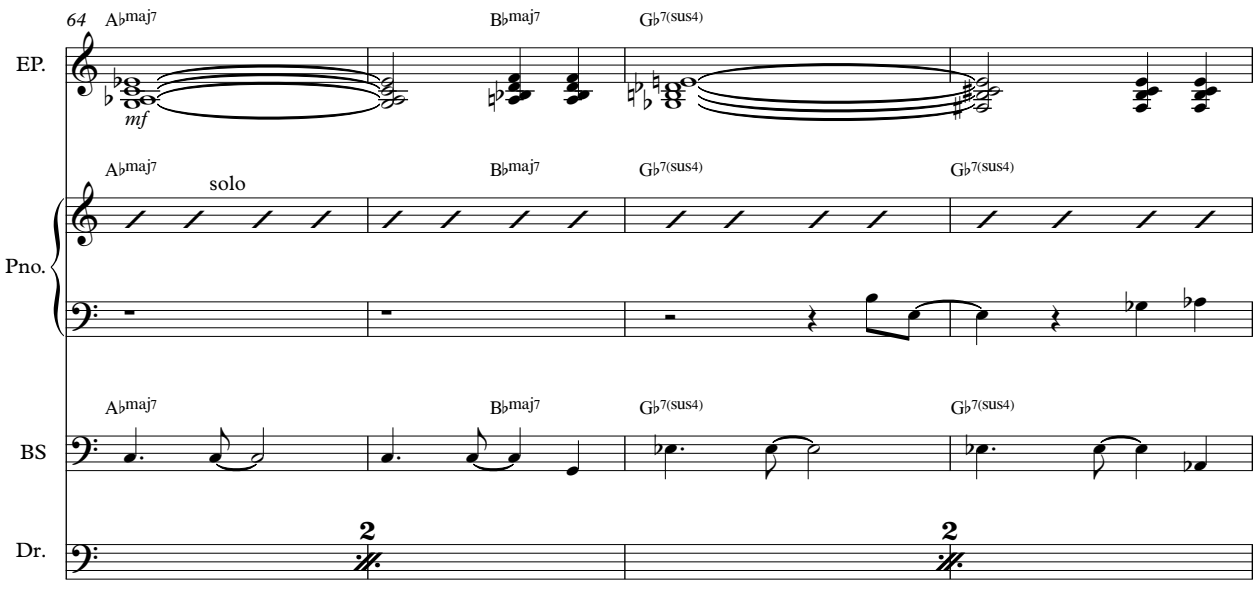
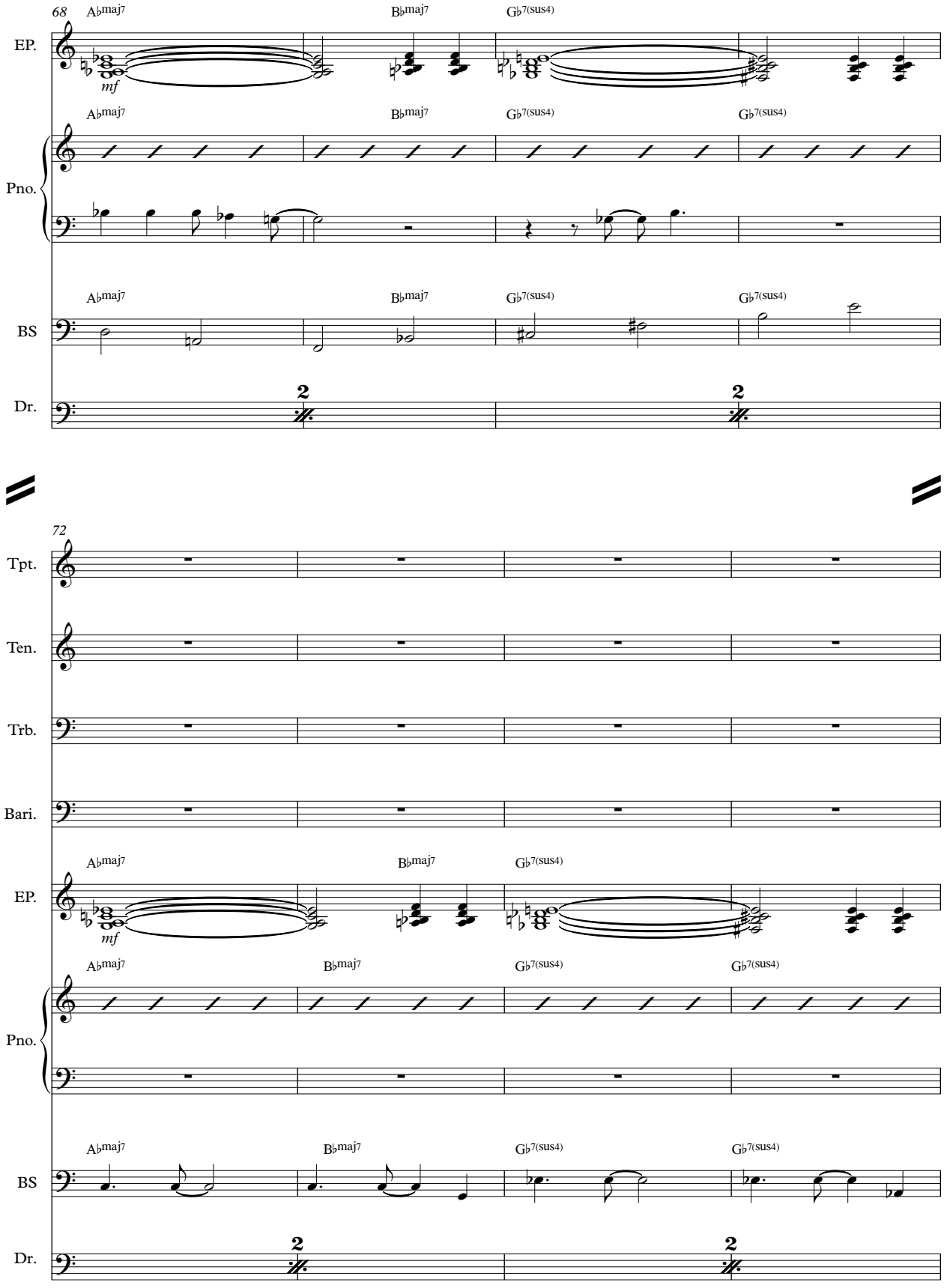
Tpt.
Ten.
Trb.
Pno.
BS
Dr.
f
Ad Lib Fill
2


64
A♭maj7
B♭maj7
G♭7(sus4)
EP.
mf
solo
Pno.
BS
Dr.
2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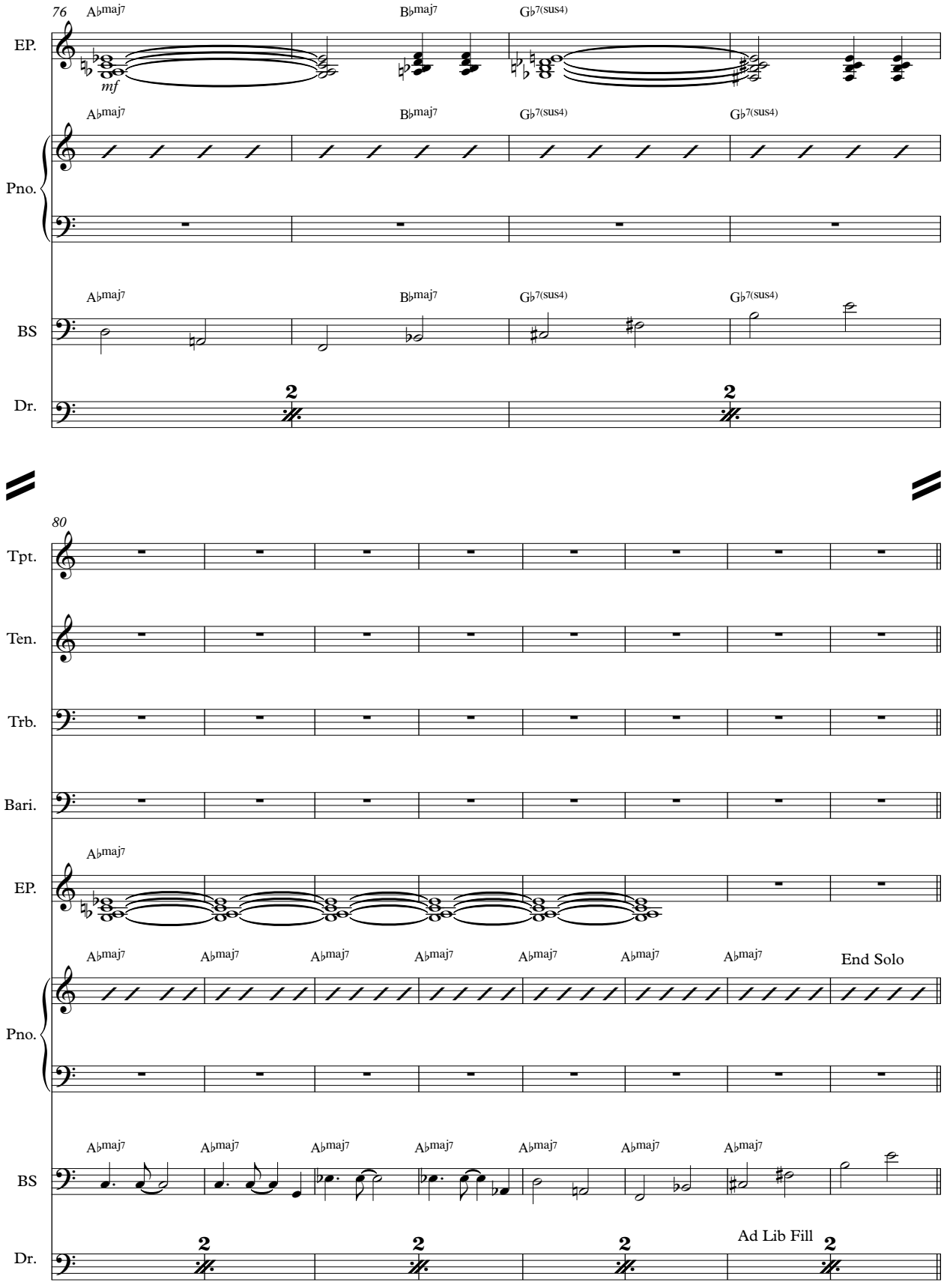
A♭maj7
B♭maj7
G♭7(sus4)
EP.
mf
Pno.
BS
Dr.
2
72
Tpt.
Ten.
Trb.
Bari.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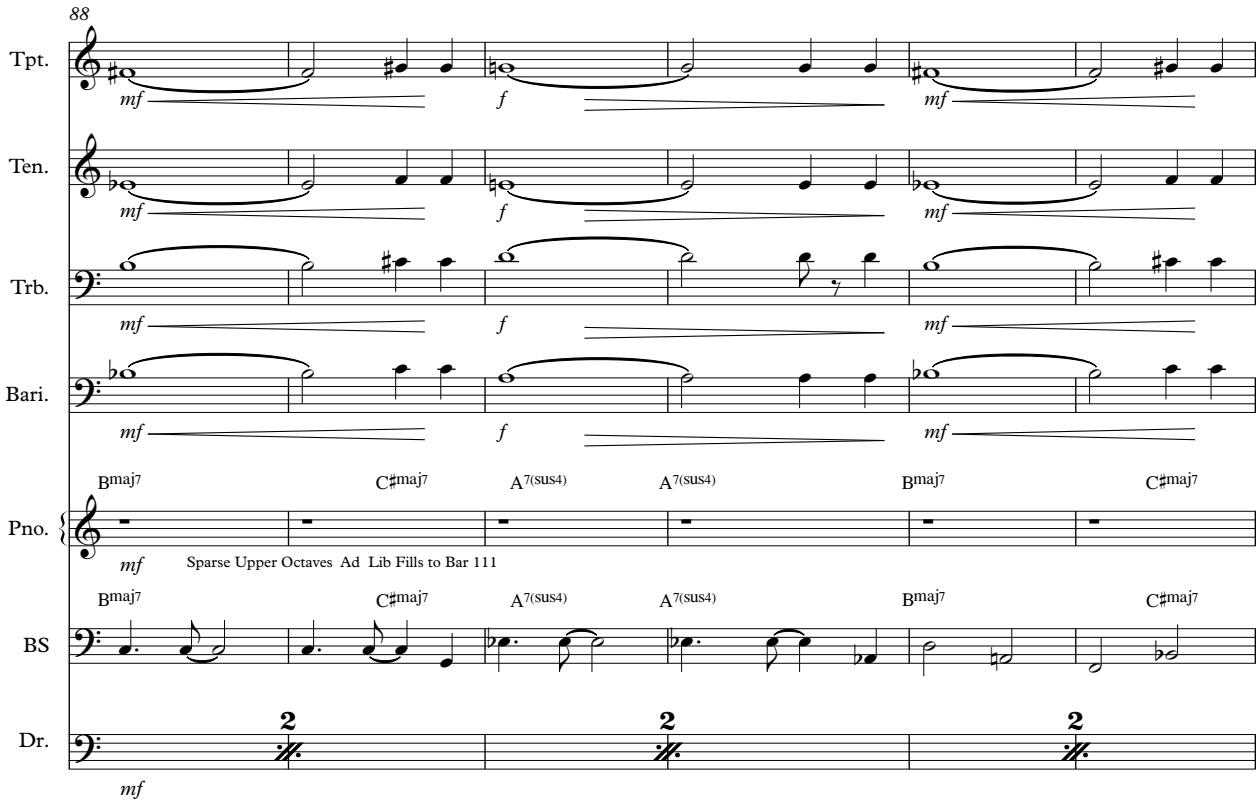
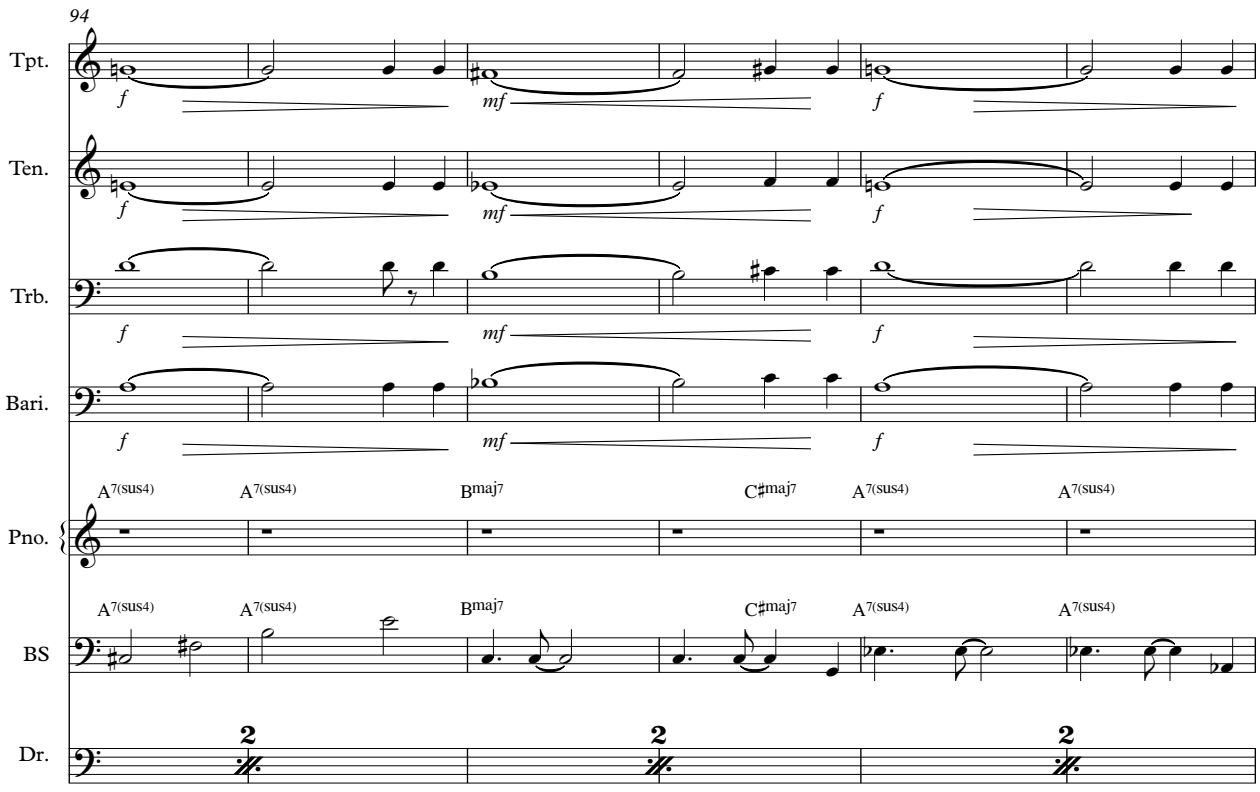
A♭maj7
B♭maj7
G♭7(sus4)
EP.
mf
Pno.
BS
Dr.
2
80
Tpt.
Ten.
Trb.
Bari.
End Solo
Ad Lib Fill


88
Tpt.
Ten.
Trb.
Bari.
Pno.
BS
Dr.
mf
f
Bmaj7
C♯maj7
A7(sus4)
Sparse Upper Octaves Ad Lib Fills to Bar 111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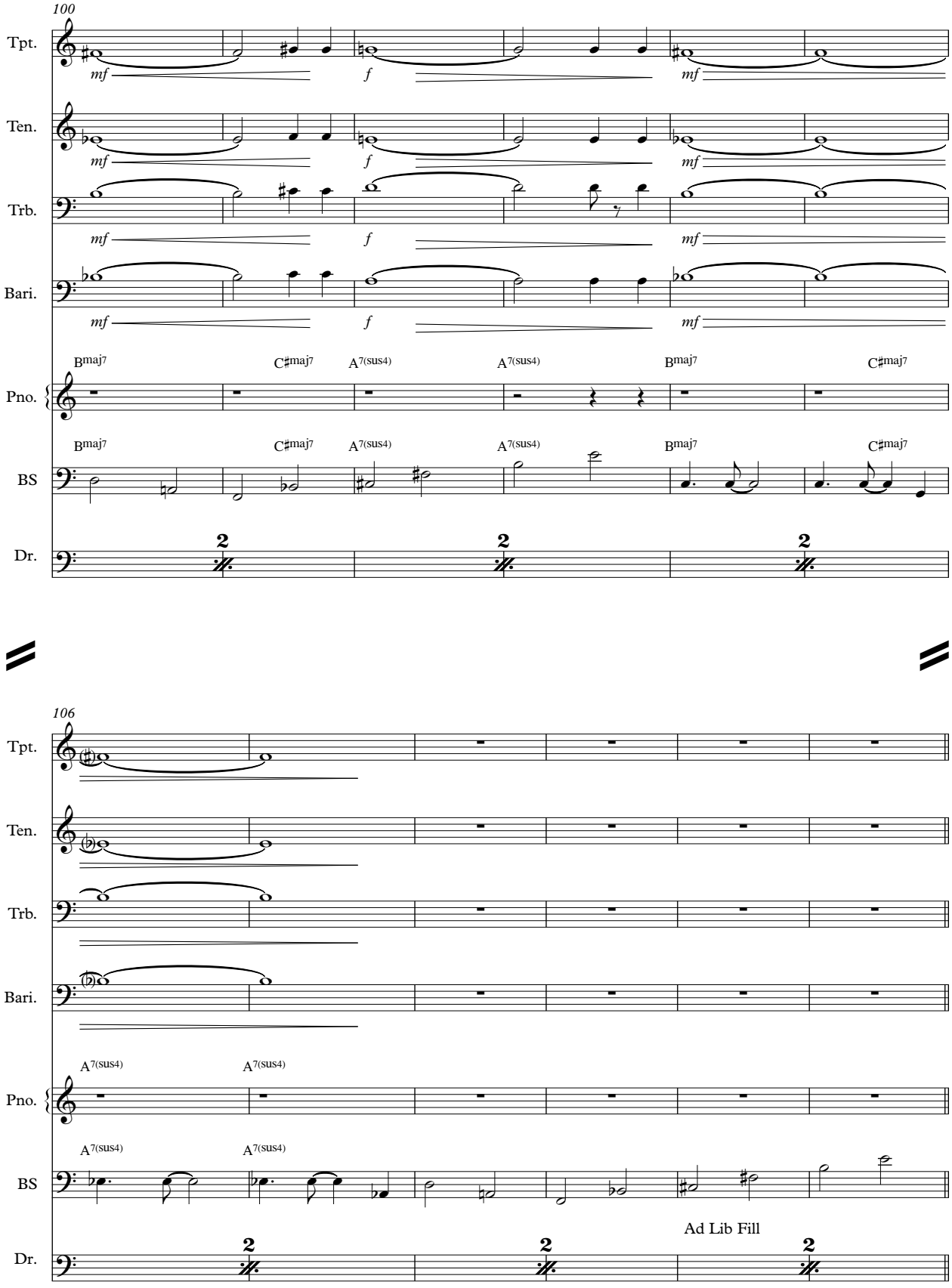
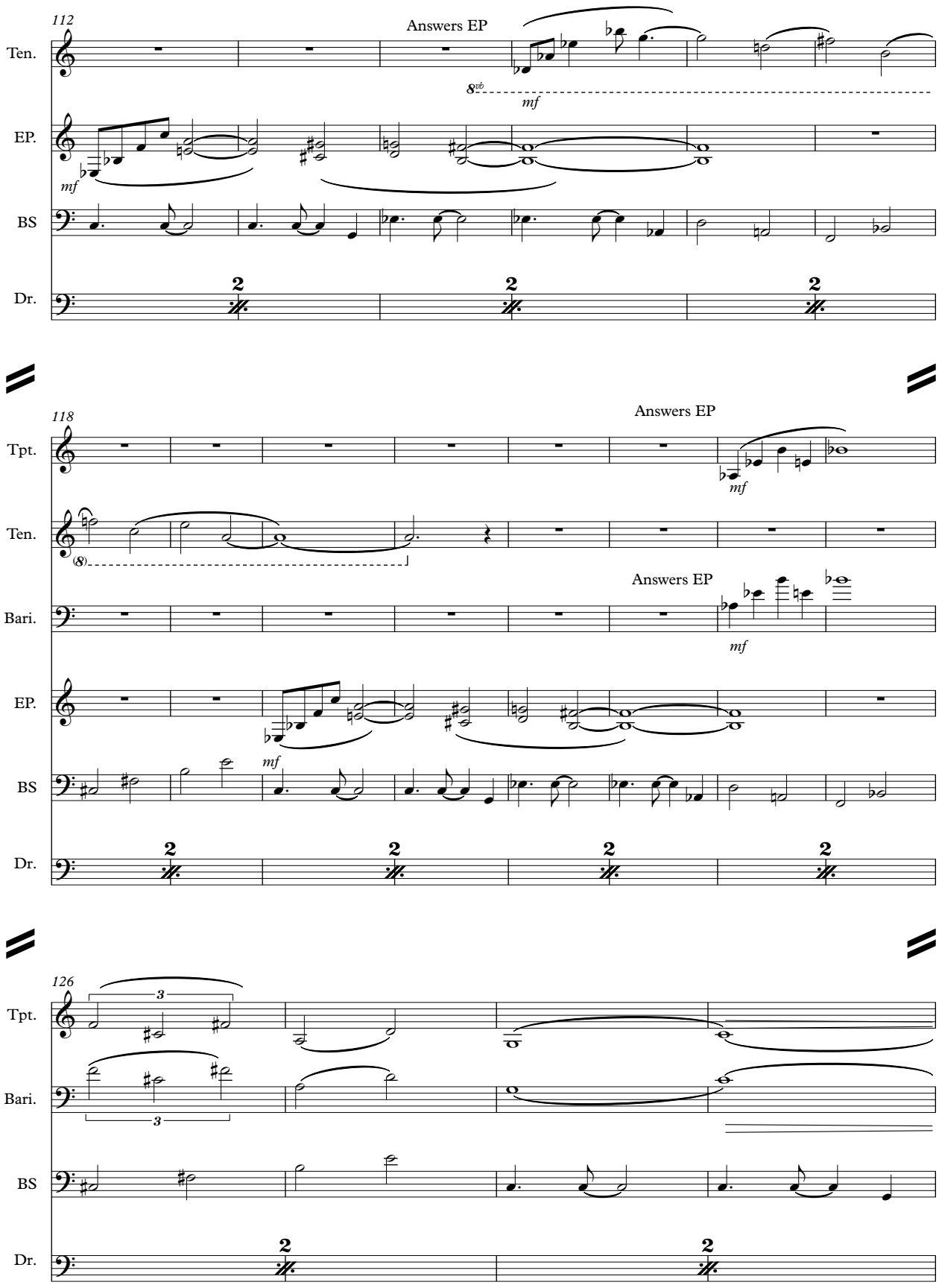
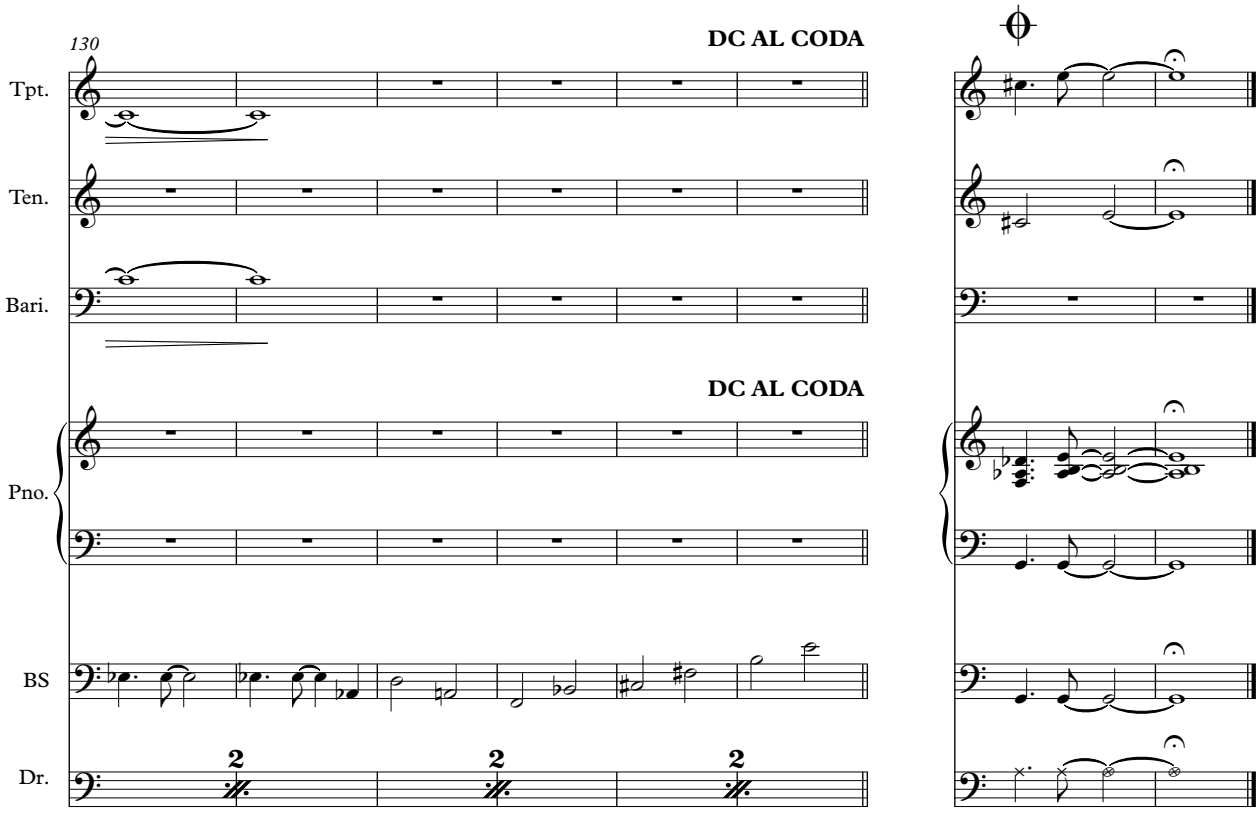
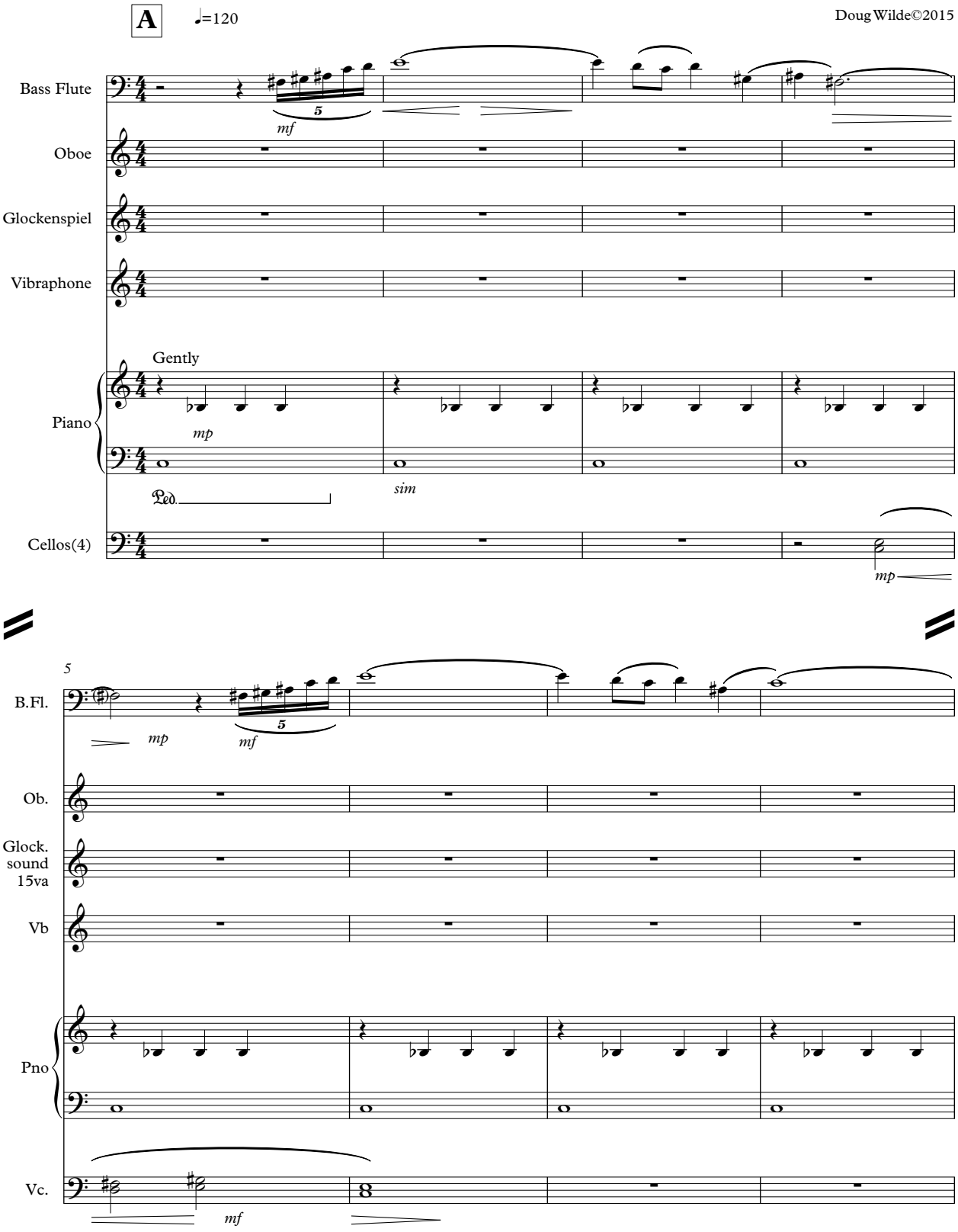
Ten.
Trb.
Bari.
Pno.
BS
Dr.
f
mf
A7(sus4)
Bmaj7
C♯maj7

