IRONY MACHINES

by

AARON BASIL CARTER

(Under the Direction of Adrian P. Childs)

ABSTRACT

In accordance with the requirements for the completion of the degree Doctor of Musical Arts in Composition, this document consists of three parts: an original composition for orchestra; an analysis of that work with critical commentary on its formal structure, harmonic materials, and textural constructs; and an analysis of related literature by Luciano Berio with the primary focus being textural considerations and formal structures. The compositions by Luciano Berio are *Allelujah II* for orchestra and *Perspectives*, a piece of electronic music. *Allelujah II* explores complex textures, spatialization effects, and rhythmic freedom in the orchestral framework. In these ways, Berio's approach to *Allelujah II* is similar to my conception of *Irony Machines*. These pieces have strong commonalities with electronic music. Thus, *Perspectives* is a helpful analytical companion to these works. It is a composition written in close proximity to *Allelujah II* and by the same composer. This piece shares the pointillistic style of *Allelujah II* and influences *Irony Machines* in the areas of spatialization and rhythmic freedom. *Irony Machines* will be included in full score as an appendix. The composition is a tone poem and is approximately sixteen minutes in length.

INDEX WORDS: Orchestra, Tone poem, Luciano Berio, Original composition, *Irony Machines, Allelujah II, Perspectives,* Electronic Music

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CHAPTER 1

INTRODUCTION

Original Composition for Orchestra

Irony Machines is a composition for orchestra that uses an electronic composition aesthetic which is adapted for the ensemble in order to produce an individual artistic product. The specific instrumentation of the orchestra is: 3 flutes, 2 oboes, English horn, 3 B-flat clarinets, bass clarinet, 2 bassoons, contrabassoon, soprano saxophone, alto saxophone, tenor saxophone, baritone saxophone, 4 horns in F, 3 B-flat trumpets, 2 trombones, bass trombone, tuba, timpani, vibraphone, marimba, 3 percussion parts with various instruments, piano/celesta, violin I and II, viola, violoncello, and double bass. The most notable augmentation to the standard orchestra instrumentation is the inclusion of the saxophone family. The overarching focus of the piece is the textural and timbral manipulations of the instruments in a form that allows those characteristics to evolve and interact. Some decisions about pitch, register, instrumentation, dynamics, and length were made with the intent of imitating certain well-known characteristics of the electronic medium. These include spatialization, echo, and delay. The genre of the piece is “tone poem” due to its loose inspiration by abstract ideas on irony, free intelligence, and electronic music.

Irony Machines is approximately sixteen minutes in length and contains five distinct sections. The piece is through-composed and the sections flow continuously. The five sections are characterized as follows:

I Introduction: white noise and bass instruments
II Pulsing: individual instruments playing constant tones with a rhythmic pulse (rhythms are given to individual instruments and the instruments perform together, creating the aggregate effect)
III Glissandi: mainly an effect achieved in the string choir (though not exclusively) with dynamic shaping.
IV Sound Mass: Cluster harmonies played by choirs, mixed choirs, or the entire ensemble in an evolving dynamic plan to produce a textural complexity. This section contains the climax of the piece.
V Recapitulatory Denouement: An evolution of the piece's sections to provide narrative closure.

Throughout the work, the [016] trichord is juxtaposed with sonorities built with major and minor thirds as an underlying thread to provide inter-unit consistency.

Section I is achieved through the use of a vocal effect by the instrumentalists of the orchestra. This vocal effect is a "sh" sound that is combined with percussion instruments that have a similar sound, such as an ocean drum, rain stick, suspended cymbal, and maracas, to create a sound that is similar to white noise (a commonly used sound in electronic music). This sound introduces and accompanies a long pitch in the instruments of the deepest range in the orchestra. This pitch is augmented over time to create an "out of tune" aggregate effect through the use of consecutive semitones. Added pitches in a much higher register provide an allusion to frequency sidebands and harmonic resonant frequencies that are commonly exploited and emphasized in electronic music.

The instrumentalists create the "pulsing" effect that dominates Section II by playing a consistent pitch while dynamically growing and diminishing at a specified rhythm. For many instruments, such as the woodwinds and brass, this effect is achieved by way of a controlled vibrato at the specified tempo. String instruments perform passages in this section by simply using legato with a change of bowing for each pulse. Mallet percussion instrumentalists contribute to the texture by playing the specified rhythms and allowing the instrument to vibrate

(either by allowing notes played by the vibraphonist to sound without being dampened or simply not damping other instruments). Performance notes in each individual part describe how best to achieve this effect.

Another contributing factor to Section II is the concurrent use of several rhythmic motives to create a polyrhythmic effect. Each instrument is asked to "pulse" on a given rhythm, while another instrument enters with a different rhythm. Because the rhythms differ from instrument to instrument, the majority of articulations occur at different times within a measure.

Glissandi in various instruments principally characterize Section III. For the purposes of clarity, the author's use of the terms "glissando" and "glissandi" will be explained presently. Technically speaking, the terms "glissando" and "glissandi" are used when referring to musical gestures that involve moving between two pitches by performing the chromatic (or nearly chromatic) pitches between them. The author's use of these terms is both technically and practically correct when used in reference to the woodwinds, brass (except trombone and bass trombone), and pitched percussion. The strings, however, are asked to smoothly slide from one pitch to another without distinct chromatic articulation or emphasis. This effect is technically known as "portamento," but orchestration conventions dictate that this should be called "glissando" in the score. As the use of the term "portamento" would be confusing to the string performers of the orchestra, the terms "glissando" and "glissandi" are used in both the score and the analysis.

The chief choir that is used in this section is the strings due to the ease with which smooth glissandi can be achieved for long (breathless) periods of time. Other choirs imitate the glissandi of the strings by way of chromatic passages at differing speeds. The goal of

this section is to have a sound composed by different lines of glissandi moving at different speeds within different pitch ranges.

Section III abruptly shifts to Section IV. Unlike the previous sections that manipulate melodic and rhythmic motion (whether it be “pulsing” or glissandi), Section IV is almost exclusively focused on harmonic sonorities. Chromatic clusters with lengthy durations characterize this section. Mixed choirs of instruments play clusters determined by hexachords that combine to form the aggregate. One group of instruments lingers on a cluster of six chromatic pitches and then a transition occurs to another instrument group that performs the other six chromatic pitches. This texture builds and transforms by way of increased dynamics and changes in instrumentation until the climax of the piece is reached. This climax is a chromatic cluster that contains every pitch in at least a three-octave range being played by every member of the orchestra. This large chromatic cluster is then smoothly and slowly moved down by a minor third.

Shortly after the climax, materials from Section III return. The glissando focus is maintained while occasional outbursts from non-string instruments add color and dramatic intrigue to the sound world. This constitutes the beginning of Section V, which briefly summarizes the piece. This section does not sound like a proper return to any of the previous sections, but only references them by way of short passages and characteristic sounds from those units. The piece ends with a long low tone in the bass instruments.

Irony Machines is the largest and most important part of this dissertation, and was performed by the UGA Symphony Orchestra on April 21, 2011 at 3:30pm in the orchestra rehearsal room located in the Performing Arts Center.

Analyses

An accompanying document analyzes both *Irony Machines* and two pieces that are similar to it. In order to present this information in the clearest way, the dissertation document is organized as follows:

Chapter I	Introduction
Chapter II	An analysis of Luciano Berio's *Allelujah II* and *Perspectives*
Chapter III	An analysis of *Irony Machines*
Bibliography	
Appendix	*Irony Machines* in full score

Allelujah II was chosen as an analytical companion to *Irony Machines* in the forthcoming dissertation chapter because they are both works for orchestra and they contain four saxophones. An element of *Allelujah II* is the separation of the orchestra into five groups that are distributed physically throughout the performance area.

The analysis of Luciano Berio's *Allelujah II* includes a short section about the piece's historical context and place in the repertory. The primary focus, however, is on a theoretical evaluation that specifically spotlights the piece's formal units and how they are characterized. This includes an analysis of pitch classes, rhythmic details, and spatial considerations. Of particular note will be the contribution of the saxophones to the overall sound of the orchestra, the spatially separated groups to which they belong, and how they are used (or not used) to blend the groups together.

Luciano Berio's *Perspectives,* a piece of electronic music, was selected for analysis because it was written by the same composer as *Allelujah II*, it is similar to *Allelujah II* in its style, and it provides a point of comparison to *Irony Machines* since *Irony Machines* is written in an electronic style. The interrelationship of the pieces holds the analyses together conceptually. Like *Allelujah II* and *Irony Machines, Perspectives* uses complex textures as the primary focus of

the work. Spacialization effects are also common to all three pieces. *Perspectives* and *Allelujah II* are both have a pointillist texture throughout.

Analytical approaches to electronic music informs the analysis of *Irony Machines*. The article "Texture and Timbre in Barbara Kolb's *Millefolgie* for Chamber Orchestra and Computer Generated Tape" by Judith Lochhead[1] is observed to provide insight into how these elements can be discussed in a clear and concise manner. Lochhead's article uses language such as "murmur," "siren," and "swish" to describe electronic sounds. These types of labels not only work for this author's analysis of *Perspectives,* but they also prove useful in speaking about *Irony Machines* and *Allelujah II* due to their complex textures. Lochhead's article also focuses on the length of formal units and their constitutive parts, thus drawing the reader's attention to the "formal rhythm." Furthermore, Lochhead's article presents a format for discussing textural evolution and the relationship of formal units by way of tables, musical excepts, and terminology such as "textural crescendo." This approach to analysis is utilized in the discussion of the aforementioned works due to the adequacy of the means and language, as well as its ability to tie the pieces together.

Because this type of analysis is rarely employed in discussions of orchestral music, the language of electronic music is used in combination with more standard language of analysis to provide the most thorough study. This more standard language consists of the terminology and application of pitch-class set theory as set forth by Joseph N. Strauss in *Introduction to Post-Tonal Theory*[2] and other established terminologies from traditional tonal analysis. The traditional tonal analysis includes chord labels such as "major" and "minor," as well as functional labels

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[1] Judith Lochhead, "Texture and Timbre in Barbara Kolb's *Millefoglie* for Chamber Orchestra and Computer-Generated Tape" in *Engaging Music*, edited by Deborah Stein, 253-271 (Oxford: Oxford University Press, 2005).
[2] Joseph N. Straus, *Introduction to Post-Tonal Theory*, Third Edition (Upper Saddle River, NJ: Prentice Hall, 2005).

such as “dominant.” There is also a discussion of the textural evolutions found throughout the piece in orchestration, dynamics, and range.

CHAPTER 2

AN ANALYSIS OF LUCIANO BERIO'S *ALLELUJAH II* AND *PERSPECTIVES*

Luciano Berio's symphonic work *Allelujah II* was written between 1955 and 1958 in Milan, Italy.[3] This piece is distinctive in many respects, but only three special characteristics of the piece will be explored in this document. The first of these is the time in which it was written in the context of Berio's own output and style. The second aspect to be examined here are the unique textures and orchestral effects that appear in the piece. These textures involve collections of pitches, choices for the orchestration, general atmosphere (or mood), rhythm, and combinations of all of these elements. The third unique aspect to be explored will be the use of saxophones in the orchestra as non-soloists. Pieces using the saxophone in this manner are few in comparison to the many works for the orchestra with a featured saxophone, such as concerti or special saxophone solos.

* * *

Luciano Berio attended a public concert held on October 28, 1952 at the Museum of Modern Art in New York. The concert consisted of acoustic works by Edgard Varese and tape pieces by Vladimir Ussachevsky and Otto Luening. Berio found the electronically manipulated sounds of Luening and Ussachevsky invigorating, inspiring, and novel. Thus, Berio began the business of establishing a tape music studio in Milan, Italy.[4] With help from the then up-and-coming composer and conductor Bruno Maderna (who Berio met in 1953) and other technical

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[3] David Osmond-Smith, *Berio* (Oxford: Oxford University Press, 1991), 19.
[4] Osmond-Smith, *Berio*, 11-12.

assistants, the *Studio di fonologia musicale* was established in August 1955. Being one of many tape music studios to be founded in this decade, the Milan studio earned individuality by choosing not to strictly follow either the *Elektronische Musik* approach of the Cologne studio at Nordwestdeutscher Rundfunk or the *musique concrete* approach of the Paris studio at Radiodiffusion-Television Francaise. Instead, the Milan studio's strength was in blending the two approaches.[5] Berio's first work at the studio, *Perspectives*, was released in 1957.[6]

It was this investigation into the layering of electronic (and electronically altered) sounds that spilled over into Berio's acoustic writing. Also, the coordination of sound placement in a sound field became an aspect that the composer wanted to take advantage of in a traditional acoustic venue. In 1955 Berio took on the ambitious project of writing an orchestral work that would layer complex sounds live using the principles exercised in the studio. The spatial aspects of the orchestral sounds would be accomplished by dividing the orchestra into six instrumental groups that are distributed widely across the performance space. The resulting work, *Allelujah*, premiered in Cologne in 1957. Upon first hearing the piece live, Berio realized that the piece, as it existed then, did not satisfactorily demonstrate the principles that he had set out to exploit. Thus, an almost complete recomposing process began.

Allelujah II exists as an elaborate reworking of *Allelujah*. Taking what he had learned from the first piece at its Cologne premiere, the orchestra was now divided into five groups instead of six.[7] The instruments included in each group were also reconsidered to bring out a

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[5] Joel Chadabe, *Electric Sound* (Upper Saddle River: Prentice Hall, 1997), 48.
[6] Osmond-Smith, *Berio*, 14.
[7] Osmond-Smith, *Berio*, 19.

more distinct character. The composer also provided specific directions for how the instrumental groups are to be distributed on the stage (which will be discussed later in this document).[8]

The reworking of *Allelujah* brought the piece closer to Berio's initial aspirations for the piece. The two *Allelujah* works received their title from Berio's description of his compositional goals. He wished to establish an "apparent alleluiatic disorder kept at bay by hidden symmetries."[9] His "hidden symmetries" can be found in the quasi-serial pitch orderings he chose and their consequent impact on the form of the piece.

The "disorder" is more difficult to ascertain and define. This author's hypothesis is the combination of the unusual treatment of the orchestra as if it were a complex electronic sound source, the divisions of the instruments into smaller groups, the unfamiliar spatial arrangement of those groups, and the weaving together of intricate textures all serve to create the apparent "disorder."