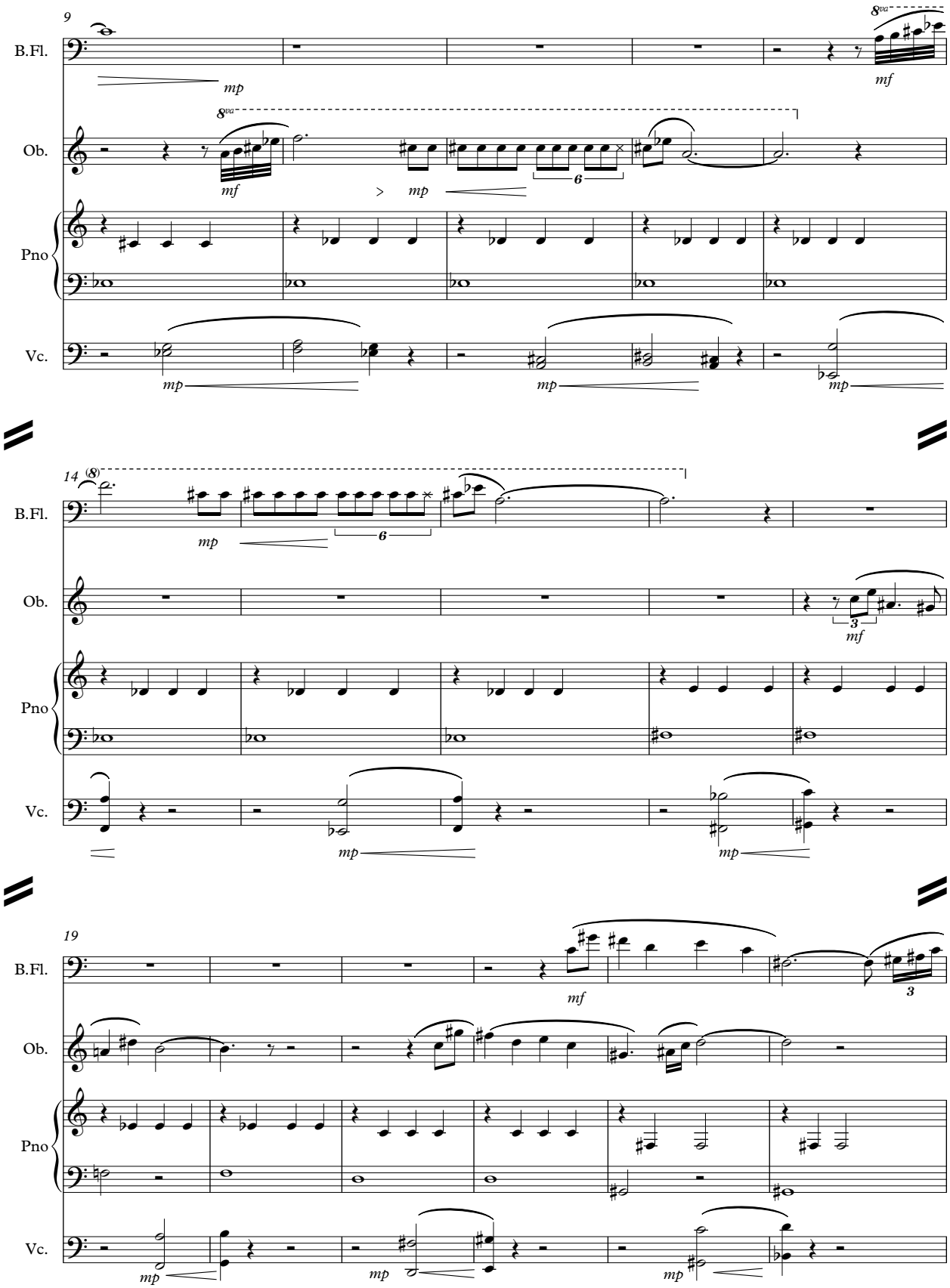

100
Tpt.
Ten.
Trb.
Bari.
Pno.
BS
Dr.
mf
f
mf
Bmaj7
C♯maj7
A7(sus4)
A7(sus4)
Bmaj7
C♯maj7
2
106
A7(sus4)
A7(sus4)
Ad Lib Fill


112
Answers EP
Ten.
8vb
mf
EP.
mf
BS
Dr.
2
118
Answers EP
Tpt.
mf
Ten.
(8)
Answers EP
Bari.
mf
EP.
mf
BS
Dr.
2
126
3
Tpt.
Bari.
3
BS
Dr.
2


130
DC AL CODA
Tpt.
Ten.
Bari.
DC AL CODA
Pno.
BS
Dr.
2
2
2

Six Degrees of Separation

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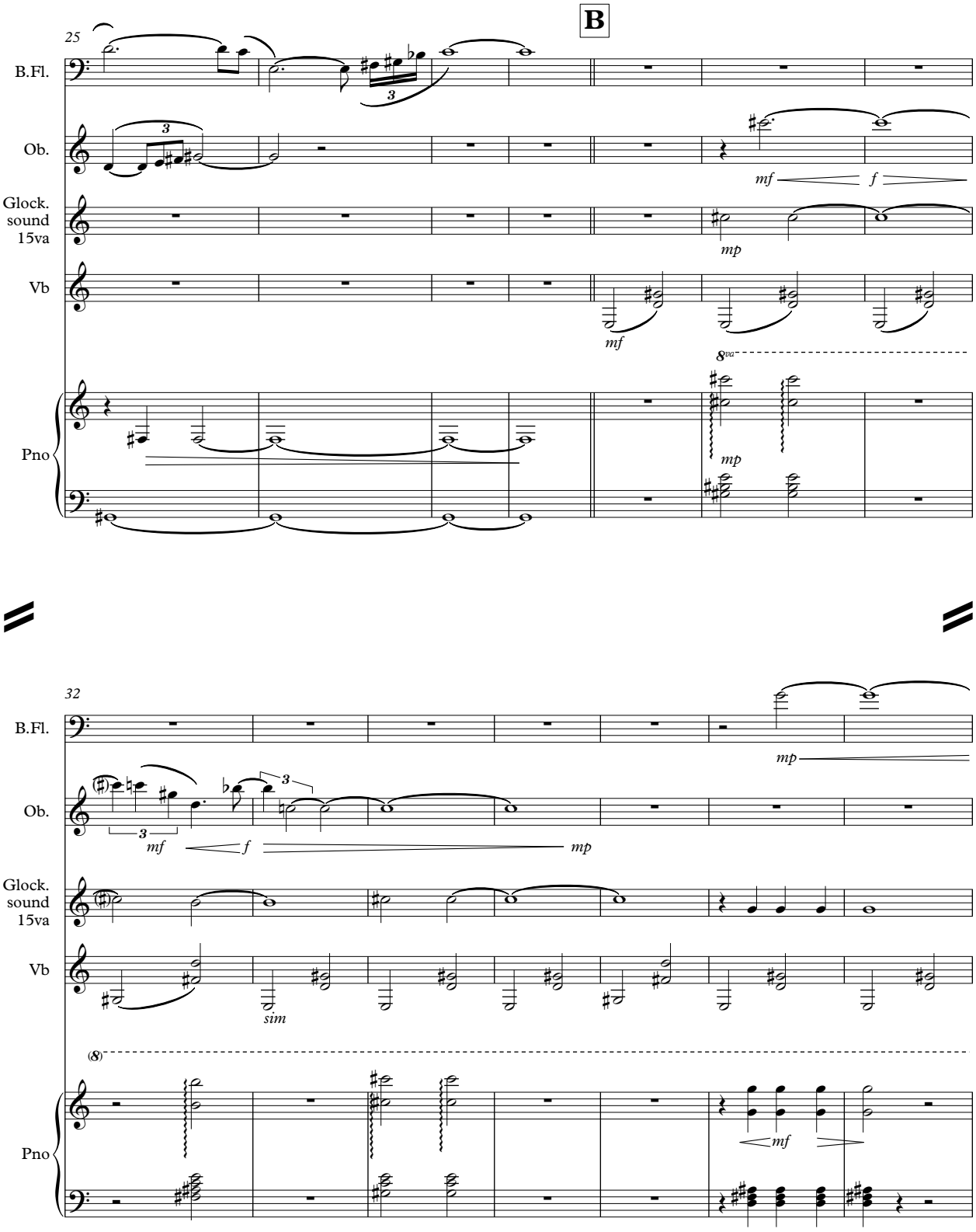
Ob.
Pno
Vc.
mp
mf
8va
14
19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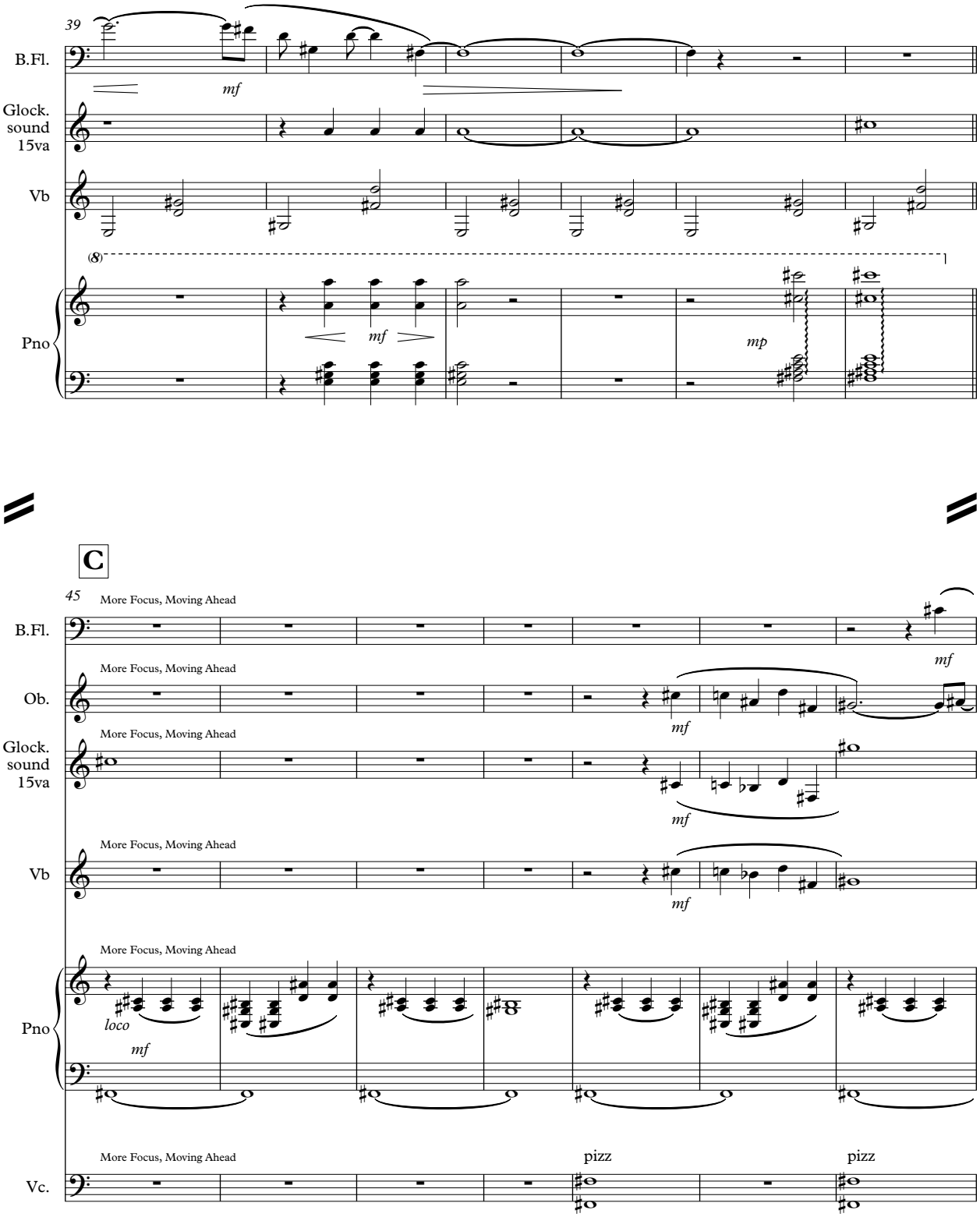
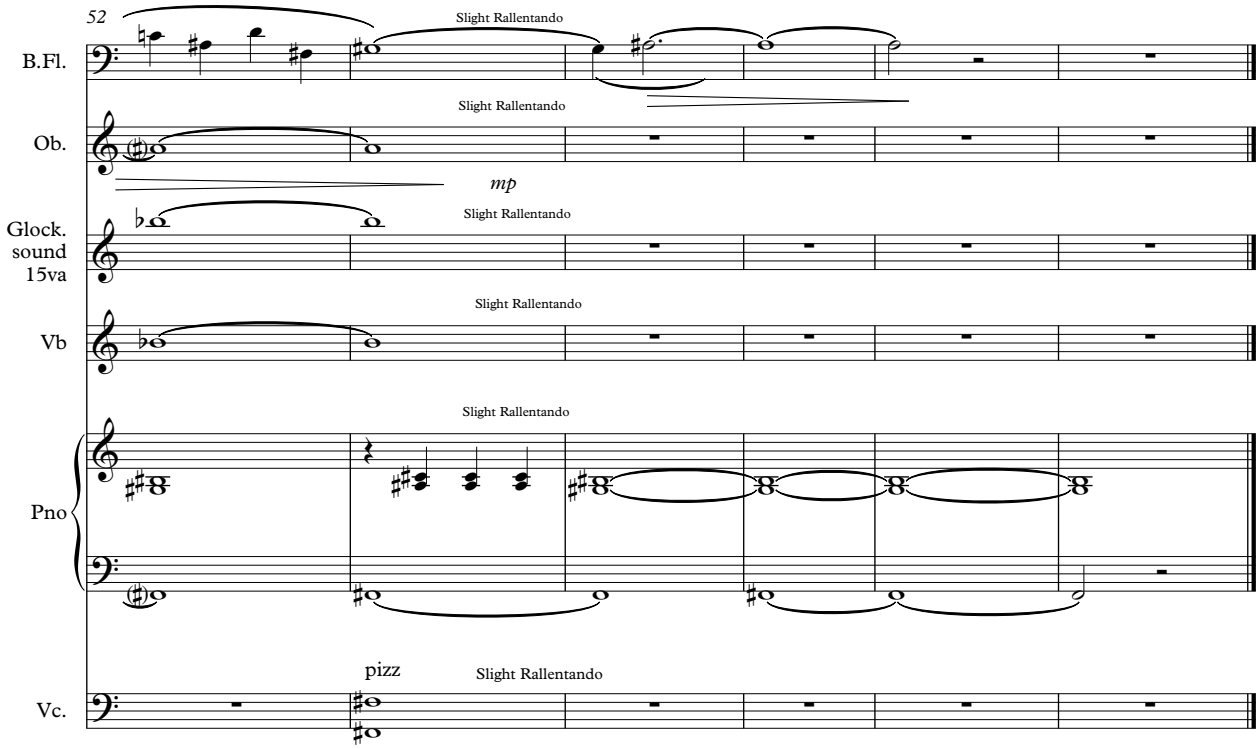
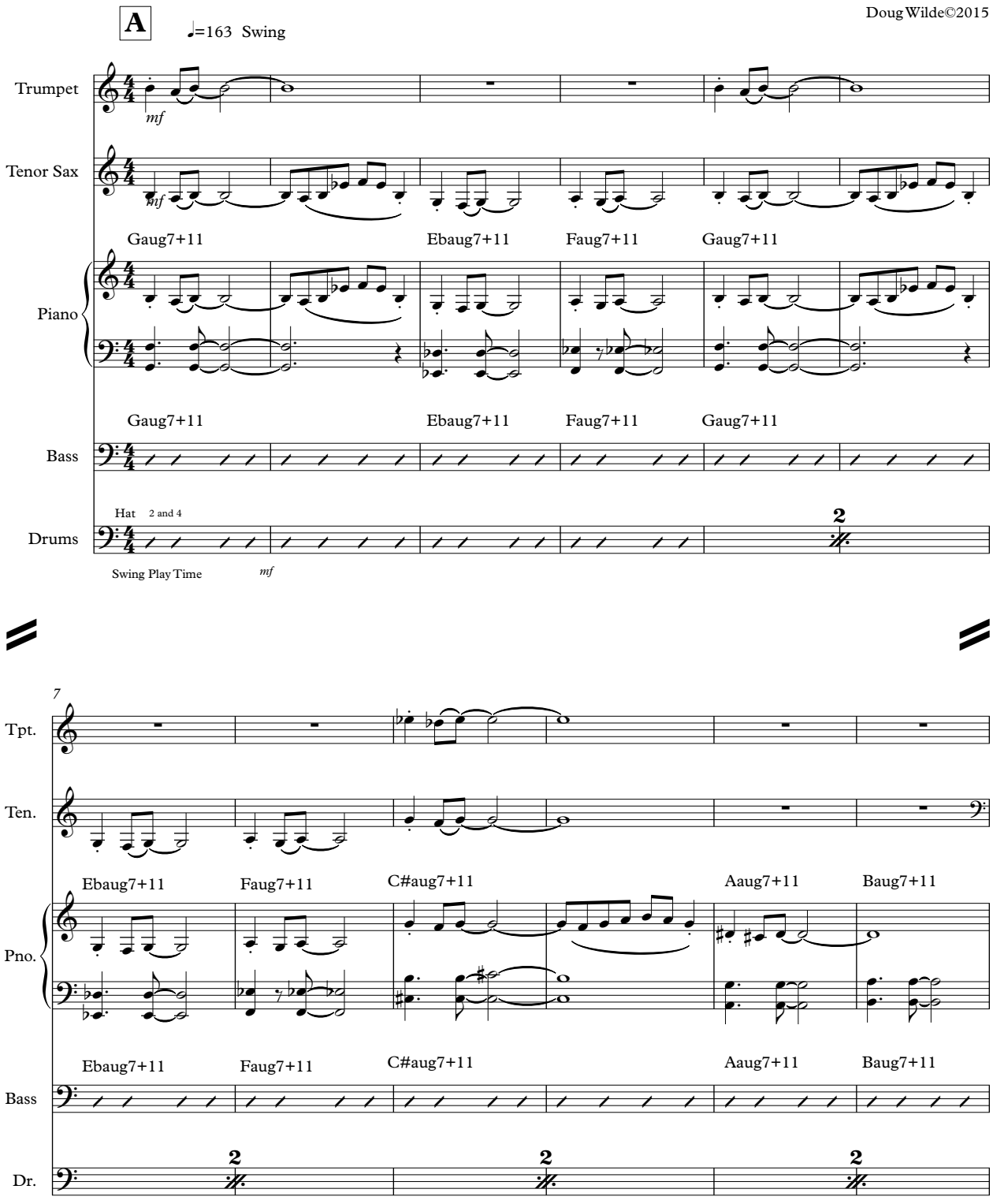
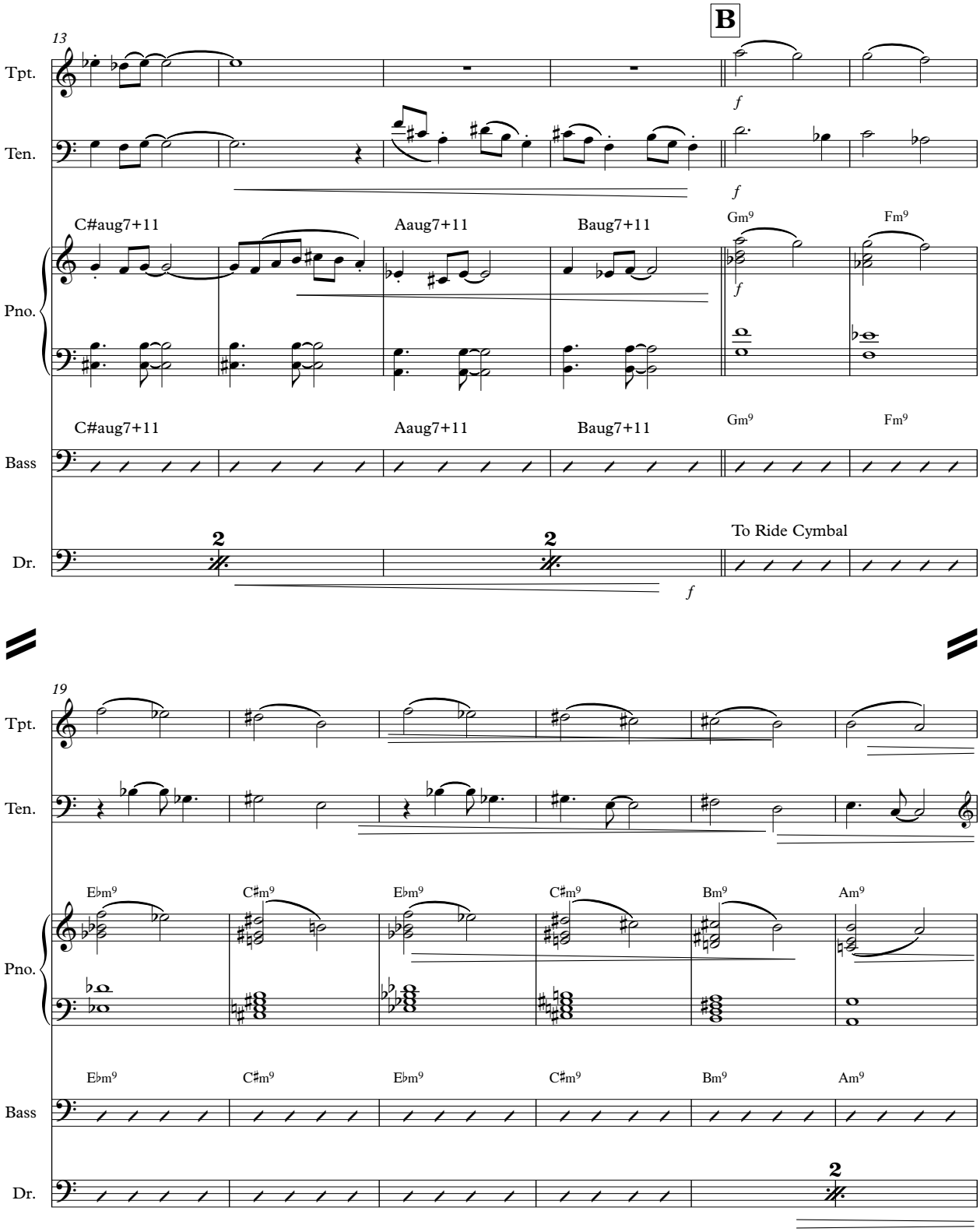
25
B.Fl.
Ob.
Glock.
sound
15va
Vb
Pno
mf
f
mp
8va
32
sim
(8)

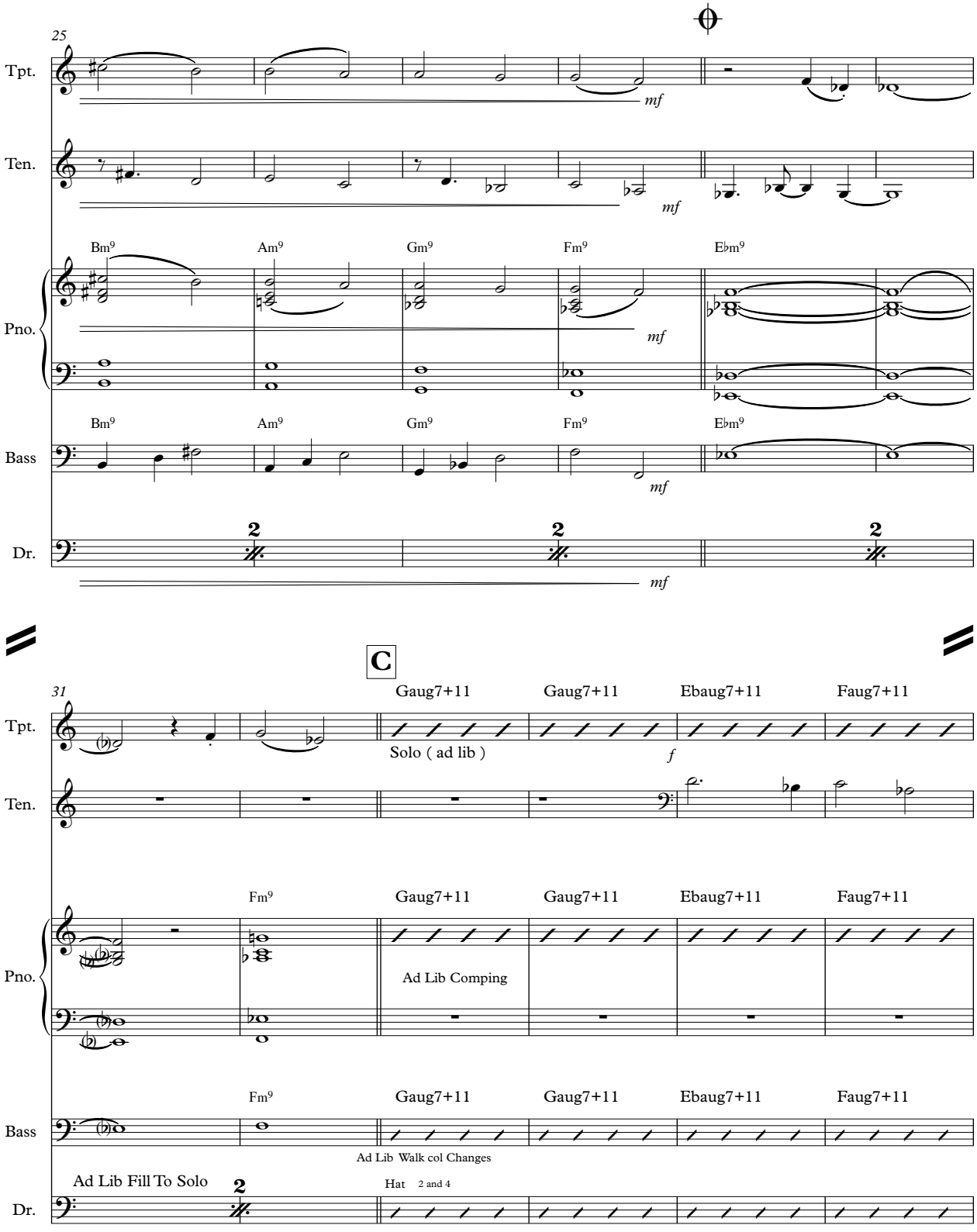

39
B.Fl.
mf
Glock.
sound
15va
Vb
(8)
Pno
mf
mp
C
45
More Focus, Moving Ahead
B.Fl.
mf
Ob.
mf
Glock.
sound
15va
mf
Vb
mf
loco
mf
Pno
Vc.
pizz
pizz