Examining the electronic works by Berio from this period of his career also proves to be a valuable tool for comparison and contrast to *Allelujah II* in how he handles timbres and textural material. Two notable works are the aforementioned *Perspectives* (1957) and *Thema (Omaggio a Joyce)* (1958), both for two-track tape; these works display similar treatment of time, development, and types of texture. *Allelujah II* also shares many similarities with *Nones* (1954), Berio's first orchestral endeavor, including the treatment of pitch material in a quasi-serial fashion and additions to the orchestra's instrumentation (in the case of *Nones*, an electric guitar).

The separation of the orchestra into several spatially separated groups was also being explored by Karlheinz Stockhausen at this time, resulting in the piece *Gruppen* which was started

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[8] Luciano Berio, *Allelujah II* (Milan: Edizioni Suvini Zerboni, 1960), 3.
[9] Luciano Berio, *Two Interviews* (New York: M. Boyars, 1984), 64.

in 1955 and premiered in 1958 (the same years as the *Allelujah* projects).[10] The similarities with *Nones* and *Gruppen* will not be explored in the present document as the focus remains on textural and timbral considerations of *Allelujah II* compared to *Perspectives*.

* * *

In attempting to understand the timbres, textures, and spatialization effects of *Allelujah II*, it is crucial to examine the ways in which Berio divides the orchestra. The first division is the establishment of five instrumental groups, each of which has a particular sound character. Table 1 details the members of each group and provides a description of the dominant timbres in those groups. Table 1 also shows that the aggregate instrumentation is similar to the standard orchestral instrumentation. There are a few notable additions: the electric guitar that is among the pitched percussion instruments of Group I, the two alto saxophones among the woodwinds of Group II, and the two tenor saxophones among the brass instruments of Group V. The strings are divided between the different groups such that each group has a string instrument represented. The ten violins, ten violas, and six contrabasses maintain all players in their respective groups. The eight violoncellos are split evenly among Group II and Group IV.[11]

Berio insists that the groups should be arranged around the performance area to provide a more unique utilization of the sound field and enable spatial effects to be performed across acoustic families. Guidelines are given by the composer in the score as follows:

> The five groups can be arranged in different ways according to the size, acoustic features, and architectural characteristics of the site chosen. For the performance, however, any arrangement made must consider the need to put at least one or two groups behind or beside the audience and take into account that:
>
> 1. Groups should be spaced as far apart as possible from one another.

[10] Osmond-Smith, *Berio*, 16-19.
[11] Berio, *Allelujah II*, 4.

Table 1 - How the orchestra is divided into five groups and the dominant timbres in each group.

Complete Instrumentation List	Group Composition	Dominant Timbres
	Group I:	
	Celesta	
4 Flutes (II in sol, II and IV double as piccolos)	Vibraphone	
	Marimba	
2 Oboes	Electric Guitar	
English Horn	2 Harps	
E-flat Clarinet	Tubular Chimes	Percussion (mixed) / Basses
2 B-flat Clarinets	2 Bongos	
B-flat Bass Clarinet	9 or 10 Chinese Gongs	
2 Alto Saxophones	Bass Drum	
2 Tenor Saxophones	Triangle	
2 Bassoons	6 Double Basses	
Contrabassoon	Group II:	
8 Horns	4 Flutes	
6 Trumpets (I doubles as Trumpet in F or Trumpet in B-flat)	2 B-flat Clarinets	
	B-flat Bass Clarinet	
	2 Alto Saxophones	Woodwinds / Percussion (mixed) / Cellos
5 Trombones	Timpani	
Tuba	Xylophone	
Contrabass Tuba	4 Cowbells	
Timpani	Triangle	
2 Snare Drums	4 Violoncellos	
2 Bongos	Group III:	
3 Tom-toms	4 Horns	
3 Tam-tams	3 Trombones	Brass / Non-pitched Percussion / Violins
3 Suspended Cymbals	Contrabass Tuba	
Bass Drum	3 Tam-tams	
2 Triangles	3 Suspended Cymbals	
2 Wooden Drums	10 Violins	
4 Cowbells	Group IV:	
5 Temple Blocks	2 Oboes	
9 or 10 Chinese Gongs	English Horn	
Tubular Chimes	E-flat Clarinet	
Piano	2 Bassoons	
2 Harps	Contrabassoon	Woodwinds / Percussion (mixed) / Cellos
Celesta	3 Trumpets	
Glockenspiel	2 Snare Drums	
Electric Guitar	3 Tom-toms	
Xylophone	4 Temple Blocks	
Marimba	Glockenspiel	
Vibraphone	4 Violoncellos	
10 Violins	Group V:	
10 Violas	2 Tenor Saxophones	
8 Violoncellos	4 Horns	
6 Double Basses	3 Trumpets	
	2 Trombones	Brass / Violas
	Tuba	
	2 Wooden Drums	
	10 Violas	

> 2. Groups II and III, and Groups IV and V, should especially be placed as far apart as possible. Therefore, it is always preferable that Group V is placed behind the audience and Group III be placed in front of the audience, the maximum distance away from Group V. If the stage is sufficiently wide enough, Groups II and IV should be placed on the extreme left and right sides of the stage.
>
> 3. For groups located behind or to the sides of the audience, possibly elevated on platforms, an additional conductor is almost always required because the room does not allow all five groups to be controlled by a single conductor.
>
> 4. The 10 violins of Group III and the 10 violas of group V must each sit side by side to form lines. The line should be opposite one another and spaced as far apart as possible. It is preferred that the violins and violas take their place after all of the other instruments.[12]

The composer then goes on to visually diagram different arrangements of the orchestra from which a conductor may choose. In describing the relationship between Group II and IV, the term "rival" is used because these groups are always to be kept on different sides of the audience and as far apart as possible. "Rival" is also used to reference the relationship between Group III and Group V for the same reasons. Examining these suggestions more carefully uncovers certain spatial aspects of the piece that are very important.

Because no directions are given in reference to the placement of Group I, this group is placed in front of the audience in every suggested diagram and, in most, it is the closest to the center of the stage. The reasons for this placement pertain to the characteristics and interactions of the group. Part of the reason for this is the quiet instruments in the group such as the celesta, vibraphone, marimba, harps, and piano. The placement of the electric guitar can provide insight into how that instrument is used and its role within the Group I.[13] The electric guitar has a similar timbre to the keyboard and keyboard percussion instruments of the group. Therefore, the group maintains a variety of sounds that can be exploited in the work, but maintains uniformity in that the keyboard percussion sound is dominant. The electric guitar does not only function as

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[12] Berio, *Allelujah II,* 3.
[13] Berio, *Allelujah II,* 4.

a homogeneous contributor to Group I, but is also used as a bridge between instruments from different groups. One example of this connecting role can be found in measure 32 of the piece (See Figure 1). The electric guitar is playing in unison with the vibraphone tremolo (the vibraphone being a fellow member of Group I) which reinforces the pitches G-flat and B-flat while also serving as an initiator of the gesture played by the second flute (Group II) at the anacrusis of measure 33. The second flute's gesture begins with a B-flat and moves to an A-flat.[14]

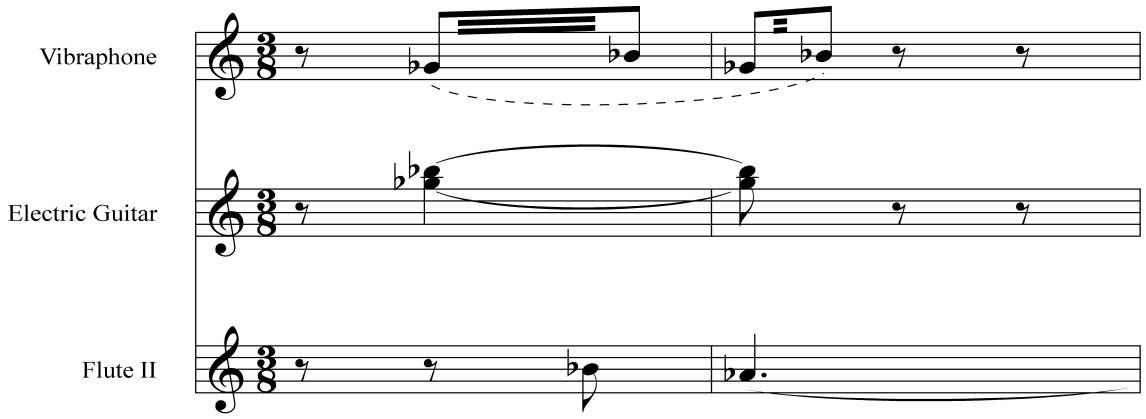

Figure 1 - Berio, *Allelujah II*, m. 32-33.

The texture of this opening section to the work is comprised of the individual instruments of the orchestra making brief points of sound that occur quickly. Because these sounds are also varied, the aggregate effect is turmoil and confusion. In such a texture, moments like the one shown above provide continuity and connect isolated points of sound.

Directions dealing with Group II mention the required distance away from Group IV. Both Group II and Group IV feature similar instrumentation (see Table 1). They each contain

[14] Berio, *Allelujah II*, 9.

roughly half of the orchestra's woodwind choir (high and low voices being spaced roughly equally among the groups) and the eight violoncellos (also split evenly). Furthermore, they both feature percussion sections that mix pitched and non-pitched instruments. Because these groups are so similar and are preferred to be on different sides of the audience, passages in which sounds travel from one group to the other have a special spatial effect.[15] Perhaps the most powerful of these events occurs at measures 183 through 185 (see Figure 2).

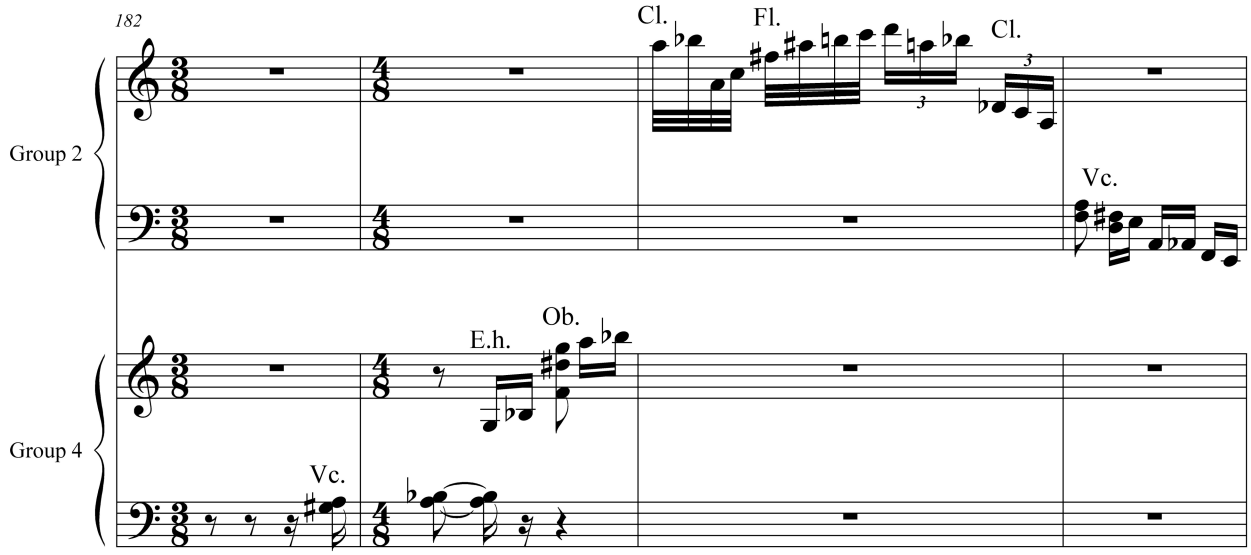

Figure 2 - Berio, *Allelujah II*, mm.182-185.

A rising gesture initiated by the violoncellos in Group IV at the anacrusis to measure 183 is passed among the instruments of Group IV and is assumed by the clarinets and piccolos of Group II at measure 184. At the midway point of measure 184 the gesture reaches its peak and begins a descent through the instruments of Group II and ends in the violoncellos of Group II. Because the groups are similar in their instrumentation, the composer is able to begin and end the

[15]Berio, *Allelujah II*, 3.

gesture with the same instruments while allowing for the spatial movement to occur near the peak in instruments of similar timbre.[16]

Groups II and V are constructed and treated in much the same fashion. Both of these groups feature a heavy brass presence. The eight horns are divided equally with four in each group. The five trombones are distributed as three in Group III and two in Group V. Group III contains the Contrabass Tuba while Group V has the Tuba. Both groups are given a compliment of non-pitched percussion instruments. The string families assigned to each group are the violins for Group III and the violas for Group V.[17] An effective demonstration of how there groups are used can be found at measures 61 through 74. This section alternates between gestures that are played exactly together and gestures that use a "call and response" effect. Given the spacing of the groups on opposite sides of the audience, this type of alternation is extremely effective in conveying the spatial goals of the work.

Table 2 - The rhythmic content of m. 61-75 in Berio's *Allelujah II*.

m. 61	m. 62 - 64	m. 65 - beat 1 of 66	m. 66 - 75
Together	Call and Response	Together	Call and Response

Measure 61 begins with a long B-flat held in the violins and violas of each respective group. The Group III violins are decreasing in volume from a *fortissimo* entrance. the Group V

[16] Berio. *Allelujah II*, 35-36.
[17] Berio, *Allelujah II*, 4.

violas are increasing in volume from a *pianissimo* entrance.[18] Table 2 shows the gesture scheme of the section by measure or collection of measures. The labels "together" or "call and response" describe the gestural content.

Another notable section of interplay between groups earns special mention. The six trumpets have been equally dispersed among Group IV and Group V. In the especially brass heavy section of the work around measure 147, Berio passes the C5 from the trumpets of Group IV to those of Group V. This handshake between the two groups of trumpets not only serves the purpose of smoothly sending the listeners' attention to a new area of the listening space, but also serves the practical purpose of allowing the Group IV trumpets to breathe and rest after their especially long and challenging feature (that is, measures 131 through 148, and most especially 143 through 148). The Group V trumpets then perform a rhythmically dense section while the trumpets of Group IV support with long tones, followed by their own individual dense material.[19] This section not only adds depth and complexity to the aggregate ensemble sound, but adds another layer of complexity in the listening space.