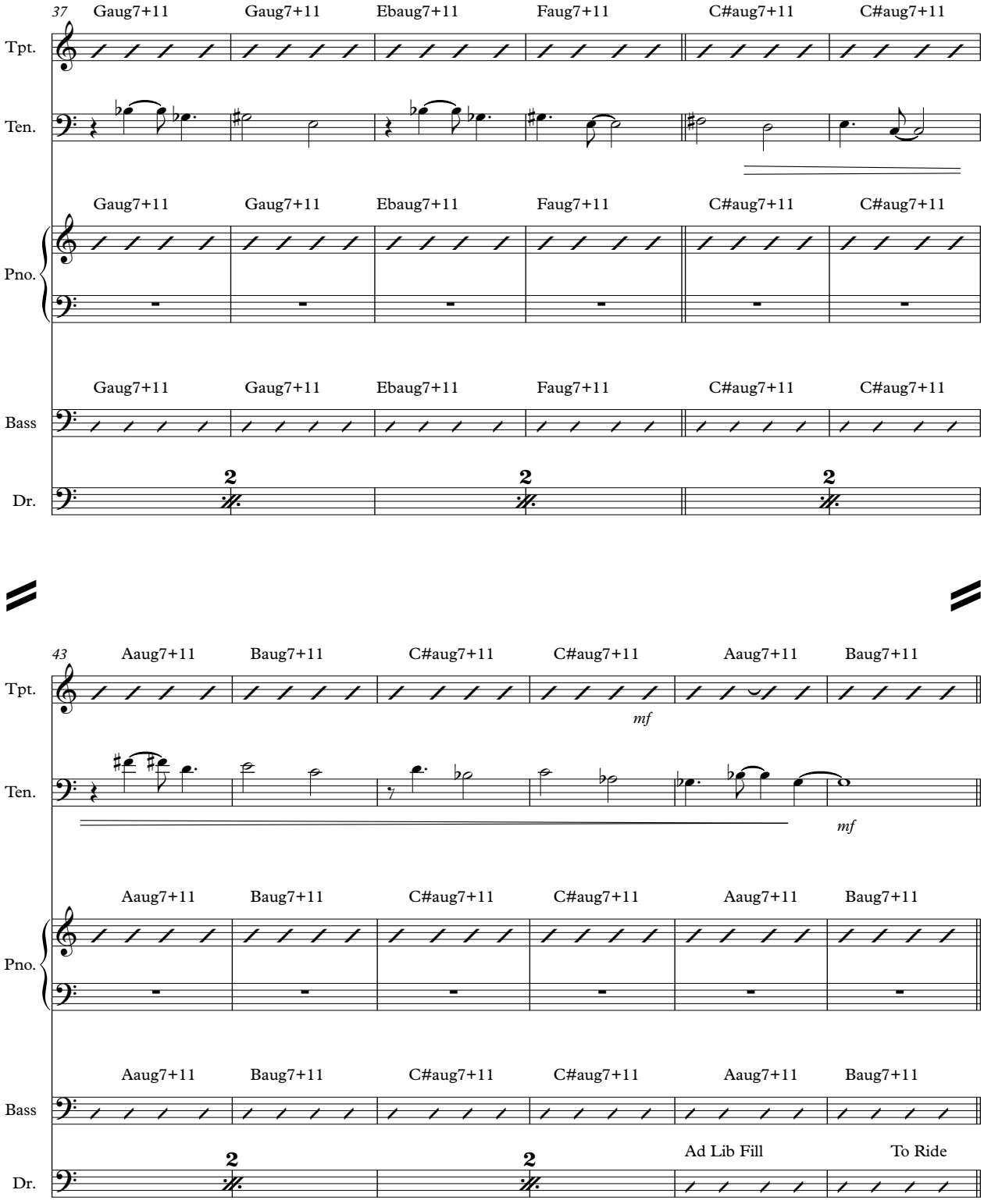

52
B.Fl.
Slight Rallentando
Ob.
Slight Rallentando
mp
Glock.
sound
15va
Slight Rallentando
Vb
Slight Rallentando
Pno
Slight Rallentando
Vc.
pizz
Slight Rallentando

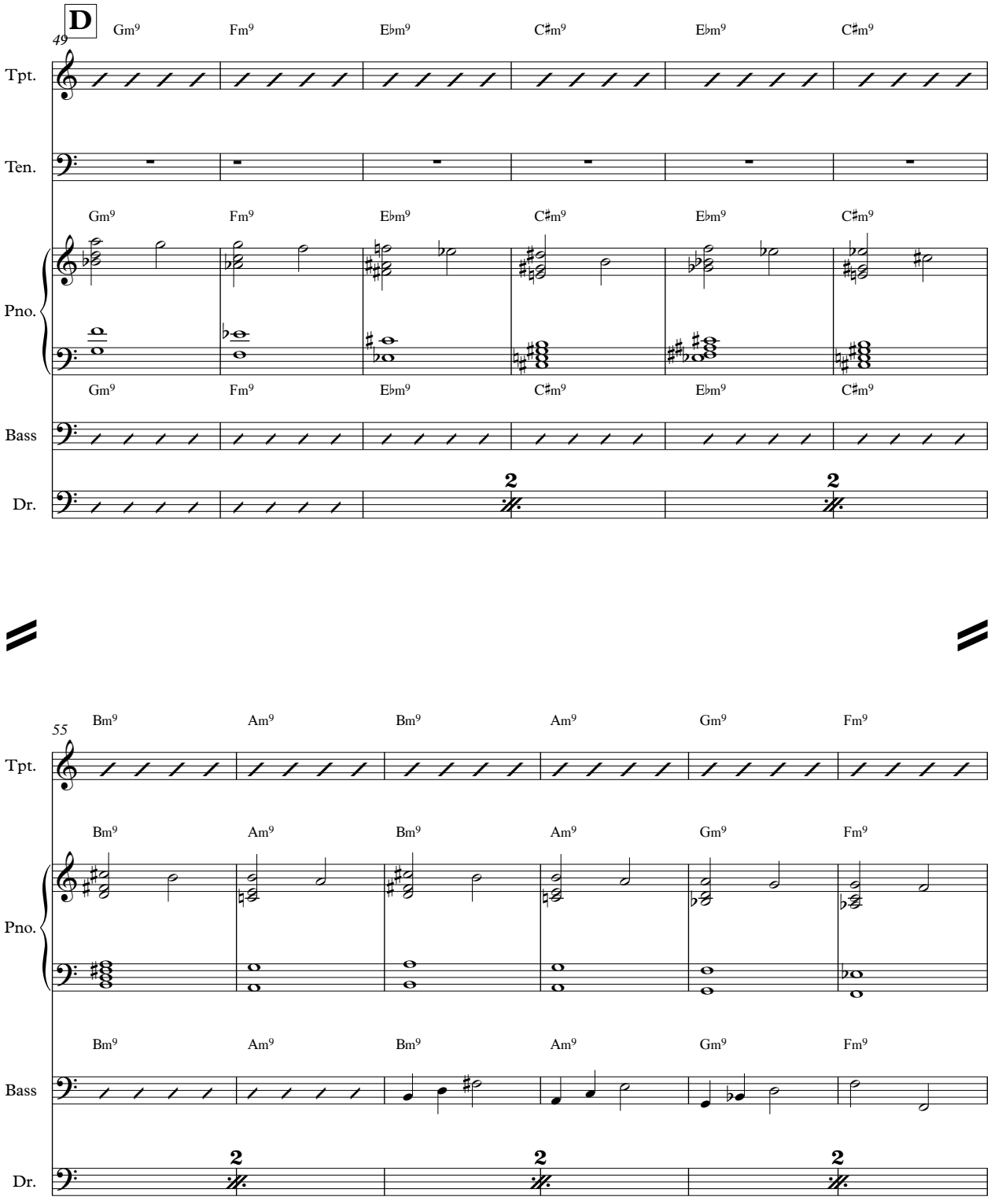
La Tuta Vero

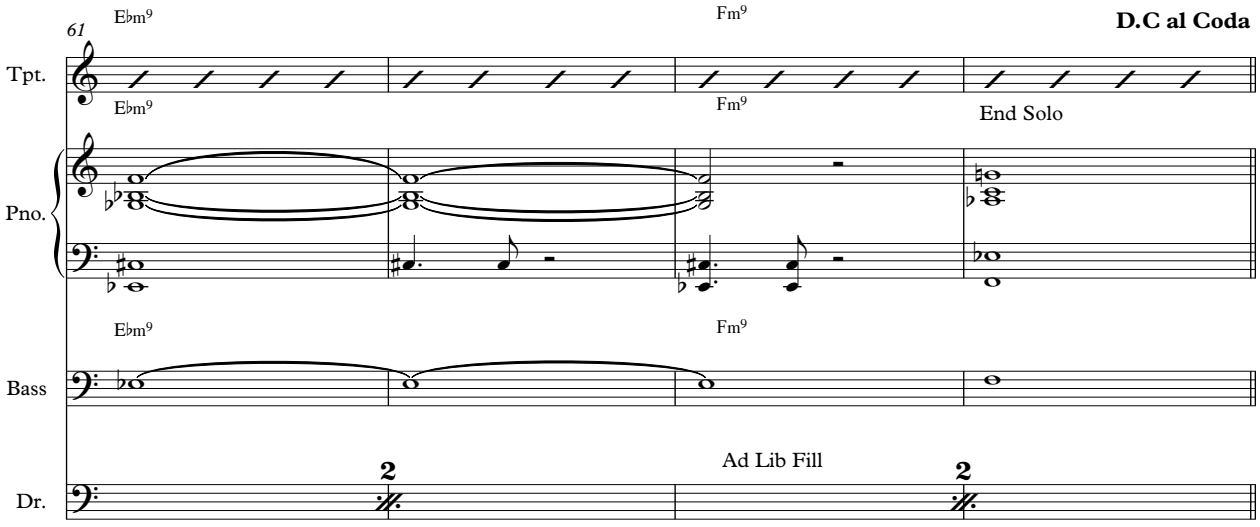


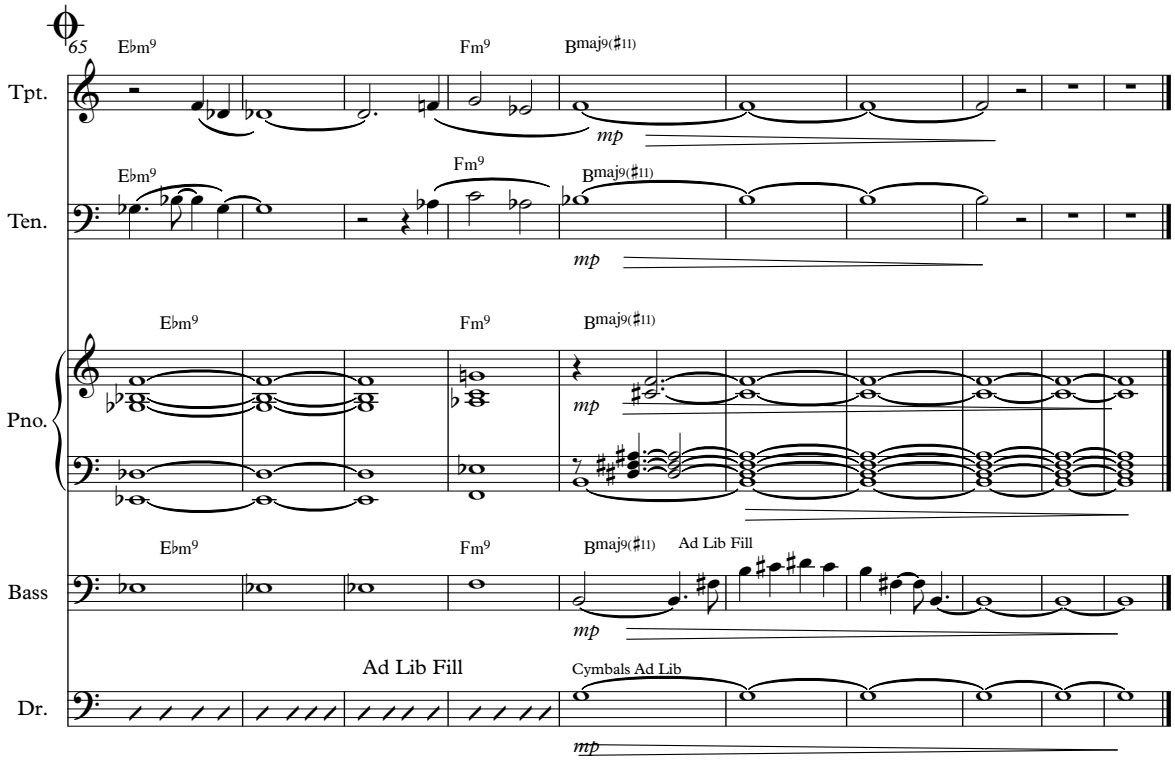

13
B
Tpt.
Ten.
Pno.
Bass
Dr.
C#aug7+11
Aaug7+11
Baug7+11
Gm9
Fm9
To Ride Cymbal
19
Eb m9
C# m9
Bm9
Am9


25
Tpt.
Ten.
Pno.
Bass
Dr.
mf
Bm9
Am9
Gm9
Fm9
E♭m9
2
C
31
Gaug7+11
Ebaug7+11
Faug7+11
Solo (ad lib)
f
Ad Lib Comping
Ad Lib Walk col Changes
Ad Lib Fill To Solo
Hat 2 and 4

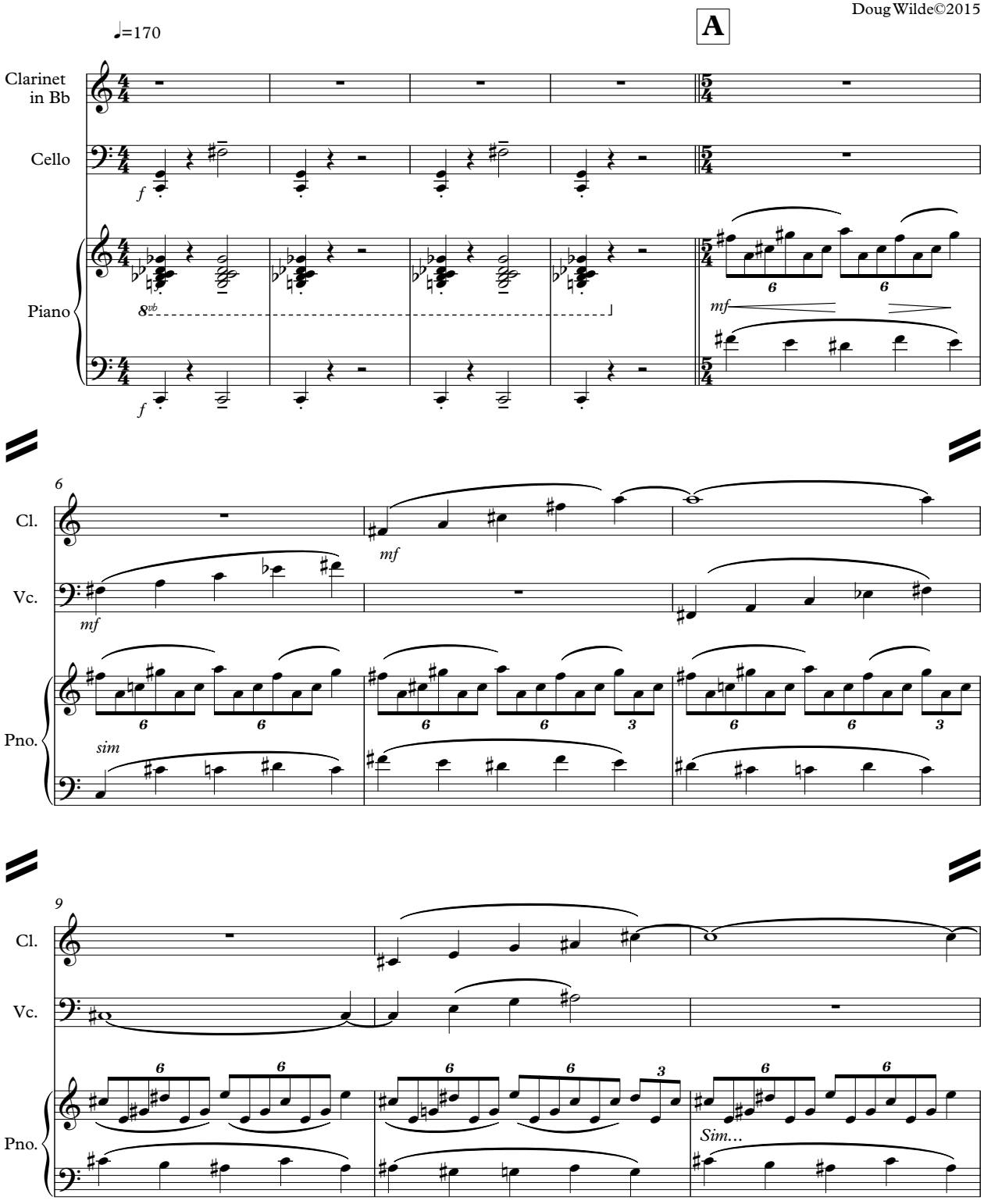

37
Gaug7+11
Gaug7+11
Ebaug7+11
Faug7+11
C#aug7+11
C#aug7+11
Tpt.
Ten.
Pno.
Bass
Dr.
43
Aaug7+11
Baug7+11
C#aug7+11
C#aug7+11
Aaug7+11
Baug7+11
mf
mf
Ad Lib Fill
To Ride

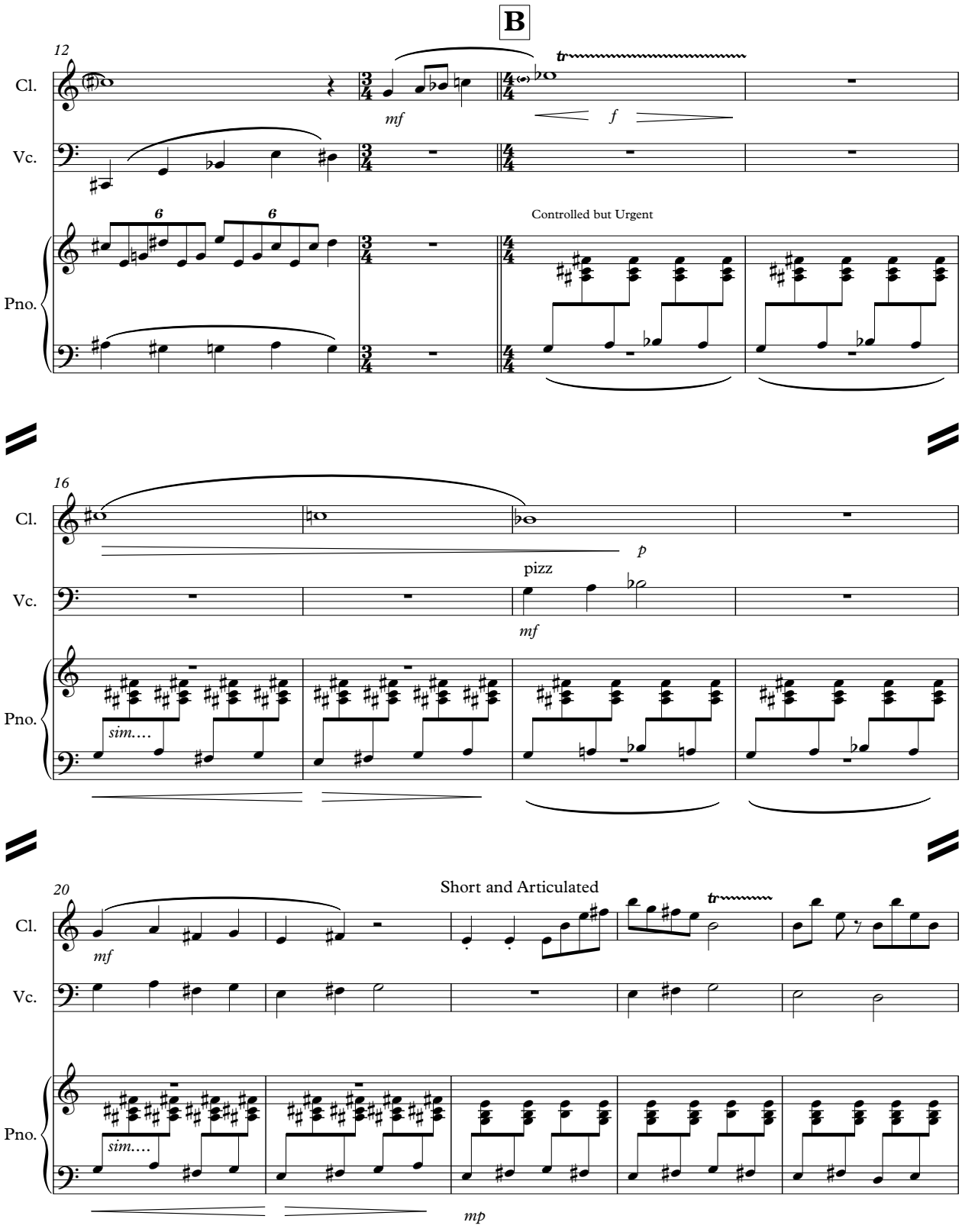

D
49
Gm9
Fm9
E♭m9
C♯m9
E♭m9
C♯m9
Tpt.
Ten.
Pno.
Bass
Dr.
2
2
55
Bm9
Am9
Bm9
Am9
Gm9
Fm9
Tpt.
Pno.
Bass
Dr.
2
2
2

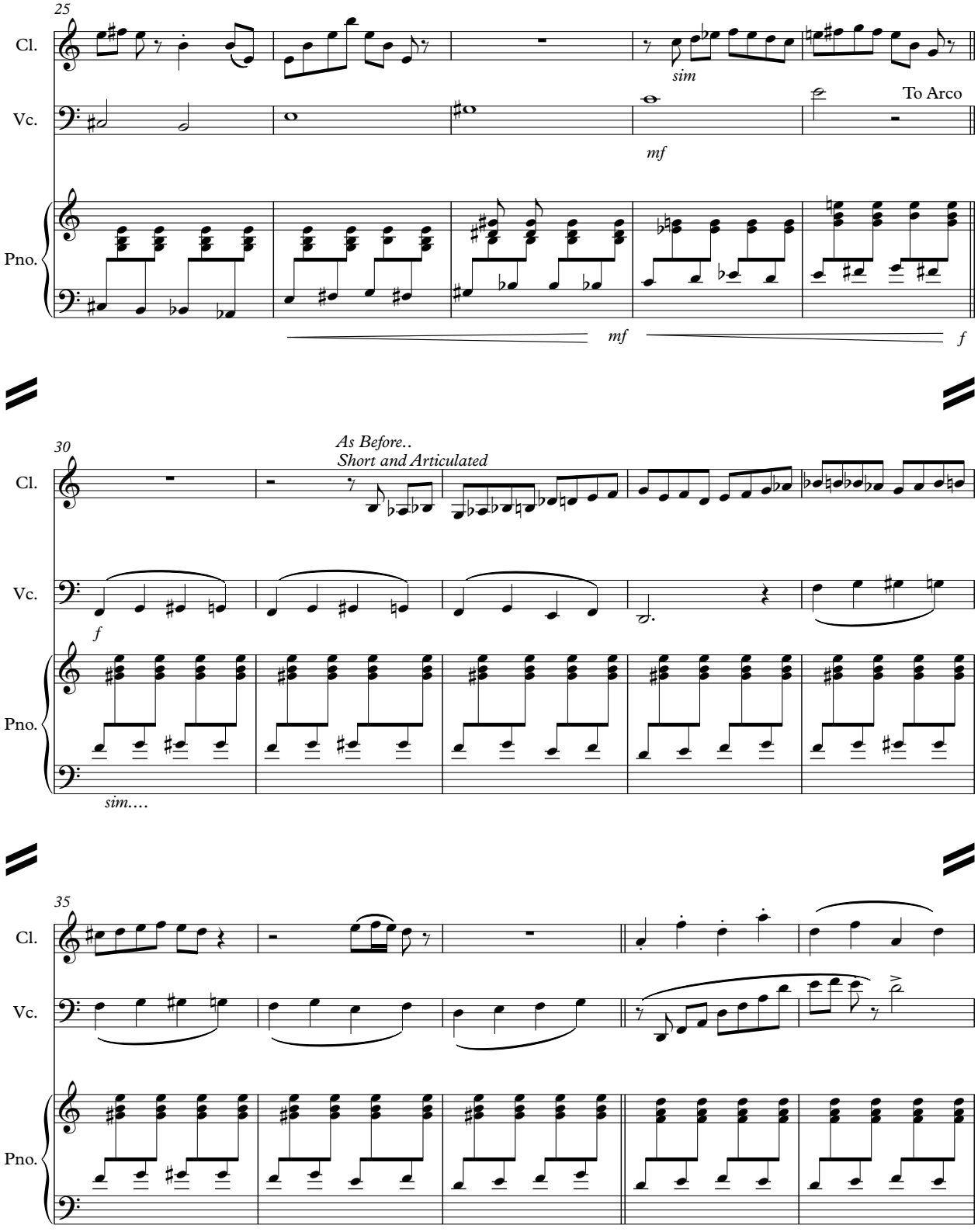

61
E♭m9
Fm9
D.C al Coda
Tpt.
E♭m9
Fm9
End Solo
Pno.
E♭m9
Fm9
Bass
Ad Lib Fill
2
2
Dr.

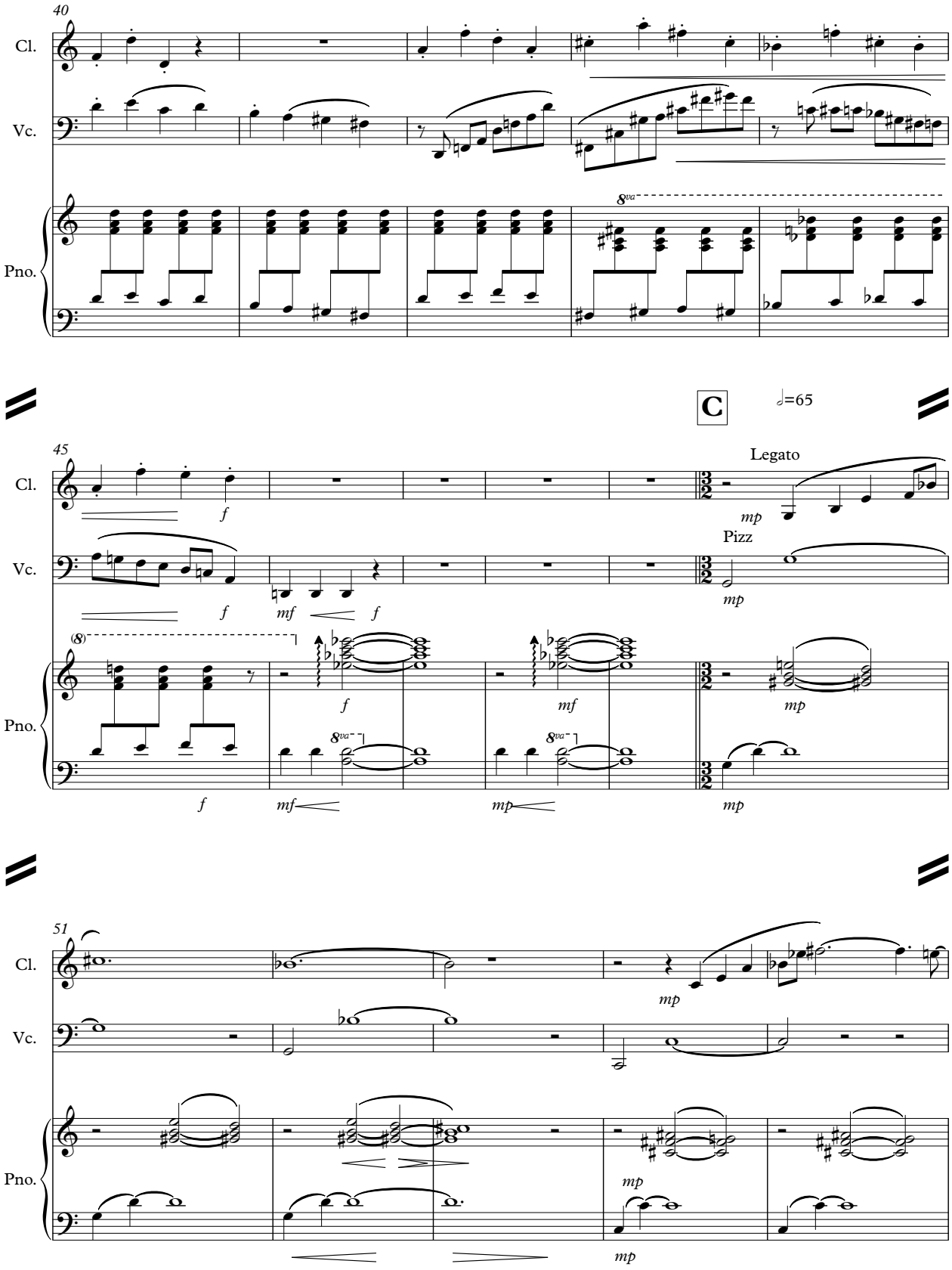

65
E♭m9
Fm9
Bmaj9(♯11)
Tpt.
mp
E♭m9
Fm9
Bmaj9(♯11)
Ten.
mp
E♭m9
Fm9
Bmaj9(♯11)
Pno.
mp
E♭m9
Fm9
Bmaj9(♯11)
Ad Lib Fill
Bass
mp
Ad Lib Fill
Cymbals Ad Lib
Dr.
mp

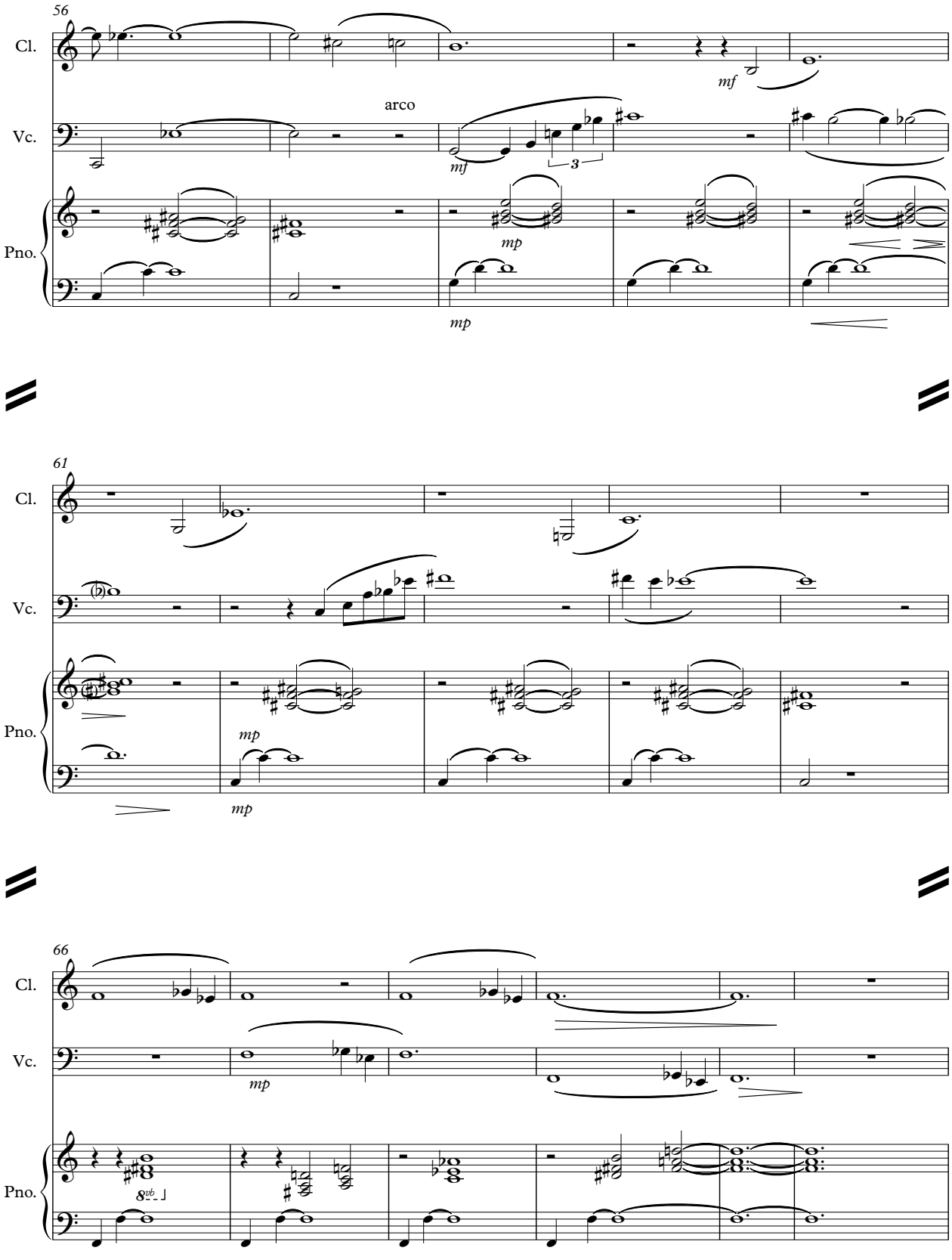
Octogram

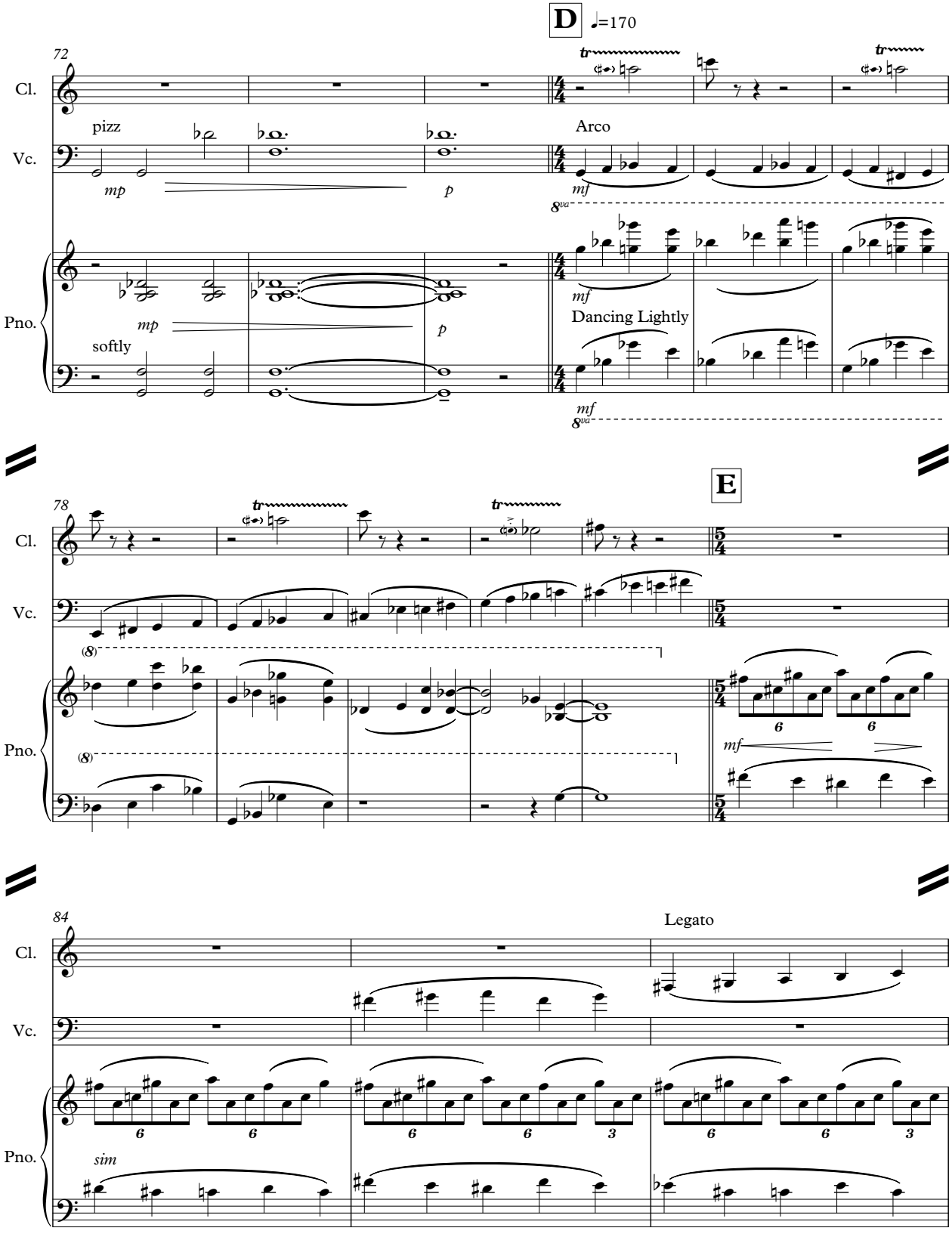


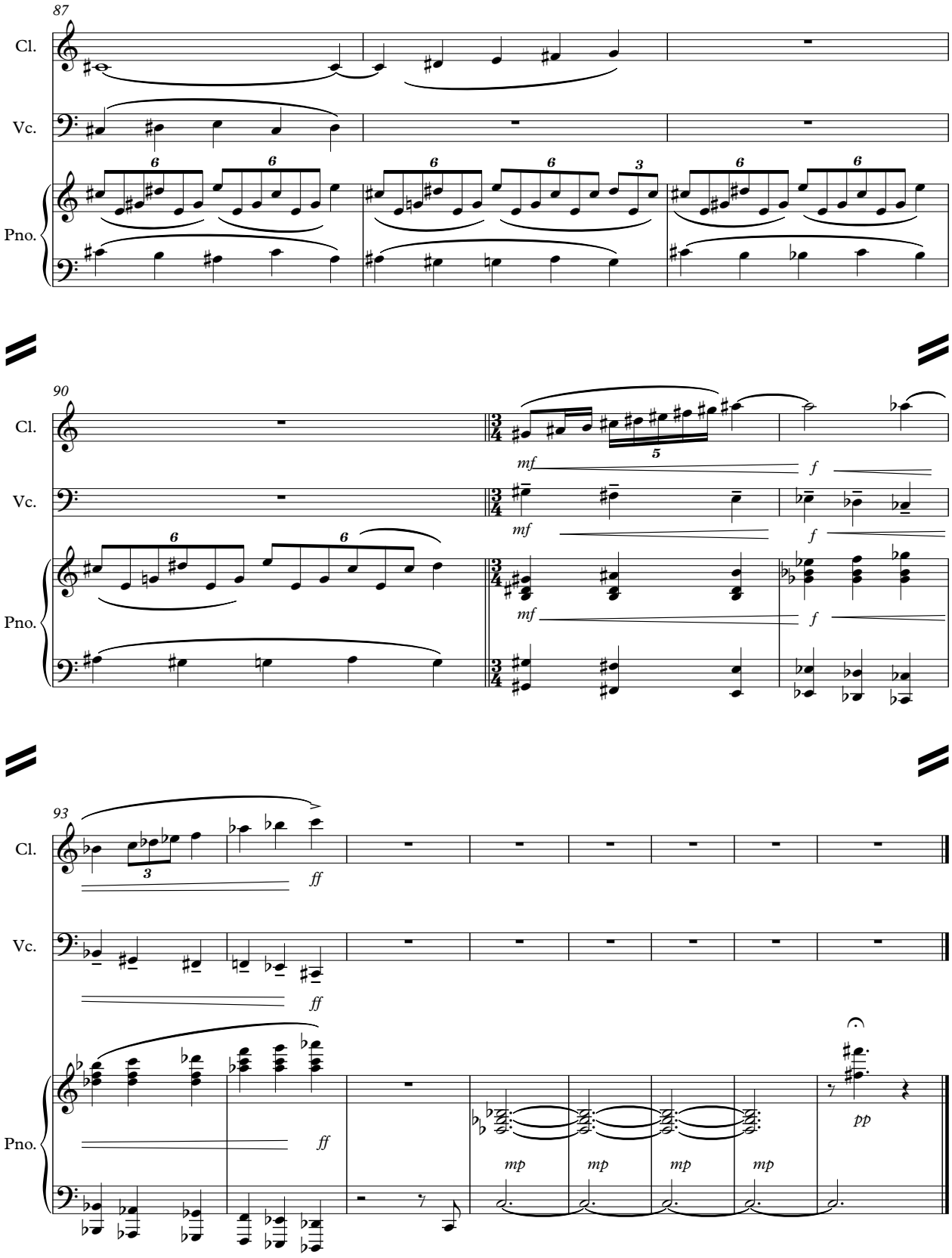

B
12
Cl.
Vc.
Pno.
mf
f
tr
Controlled but Urgent
16
p
pizz
mf
sim....
20
Short and Articulated
mf
mp


25
Cl.
Vc.
Pno.
sim
To Arco
mf
mf
f
30
As Before..
Short and Articulated
Cl.
Vc.
Pno.
f
sim....
35
Cl.
Vc.
Pno.


40
Cl.
Vc.
Pno.
8va
C
♩=65
45
Legato
mp
Pizz
f
mf
(8)
51


56
Cl.
Vc.
arco
Pno.
mf
mf
3
mp
mp
61
Cl.
Vc.
Pno.
mp
mp
66
Cl.
Vc.
Pno.
mp
8vb

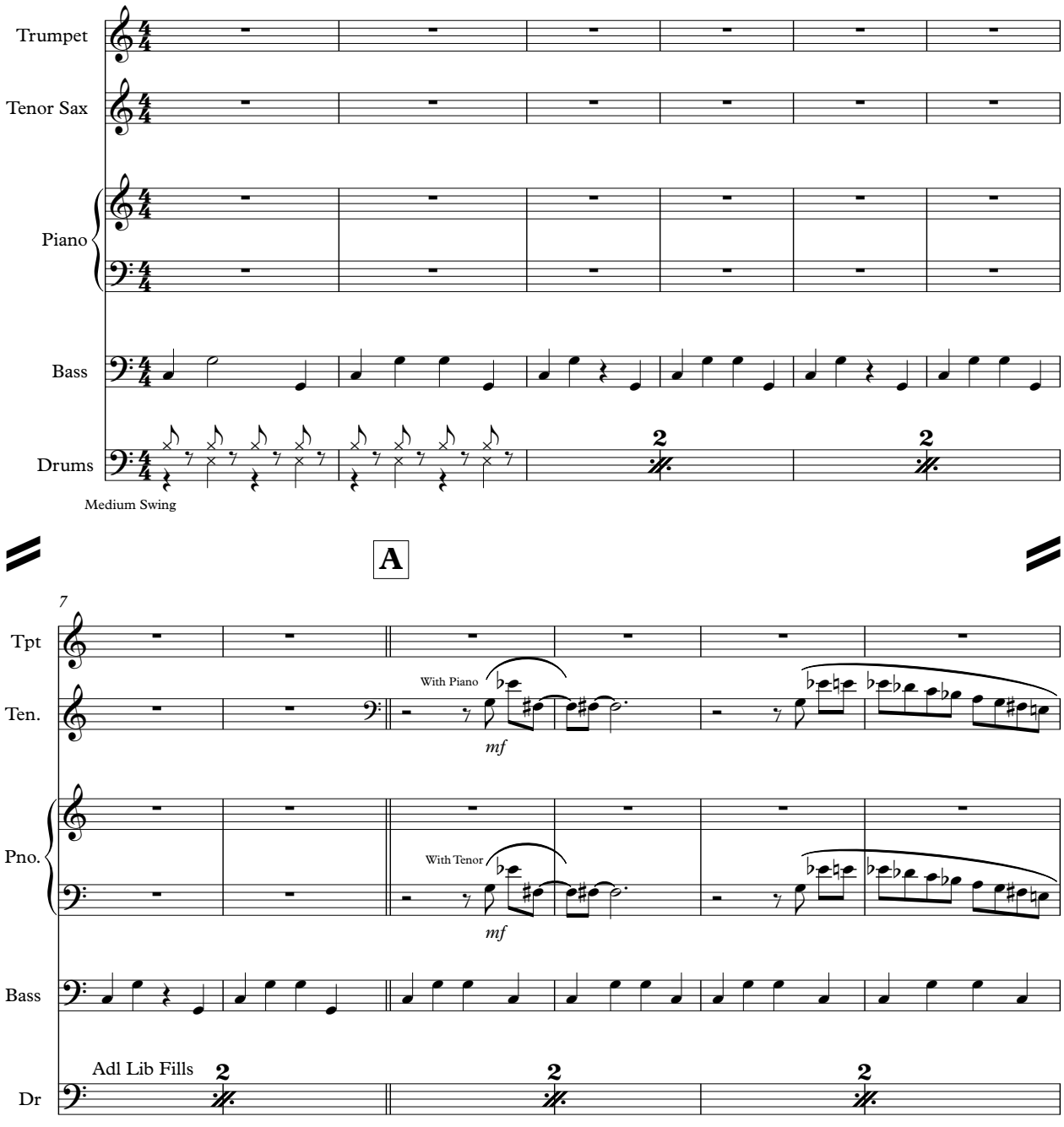

D
♩=170
72
Cl.
Vc.
Pno.
pizz
mp
p
Arco
mf
8va
mf
Dancing Lightly
mp
softly
p
mf
8va
E
78
Cl.
Vc.
Pno.
tr
tr
(8)
(8)
6
6
mf
84
Cl.
Vc.
Pno.
Legato
sim
6
6
6
6
3
6
6
3

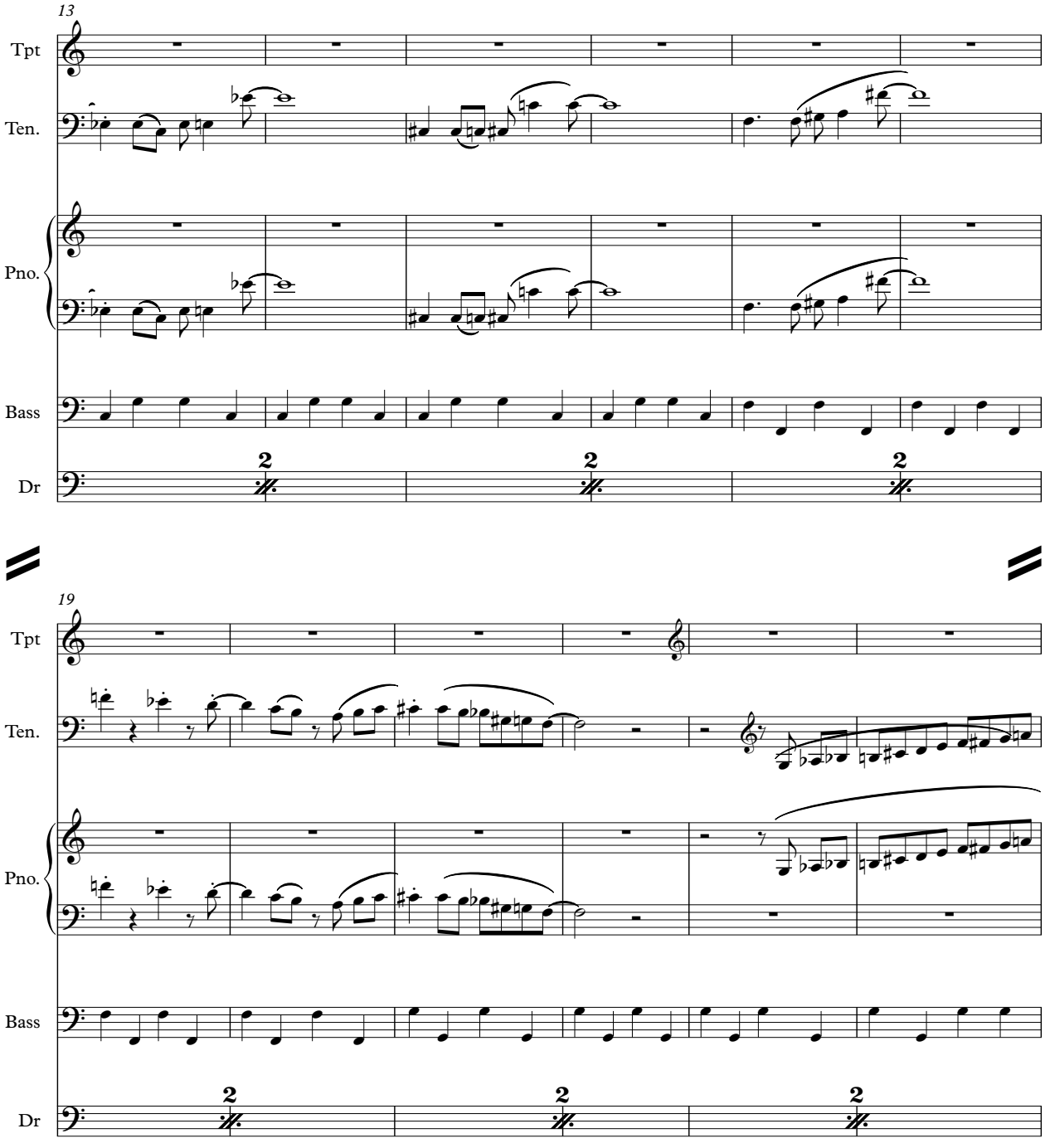

87
Cl.
Vc.
Pno.
90
Cl.
Vc.
Pno.
mf
f
mf
f
mf
f
93
Cl.
Vc.
Pno.
ff
ff
ff
mp
mp
mp
mp
pp

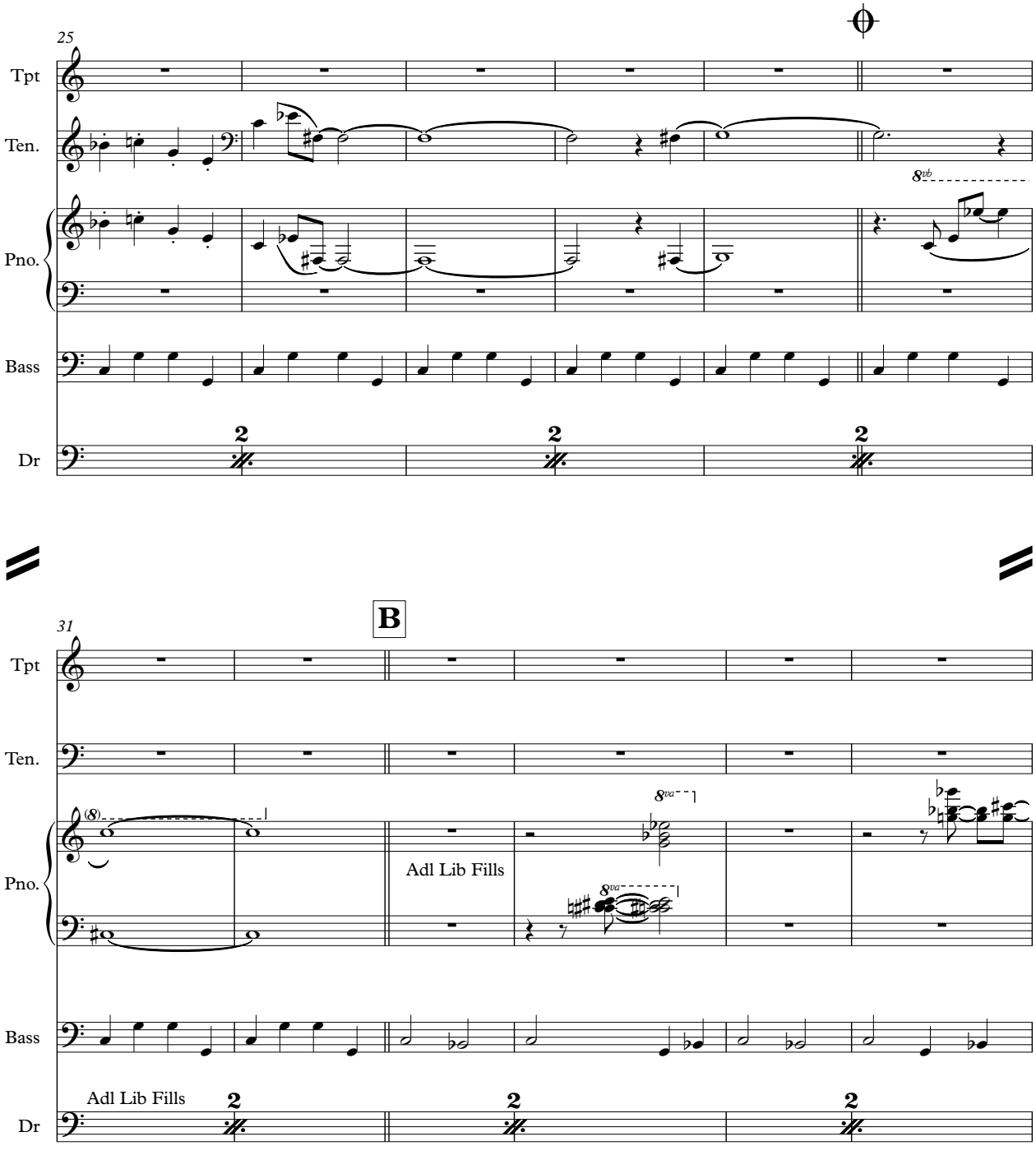
The Eighth Day

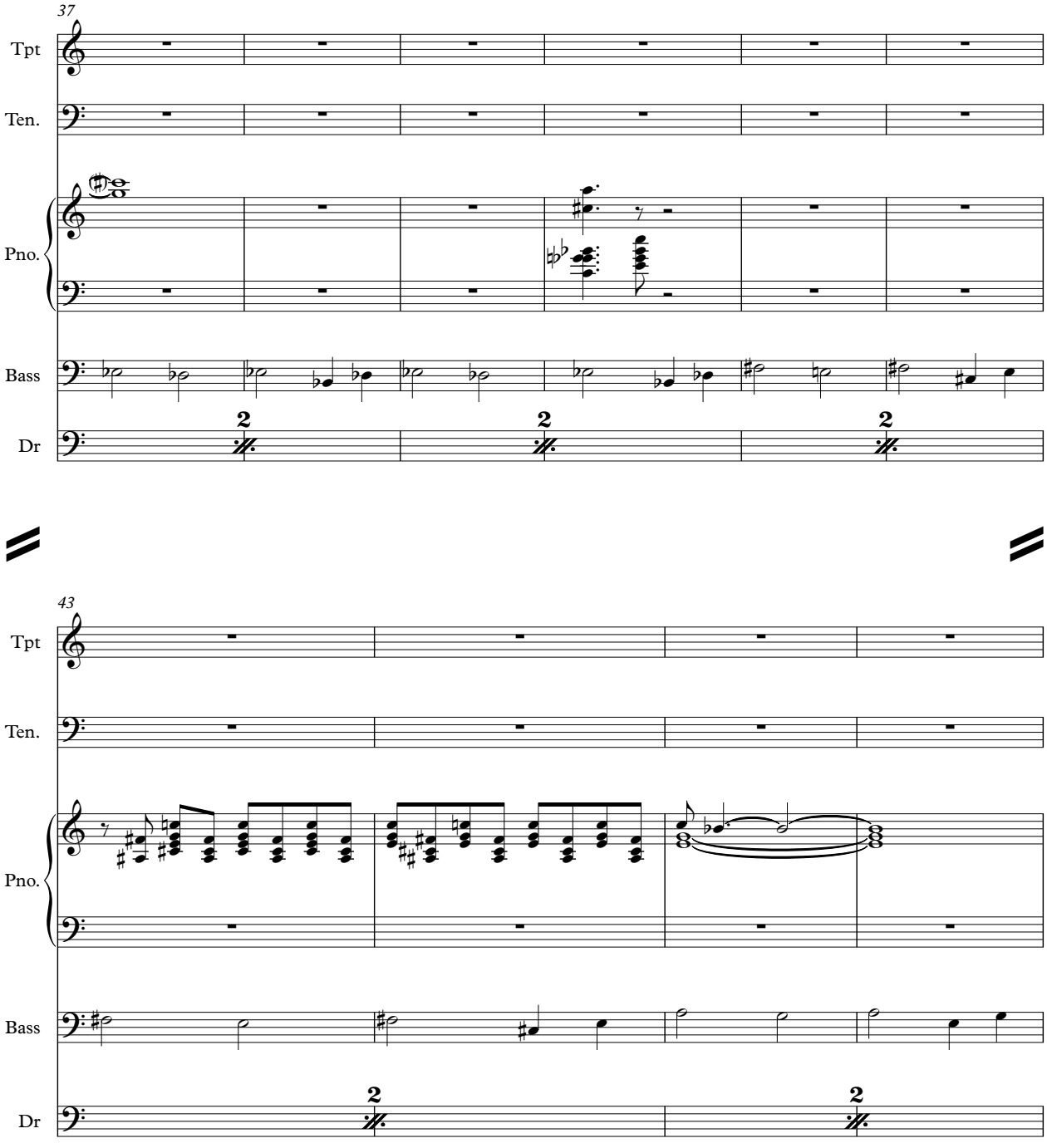
Doug Wilde©2015

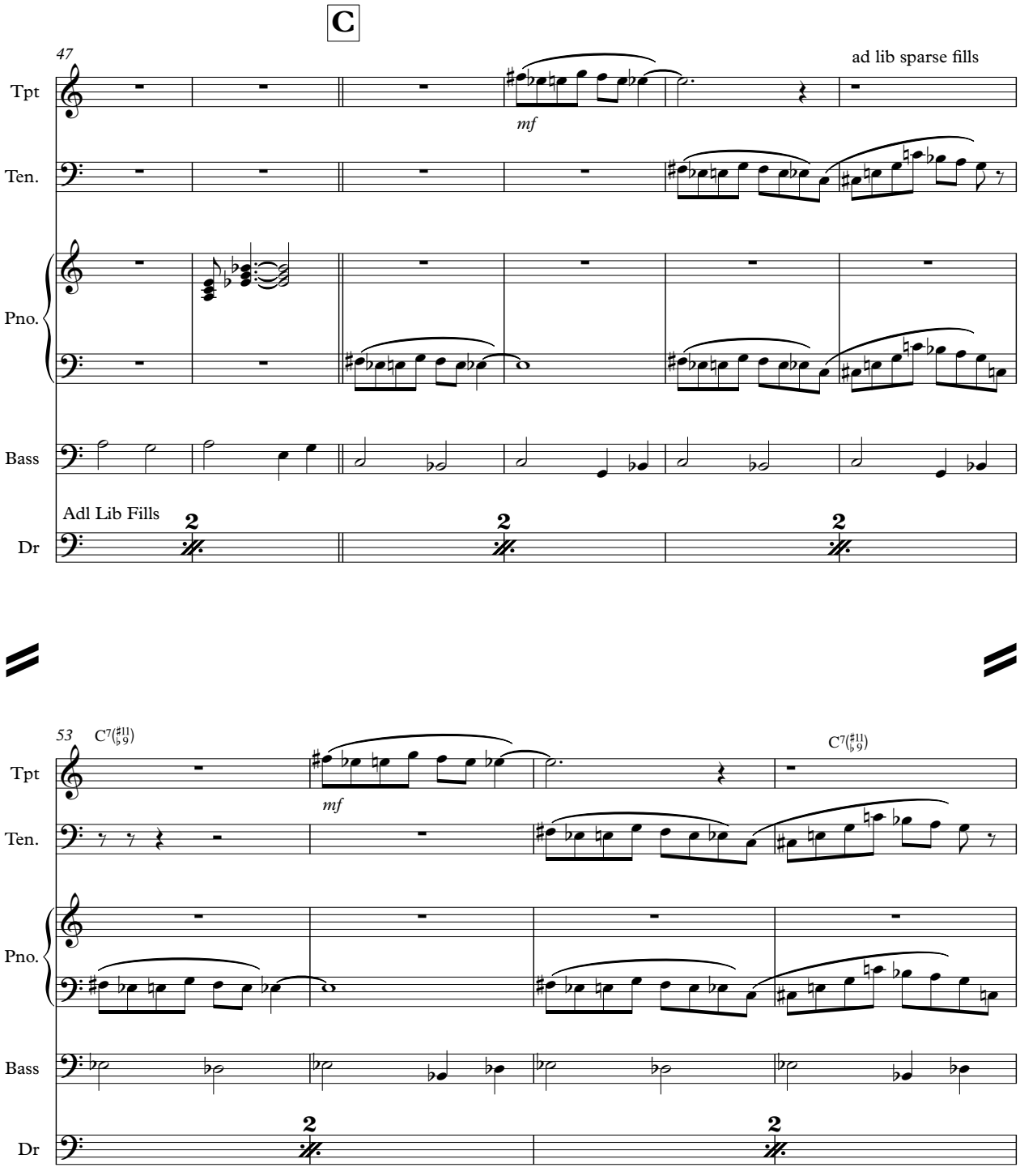
♩=168 (Swing)