To rightly understand the role that each group plays relative to one another, a discussion of the overall formal structure of *Allelujah II* is warranted.[20] The piece is constructed in two major parts. The first part introduces the pointillistic style of writing that governs the entire work. In this style, brief gestures are played by individual instruments. The development of the work can often be observed in the amount of silence between the gestures, the instruments playing them, and/or how they connect to one another. Despite the pointillist focus, there is an

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[18] Berio, *Allelujah II,* 14-16.
[19] Berio, *Allelujah II,* 25-29.
[20] The analytical methodology used in this and the following chapter is strongly influenced by Judith Lochhead's "Texture and Timbre in Barbara Kolb's *Millefoglie* for Chamber Orchestra and Computer-Generated Tape." The full article is cited in this document's bibliography.

almost constant current of sound. The first major part of the work is divided into two smaller parts. Each of the smaller parts contain two subdivisions. Table 3 describes how the first part is constructed.

Table 3 - Formal units by duration and measure in the first part of Berio's *Allelujah II* with a brief description and label.[21]

Measure Range	Time	Description	Label
1 - 50	0'00" - 1'20"	Woodwind and Pitched Percussion dominant	I-A1
51 - 128	1'20" - 3'44"	Brass and Strings dominant with woodwind interludes	I-A2
129 - 145	3'44" - 4'11"	large crescendo lead by Brass and Non-pitched Percussion.	Transition 1
146 - 177	4'11" - 5'10"	loud, frantic Brass stabs	I-B1
178 - 207	5'10" - 6'02"	loud Brass stabs juxtaposed with soft long tones	I-B2
208 - 212	6'02" - 6'20"	Saxophone "handshake" to second part	Transition 2

Groups containing the dominant forces of each section are, therefore, used to a greater extent. This also means that the spatial effects between the featured group and its "rival" (groups that are intended to be placed as far physically apart as possible) are of special significance in certain

[21] The times provided here come from the recording listed in the bibliography of this document. The compact disk is an LP transfer and features the BBC Symphony Orchestra with Berio and Pierre Boulez conducting.

structural sections. The aforementioned interaction of Group II and Group IV in the rising and falling motion of measures 183 through 185 occur as a brief respite from the loud brass stabs that characterize section I-B2. The viola and violin interactions of measures 61 through 75 described above occur as part of the string dominance of section I-A2.

Section I-A1 is performed almost entirely by Groups I and II. The soft woodwinds of Group II with the pitched percussion of Group I open the piece with pleasant docility. The only instruments that have a significant role in I-A1 outside of Groups I and II are the violins of Group III that provide an underpinning of long tones and low-volume "points" in the second half of the section.

Groups III and V are the initial focus of section I-A2. These groups are heavily populated by brass and string instruments. The woodwinds of Groups II and IV provide most of the interlude material while the trumpets of Group IV shine out in the brass-dominated sections. Because of the natural loudness of brass instruments, this section has a larger dynamic range than did I-A1. This serves as a large scale crescendo to the very loud Transition 1. Transition 1 features all of the groups, thereby introducing the full orchestral forces.

In the frenzied jumble of brass stabs that characterize section I-B1, Groups III, IV, and V are used to the near exclusion of I and II. Group IV, which contains the three trumpets that aid the thundering brass, also has a great deal of woodwinds to provide a softer layer underneath.

The main spatial play in this section occurs between the brass families of Groups III and V. The composer uses the rhythms of Groups III and V's brass to lead the listener's ear from one spatial zone to another in measures 146 through 150. This motion can be seen in Figure 3. The brass of Group III initiates the gesture with relatively long, held notes. Those notes are then passed to the brass of Group V. In many of the composer's diagrams on how to physically

arrange the orchestral groups, this motion would be perceived by the listener as a motion from front to back. After this a short, forceful stab in Group III sets up a delayed response from Group V. Then, both Groups stab together in measure 149. After this moment together, Group V takes over as the dominant group for a further 10 measures.[22]

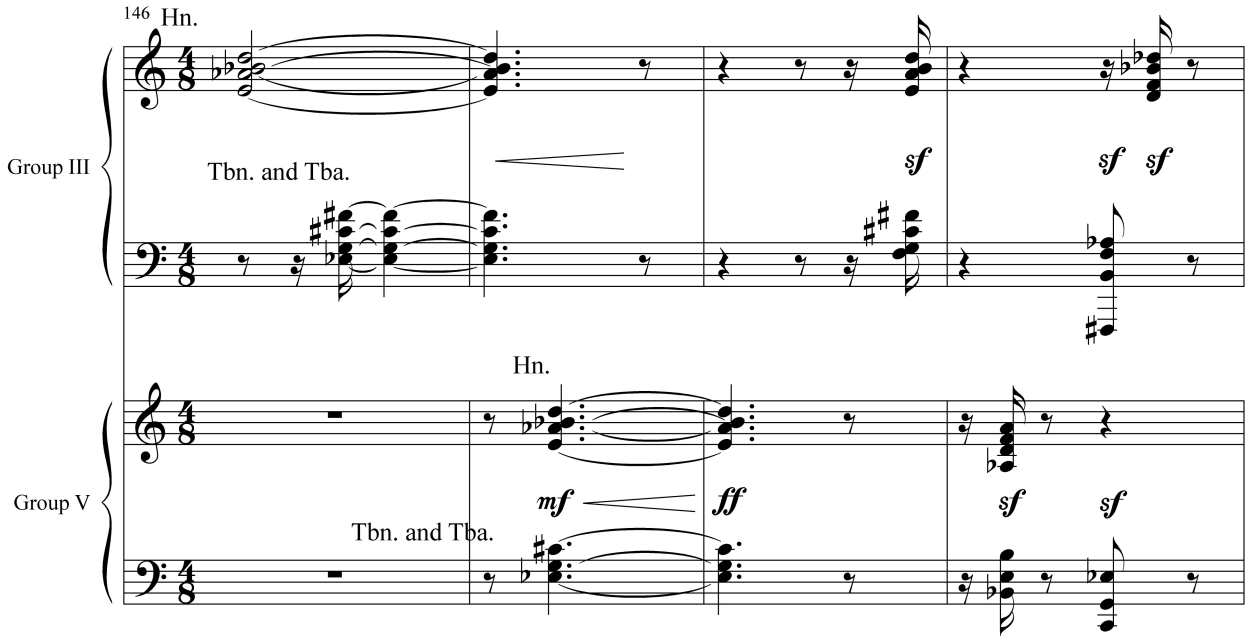

Figure 3 - Berio, *Allelujah II*, m. 146-150.

In section I-B2, the brass stabs continue, but the role of the woodwinds and strings takes on more prominence. Though this stabbing texture characterizes the section as a whole, one portion of music stands out in terms of interrelating the instrumental groups and spatialization. This portion, measures 180 through 192, is characterized by almost abrupt shifts of material from one group (or collection of groups) to another.[23] Table 4 details these shifts. The performance groups could be arranged in any of Berio's suggested positions, but in every possible orientation

[22] Berio, *Allelujah II*, 28-31.
[23] Berio, *Allelujah II*, 36-38.

the changing of groups will create a spatial effect. Moreover, since the groups have different comprising instruments, this type of orchestration means a significant change of timbre each time a new group is used. In this section, the pitch material travels through these instrument families in this order: strings, brass, strings, woodwinds, strings, brass, strings and brass.

Table 4 - Group dominance by measure in Berio's *Allelujah II*, m. 180-192.

Measure or Measures	Group or Groups Performing
180 - 182	Group V
anacrusis to 183 - 183	Group IV
184 - 185	Groups I and II
186	Group III
187	Groups III and IV
188 - 192	Groups IV and V

Measure 208 marks the beginning of Transition 2, the transitional material that ushers in the second major part of the composition. These five measures from 207 to 212 feature the saxophones, which are in Groups II and V.[24] These instruments are not included in the standard orchestra, so the prominent feature of these instruments attracts special attention from the listener. The saxophones may have been chosen for this transition for many reasons including: the aforementioned fact that they are not part of the standard orchestral instrumentation, they provide spatial interest to the section because of their placement in different groups, and their tremendous blending power.

The saxophone is a woodwind instrument that can augment and support the woodwind choir. Saxophones also have a timbre similar to brass instruments. Because of these

[24] Berio, *Allelujah* II, 41-42.

characteristics, saxophones can serve as a bridge between the woodwind and brass families. This aspect of their orchestrational use will be explored in the following discussion of the second half of the piece. Furthermore, the saxophones share an aspect with the strings in that both the strings and the saxophones have a quite homogeneous timbre throughout the overall range of the family. Because of all of these factors, the saxophones make great candidates for transitional portions such as this one. Section I-B2 ends with the entire orchestra playing. The saxophones come out of the full orchestra to perform the transition. Only soft, sustained sounds from the upper strings augment the saxophone sound of Transition 1, but as Section II-A1 begins, the saxophone is used to blend different instrument choirs. At measure 215, woodwinds join and blend with a sustaining alto saxophone. Then the tenor saxophone blends with the woodwinds, and as those woodwinds are subtracted leaving the tenor sustaining a note, the brass enters and blends into the texture at measure 219.[25]

The second half of *Allelujah II* begins in measure 213. Table 5 shows the measure numbers, duration, dominant timbre, and this author's labeling of the sections in this half. By and large, this half is much slower in tempo with outbursts of loud cluster-type harmonies. This slower tempo is initiated by section II-A1. Long tones prevail in this section. Because of this, dynamic changes become more central to the complexity of the piece. One of the most interesting dynamic passages in section II-A1 occurs from the anacrusis to measure 268 through 269. This section consists of a chord that is passed from the cellos of Group II to the violins of Group III to the cellos of Group IV.[26] Because the chord is passed between the instruments of different groups, it is also passed through the listening area spatially. Figure 4 shows the motion

[25] Berio, *Allelujah* II, 40-43.
[26] Berio, *Allelujah II*, 52.

of the chord through the instrumental groups. In this figure, an [0157] tetrachord is passed from Group II to Group II and then Group IV.

Table 5 - Formal units by duration and measure in the second part of Berio's *Allelujah II* with a brief description and label.

Measure Range	Time	Description	Label
213 - 288	6'21" - 9'32"	Woodwind long tones, String pizz., Brass stabs	II-A1
289 - 339	9'33" - 11'08"	Woodwind long tones, more rhythmic motion	II-A2
340 - 359	11'09" - 11'52"	loud Brass stabs, Woodwind interludes	Transition 3
360 - anacrusis to 447	11'53" - 15'29"	soft, long tones in Woodwinds and Pitched Percussion	II-B1
anacrusis to 447 - 459	15'30" - 15'54"	Brass dominate	Transition 4
460 - 477 (end)	15'55" - 16'37" (end)	Denouement	II-B2

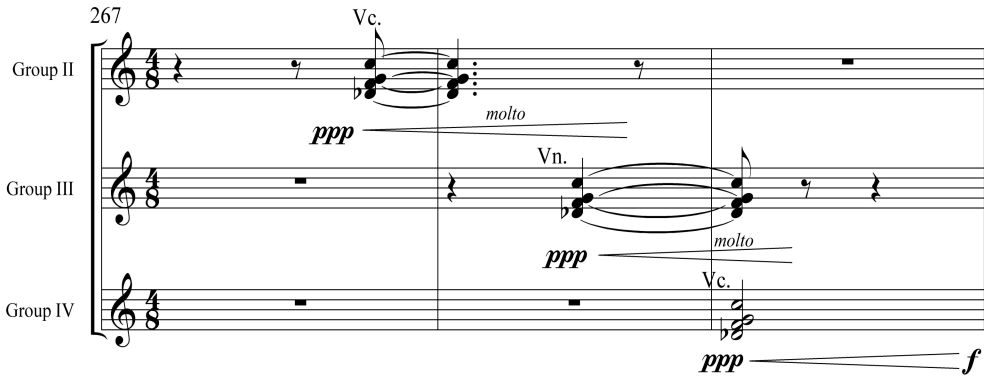

Figure 4 - Berio, *Allelujah II*, m. 267-269.

Section II-A2 is similar to section II-A1, but the rhythmic activity has increased. There are also more measures that are more thickly orchestrated. Take, for example, the sonority present in measures 320 and 321. The dynamic level is *forte* and a reduction of the sonority appears in Figure 5.[27] The overall structure of *Allelujah II*'s second half is very similar to the first half. The harmony presented here is based on concurrently performed triads. The notes of the bass clef constitute a G minor triad with an outlying C as the lowest pitch. The treble clef voices perform the pitches of a B major triad, an A major triad, and F and A-flat (perhaps part a D-flat major triad, counting the enharmonic C-sharp).

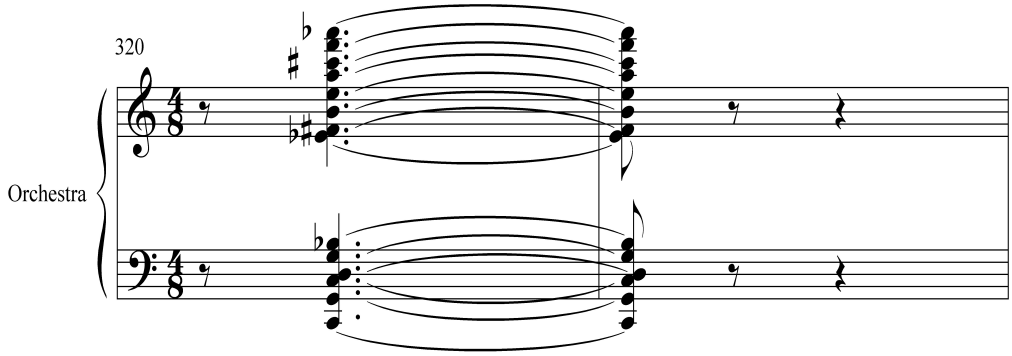

Figure 5 - Berio, *Allelujah* II, m. 320-321.