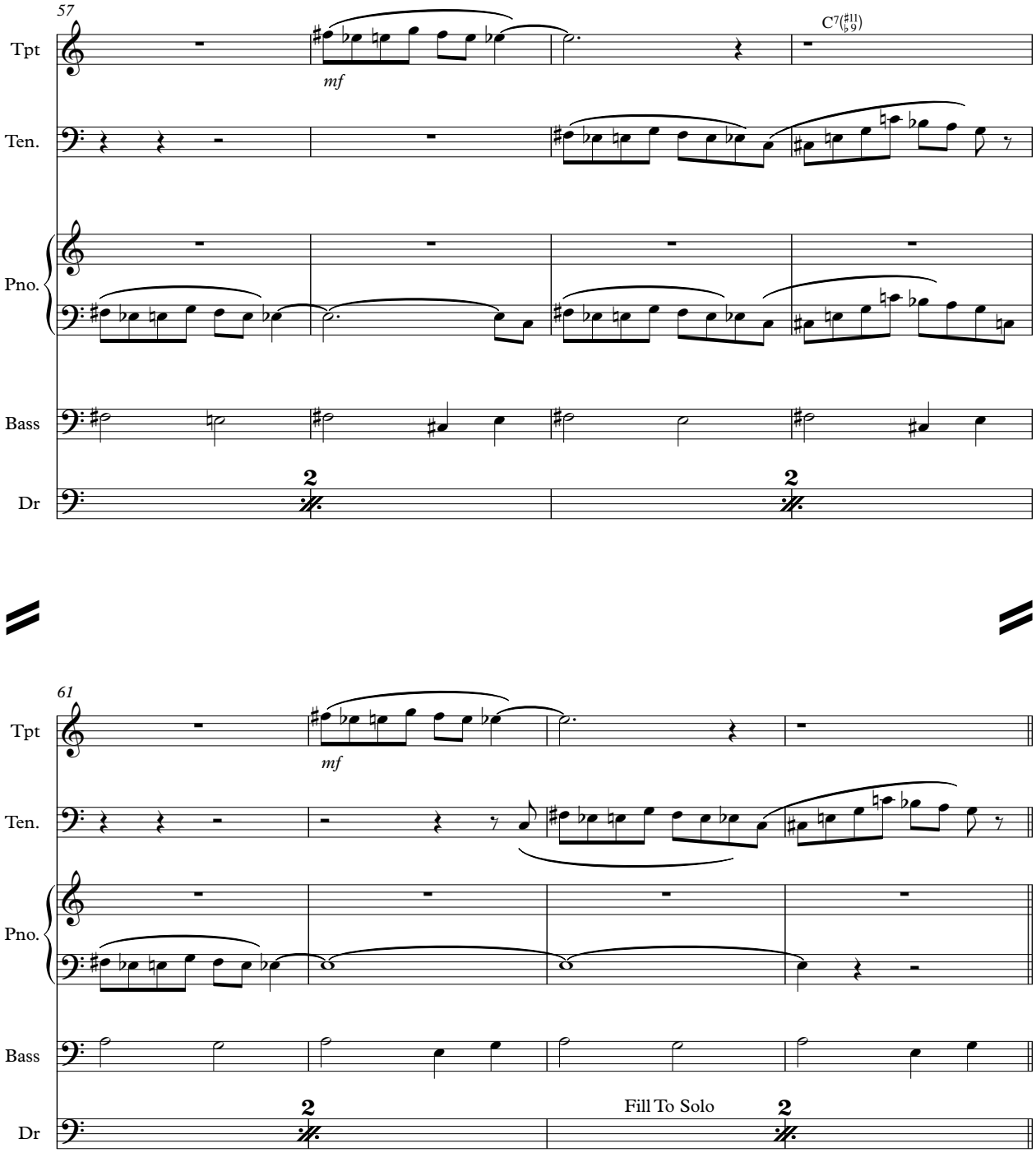



13
Tpt
Ten.
Pno.
Bass
Dr
2
2
2
19
Tpt
Ten.
Pno.
Bass
Dr
2
2
2

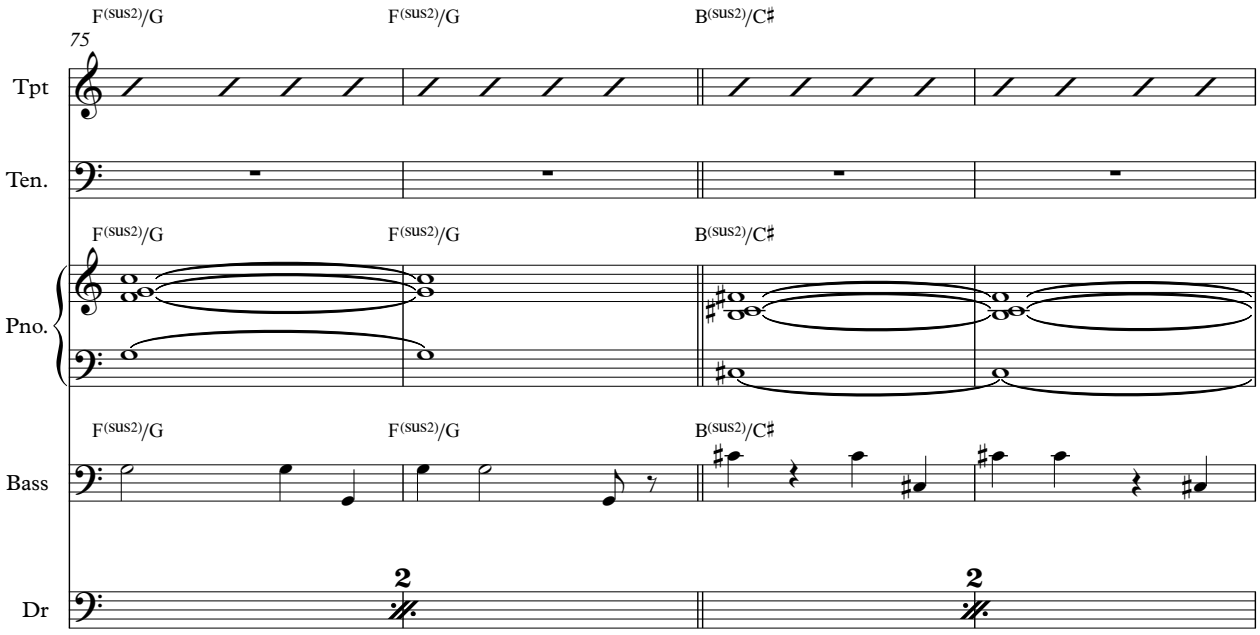

25
Tpt
Ten.
Pno.
Bass
Dr
8vb
2
2
2
31
B
Tpt
Ten.
Pno.
Bass
Dr
(8)
8va
8va
Adl Lib Fills
Adl Lib Fills
2
2
2

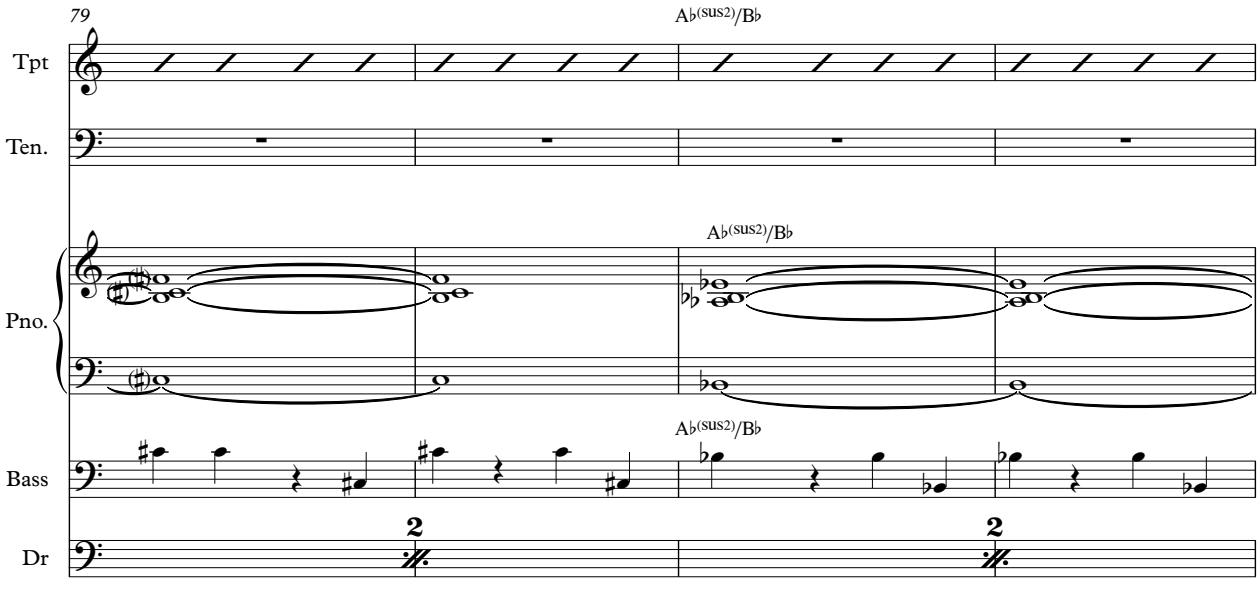

37
Tpt
Ten.
Pno.
Bass
Dr
2
2
2
43
Tpt
Ten.
Pno.
Bass
Dr
2
2

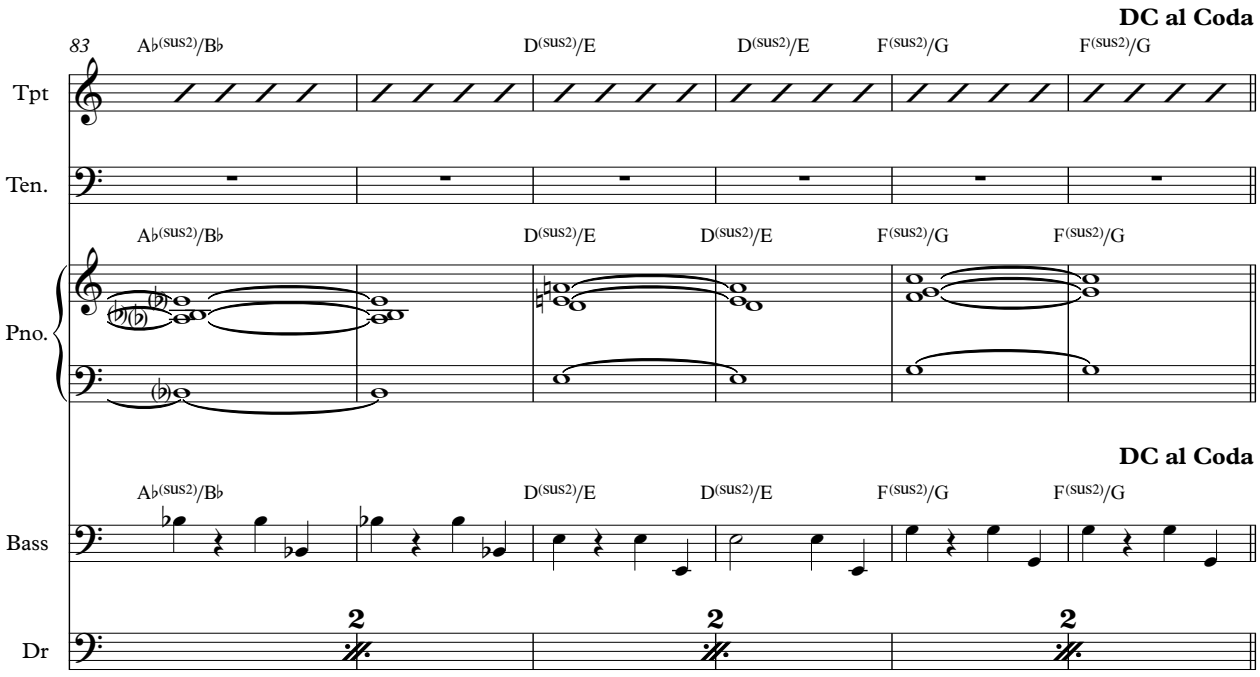

C
47
ad lib sparse fills
Tpt
Ten.
Pno.
Bass
Adl Lib Fills
Dr
mf
2
53
C7(♯11/♭9)
C7(♯11/♭9)
Tpt
Ten.
Pno.
Bass
Dr
mf
2

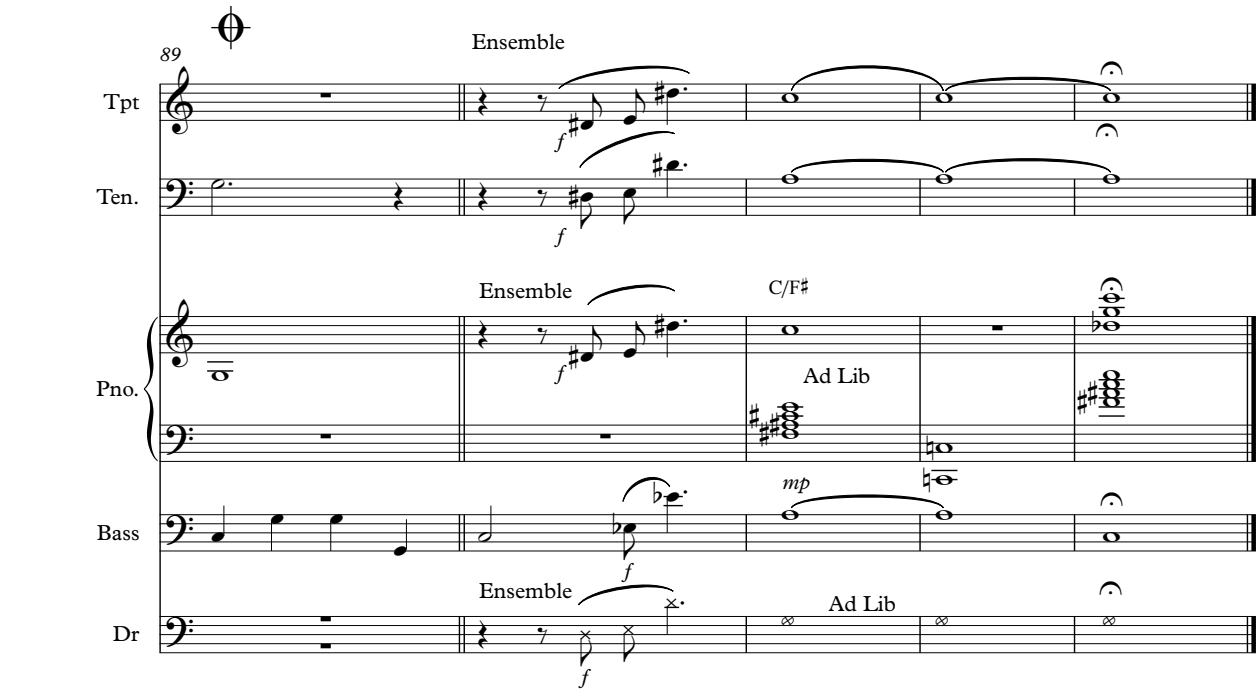

57
Tpt
Ten.
Pno.
Bass
Dr
mf
C7(♯11 ♭9)
2
2
61
Tpt
Ten.
Pno.
Bass
Dr
mf
2
Fill To Solo
2


D
65
B(sus2)/C♯
B(sus2)/C♯
Trumpet Solo Ad Lib
Tpt
Ten.
B(sus2)/C♯
Pno.
B(sus2)/C♯
Bass
Dr
69
A♭(sus2)/B♭
D(sus2)/E
D(sus2)/E
Tpt
Ten.
A♭(sus2)/B♭
D(sus2)/E
D(sus2)/E
Pno.
A♭(sus2)/B♭
D(sus2)/E
D(sus2)/E
Bass
Dr

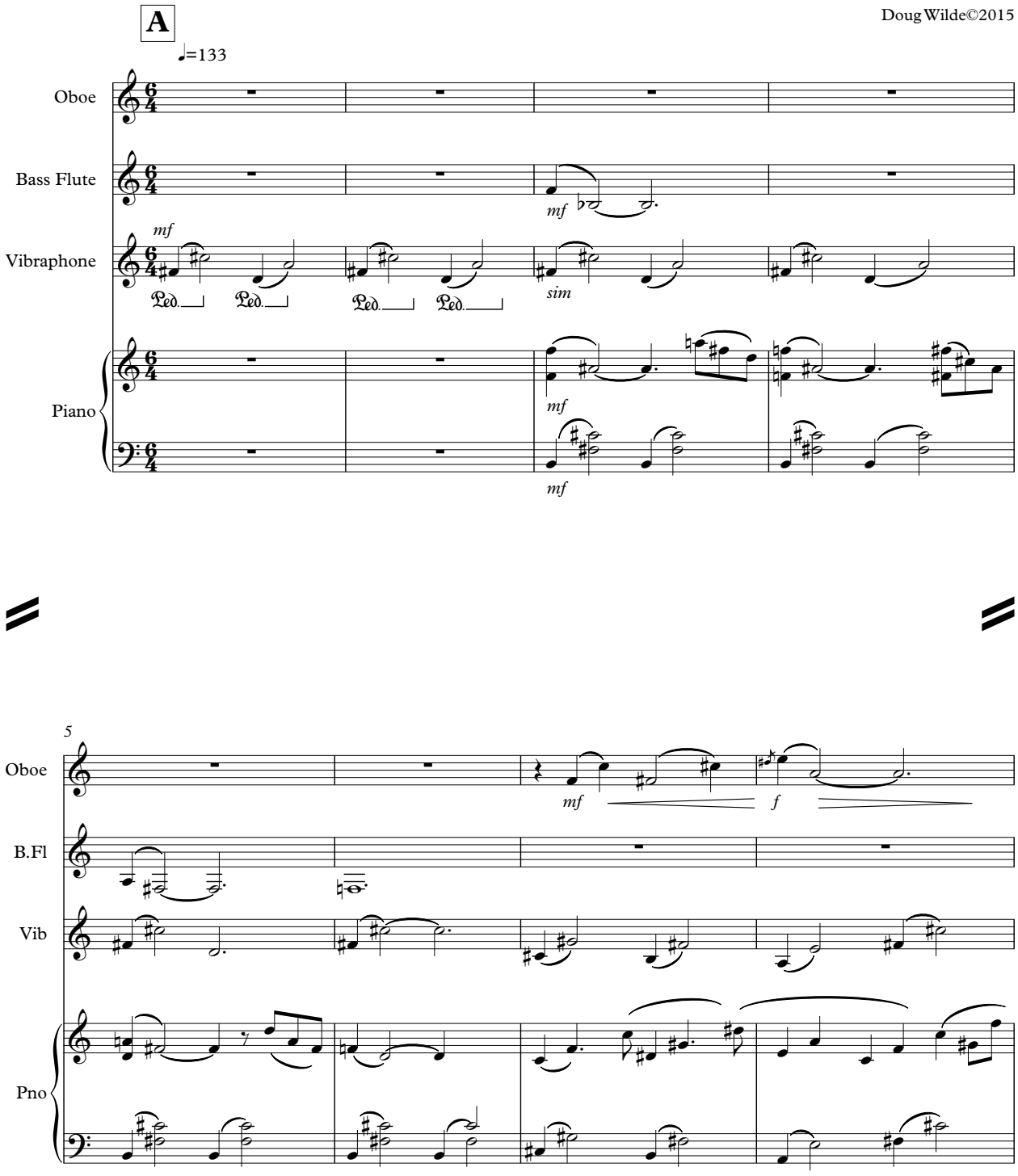

F(sus2)/G
F(sus2)/G
B(sus2)/C♯
75
Tpt
Ten.
F(sus2)/G
F(sus2)/G
B(sus2)/C♯
Pno.
F(sus2)/G
F(sus2)/G
B(sus2)/C♯
Bass
2
2
Dr

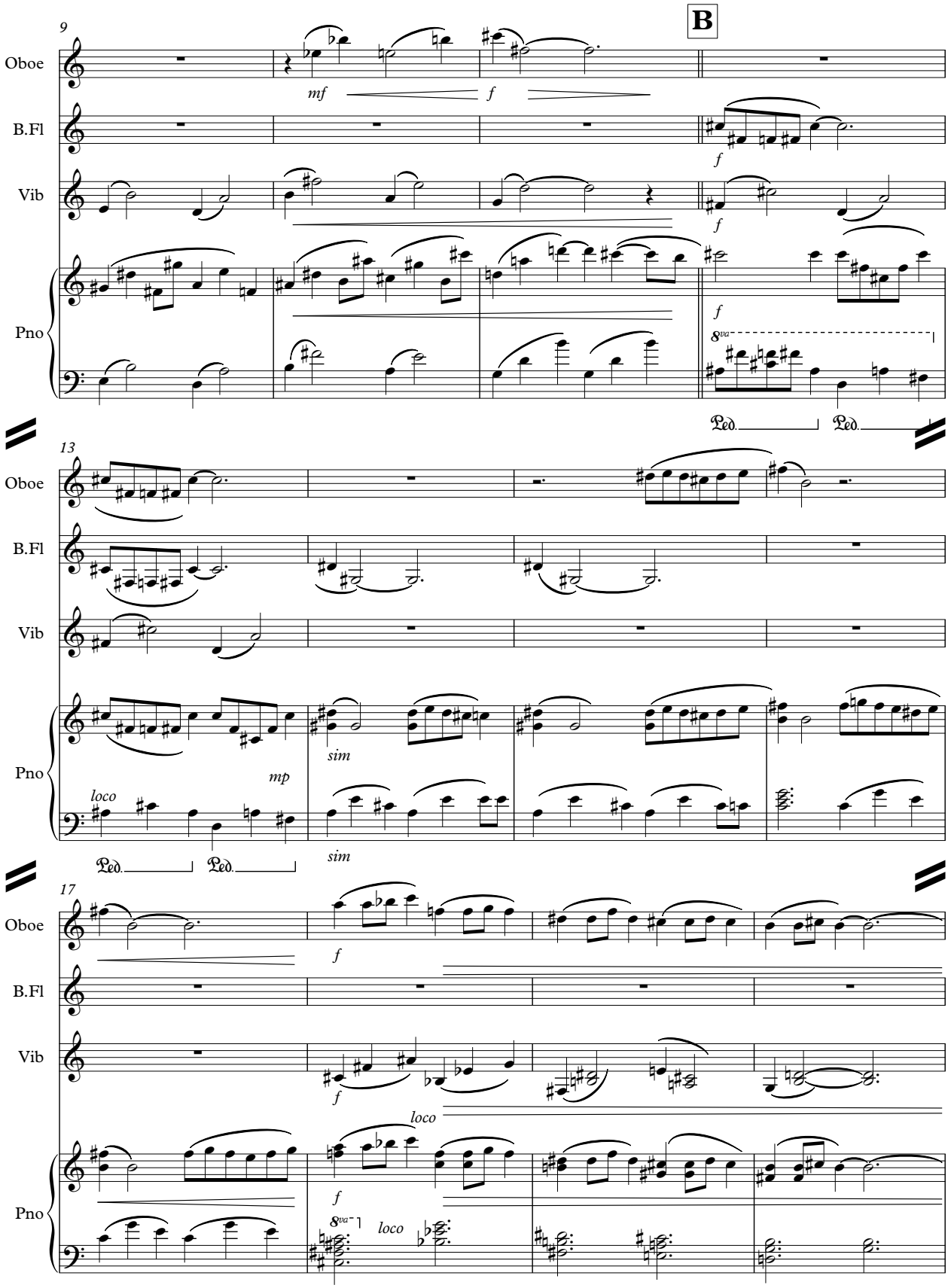

79
A♭(sus2)/B♭
Tpt
Ten.
A♭(sus2)/B♭
Pno.
A♭(sus2)/B♭
Bass
2
2
Dr

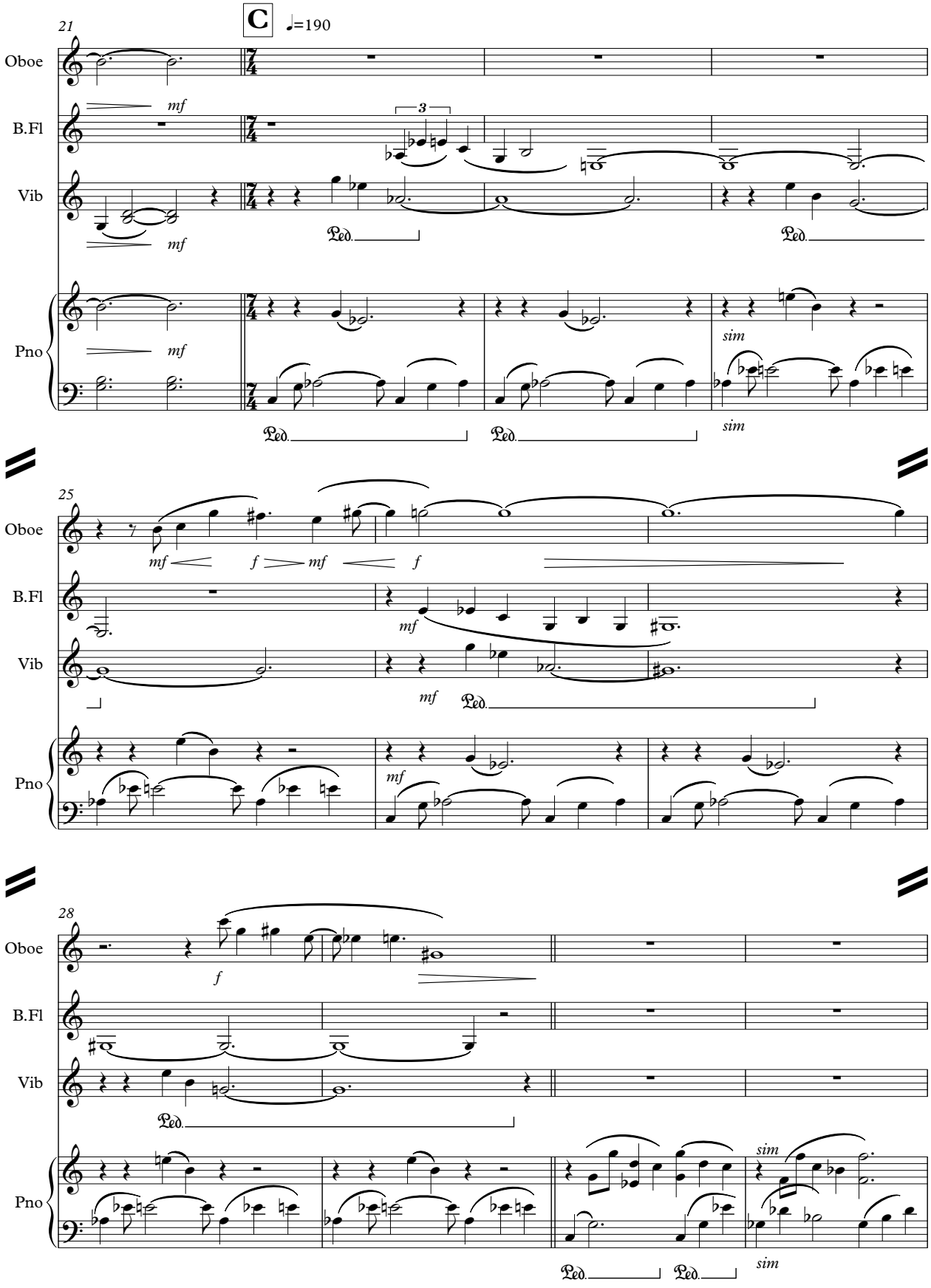

DC al Coda
83
A♭(sus2)/B♭
D(sus2)/E
D(sus2)/E
F(sus2)/G
F(sus2)/G
Tpt
Ten.
Pno.
Bass
Dr
2