There are six divisions within each half. Table 6 visually displays the near symmetry of the work. The symmetry can be further emphasized by reviewing the criteria by which this author applied these labels. In every section except transitions, a Roman numeral is assigned. This Roman numeral indicates which half of the piece the section occurs. The Arabic letter indicates both the placement within its half (A sections temporally coming before B sections) and to indicate musical similarities such as rhythmic profile or dominant instrumentation. In the case of

[27] Berio, *Allelujah II*, 62.

I-A1 and I-A2, the similarity is the rhythmic profile. Both sections share a profoundly pointillistic style. The final Arabic numeral indicates changes within similar sections. Again in the case of I-A1 and I-A2, the change is the instrumentation. Section I-A1 is dominated by woodwind and pitched percussion instruments. Section I-A2 is dominantly brass. Sections I-B1 and I-B2 share assertive brass stabs. Section I-B2 is slightly different in that there are soft long tones in the other instrument families and a slight reduction in the overall dynamic level.

Table 6 - The near symmetry of the formal units of Berio's *Allelujah II*.

First Half Section Labels	Second Half Section Labels
I-A1	II-A1
I-A2	II-A2
Transition 1	Transition 3
I-B1	II-B1
I-B2	Transition
Transition 2	II-B2 (Denouement)

Sections II-A1 and II-A2 share long woodwind tones with a few pizzicato string and brass stab interjections. II-A2 includes a slight increase in the rhythmic motion. Sections II-B1 and II-B2 are both dominated by long tones in the woodwinds with much support from the pitched percussion. Section II-B2 is a denouement to the piece as a whole, and within it the rhythmic motion has slowed. The sections II-B1 and II-B2 are also interrupted by a transitional section that is characterized by brass dominance.

* * *

Luciano Berio's *Perspectives* is a nearly seven minute long work for two-track magnetic tape. The piece has a similar character to *Allelujah II* in that they both put forth a *pointilliste* style of writing, they both use long tones in juxtaposition to these points later in the respective

pieces, they both contain spatialization techniques, and they both use dramatic and abrupt changes in dynamic level to add theatrical intrigue. In his 1991 book on Berio's life and music, entitled simply *Berio*, David Osmond-Smith says this about *Perspectives*:

> Berio's own work in the *Studio di fonologia* during 1957 moved beyond the exploratory stage, and began to open up new territory. In *Perspectives* he limited his resources to four types of electronic sound, one of which was particularly important in establishing the work's character. He recorded sine waves of differing pitch, cut the tapes into small pieces, and made of them a *montage* with a regularly recurring pattern. Played at their original recording speed, these produced a sort of manic tintinnabulation, such as can be heard at the start of the piece. But speeded up, the individual components merged to produce a single complex sound with a characteristically shimmering quality. Berio had, in other words, found a means of generating complex timbre by accelerating micro-montages: a stimulating and relatively rapid alternative to the painstaking superposition of basic components pioneered by Stockhausen a few years earlier.[28]

The work is organized into eight sections, each set apart by lengthy (usually about 3.5 seconds in length) silences. Table 7 details the section number (here in the table in Roman numerals), the length of time that section occupies in the work, and a general characterization of the mood of each section.

The introductory section, Section I, introduces the two main musical materials of the work, extremely short sounds and long sounds. The extremely short sounds, referred to here as "points," were generated by the compliment of nine oscillators available in the Milan studio.[29] As David Osmond-Smith explains, different pitches of sine waves were recorded onto different tapes. Those portions of tape were then cut, jumbled, and reassembled to created a "manic" series of pitches. This sine wave pattern is used and manipulated throughout the piece, making it the most important force in the work. The other sounds are sustained for much longer periods of

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[28] Osmond-Smith, *Berio*, 14.
[29] Chadabe, *Electric Sound*, 48.

time and are referred to here as “long sounds.” Many of these sounds are reminiscent of bells, both in their metallic timbre and loud attack that quickly fades. This author believes these sounds to be manipulated recordings of actual bells. Other long sounds are present in the piece as well with different timbres and lengths. Section I is quiet and sparse, setting an atmosphere of anticipation while introducing the compositional elements.[30]

Table 7 - The formal units of Berio’s *Perspectives* with time markers and a brief description.

Section	Time	Description
I	0'00" - 0'16"	"Points" dominate, few long sounds
II	0'17" - 0'52"	"Points" dominate, long sounds become more prominent, frequency range increases
III	0'53" - 1'30"	Long sounds dominate, "points" used as initiators or color, "points" also evolve a softer envelope and shimmering reverb
IV	1'31" - 2'32"	"Points" dominate but retain the softer character of section III, all sounds have more reverb
V	2'33" - 5'17"	Long sounds dominate, more reverb on all sounds, focus on abrupt dynamic shifts
VI	5'18" - 5'39"	Long sounds and "points" share equal emphasis
VII	5'40" - 6'19"	"Points" dominate, long sounds are dynamically louder
VIII	6'20" - end	Long sounds and "points" share equal emphasis, dynamically much softer, more ambient

[30] Osmond-Smith, *Berio*, 14.

In Section II, the points are still the dominant force, but the long sounds have taken a more central role. Not only have the long sounds become dynamically louder, but the register range of the sounds have deepened. Because the long sounds are the lowest sounds heard to this point in the piece, their continued increase in prominence is emphasized. At this point, the pendulum of emphasis has begun to shift away from complete dominance of points and toward the dominance of long sounds.

Section III is marked by the governance of long sounds. Because of this, the piece takes on a more harmonic ambiance. Berio gradually applies more rounded attacks to the entrances throughout the section. The envelope of the points also begin to feature softer attacks. The role of these points has become that of initiators and color effects atop the dominant long sounds. As initiators, the points accompany the attack of the long tones to create a complex start to the sounds. Furthermore, the addition of the points (in a sped up version) after the long sounds have begun adds a layer of complexity to the texture of those long sounds. Also, the points decay more slowly and smoothly. More reverberation is applied creating a shimmering timbre. As Section II increases the register of the piece to include more lower frequencies, Section III does the same toward the upper frequencies. Additionally, the pendulum swings even further towards long sound supremacy.

The increase in reverberation on the points continues to add ambience in Section IV. Like Section II, the mix of points and long sounds is slightly in favor of the points, but the long tones are not relegated to background material or color. Section IV is the longest section thus far in the work, lasting just over one minute. During this portion of the piece, the point material continues its recognizable sequence, but the character of the material is drastically different than the first presentation in Section I. As stated before, the reverberation applied to the sound has

increased, but the layering of the sound (at different speeds, volume levels, and pitch levels) both atop one another and atop the long sounds increases the dramatic tension of the piece.

Section V contains the climax of *Perspectives*. To this point, the piece has been ever growing in the areas of dynamics, density of textures, and increased ambiance due to reverberation. That reverberation increases even more and is applied to almost every sound in Section V. By and large, the long sounds dominate this section. Thus, the pendulum tips slightly away from Section IV's slight emphasis on the points. This section is also the portion of the piece that deals with dynamic contrasts in a more abrupt and urgent way. Sections I through IV have been participants in a large scale crescendo. This crescendo leads to the abrupt dynamic changes of Section V. Those dynamic changes lead to the loudest part of the work, and marks the dramatic climax of the piece, at 4'52". This dramatic moment is created by using concurrent long sounds that represent every range of the listening spectrum, as well as loud stabs of the points in the higher registers. These points are varied in speed and pitch, and stacked together to form the most complex timbres heard in the piece.

Section VI retains the ambiance of reverberation that saturated Section V. This section, however, dials back on the loud dynamic outbursts and abrupt dynamic shifts. The pendulum of emphasis rests evenly between the long sounds and points. Also, this section is brief, lasting only twenty one seconds. This brevity is striking due to its position immediately following the relatively lengthy Section V (which was 2'44"). Another brief section begins at 5'40". Section VII is mostly focused on the points, but the volume of the long sounds jut out of the mix quite strikingly. These longs sounds, when present in this section, are quite a bit louder than their shorter counterparts. This section lasts thirty nine seconds.

The final section, Section VIII, is characterized by quiet ambiance. If Sections I - IV (and the first portion of Section V) are viewed as a large crescendo to the climax, Sections VI - VIII should be seen as a large diminuendo. The pendulum of emphasis rests in the center between the long sounds and points. The piece, as a whole, has a surprising number of complexities in its narrative given the economy of sound sources used in its composition. One layer of complexity is the giving and taking of emphasis to the long sounds and the sine-wave points. Another layer is the large scale crescendo and diminuendo embedded into the piece. Yet another is the layering of textures and the evolution of those textures via applied electronic manipulations such as reverberation and spatialization.

* * *

Allelujah II and *Perspectives* are manifestations of Berio's interest in a pointillistic approach to writing. Furthermore, they both stand as testaments to Berio's ability to create complex textures through layering few individual musical elements concurrently. These works hold many of the governing ideas that are heard in *Irony Machines*, which will be examined in the following chapter. All of these works (*Allelujah II, Perspectives,* and *Irony Machines*) feature melodies and specific harmonies, but the shifting of timbres as well as increases and decreases of the complexity of those timbres act as the primary narrative force. The juxtaposition of thin textures to thick ones, the duration of formal units or sections and how they relate to those surrounding, and the exploitation of changing instrumentation (or sound types in the case of *Perspectives*) are emphasized.

Chapter 3

ANALYSIS OF *IRONY MACHINES*

Irony Machines is an approximately sixteen minute long tone poem for orchestra. The work draws its inspiration from many sources. It is, in the composer's intention, a manifestation of a desire to write a piece for a large acoustic force with an electronic music approach and aesthetic. As such, instrumentalists in the orchestra are asked to perform a vocal effect (a "sh" sound to be discussed shortly) as well as play lengthy passages using less standard techniques. One of the central features of this work is the creation, evolving, and exploring of textures of sounds. The labeling of sections (found on page 2 of this document) is determined by what texture is most prominent in that section. When a different texture become the most prominent musical idea, the section label is changed. The following analysis of *Irony Machines* is not intended to account for every note, but to describe these sections which feature different musical ideas and to point out key representative moments.

Throughout the piece, as these textures are presented, explored, and exchanged with other textures that assume the most prominent role, some musical materials are needed to tie the sections together. In the interest of maintaining a cohesive whole, two sonorities are used throughout all of the sections. The [016] trichord is juxtaposed with sonorities built upon major and minor thirds. Depending on how it is orchestrated and spaced, the [016] trichord may be heard as dissonant, consonant, or a mix of these. In most cases, the trichord is presented in the most compact arrangement (a minor second and a tritone above the lowest pitch). In this arrangement, the dissonance of the trichord is emphasized.

The interval of a third (major and minor) is used to balance the [016] trichord and create contrasting types of sonorities. In most cases, the major or minor third is presented as the two pitches required to form the interval. Again, orchestration and spacing are crucial in determining the audible character of the interval. The middle and upper registers of the orchestra are used most often to perform the thirds (or sonorities built upon them). Thirds in the lower registers may come across as "muddy" or "dark." The interaction of [016] and sonorities built on thirds is used to create a common thread that is used across the sections to tie the piece together.

The musical materials were inspired by various composers and works. The tone poems of Richard Strauss proved useful, especially in terms of form and general atmosphere. Texture-based compositions such as Iannis Xenakis' *Metastasis*, Tristan Murail's *Gondwana*, and Gyorgy Ligeti's *Atmospheres* also aided in providing examples of how to govern duration of formal structures in a textural context. This is not to exclude the profound effect of the aforementioned works by Luciano Berio; *Allelujah II* and *Perspectives.* Electronic works such as Otto Luening's *Low Speed* and Morton Subotnick's *Silver Apples of the Moon* were monumental in their influence on *Irony Machines* as well. The Subotnick and Luening works are electronic compositions.

Another source of inspiration for the work was late-1970's and early-1980's Futurist art. Concept artists were hired by NASA at this time to visualize space colonies and efficient architecture on various planets. This art has a powerful scale made by the juxtaposition of very small human representations against large geological features such as mountains and deserts. Buildings were given a sleek but functional appearance. There was also the work of more abstract Futurists and Surrealists of the previous generation such as Marcel Duchamp.

In addition to the aforementioned musical and artistic considerations, the piece is inspired by the subject of irony. Irony is a complex mental process that can force an emotional response. Because of this, irony could be seen as something to aspire to as a means of living an interesting life. Noted author and intellectual Christopher Hitchens tells his approach to life after being diagnosed with esophageal cancer:

> I know what's coming. I know no one beats these odds. And it's a matter of growing up and getting used to that, and realizing that you are expelled from your mother's uterus as if shot from a cannon towards a barn door studded with old nail files and rusty hooks. It's a matter of how you use up the time in an intelligent and ironic way, and try not to do anything as ghastly as your fellow creatures.

In his book *God is not Great: How Religion Poisons Everything*, Hitchens goes on to say, "The struggle for a free intelligence has always been a struggle between the ironic and literal mind."[1] Irony, as defined by this author, is the use of words or actions to convey the opposite of their literal meaning. In many cases, creating irony requires a substantial social and terminological context. Pieces of music that use acoustic instruments for considerable amounts of time to create unconventional sounds is not exclusive to this piece, nor is the act of using extended techniques ironic. Part of the irony of *Irony Machines* lies in the intention of this composer of making the orchestra sound like a complex electronic instrument and its product sound like a piece of electronic music. Electronic music being performed by a large acoustic force is intended to convey irony.

Further, it is such a difficult idea to both define and execute that it has long been believed that humans are the only organisms capable of this function. Recently, however, computers have

[1] Christopher Hitchens, *God is Not Great* (New York: Twelve Books, 2007), 124.

been programmed to detect and interpret concepts such as puns, humor, and irony. These machines are also capable of creating ironic sentences and "speaking" them aloud. The wish to be ironic, the human capacity to be ironic, and the desire to create new things has now manifested in a computer that can behave more like a human. A machine behaving as a human may be viewed as ironic.

* * *

The piece begins with the members of the orchestra making a vocal "sh" sound. This vocalization is intended to imitate white noise, a sound commonly used in electronic music. The white-noise opening creates a quiet, mysterious ambiance. While the piece opens with the vocalizations only, they are shortly thereafter augmented by similar-sounding percussion instruments such as a rainstick, maracas, and ocean drum. Because a single type of sound is being used here, other aspects of sound control are used to bring complexity and intrigue to the work. Consider measures 4 and 5. Measure 4 is a crescendo featuring the performers of the flutes, oboes, English horn, soprano and alto saxophones, the aforementioned percussion instruments, and violin I. Measure 5 is the answering diminuendo featuring the roughly equal forces of the tenor and baritone saxophones, trombones (including bass), rainstick, and violin II. Similar dynamic play occurs throughout this introductory unit.