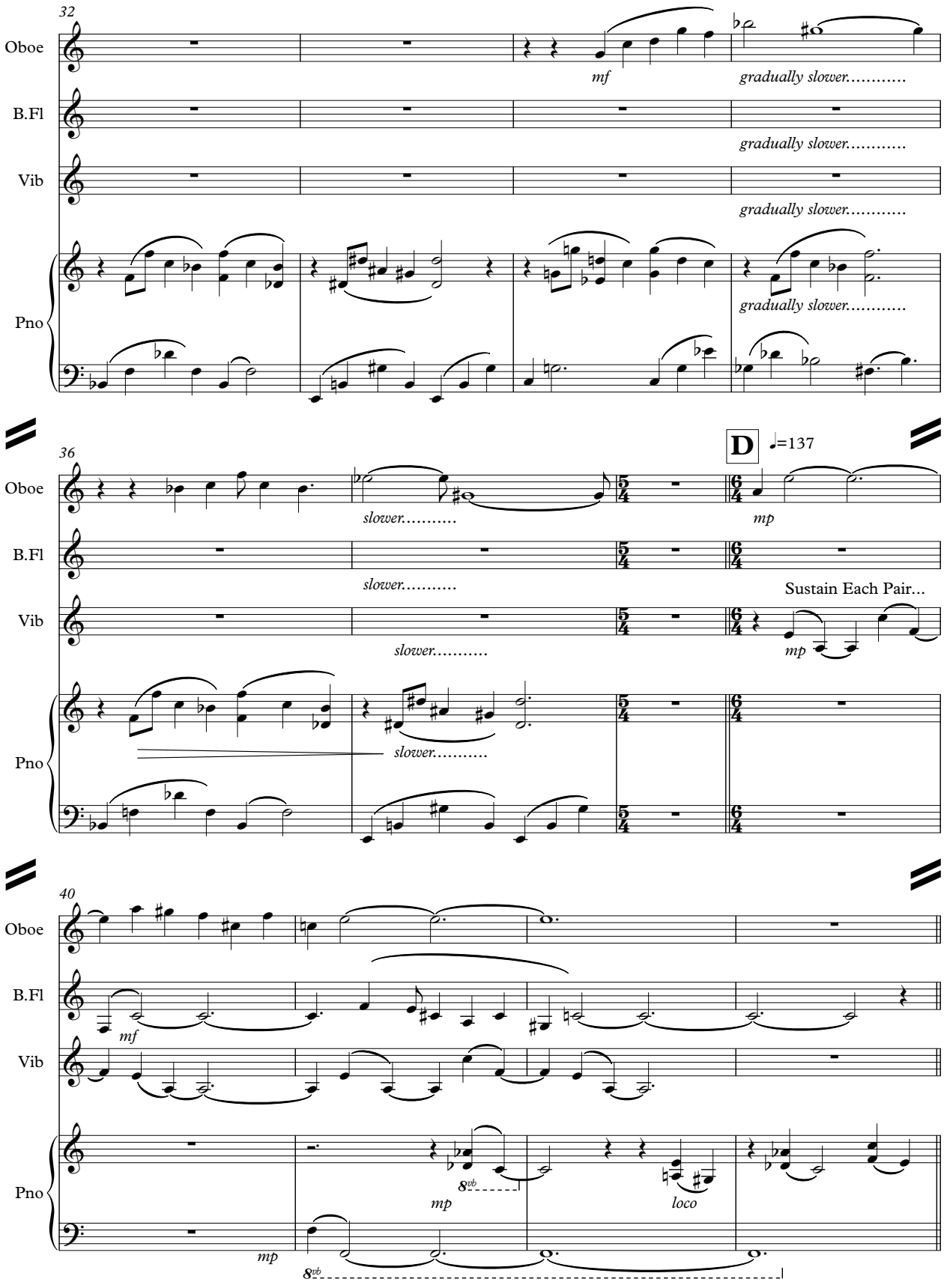

89
Ensemble
Tpt
Ten.
Pno.
Bass
Dr
C/F♯
Ad Lib
mp

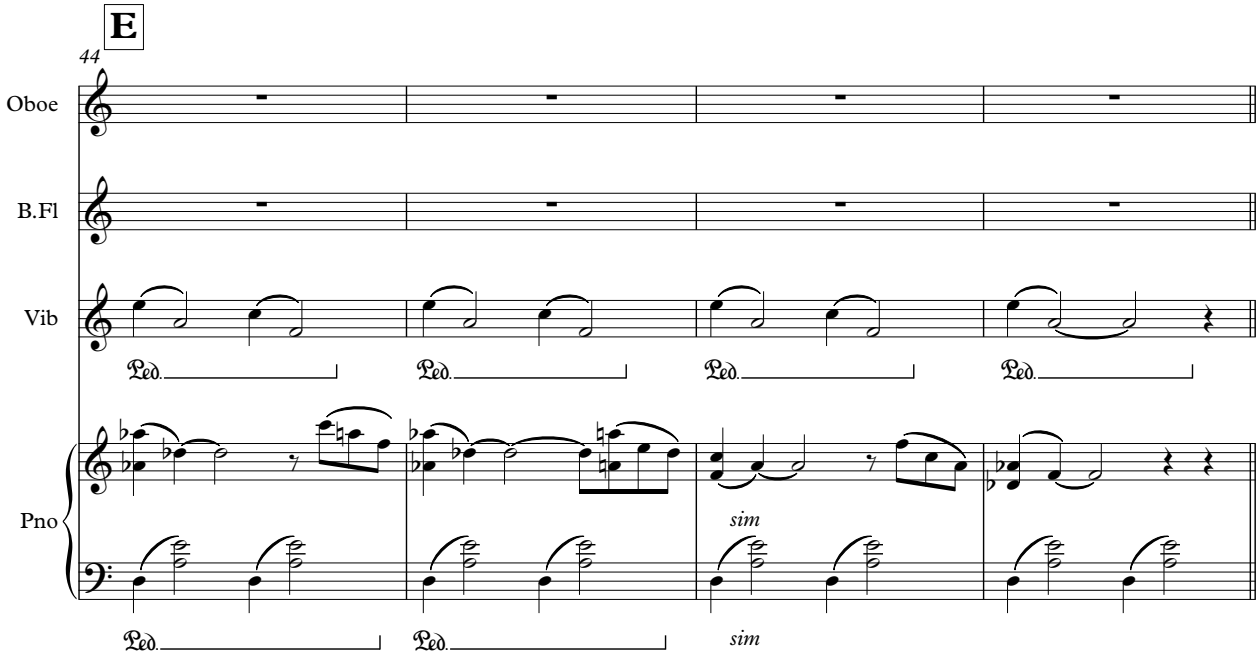
Chamber Three

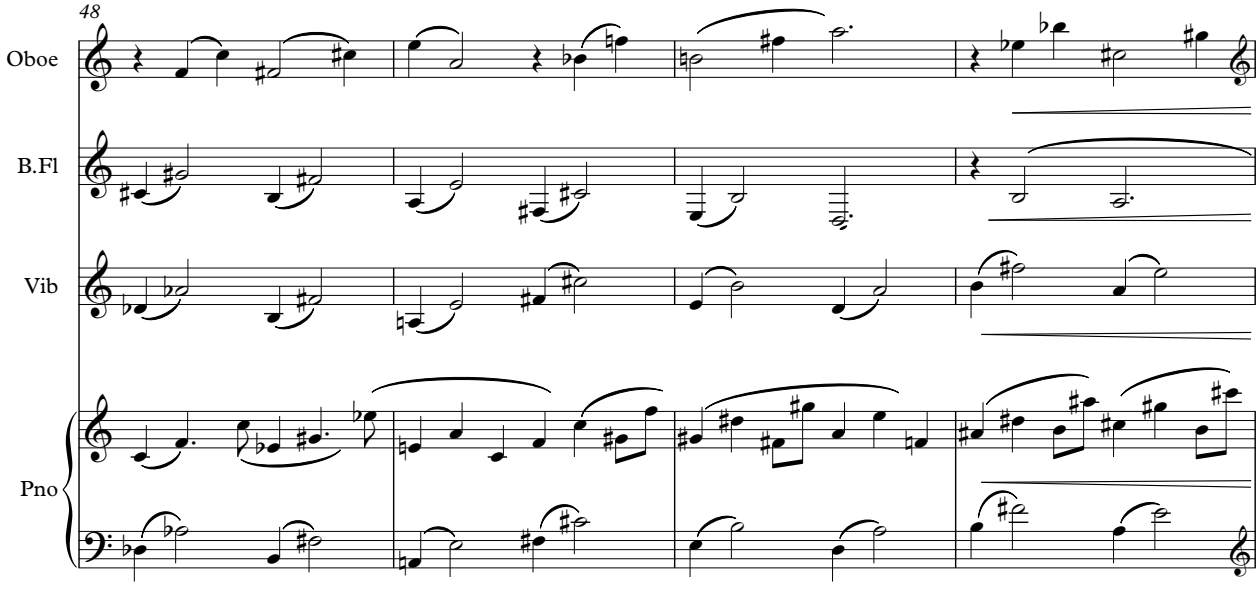


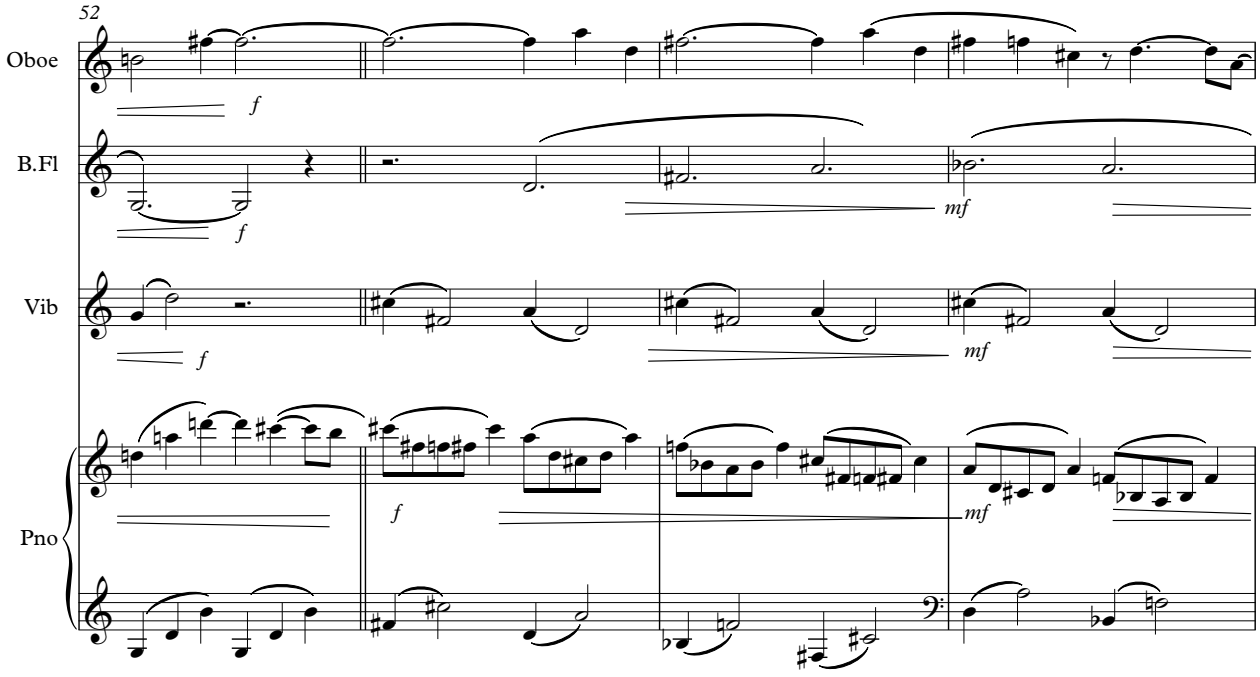

9
B
Oboe
B.Fl
Vib
Pno
mf
f
f
f
f
8va
Ped.
Ped.
13
Oboe
B.Fl
Vib
Pno
sim
mp
loco
Ped.
Ped.
sim
17
Oboe
B.Fl
Vib
Pno
f
f
f
loco
8va
loco

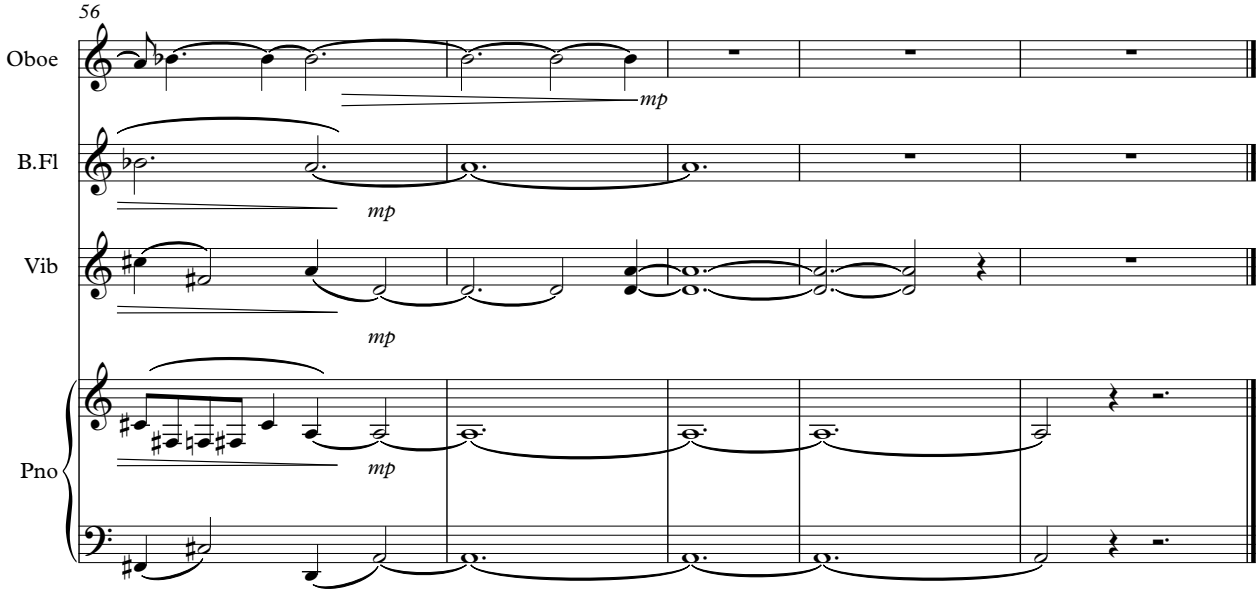

21
C
♩=190
Oboe
B.Fl
Vib
Pno
mf
3
Ped.
sim
25
f
mf
28
f
sim


32
Oboe
B.Fl
Vib
Pno
mf
gradually slower.....
gradually slower.....
gradually slower.....
gradually slower.....
36
D
♩=137
slower.....
slower.....
slower.....
mp
mp
Sustain Each Pair...
40
mf
mp
8vb
loco
mp
8vb