Another aspect of the white-noise opening that adds complexity is the spatial play. measures 9 through 12 illustrate this principle. Beat 3 of measure 9 marks the entrance of the saxophonists on the "sh" vocalization. That sound swells dynamically and diminishes. As the saxophonists near the end of their vocalization, the horns and trombones (a slightly larger force) take up the white-noise swell. Because of the instruments' placement, this creates an effect in which the sound seems to move from the back and right of the orchestra to the back and left. To

conclude this particular pocket of spatial play, as well as the "sh" introduction, almost every member of the orchestra performs the white-noise sound in measures 11 and 12. This is the loudest point of the "sh" introduction and the bridge to the entrance of C1.[31]

Inspired by Richard Strauss' *Also Sprach Zarathustra*, the double basses enter this low C1 in measure 12. This pitch is bolstered by staggered entrances from the marimba, contrabassoon, tuba, bassoons, bass trombone, and bass clarinet (in that order) over the course of measures 13 through 17 and is intended to create yet another layer of mysterious anticipation. To augment the color of this low sound, upper woodwind instruments are employed to emphasize certain overtones of C1. The first to do so is flute I in measure 16. This solo instrument sneaks into the texture on the pitch E5 far above the established C1. The flute slightly swells the E5 for dynamic intrigue. This type of overtone emphasis is a technique used in both acoustic and electronic music, and in this case it is intended to slightly augment the orchestra's color. The pitch E5 is then passed to the oboe I and clarinet I who also dynamically swell.

Measure 17 is the first appearance of a low D-flat1. It appears first in the contrabassoon and bass trombone on beat 4. The intended effect of this D-flat1 is to create dissonance and tension against the established low C1. The bassoons, piano, marimba, and violoncellos take up the D-flat in measure 18. The intended aggregate effect of the mixture of C1 and D-flat1 in such a low range is an "out-of-tune" character. The entire orchestra remains in a low dynamic range, thus maintaining the intended sense of anticipation and intrigue. At this moment, these intended moods are augmented with a slight tinge of foreboding. While the dissonant C1 and D-flat1 of the low registers continue to sound through measure 27, they are aided by the overtone emphasis

[31] Following the standard of the Acoustical Society of America, middle C is designated as C4.

mentioned before. In measure 22, flutes I and II enter on F-sharp5. In this case, in order to maintain the dominance of and focus on the low C1 and D-flat1 conflict, the pitch does not feature a dynamic swell. The oboes take up the F-sharp5 in measures 23 and 24. As an echo to the low register conflicting semitone, flute I and flute II enter in measure 26 with a very high semitone of G-flat6 and F6. This entrance is intended to ratchet up the tension, especially in combination with the fact that the orchestration has thinned on the low C1 and D-flat1. The instruments that remain in measure 27 perform a large crescendo which pushes the piece into the next section.

As the measure 27 crescendo reaches its peak, it is answered by the piano part. The pianist has been asked to take a soft bass drum mallet and strike the inside strings of the instrument in the lowest possible range. While the pianist has been asked to perform this gesture at a fortissimo dynamic level, the overall sound is quite soft. This is an abrupt change from the final point of the crescendo in measure 27. The soft piano strike of measure 28 initiates a tremolo motion in the strings. The strings are asked to tremolo on the pitch C4 (this C4 being in a higher register than the introductory C1), then slide smoothly to the adjacent D-flat4, then return to C4. This motion happens quickly. Motion from C4 to D-flat4 in this manner is meant to serve as a continuation of and reference to the semitone conflict of the previous section. The first occurrence of this figure is in the violas and violoncellos at measure 28, and each occurrence is accompanied by a dynamic swell.

The switching of meter from 4/4 (from the beginning of the work through measure 27), to 5/4 in measure 28, to 5/8 in measure 29, to 3/4 in measure 30 marks a portion of this piece in which the fixed pulse is suspended. Because the sense of pulse could be lost during this section, the material could alter a listener's sense of time as it relates to this piece.

The “sh” vocal effect returns at measure 30 accompanied by a new texture not yet heard in the work. The string choir is asked to play pizzicato with quick rhythms in a given pitch range. That pitch range is in a high register for each string instrument. The aggregate effect is a portion of music, that is generally high in pitch but still registerally diverse, that will differ with each performance due to the independent decisions being made by the players of the orchestra. Because of the directions provided in the score, however, each performance will have a similar character. The random pizzicato figure in the strings is strengthened by the woodwinds who have been directed to perform key clicks on their respective instruments with random and quick rhythms. Because the woodwind choir features many instruments of varying lengths and sizes, the key clicks will sound in high and low registers simultaneously. Together, the string pizzicato and the woodwind key clicks form an aggregate effect that might be reminiscent of numerous insects scurrying about. Thus, hereafter this effect will be referred to as “bugs scurrying.”

The bugs-scurrying effect gives way to the continuation of the tremolo figure which is reintroduced by the violas in measure 31. To this point in the work, the tremolo figure has been performed in one rhythmic construct. The violoncellos perform a lengthened version of the rhythm in measures 32 and 33. In addition to augmented versions of the rhythmic gesture, other similar gestures appear such as bowed tremolos on a single pitch (seen in the violin I part at measure 34) and slides to pitches that are farther than a semitone away from the first note (seen in the violoncellos at measure 37 and the violin I part at measure 38). Other additions to the figure are also performed in this portion of the piece. The flutes utilize a flutter tongue technique to emulate a string instrument’s bowed tremolo in measure 35. The flute completes the gesture without the smooth slide between semitones for reasons of practicality. Also, the tremolo figure

is played on pitches that are not C and D-flat. The first example of this is found at measure 38 in the viola part, where the pitches are G3 and A-flat3.

In addition to the bugs-scurrying effect, the pianist's striking the strings inside the piano and the sliding tremolos, all of which characterize this section, a layer appears underneath to both add depth and reference the beginning of the work. The I and III horns enter on the pitch C4 in measure 32. This C4 is sustained by passing the pitch to horns II and IV and then back to I and III. Over this barely-heard pitch enters the oboe I in measure 36 on the pitch E5, which is in a higher register. This material is meant to emulate and reference the emphasis of overtones that took place earlier in the piece. Other instruments enter to reinforce the pitch C in the horns such as the clarinet III in measure 38. In addition, instruments enter to reinforce the overtones such as the soprano saxophone in measure 37.

More instruments join either the C long tones or the overtone emphasis in measures 40 through 46. A new construct that is intended to add color to the piece is the brief and simple melodic gesture that is found in the piano, glockenspiel, marimba, and vibraphone in measures 40 through 42. The pitches B-flat, E, and G-flat were selected because they have been the most common pitches in the previous overtone-emphasis layers. The B-flat in measure 40 is reinforced by the triangle and pizzicato notes from the violins. The second eighth note of beat 2 in measure 40 marks a passage in which the string choir states a tremolo swell, similar to previous iterations, then states a stretched version beginning on beat 2 of measure 41 and ending on the second eighth note of measure 42. Finally, the strings perform a long, dynamically growing and registerally ascending glissando from the pitch F (in octaves) to the pitch G, a ninth above F. This long glissando foreshadows more lengthy glissandi passages in the work that primarily characterize Section III.

Measure 46 establishes the beginning of *Irony Machines*' second section. The first section concludes with long tones in a low register of the orchestra juxtaposed against high notes in the violins that terminate after a quick upward glissando on the E string. Meanwhile, flutes I and II begin to "pulse." This pulsing is created by playing a constant tone on the given pitch and providing a slight dynamic swell at the specified rhythm.

This texture is inspired by Otto Luening's work *Low Speed*. In this piece, the flute's vibrato is played at a low speed, which creates a dynamic swell. Like *Low Speed*, this rhythmic pattern is layered with different rhythms in *Irony Machines*. Also, this composer's work features different instruments which are directed to pulse. The flute players begin the pulse at the eighth note, creating eight swells per measure (after a short initiating gesture in measure 46). The three flute parts adhere to a pattern of two measures playing, then one measure resting, for the purpose of allowing the performers time to breathe.

The next instruments to enter in the pulse texture are the soprano and alto saxophones. The pulse performed by the saxophone family is slightly different in that they are the only family asked to create the pulse with wide vibrato. Because of this, the pulse takes on a slight pitch variation in addition to the dynamic swell. The saxophones are given a rhythm that facilitates three equal pulses per measure as three half notes in the space of two. The rhythm appears different in the score for purposes of convenience and practicality for performance. These layers all are performed on the pitches F, G-flat, and B, constituting an [016] trichord. This harmony is weaved through the piece, appearing in nearly every section, and adding continuity to the work.

Oboes and horns enter in measure 49 to pulse six times per measure (two quarter note triplets per measure that is scored differently for ease of reading). Horns I and II in measures 49 and 50 present a pitch that lies outside of the established [016] trichord. The pitch E-flat forms

the equivalent of a major third with the B presented in the oboe II, alto saxophone, and horn III. It also forms a minor third with the G-flat in the flutes. This introduces the aforementioned major feature of the piece, a conflict between the [016] trichord and the interval of a third (both major and minor). In some cases, those stacked thirds form some common triad types. In this case, B, E-flat, and G-flat form the equivalent of a major triad. The tenor and baritone saxophones enter on beat 3 of measure 50 on the pitch F, a member of the [016] trichord. These instruments pulse on the sixteenth note creating sixteen pulses per measure.

Rarely do conventional melodic lines appear in *Irony Machines*. However, in measures 51 and 52, a melody appears in the English horn, clarinets, vibraphone, marimba, and celesta. Excluding the first pitch, the melody is comprised of two ordered [016] trichords (that is G, D-flat, and A-flat as the first trichord, then C, D-flat, and G-flat forming the other). A concurrent counter melody is presented in the bass clarinet, violoncellos, and double basses. The first three pitches of this counter melody form an [016] trichord (that is, C, G, and G-flat). The next two pitches of the counter melody constitute a major third, further exposing the interaction of the [016] trichord and the interval of a third.

Measure 53 marks the beginning of a call-and-response style section comprised of alternations between cluster harmonies and pulsing figures. Each measure is initiated by members of the orchestra clapping their hands to make a new (to this piece) and loud sound. Also, the time signature is changed in every measure, which is intended to add a layer of complexity. Measure 53 begins with a clap from the percussionists, trombones, bass trombones, and tubas. Meanwhile, the strings form a chromatic cluster in the middle range of their aggregate range that lasts for 4 beats. The time signature is changed to 5/8 for measure 54. In this measure, the clap initiator is followed closely by the flutes pulsing on eighth notes. Measure 55

is in 2/4 time and the clap initiator is augmented slightly to include key clicks from the clarinets. The chromatic cluster in the strings return and are augmented in this iteration with additions in a lower pitch range by the brass.

Measure 56 marks an addition to the pattern. The clap occurs, then pulsing begins in the saxophones. There is a pause in the pulsing on the fourth eighth note of the measure. This adds a syncopated character to the pulsing figure. The pitches that the saxophones play (and soon thereafter joined by the vibraphone and timpani) are A-flat and C, a reappearance of the major third. The measure is further layered with a brief swell from the violas. This swell contains the pitches C and D-flat in reference to the piece's opening.

The pulsing does not pause or stop for the next clap on beat 1 of measure 57, but continues through measure 58. On the second eighth note of measure 58, the pulsing is moved to the brass choir, and the pitches now form a chromatic cluster. In measure 57, the strings are instructed to sneak in with a chromatic cluster. The pulsing from measures 46 to 52 were primarily built upon the [016] trichord with an interjection of the third in the latter parts of that section. In measure 54, the pulse is on consecutive semitones. This interval references the C1 and D-flat1 dissonance from the beginning of the work and also the [016] trichord. In measures 56 and 57 the pulsing instruments form a major third. Then, the final pulse of this small portion features the chromatic cluster. In this way, this brief portion of the work represents much of the harmonic material used throughout the entire piece.

Section II continues to measure 71. In the remaining material between measure 59 and 71, pulses are introduced that are mainly built upon the ordered third. One injection of non-pulse material occurs in measure 63. Here, the horn players perform a brief melody that is intended to contrast with the orchestra's overall texture. This outburst is augmented with a long upward

glissando from the violins. This glissando serves to foreshadow the next section as well as add density to the present texture. For further complexity, a brake drum is added with an ever more rapid and increasingly loud gesture.

The final pulsing portion of this section begins at measure 64. Though not every line will be explained in this document, each instrument emphasizes major and minor thirds with their given pitch material. The number of pulses on each pitch is determined by the scheme 4 - 5 - 6. For example, the flute players pulse 4 times on G, 5 times on E-flat, then 6 times on B. This scheme is applied differently throughout the ensemble for the sake of complexity, but this scheme governs every pulse group. Every pulse group also grows in volume until the middle of measure 70. At that point, long tones are reached (on the pitches G and B, a major third) and a diminuendo occurs. This paves the way for the entrance of Section III.

Dynamically soft violas and violoncellos enter in measure 70 as initiators of Section III. This section is primarily characterized by lengthy glissando lines in the strings and other instruments.[32] At measure 71, the tempo of the work slows slightly to quarter note equals 60. As the major third dies away in the winds, the string glissandi are given added prominence. In measure 72, thirds are now passed through the orchestra on long, swelling tones. This creates changing colors and timbres while also establishing changes in the spatialization of the harmony. In measures 72 through 79, thirds travel from the low brass and keyboard percussion to the trumpets, then the oboes and English horn, then the saxophones, then the horns, then flute I and low brass, and finally the clarinets.

[32] Please refer to Chapter 1 for this author's definition and usage of the musical terms "glissando" and "glissandi."

In measure 73, the violin II's enter the glissando texture. The violin I's follow suit near beat 4 of measure 74. The glissandi of the individual instruments are varied in speed and register, and, as a result, are designed to also create contrary motion with other lines as often as possible. A goal of this section is to create contrary motion in a great majority of the duration of this texture while saving the moments of similar motion in all of the strings to crucial dramatic moments. The register of the aggregate glissando section is close to the middle of every instrument's range until the introduction of the double bass in measure 81. At this point, all five string parts are active and individual lines are allowed to stick out of the texture registerally for brief periods. As an example, the violin I section is quite high in register from measure 82 to measure 86.

The string players continue to play at a *mezzo piano* dynamic level until measures 89 and 90. In these measures, the instrumentalists begin a lengthy crescendo just as they begin an upward slide in pitch. The crescendi and glissandi reach their highest point in measure 92. The strings then recede (both dynamically and in pitch) causing an aggregate slide downward of a major second, from F to E-flat (in their respective registers). This foreshadows the climax of the piece that occurs in measures 153 through 157.

The strings stop playing as the piano and celesta enter on beat 4 of measure 93. These instruments serve as liaisons between the glissandi of the strings and the emulation of the string glissandi texture in the brass starting in measure 95 with the trumpet I. Arrangements are made for the brass in order for the performers to breathe. The fact that the brass instruments (except for the trombones) are not capable of producing the smooth portamento created by the strings becomes an important aspect of the work because it changes the texture while maintaining a similar profile to the string material. Individual brass instruments are given chromatic scales at

differing registers and speeds under slur markings to make the scales as smooth as possible. This brass emulation of glissandi extends from measure 95 to measure 102 where the strings return and perform that texture once again.

The texture of measures 96 through 104 is thickened by the timpani, vibraphone, marimba, brake drum, and piano that revive the pulse idea. These instruments enter in a staggered fashion and (except for the non-pitched brake drum) together form an [016] trichord on the pitches D-sharp (in most cases spelled enharmonically as E-flat), E (natural), and A. The instruments are given different rhythms which are intended to add complexity to the sound. These instruments remain at *mezzo piano* and since they are located in the back of the performance area and are relatively soft in terms of dynamics, they are intended to form a background texture that provides color and complexity to the aggregate orchestra sound without overpowering the primary texture provided by the brass.

The violins I and II enter in measure 102, and by measure 105, the strings completely dominate the piece. The upper strings have resumed the glissandi while the violoncellos and double basses are saved for an entrance at measure 107, where they play the pitch E in lower octaves. This deep tone was chosen to be similar to the low C1 from the beginning of the piece, but different to constitute an evolution throughout the piece. A long, steady A is reached by the violin I part at the anacrusis to measure 109 with the violin II part and violas coming to rest on C and D (respectively) shortly thereafter. These tones create a harmony similar to stacked fourths (though the G is missing) in order to provide contrast to the recent chromatic clusters and the large chromatic cluster that constitutes the approaching climax.

The major second becomes the most commonly used interval from measure 111 through 116. The double bass part features a held pitch E1 with other instruments soon joining on this

and Es in other octaves. In measure 110, the violoncello part slides up to F-sharp and from measure 111 through 116, other instruments bolster this pitch also. The piano and marimba summarize the pitch material with many presentations of registerally diverse E's and F-sharps. With a large crescendo and the aid of the flutes, oboes, and thunder sheet, the piece grows to *fortissimo* at the downbeat of measure 117. At this point, the bugs-scurrying texture returns. The entrances of the string instruments are staggered to create fluxuations in the density and volume of the texture. Moments of silence are placed in the texture to add syncopation and are intended to add a sense of anticipation for the climax. The bugs scurrying texture is short, and it dies away completely by the end of measure 123.

Measure 122 marks the beginning of Section IV of *Irony Machines*. The soprano saxophone begins the section by initiating and holding the pitch C. Other woodwinds enter on long tones until measure 129. These long tones are on every chromatic pitch between C and F (register is a non-factor for the explanation of the pitch scheme). Compare this to the collection of pitches in the pitched percussion of measures 129 through 135. Most of the pitches between F-sharp and B is presented here. A-flat is left out while an E-flat appears in the double bass. This outlier to the pitch scheme is included for colorist effect and composer preference.

A similar scheme governs the pitch material between measures 136 and 152. In the brass and double bass parts at measures 136 through 148, chromatic pitches between A and D (with the exception of B) are presented . The vibraphone and piano tremolos in measures 136 through 139 are intended as a color augmentation only (though it should be noted that the "missing" B is included in the vibraphone). As the brass instruments begin to fade at measure 146, the strings enter and present every chromatic pitch from E-flat to A-flat. This lasts through measure 152.

Table 8 displays the pitch scheme of this portion of Section IV and a comparison of the order in which the pitches are presented.

Table 8 - The pitch scheme of *Irony Machines*, m. 122-152. Pitches in parentheses do not appear in the piece, but are included in this table to show the complete pattern.

Dominant Choir	Woodwinds	Pitched Percussion	Brass	Strings
Measure Range	122 - 129	129 - 139	138 - 148	146 - 152
First Pitch	C	F-sharp	A	D-sharp
Second Pitch	D-sharp	A	C	F-sharp
Third Pitch	E	G	C-sharp	G
Fourth Pitch	C-sharp	A-sharp	A-sharp	E
Fifth Pitch	F	B	D	G-sharp
Sixth Pitch	D	(G-sharp)	(B)	F

Together, the woodwinds and pitched percussion of measures 122 through 139 present chromatic pitches by way of complimentary hexachords (excluding G-sharp which is missing in the pitched percussion). The pitches are presented in nearly the same intervallic sequence (if the third and fourth pitches were reversed in the pitched percussion it would be exactly the same). The brass and strings of measures 138 through 152 also present every chromatic pitch via complimentary hexachords (except the B missing from the brass dominated measures). They too follow the intervallic pattern of introducing pitch material.

This material featuring complimentary hexachords leads to the piece's climax which begins at measure 153. At this point, nearly every chromatic pitch for over three octaves is performed concurrently. This makes for loud and dense material, yet it is also intended to sound

placid. This musical material is inspired by Gyorgy Ligeti's *Atmospheres*. Because this sonority is complex and central to the climax of the piece, it is given nine seconds to sound without interruption at a *mezzo piano* dynamic level. This volume is much louder than indicated due to the fact that nearly every performer is playing.

At measure 155, this large chromatic cluster slides smoothly downward (by way of glissandi in the strings and discreet pitches on different rhythms for the winds) by a minor third. Support to this slide is supplied by the vibraphone and marimba which perform a "waterfall" effect (the creation of a constantly falling texture by way of repeated white key glissandi that begin on slightly lower pitches each eighth note). Once the slide is complete, the resulting harmony is played at *fortississimo* and constitutes the loudest sound heard in the piece. This harmony is held for approximately 8 seconds.

Measure 158 includes a dramatic reduction in the dynamic level of the piece. Only a *subito mezzo forte* in the string choir answers the work's climax. The harmony in the strings is a much more open sonority than the climax chord, though it does contain adjacent major seconds in the lower instruments. A woodwind and brass mixture in measure 158 presents a more open sonority that is similar to stacked perfect fifths. This chord is designed to lead to the small chromatic cluster supplied by the oboes, English horn, and clarinets in measures 159 and 160. A tightly arranged harmony (but not quite a chromatic cluster) is created by the vibraphone and marimba in measures 160 and 161. The vibraphonist plays stacked thirds, an interval which continues to be central to the work. This passing of material from one family of instruments to another via swelling sonorities leads to measure 162.

Measure 162 initiates a portion of the work, still within Section IV, that features call-and-response statements from various sources. Calls and responses are performed by different groups

of instruments throughout this section, making spatialization a primary focus. The first call comes from the string choir on the pitch E. The response is from the upper woodwind players who are sounding the pitches of a pentatonic collection. Measure 163 contains a second call from the strings, this time with a snap pizzicato on the pitch F. This is answered by a brass and woodwind mixture on the pitches of a whole tone collection. Another call on the pitch F, in measure 163, is given in a loud and noisy "splat" (a term used in the score) on beat 3. It is answered by the strings with a C dominant seventh chord. This chord is a product of stacking major and minor thirds, intervals that are used pervasively in this work. A call on the pitch G comes from the clarinet family on the downbeat of measure 165. This call is answered by the saxophones with four pitches of a whole tone collection.

A significantly different call statement is stated in measure 166. This call is not on a single pitch class, but it presents an [016] trichord on the pitches B-flat, E-flat, and E natural (sometimes enharmonically spelled as F-flat). This special call receives a special response. The pulsing effect briefly returns in the woodwinds and brass of measures 166 through 167 on the pitches E and A. This pulsing effect also answers the next call in measure 168 using the pitch E-flat.

The call-and-response material continues to measure 185. Although not every call and response will be explored in the present document, their general characteristics will be provided. Excepting the aforementioned call in measure 166 which is different than the others, calls form an almost complete E Phrygian scale. The pitches are given in order (E-F-G-A-B-C) with the D omitted. Also, the responses continue to vary in terms of pitch content and duration. There are also exceptions like measure 180 in which a the call from the baritone saxophone is longer than the normal calls.

As a transition to Section V, measure 182 states the return of the [016] trichord in the horns in three growing chord stacks. Major thirds (sometimes enharmonically respelled) govern the string pitches in 183 as they echo the horns with a faster rhythm. The [016] trichord resumes control with the clarinet notes of measure 184. Then, in the same measure, the notes of the E Phrygian scale return (in a manner which emphasizes stacked thirds) in the brass.

A slightly different trichord than the familiar [016] ushers in Section V. This is an [026] trichord formed by the strings leading into measure 185. The [026] contains a tritone just as the [016] does, but in its most compact arrangement, the interval is a major second in the [026] contrasting with the minor second of the [016]. For the purposes of the instrument entrances that are governed by the pitches of an [026], the resulting harmonies are intended to be slightly less dissonant and have slightly more space between the individual pitches. The [026] is also different from the major and minor thirds which play such a huge role in the piece. There is still a contrast between [026] and thirds, meaning that the interaction between them can share the same type of character as the [016] and thirds.

The trichord [026] provides starting posts for the return of the glissandi. These glissandi dominate the texture of the piece until measure 229. An alteration is made to this occurrence of the glissandi with the inclusion of dynamic markings that are (in most cases) relative to the register in which the instrument is playing. The higher an instrument plays in pitch, the louder its dynamic level. Because the instrument parts slide up and down at different speeds, the dynamic motion changes constantly. Thus, a particular string instrument will come out (dynamically) of the texture then fade.

Appearances of non-string instruments in this section are relatively rare, meaning that these appearances are striking additions to the glissando texture. The first of these appearances,

by the woodwinds, occurs in measure 195. These instruments enter with a thin, modified version of the "pulse" effect. In this case, the notes are played staccato instead of tenuto, and only one pitch class is played in octaves. The bassoons of measure 197 introduce a B-flat, and when this pitch is combined with the growled pitches performed by the saxophones in measures 198 and 199, it forms an incomplete major-major seventh chord (B-flat, D, A, with no fifth). The trombonists also add glissandi in measures 199 through 204, giving the aggregate sound a brass character.

The [016] trichord reappears in the woodwinds that enter in measures 216 and 217. This trichord is made from the pitches D-flat, D (natural), and A-flat. While this trichord is found in many places throughout the piece, it is rarely stated on the same pitches, adding variety to the recurrent sonority. These woodwind entrances come as the string glissando texture thins. At this point, the double basses and violoncellos have been subtracted from the texture, resulting in a string sound that is thinner, quieter, and higher in pitch.

As the woodwind instrumentalists that contribute to the [016] chord fade in measure 218, the saxophones play a falling chromatic gesture that continues through measure 220. Harmonically, the saxophones form enharmonically respelled major thirds. Combined, the woodwinds that comprise the [016] trichord and the saxophones forming parallel major thirds revive the interaction between these two sonorities. The final pitch of the saxophone gesture is supported by the horns that are playing an [013] trichord for more variety of harmonic color.

The vibraphone, marimba, and piano parts reenter in measures 220 and 221. The vibraphone and marimba players perform tremolos featuring near-triadic harmonic material, while the pianist plays a high (in terms of pitch) sequence of notes intended to add a shimmering color to the now re-thickened glissandi of the strings. The vibraphone contributes a similar high-

pitched sequence starting in measure 222. All of these instruments form an F major triad in measure 225, and apply a tremolo to that chord that lasts through measure 230.

Just as the keyboard instruments reach the F major triad at measure 225, all of the string instruments execute a dramatic drop in dynamic level. This gives the strings room to grow dynamically in measures 227 and 228 until they reach *fortissimo* just before the downbeat of measure 229. This crescendo is accompanied by a collective rise in pitch, via glissandi, to the peak pitches of the gesture which are reached at the *fortissimo*. The piano, vibraphone, and marimba contribute to the crescendo with the F major triad in tremolo.

Measure 229 is an significant marker within Section V. The second eighth note of measure 229 marks the pinnacle of the rising, growing gesture. This is the point at which a majority of the woodwinds enter at *fortissimo* volume. These woodwinds, when combined with the strings, form a loud, large chromatic cluster that is reminiscent of the portion of the climax at measure 154. This presentation is not as loud due to fewer instruments being involved, nor as dense in terms of pitches represented. It does, however, recreate the smooth slide downward of the chromatic sonority originally seen in measure 155. In measure 230, the descent is by a major third instead of a minor third. The brass instruments that were not present in the recreation of the climax resurface in measures 230 through 233 with a modified pulse texture. All brass instruments play only the pitches F or A-flat, forming a minor third. The brass continue through measure 233 as the woodwinds and strings fade through *pianissimo* to silence.

The pulse returns in the strings in measures 234 through 242. Measure 234 also revisits the call-and-response material of Section IV via a brass call and woodwind response (with a minor third). The texture of the piece has thinned considerably, with brief moments of complete silence (like beat 2 of measure 239). The violin I section, in measures 240 and 241, play eighth

notes as part of the pulsing reference, but each eighth note is preceded by a grace note. This gesture is intended to add to the mood of fading away.

Measures 243 through 245 contain the last breath of the piece, which is a long, swelling then receding C in many octaves. The C is presented in octaves and is played by most of the members of the orchestra. This C is intended to be reminiscent of the C1 that sounded near the beginning of the work and was the first pitch heard. The lowest (in terms of register) members of the orchestra softly hold the final pitch under the fermata of measure 245 and then fade away to nothing.