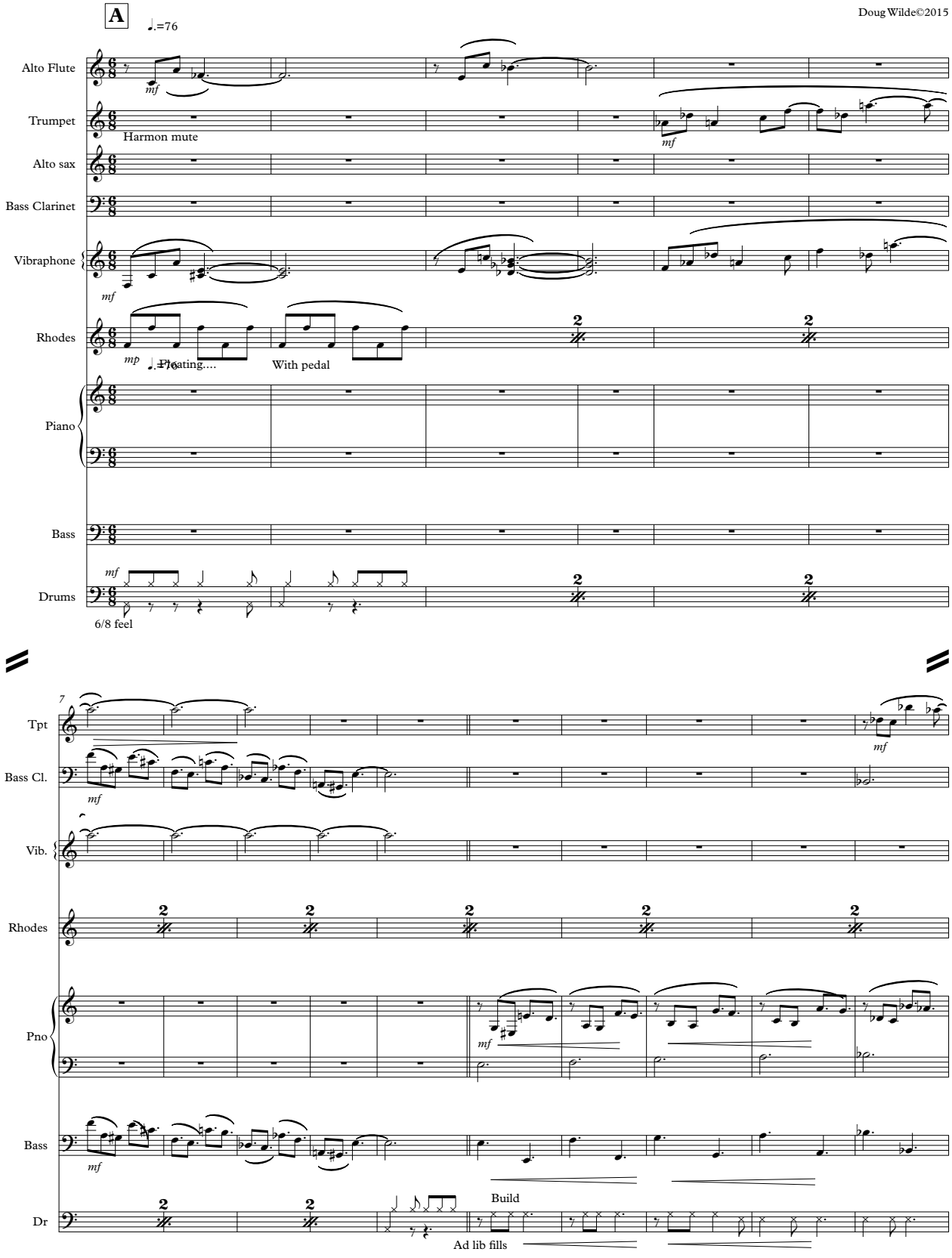

E
44
Oboe
B.Fl
Vib
Pno
Ped.
sim

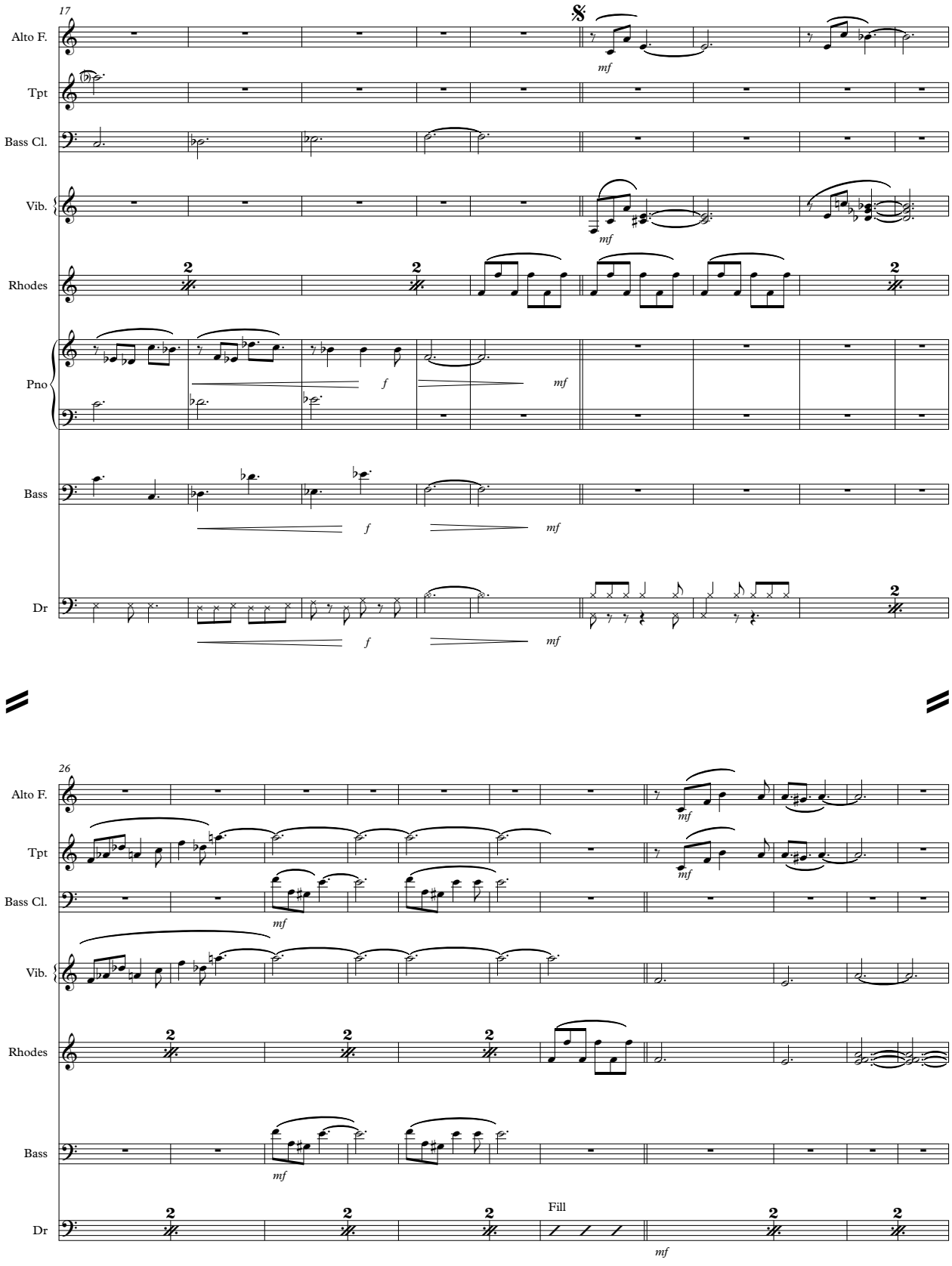

48
Oboe
B.Fl
Vib
Pno

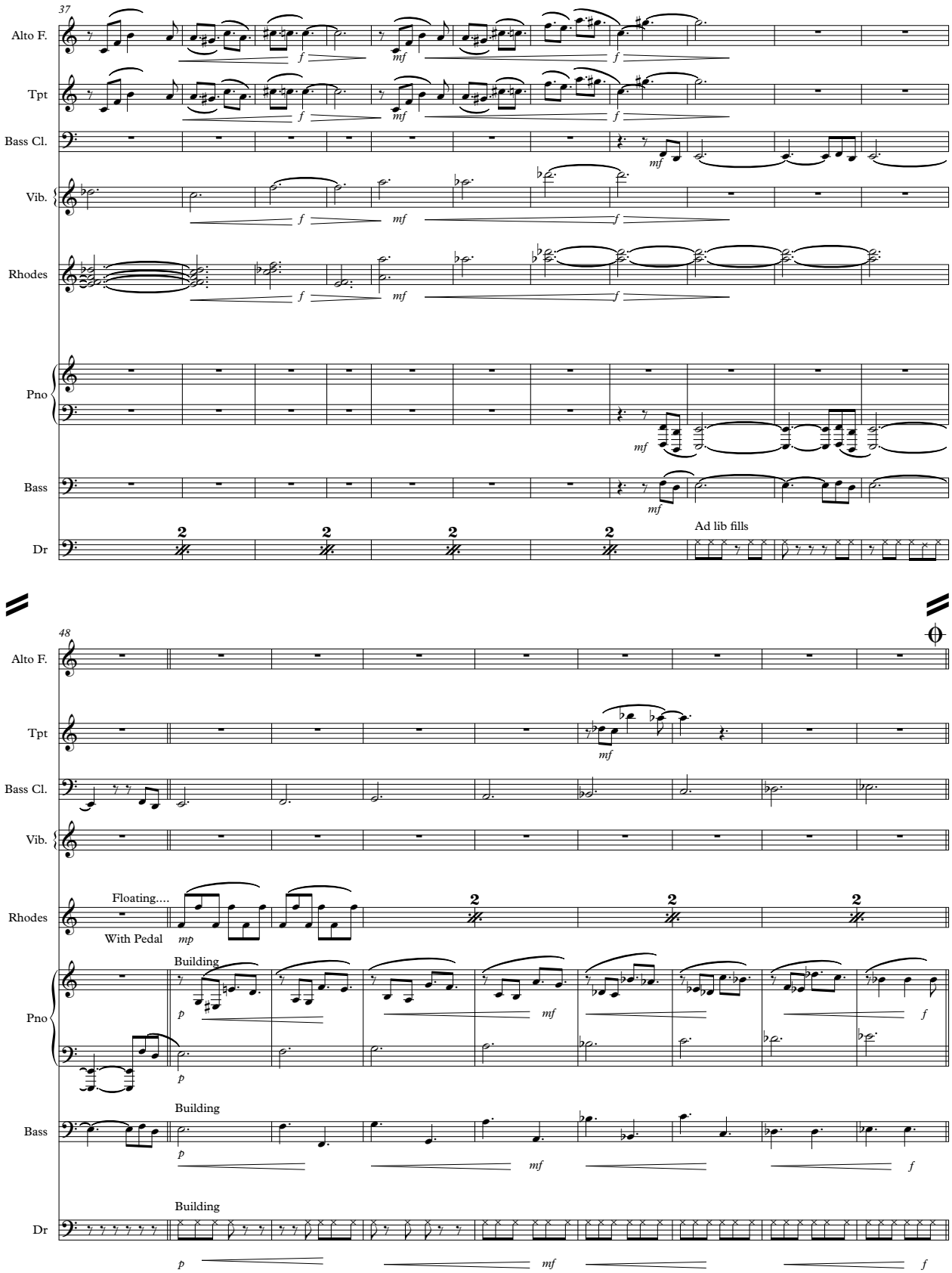

52
Oboe
B.Fl
Vib
Pno
f
f
mf
f
mf
f
mf

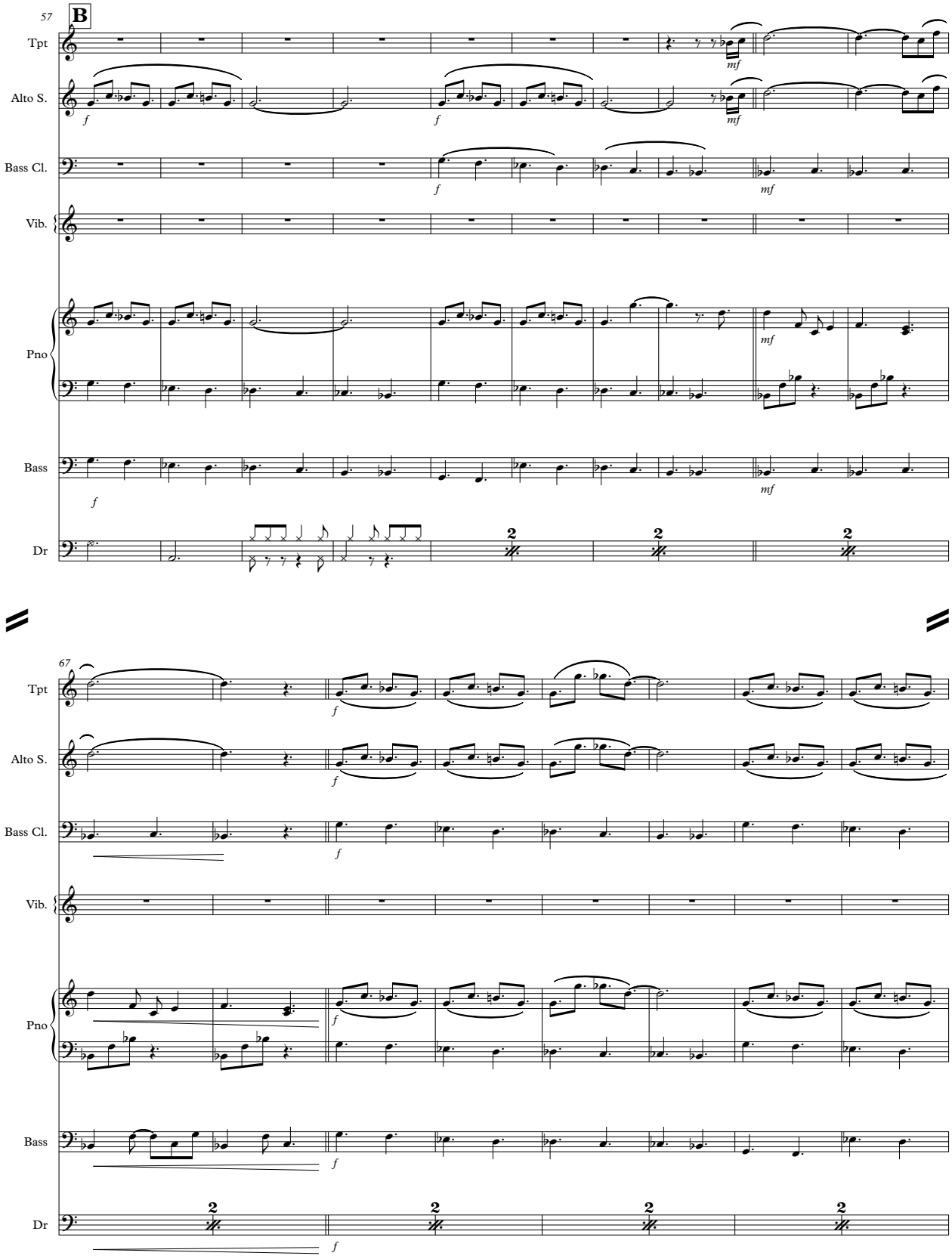

56
Oboe
B.Fl
Vib
Pno
mp
mp
mp
mp

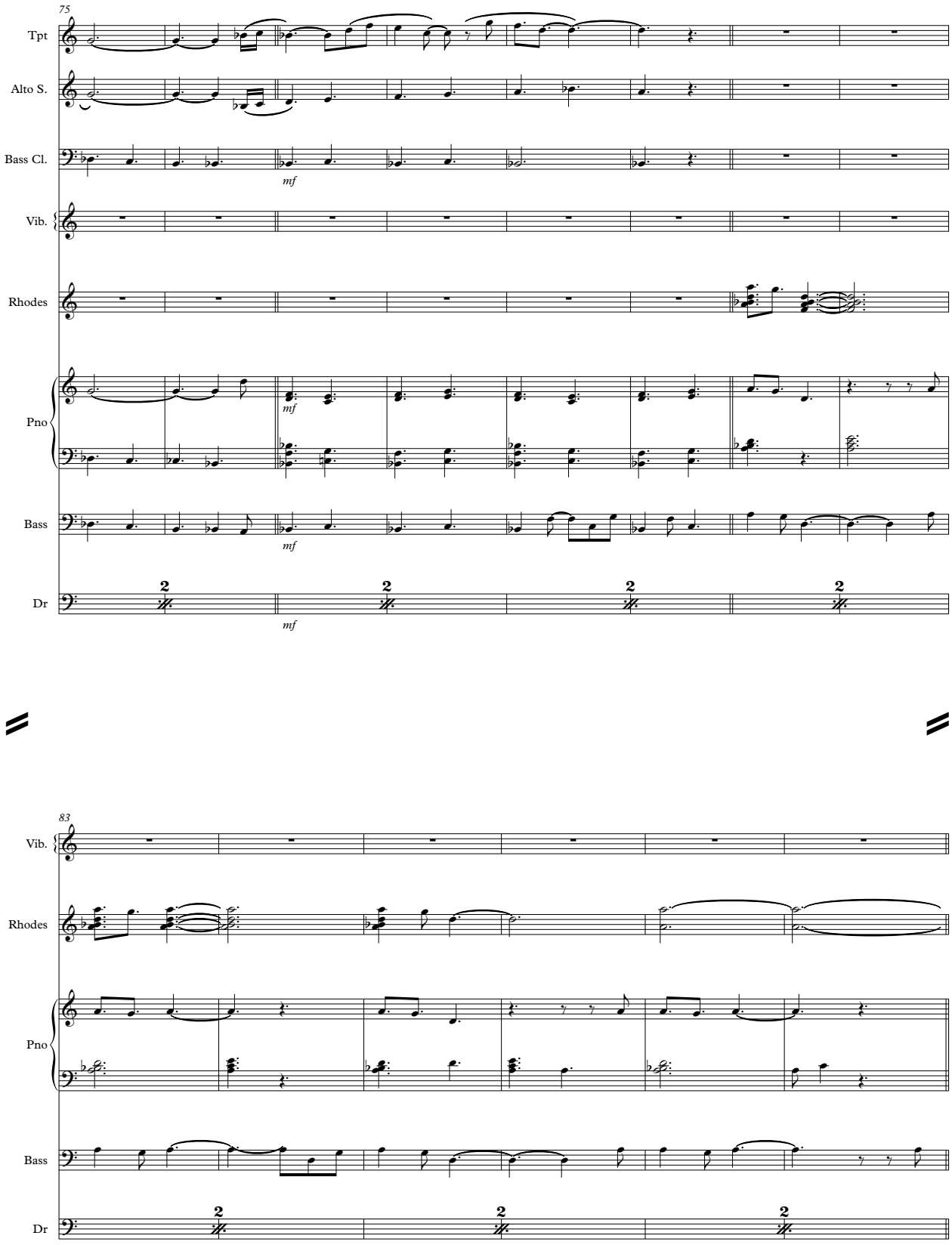
Smoke and Mirrors

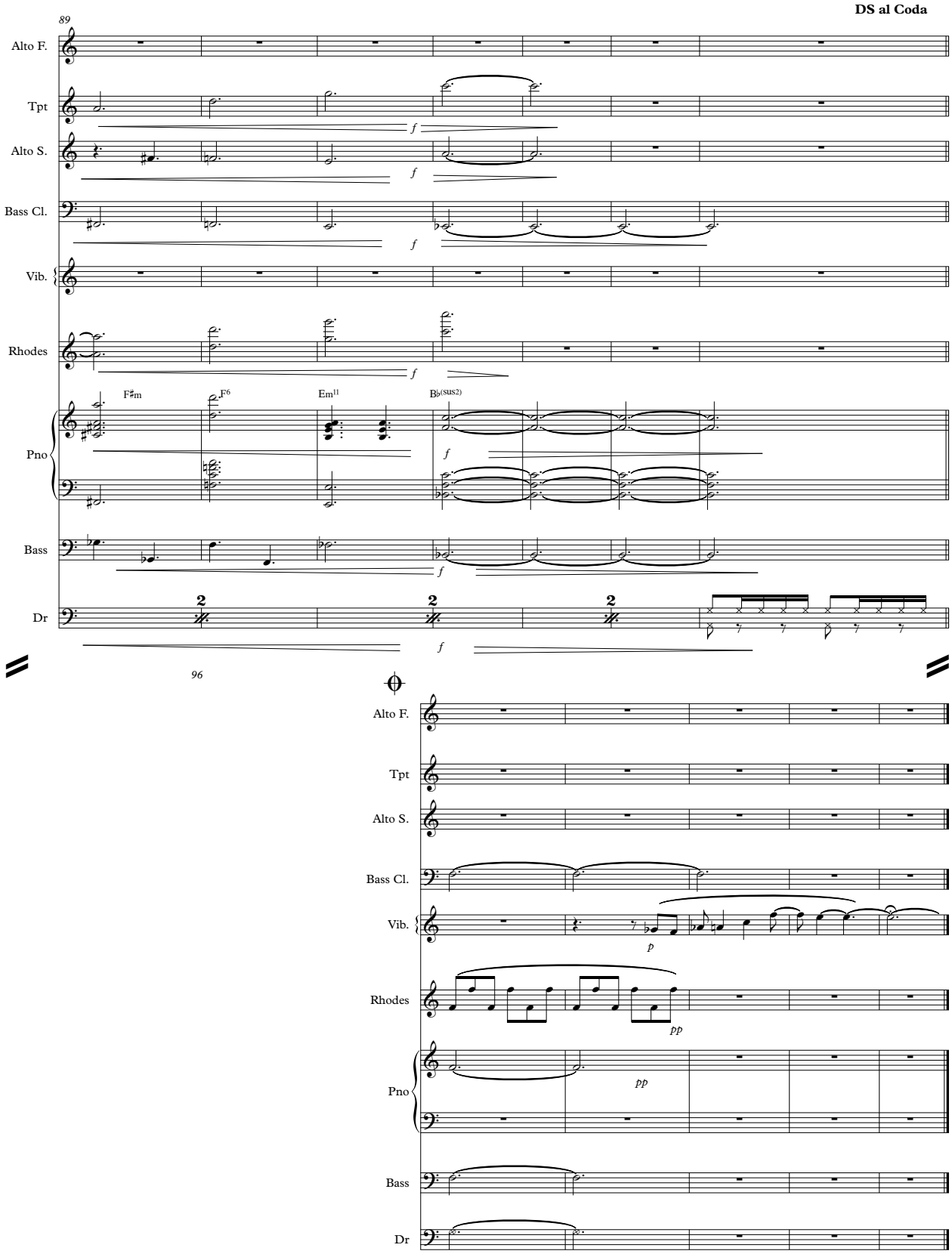



17
Alto F.
Tpt
Bass Cl.
Vib.
Rhodes
Pno
Bass
Dr
mf
f
26
Fill

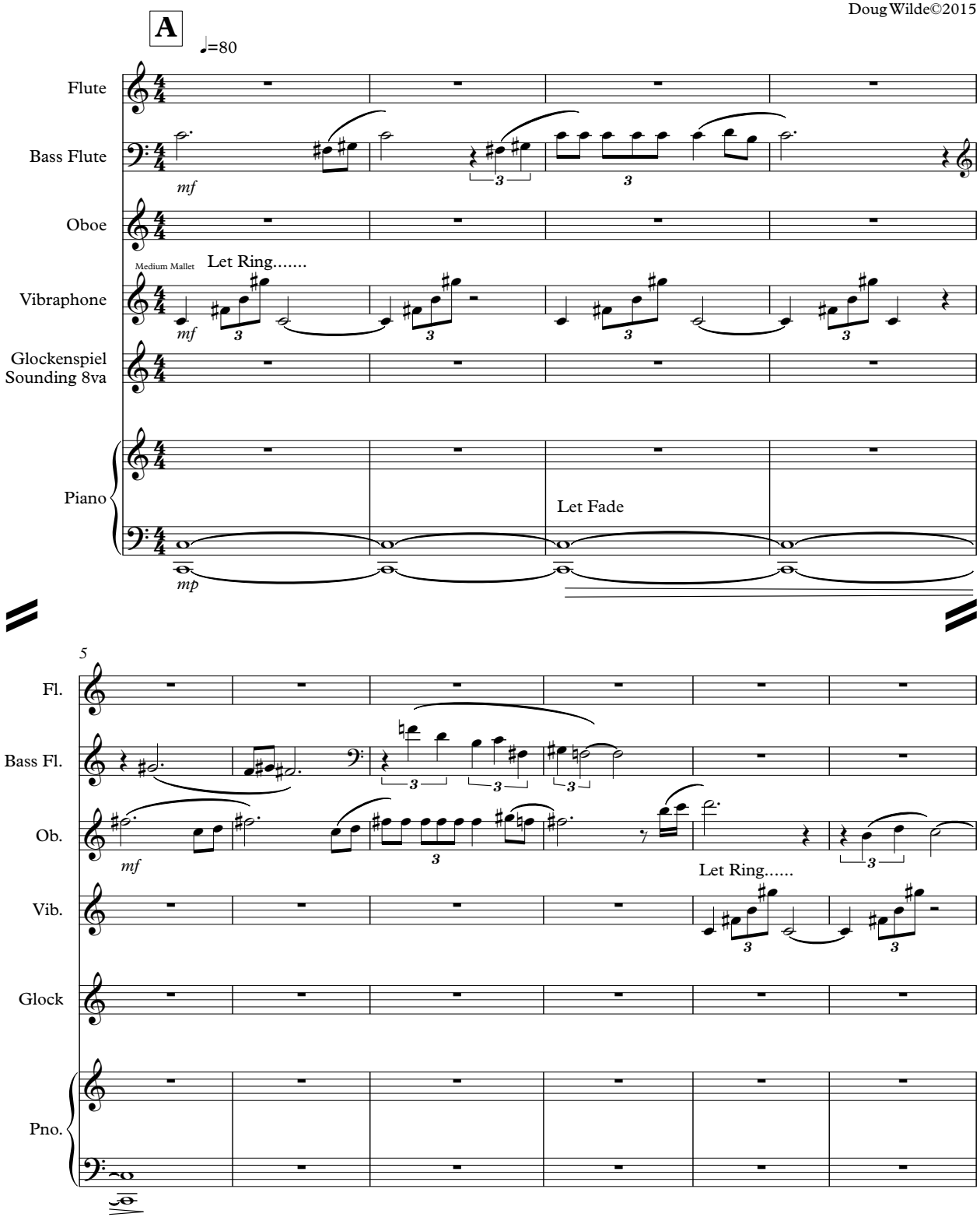

37
Alto F.
Tpt
Bass Cl.
Vib.
Rhodes
Pno
Bass
Dr
Ad lib fills
48
Floating....
With Pedal
Building

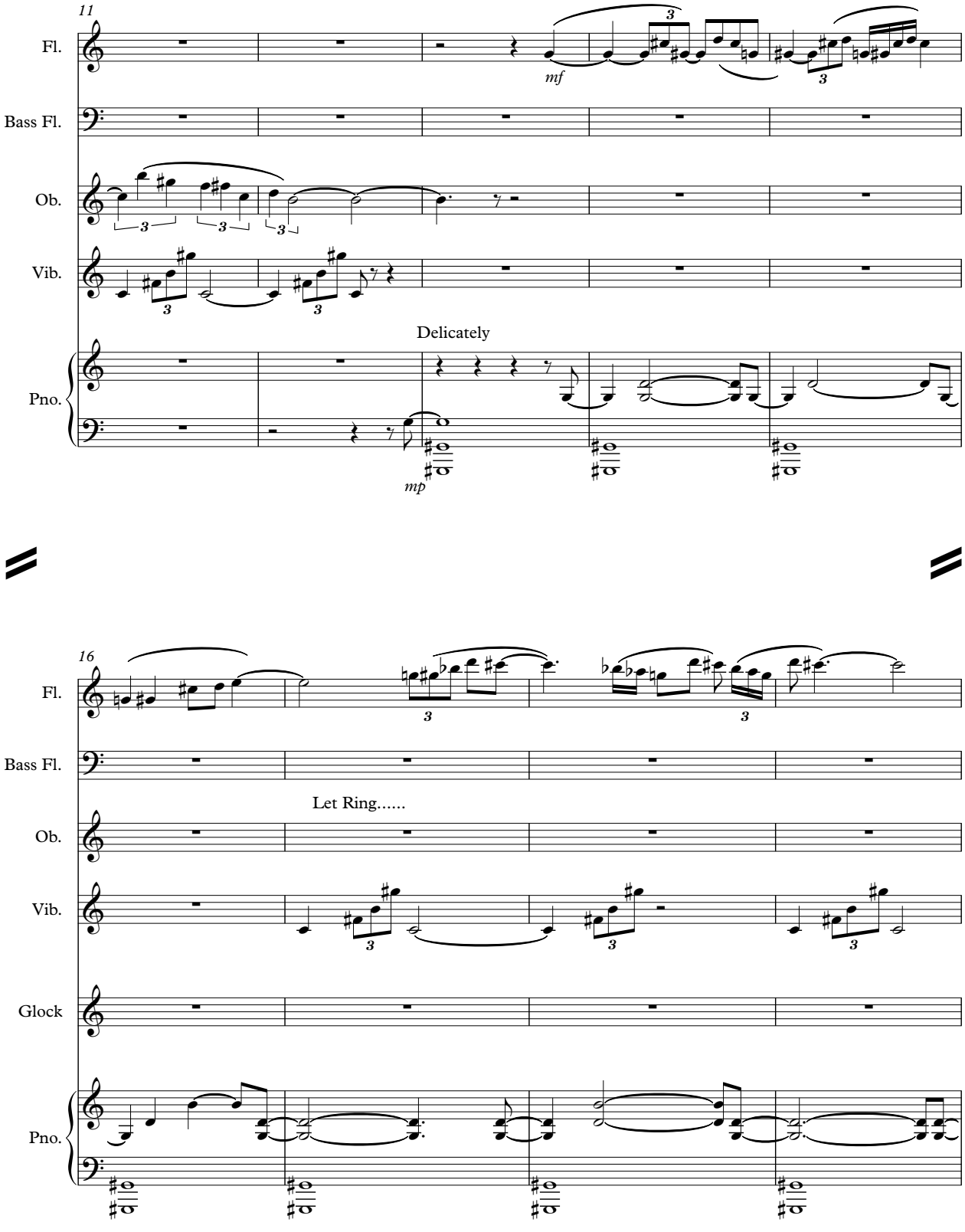

57
B
Tpt
Alto S.
Bass Cl.
Vib.
Pno
Bass
Dr
67
Tpt
Alto S.
Bass Cl.
Vib.
Pno
Bass
Dr

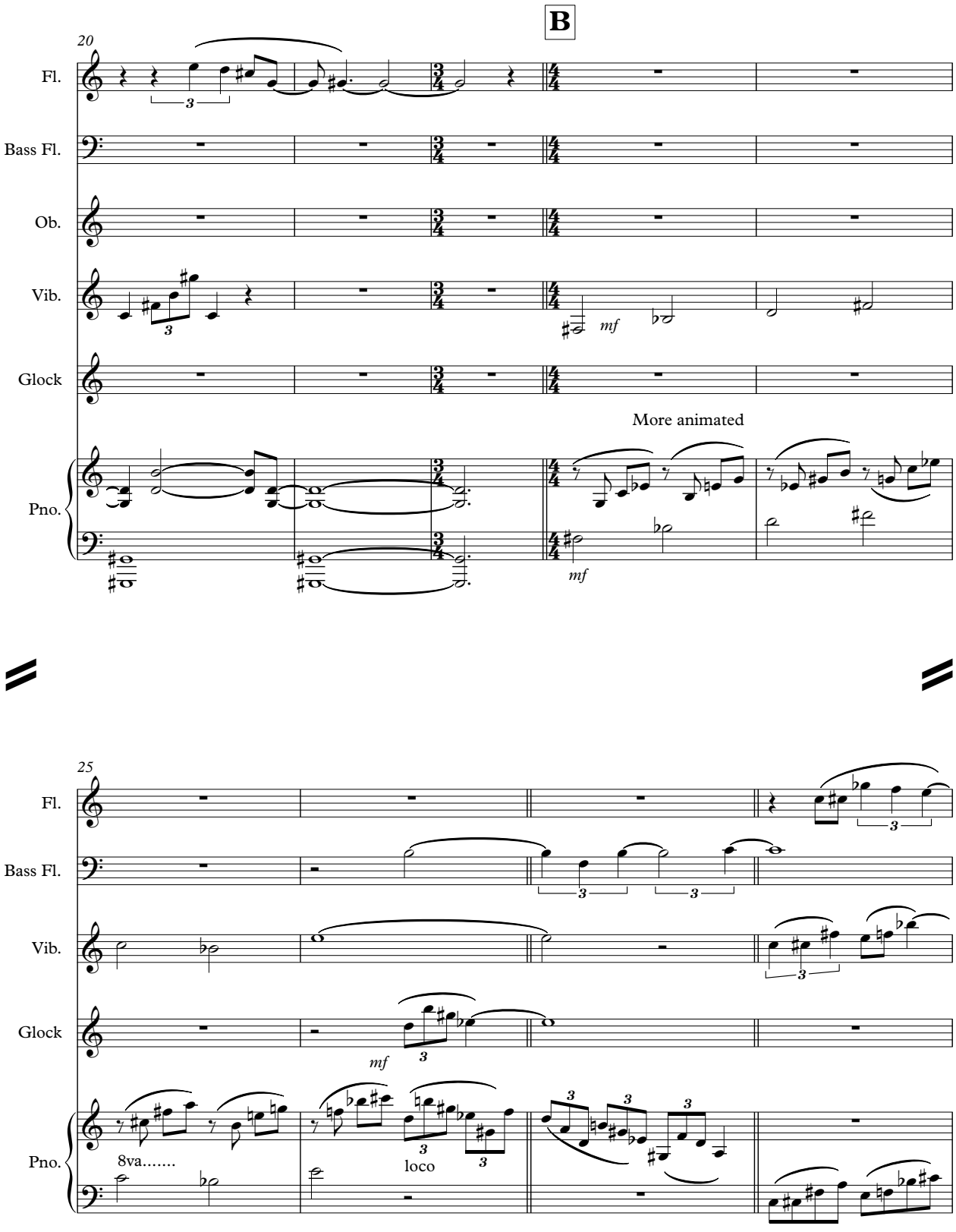

75
Tpt
Alto S.
Bass Cl.
Vib.
Rhodes
Pno
Bass
Dr
mf
2
83

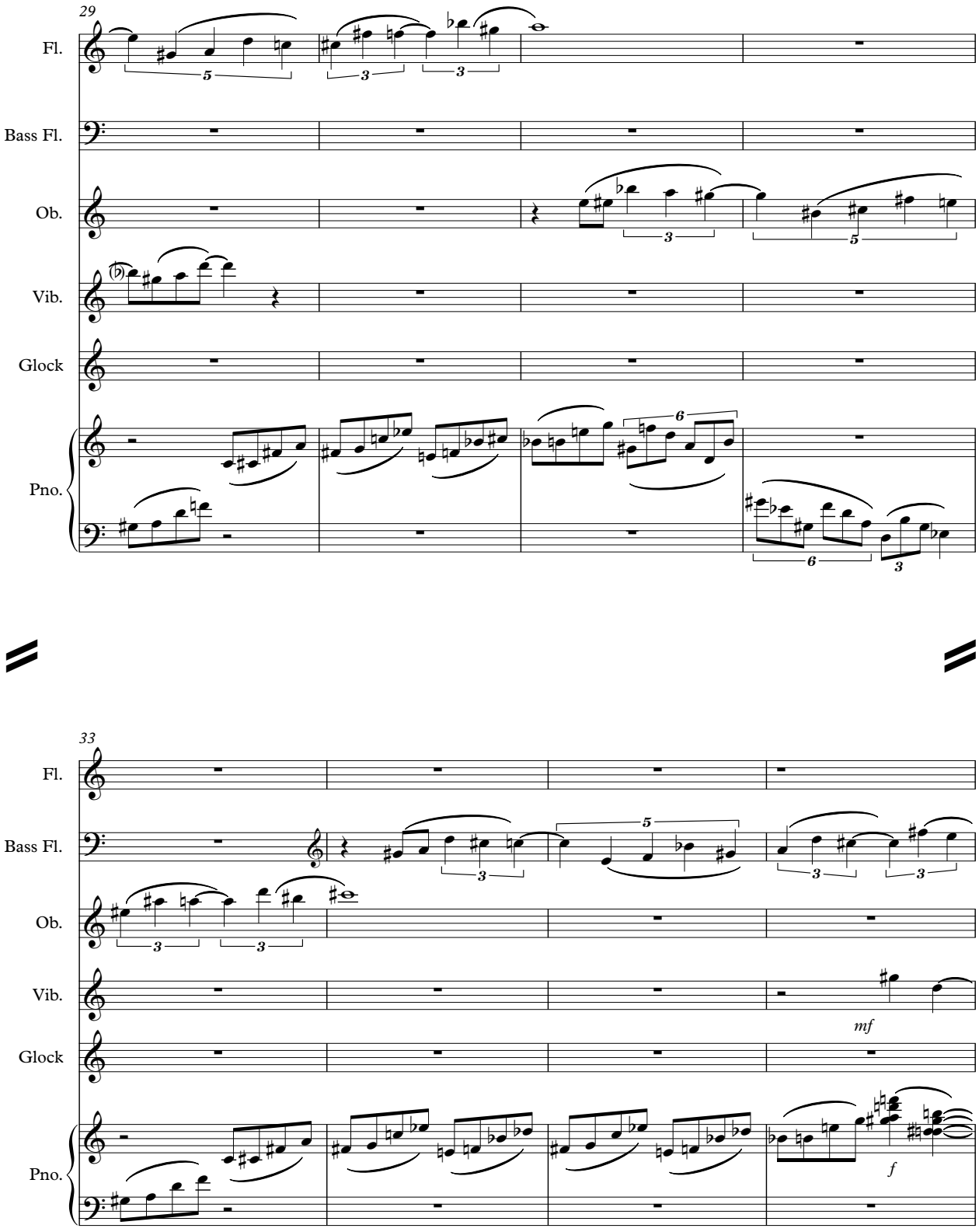

DS al Coda
89
Alto F.
Tpt
Alto S.
Bass Cl.
Vib.
Rhodes
Pno
Bass
Dr
F♯m
F6
Em11
B♭(sus2)
f
96
p
pp

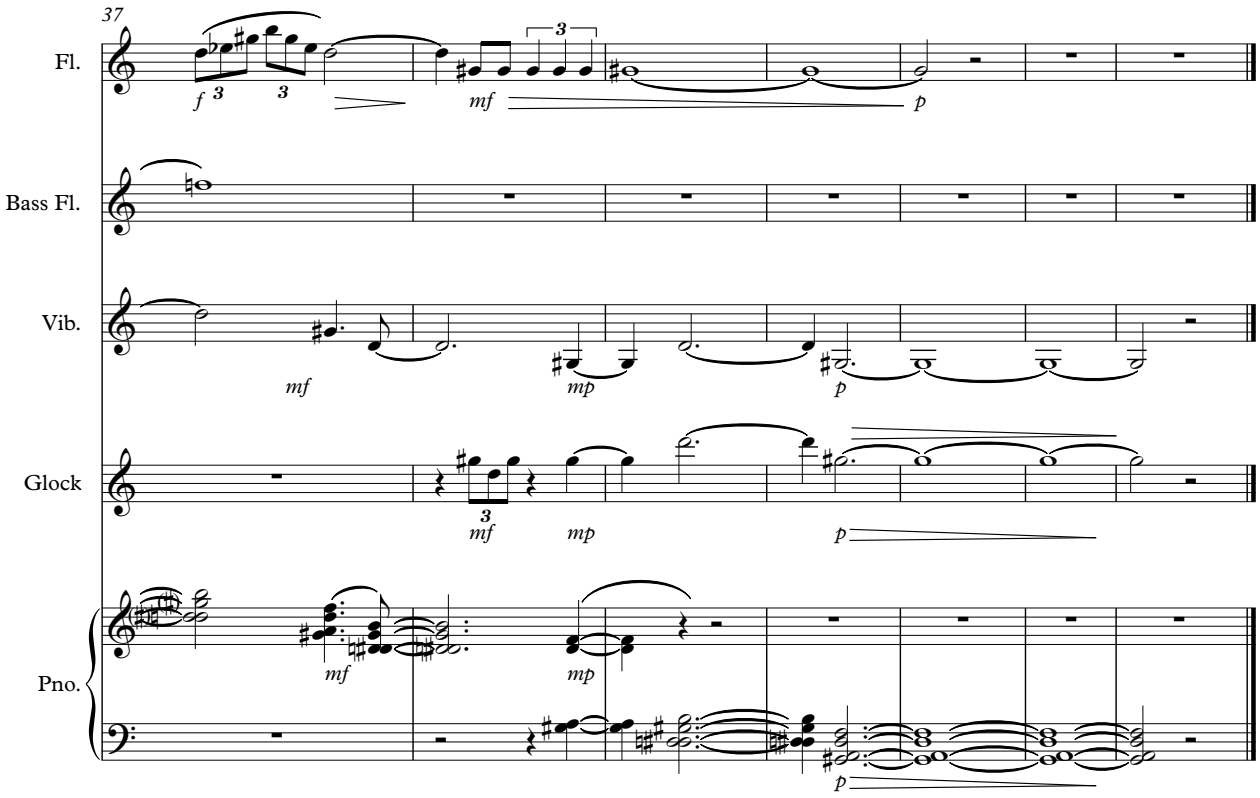
Division By Two




11
Fl.
Bass Fl.
Ob.
Vib.
Pno.
mf
Delicately
mp
16
Fl.
Bass Fl.
Let Ring.....
Ob.
Vib.
Glock
Pno.


B
20
Fl.
Bass Fl.
Ob.
Vib.
Glock
Pno.
mf
More animated
mf
25
Fl.
Bass Fl.
Vib.
Glock
Pno.
mf
8va.....
loco


29
Fl.
Bass Fl.
Ob.
Vib.
Glock
Pno.
33
Fl.
Bass Fl.
Ob.
Vib.
Glock
Pno.
mf
f


37
Fl.
Bass Fl.
Vib.
Glock
Pno.
f
mf
p
mp

Then Add Red

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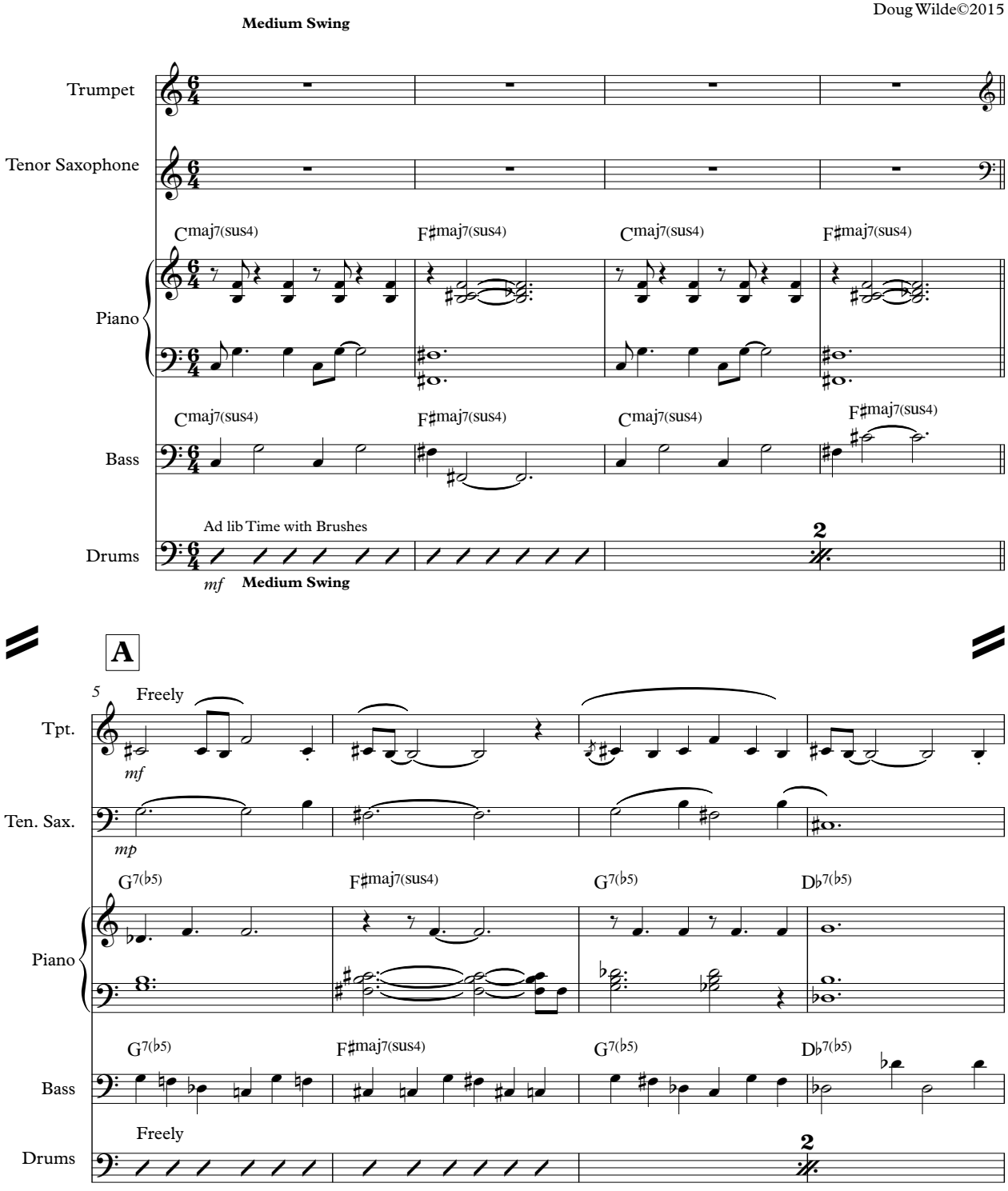
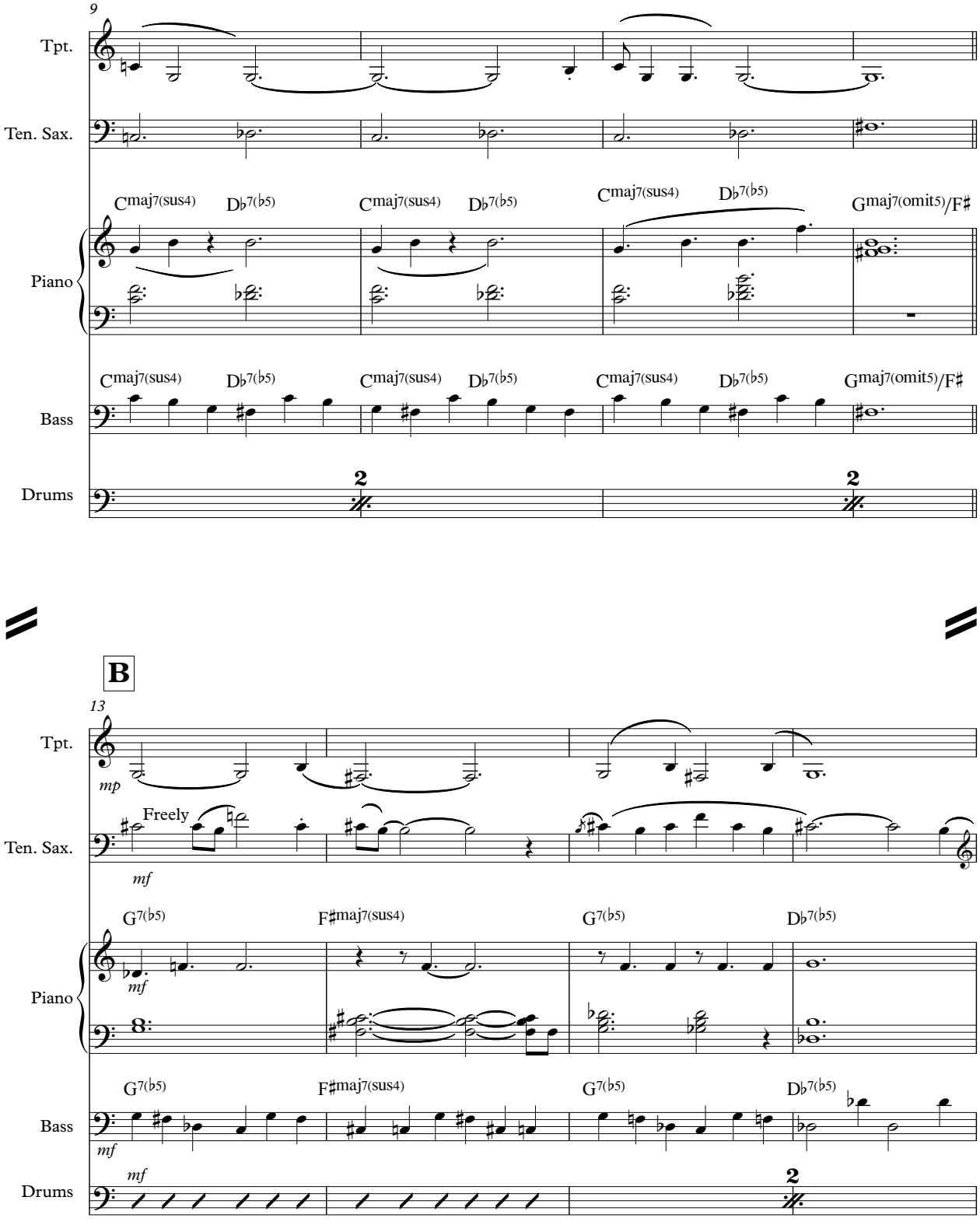
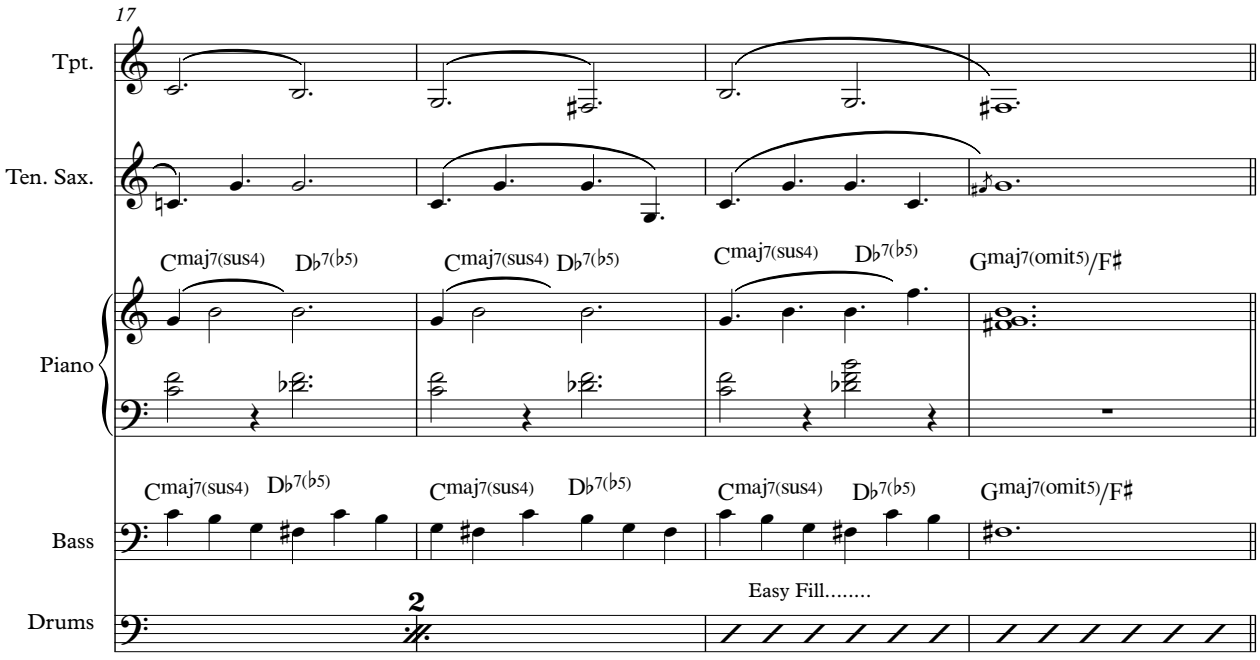
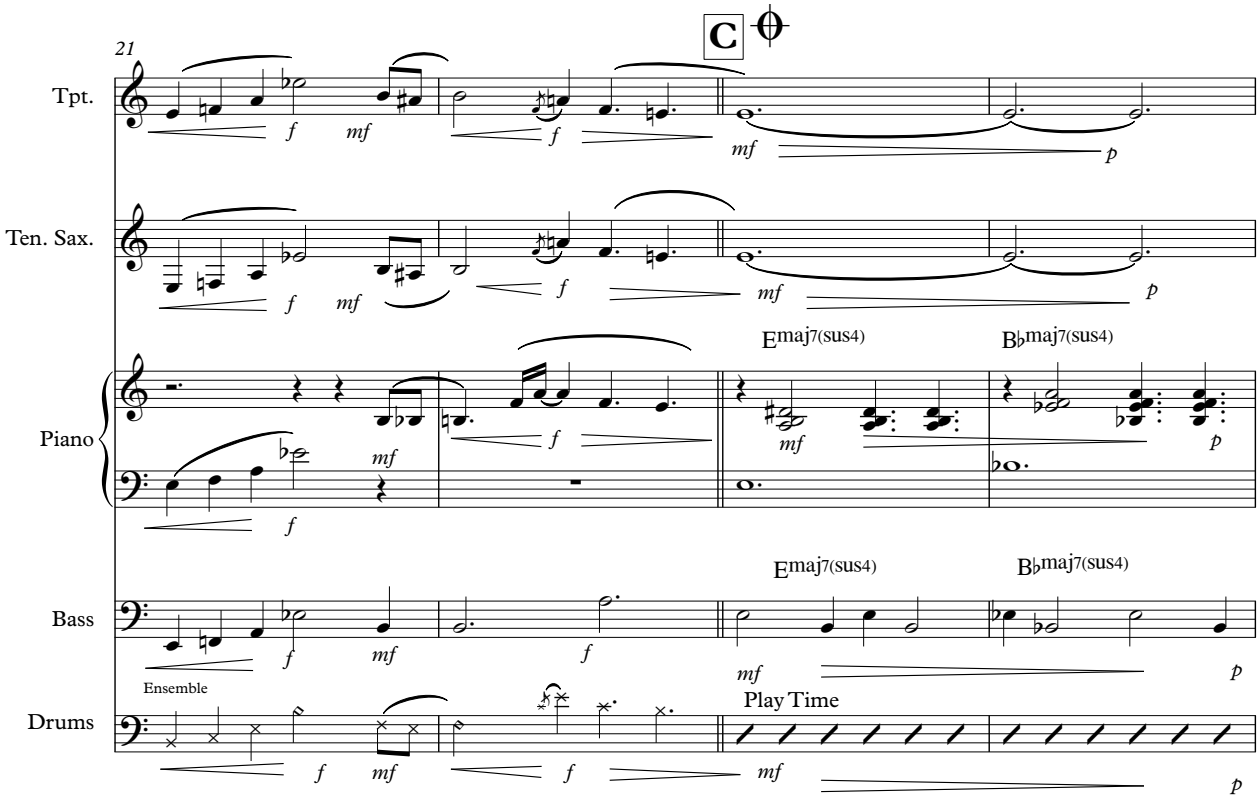
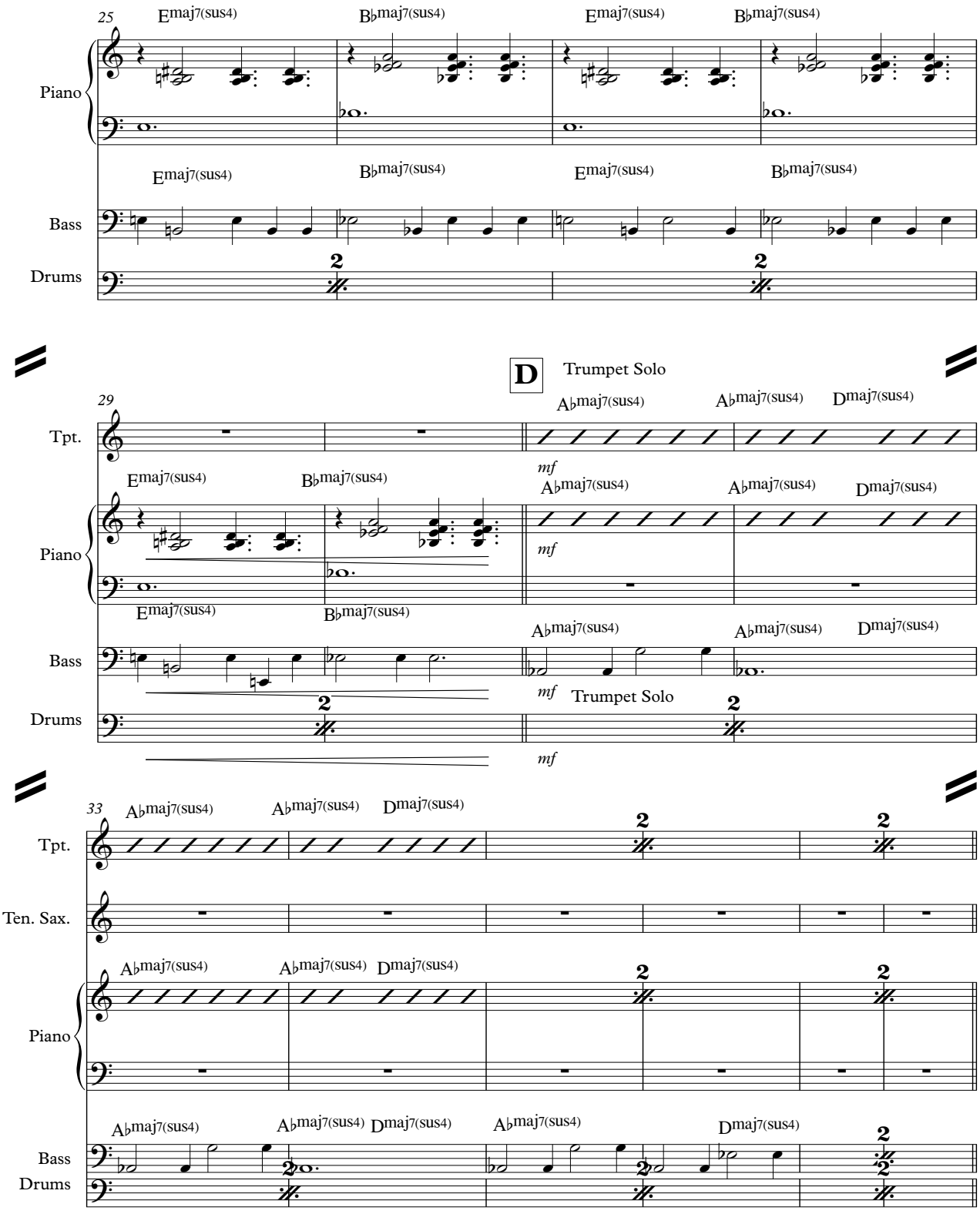
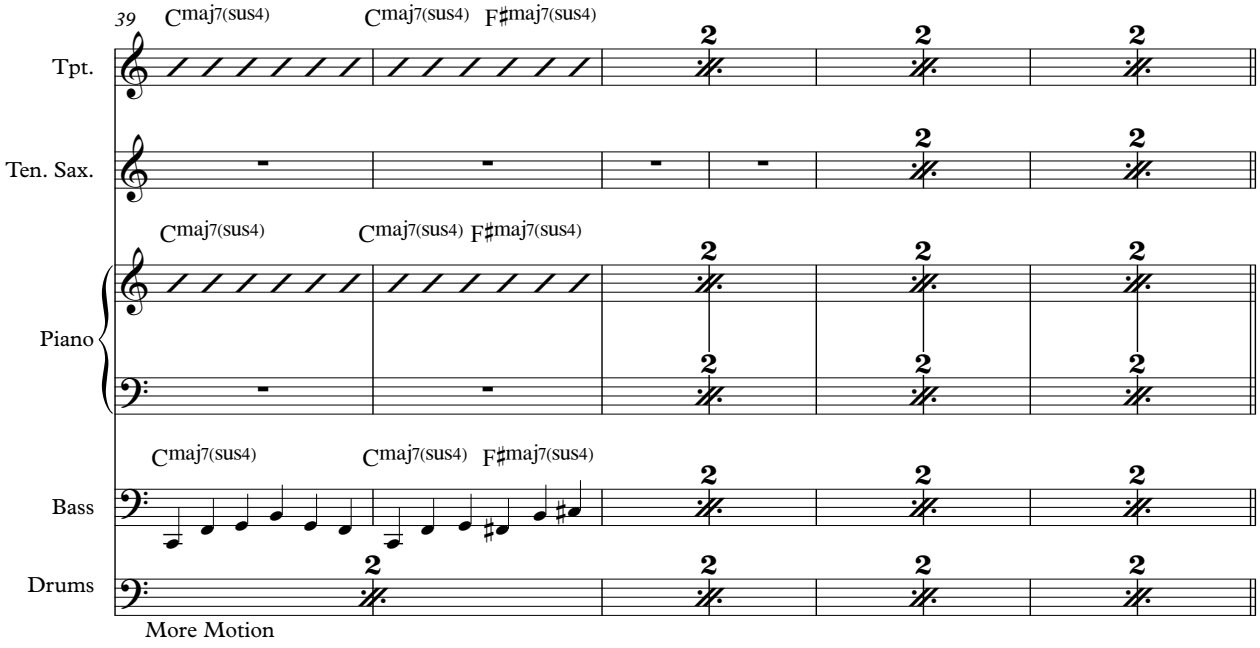


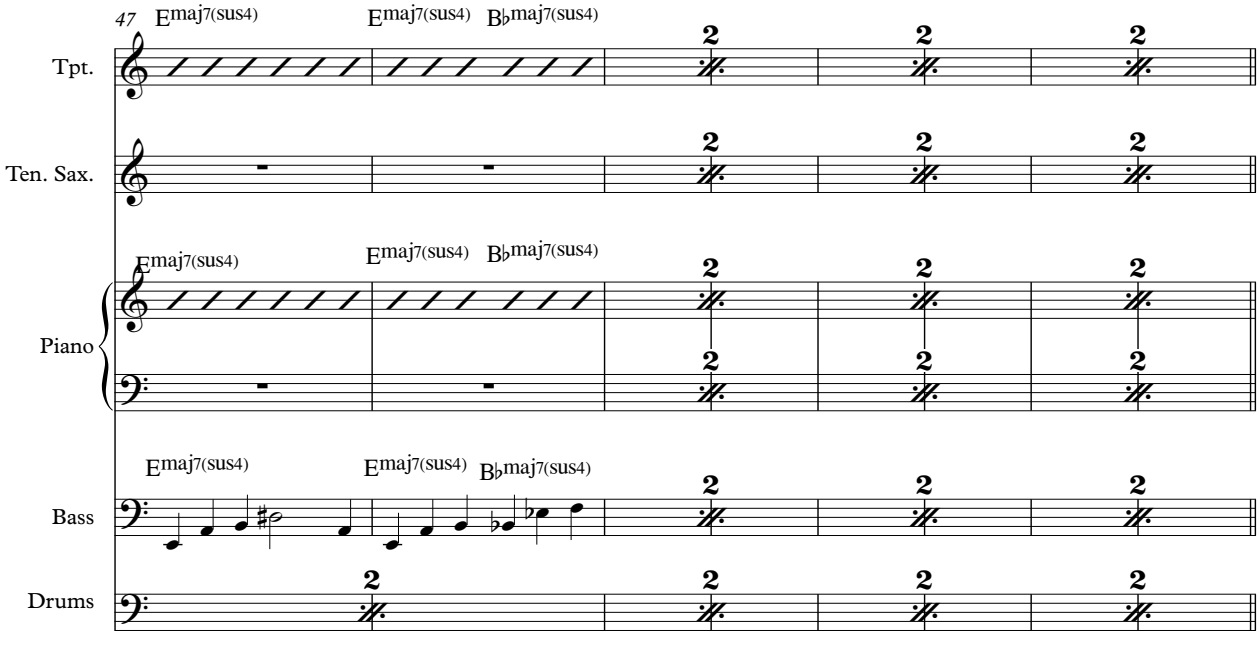

9
Tpt.
Ten. Sax.
Cmaj7(sus4) Db7(b5) Cmaj7(sus4) Db7(b5) Cmaj7(sus4) Db7(b5) Gmaj7(omit5)/F#
Piano
Bass
Cmaj7(sus4) Db7(b5) Cmaj7(sus4) Db7(b5) Cmaj7(sus4) Db7(b5) Gmaj7(omit5)/F#
Drums
2
2
B
13
Tpt.
mp
Freely
Ten. Sax.
mf
G7(b5) Fmaj7(sus4) G7(b5) Db7(b5)
Piano
mf
G7(b5) Fmaj7(sus4) G7(b5) Db7(b5)
Bass
mf
mf
Drums
2

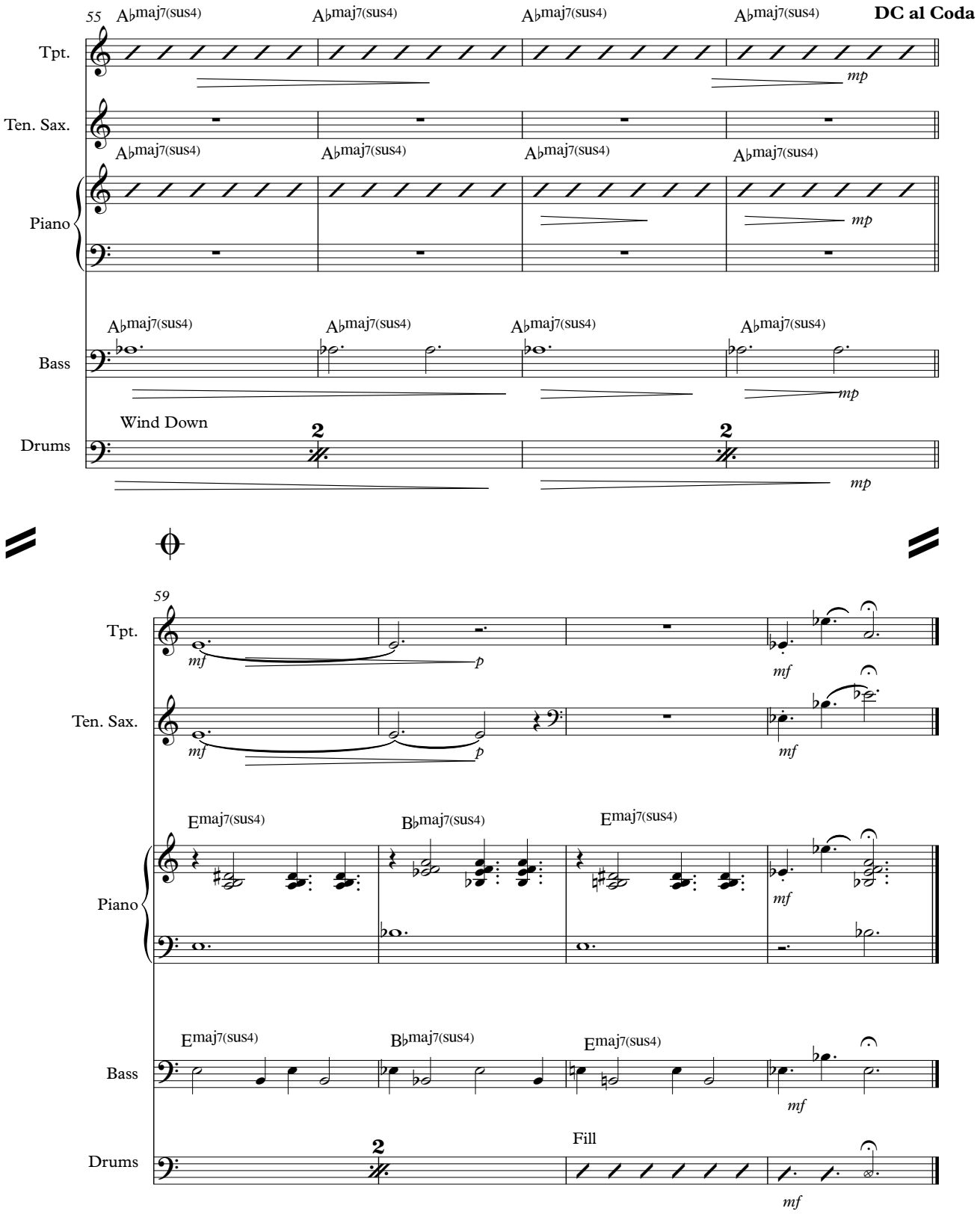

17
Tpt.
Ten. Sax.
Piano
Bass
Drums
Cmaj7(sus4) Db7(b5)
Cmaj7(sus4) Db7(b5)
Cmaj7(sus4) Db7(b5)
Gmaj7(omit5)/F#
Cmaj7(sus4) Db7(b5)
Cmaj7(sus4) Db7(b5)
Cmaj7(sus4) Db7(b5)
Gmaj7(omit5)/F#
2
Easy Fill.....


21
C
Tpt.
Ten. Sax.
Piano
Bass
Drums
Emaj7(sus4)
Bbmaj7(sus4)
Emaj7(sus4)
Bbmaj7(sus4)
Ensemble
Play Time

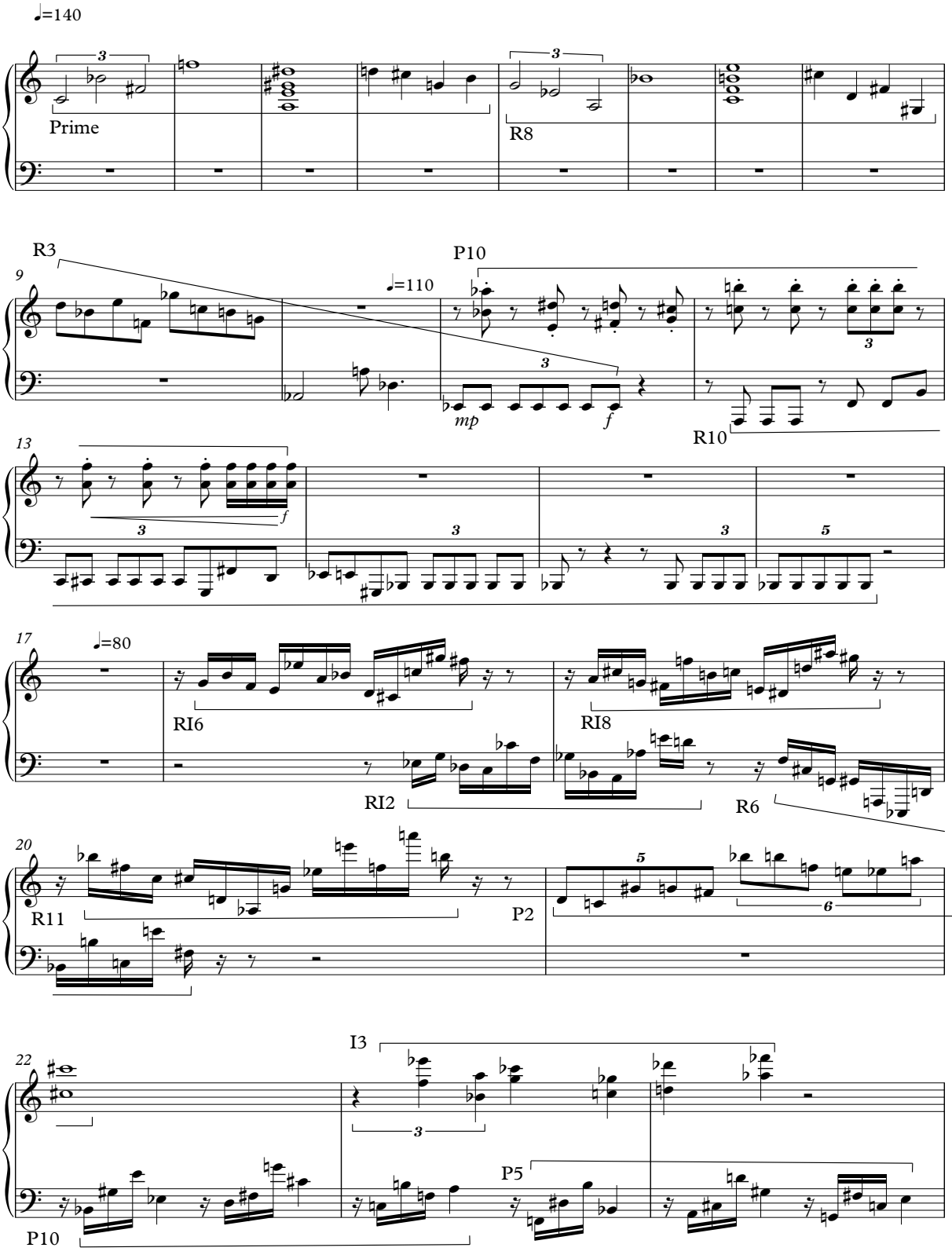

25
Emaj7(sus4)
B♭maj7(sus4)
Emaj7(sus4)
B♭maj7(sus4)
Piano
Bass
Drums
D
Trumpet Solo
29
A♭maj7(sus4)
D maj7(sus4)
Tpt.
mf
33
Ten. Sax.

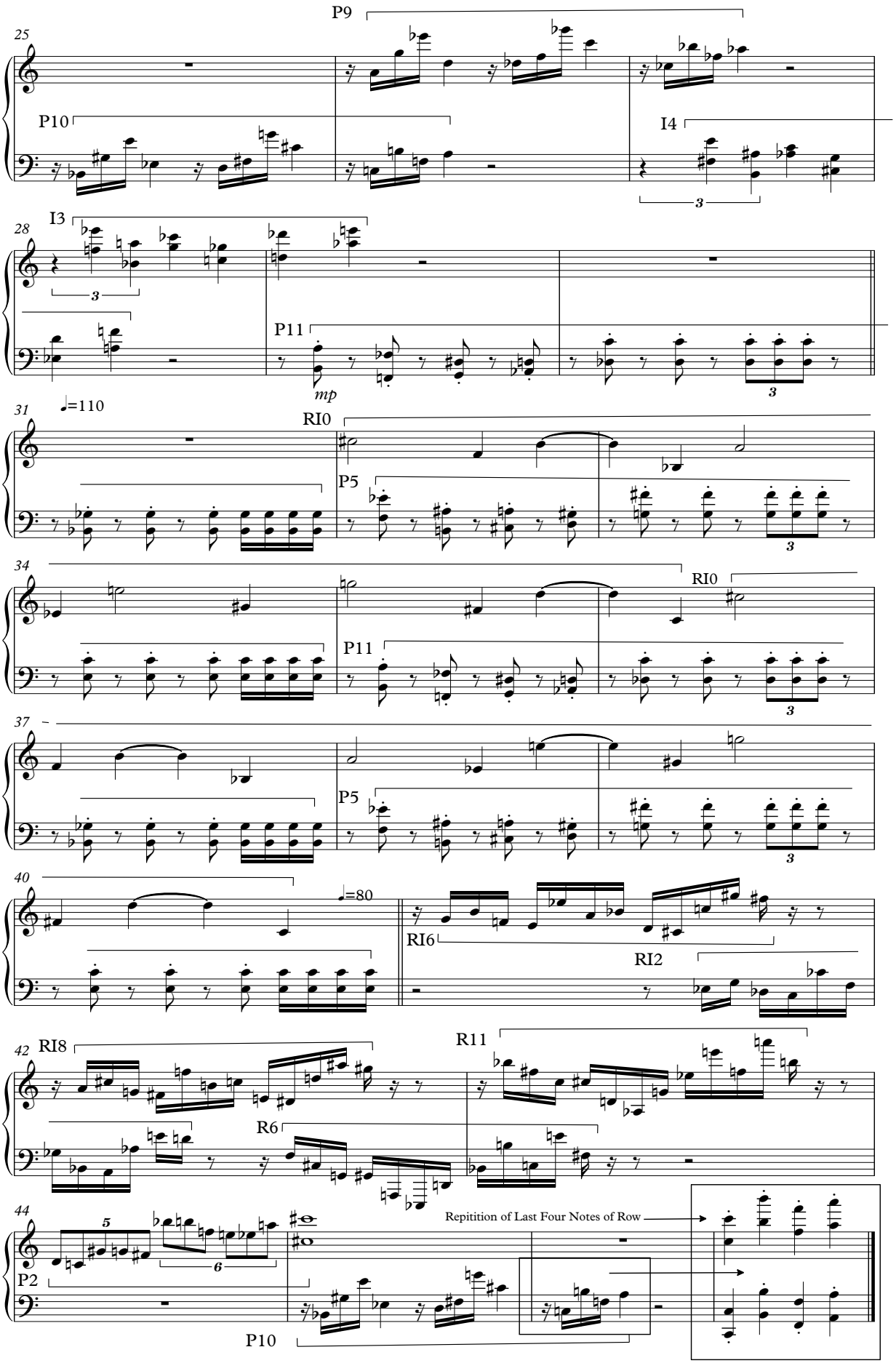

39
Cmaj7(sus4)
Cmaj7(sus4)
F♯maj7(sus4)
Tpt.
Ten. Sax.
Piano
Bass
Drums
More Motion


47
Emaj7(sus4)
Emaj7(sus4)
B♭maj7(sus4)
Tpt.
Ten. Sax.
Piano
Bass
Drums


55
A♭maj7(sus4)
DC al Coda
Tpt.
Ten. Sax.
Piano
Bass
Drums
Wind Down
mp
59
mf
p
E maj7(sus4)
B♭maj7(sus4)
Fill

APPENDIX B:
Dirty Dozen Tone Rows




P9
25
P10
I4
3
I3
28
3
P11
mp
3
31
♩=110
RI0
P5
3
34
RI0
P11
3
37
P5
3
40
♩=80
RI6
RI2
42
RI8
R11
R6
44
5
6
Repitition of Last Four Notes of Row
P2
P10