* * *

Allelujah II and *Perspectives*, compositions by Luciano Berio, share many similar characteristics with *Irony Machines*. This prompted this author to select them as analytical companions to the original composition. The characteristics shared by *Allelujah II* and *Irony Machines* are: both are written for orchestra, the orchestral instrumentation is augmented to include four saxophones, spatialization of sounds is an important aspect of the pieces that is purposefully exploited, complex and unusual textures are crucial considerations that shape the pieces' character. There are many contrasting elements between these two pieces, but the most important are: Berio's inclusion of an electric guitar, Berio's division of the orchestra into five groups which are distributed spatially in the performance venue, and Berio's use of a single pervasive texture (the pointillist texture) throughout the work. While a single texture is one of the cohesive elements for *Allelujah II*, the interaction between [016] and thirds provides the cohesion between the many different textures of *Irony Machines*.

Written within a few years of *Allelujah II* and by the same composer, *Perspectives* is a very similar piece to *Allelujah II*. Both pieces avoid clear indications of metric pulse by using a

complex pointillistic style. Sounds are presented with syncopated entrances and are given varied durations. Both pieces feature very complex textures which are changed over time by varying the thickness of the texture with more or less concurrent sound, register changes, and layering of other sounds along side the pervasive pointillistic sounds.

Because this composer's original work uses an electronic music aesthetic, a piece of electronic music is used as an analytical companion. Berio's *Perspectives* fills this role. *Irony Machines* is similar to *Perspectives* in the following ways: the works feature complex textures that evolve over time, an electronic music aesthetic and approach, and spatialization is utilized as an element that provides aural variety to the piece. There are also many differences between the works. Some of them are: Berio's sounds are made and manipulated with actual electronic devices while the sounds of *Irony Machines* are created by acoustic instruments with no manipulation occurring by way of electronic devices, and the pervasive pointillistic texture of Berio's piece stretches throughout the work while the cohesion of *Irony Machines* is achieved across many textures by way of the interaction between the [016] trichord and sonorities built with major and minor thirds.

All of these points of comparison and contrast connect the mentioned works of Berio to this composer's piece. These pieces provide a historical context for *Irony Machines,* demonstrate similarities in approach and characteristics among pieces of different origins, and demonstrate the different ways in which composers can take textural and timbral material and evolve them into a piece of music. Because of these similarities and differences, the analyses of these pieces in this present document is conceptually valuable and fortuitous.

* * *

Irony Machines was performed by the University of Georgia Symphony Orchestra on April 21, 2011 at 3:30pm under the direction of Mr. Mark Cedel with the assistance of Mr. Eric Hawk. The reading took place in the orchestra rehearsal room and was recorded by Mr. Douglas Moore. The reading concluded at approximately 5:30pm. Advisement in both the composition and reading of the work was provided by Dr. Adrian P. Childs. Additional advisement was given by Dr. Leonard V. Ball, Jr. and Dr. Roger C. Vogel on the day of the reading. *Irony Machines* appears in full score as an appendix to this document.

BIBLIOGRAPHY

Berio, Luciano. *Allelujah II: per cinque gruppi di strumenti*. Milan: Edizioni Suvini Zerboni, 1960.

Berio, Luciano. *Nones. Allelujah II. Concerto for two pianos*. Conducted by Luciano Berio and Pierre Boulez with the BBC Symphony Orchestra. RCA red seal, 1976. CD (from LP transfer).

Berio, Luciano. *Perspectives*. http://youtu.be/HpcEu1hgRjw. Accessed Jan. 15, 2011.

Berio, Luciano et al. *Electronic Music. III.* London: Turnabout Records, 196-?. LP.

Chadabe, Joel. *Electric Sound: The Past and Promise of Electronic Music.* Upper Saddle River, NJ: Prentice Hall, 1997.

Hitchens, Christopher. *God is not Great: How Religion Poisons Everything*. New York: Twelve Books, 2007.

Ligeti, Gyorgy. *Atmospheres: fur grosses Orchester ohne Schlagzeug*. Vienna: Universal Edition, 1980.

Lochhead, Judith. "Texture and Timbre in Barbara Kolb's *Millefoglie* for Chamber Orchestra and Computer-Generated Tape." In *Engaging Music*, edited by Deborah Stein, 253-271. Oxford: Oxford University Press, 2005.

Luening, Otto et al. *Pioneers of Electronic Music.* New York: New World Records, 2006. CD.

Murail, Tristan. *Gondwana*. London: United Music Publishers, 2007.

Osmond-Smith, David. *Berio*. Oxford: Oxford University Press, 1991.

Stockhausen, Karlheinz. *Gruppen fur drei Orchester*. London: Universal Edition, 1963.

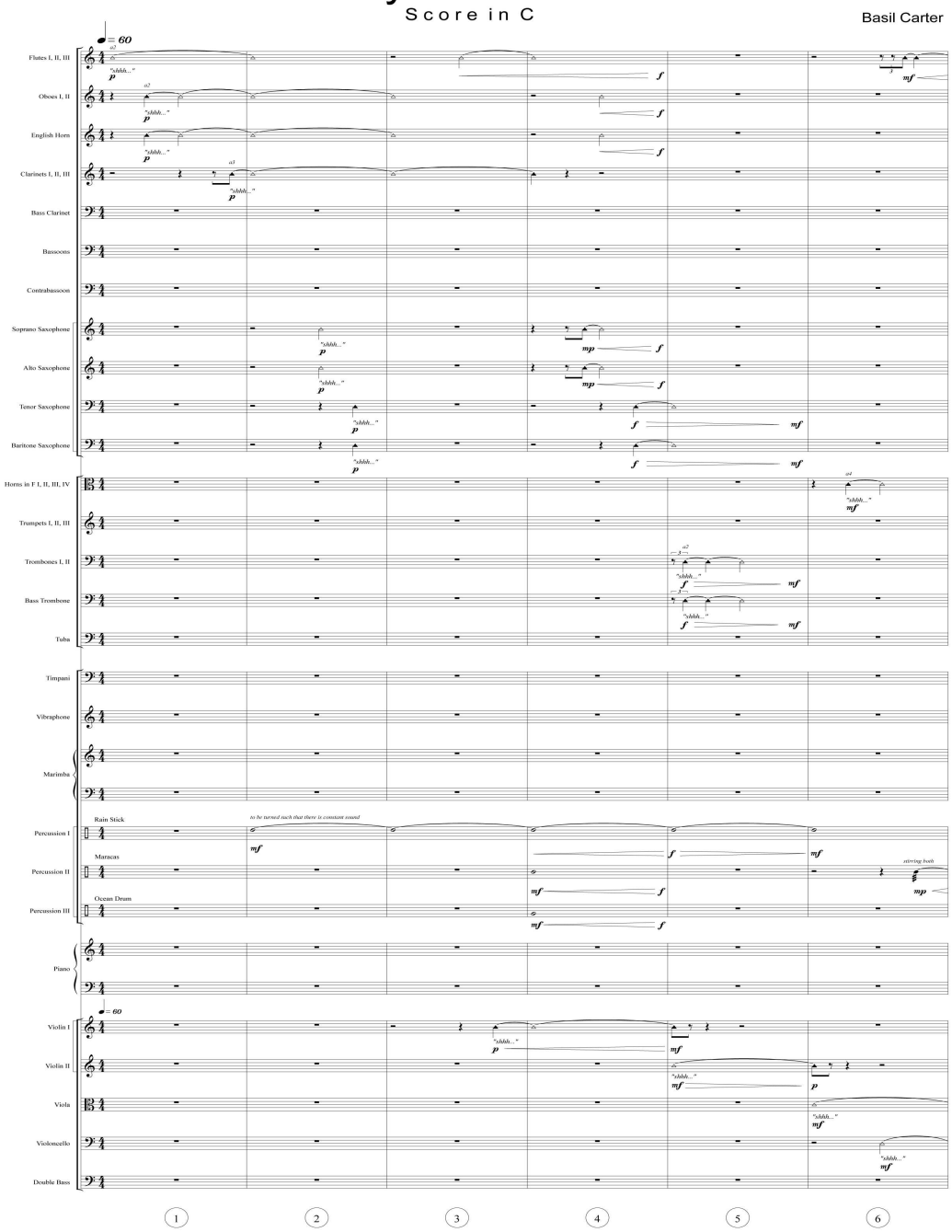
Straus, Joseph N.. *Introduction to Post-Tonal Theory*. Third Edition. Upper Saddle River, NJ: Prentice Hall, 2005.

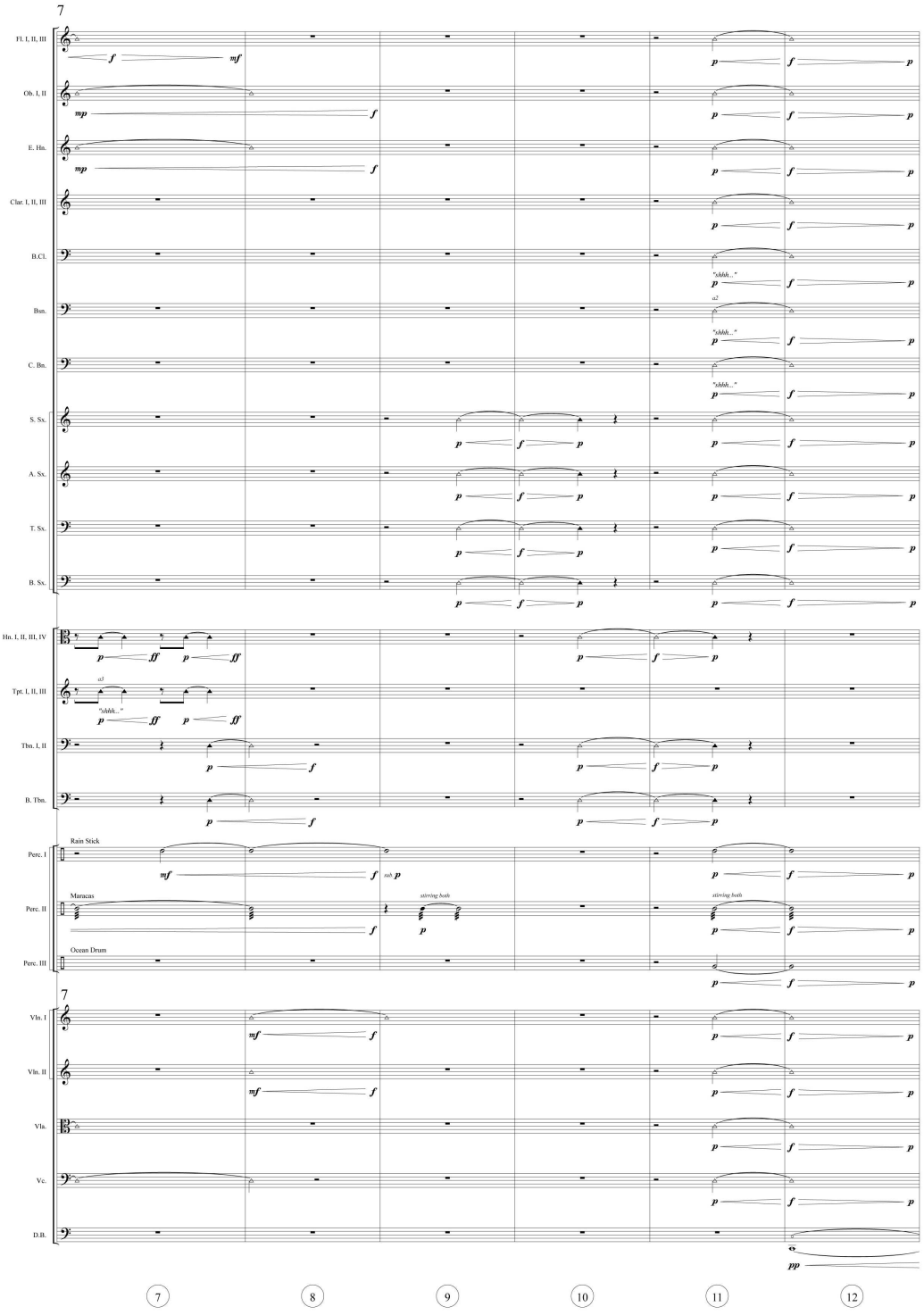
Strauss, Richard. *Also Sprach Zarathustra*. Leipzig: E. Eulenburg, 1904.

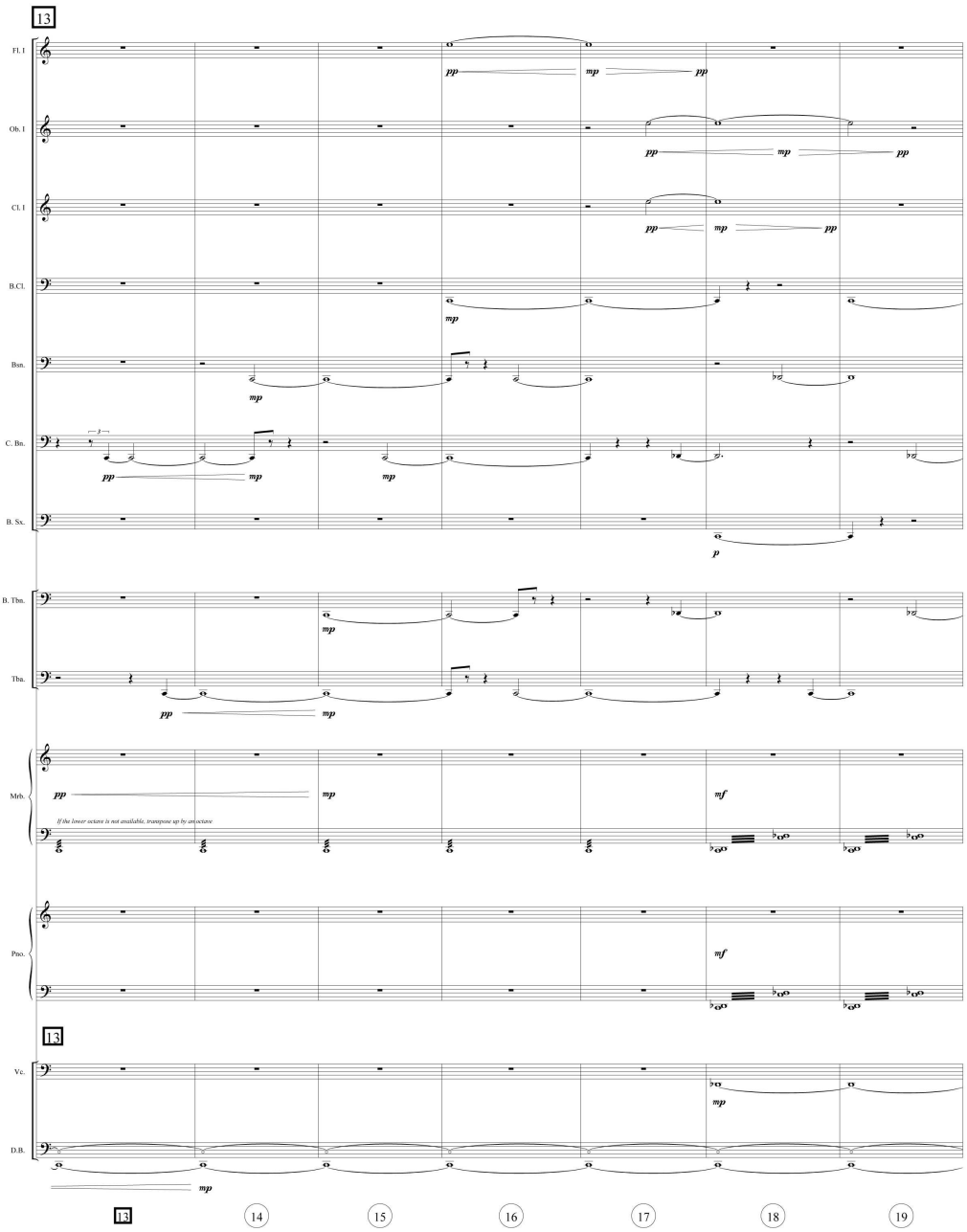
Subotnick, Morton. *Silver Apples of the Moon*. Tampa: Nonesuch Records, 1967. LP.

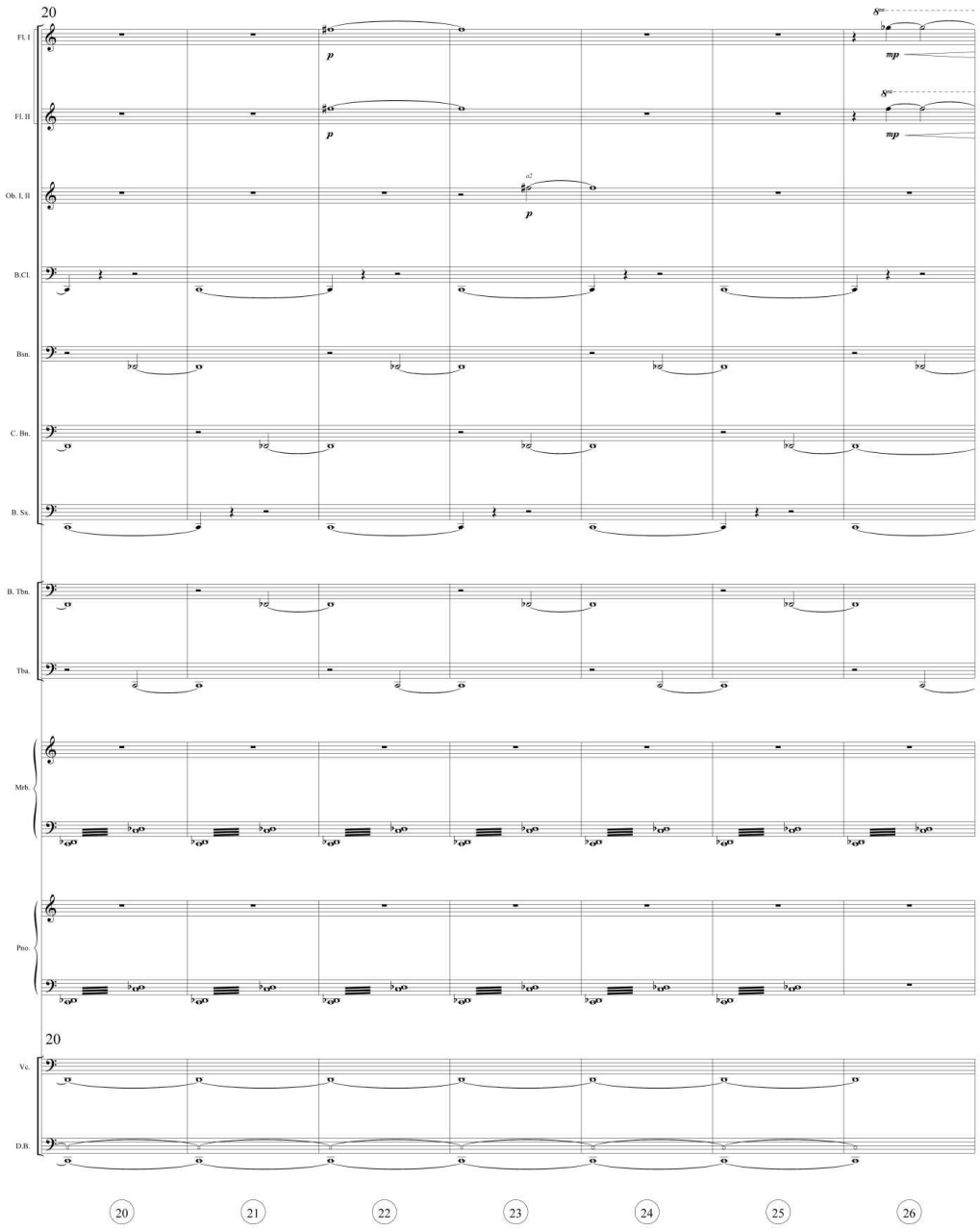
Xenakis, Iannis. *Metastaseis 1953/54*. London: Boosey & Hawkes, 1967.

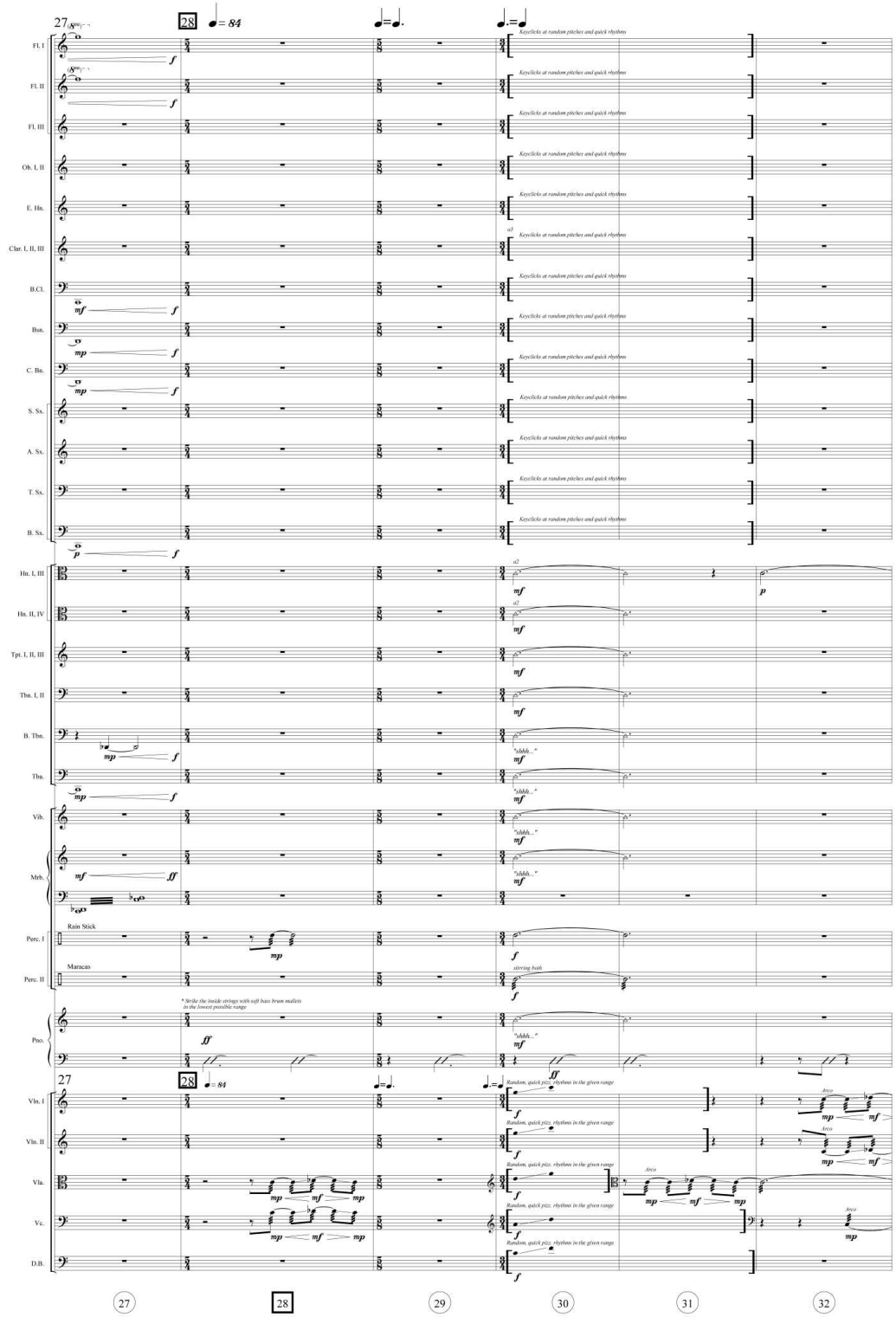
APPENDIX

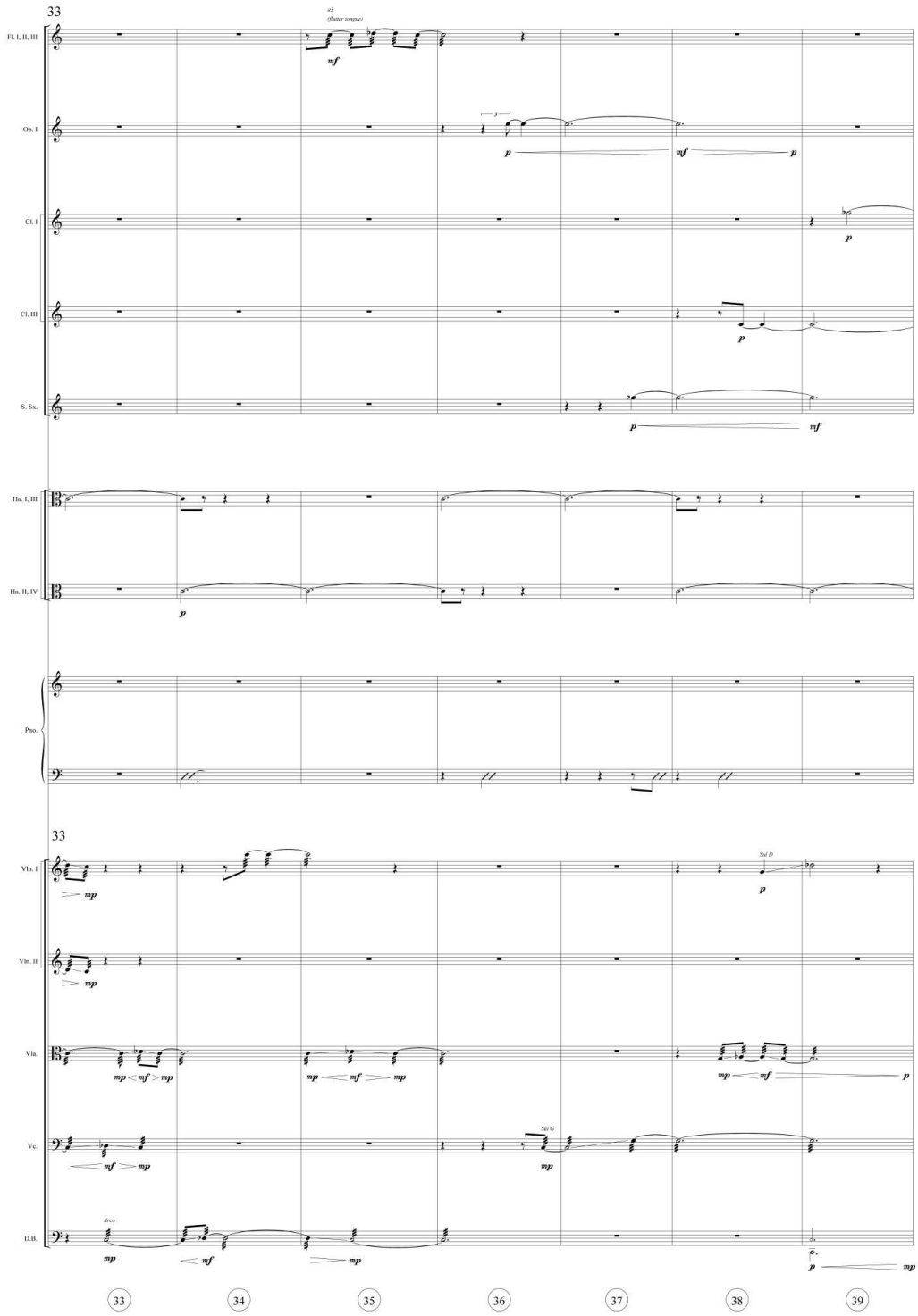

Irony Machines
Score in C
Basil Carter
♩ = 60
Flutes I, II, III
Oboes I, II
English Horn
Clarinets I, II, III
Bass Clarinet
Bassoons
Contrabassoon
Soprano Saxophone
Alto Saxophone
Tenor Saxophone
Baritone Saxophone
Horns in F I, II, III, IV
Trumpets I, II, III
Trombones I, II
Bass Trombone
Tuba
Timpani
Vibraphone
Marimba
Percussion I
Rain Stick
to be turned such that there is constant sound
Percussion II
Maracas
Percussion III
Ocean Drum
stirring both
Piano
♩ = 60
Violin I
Violin II
Viola
Violoncello
Double Bass
"shhh..."
1
2
3
4
5
6

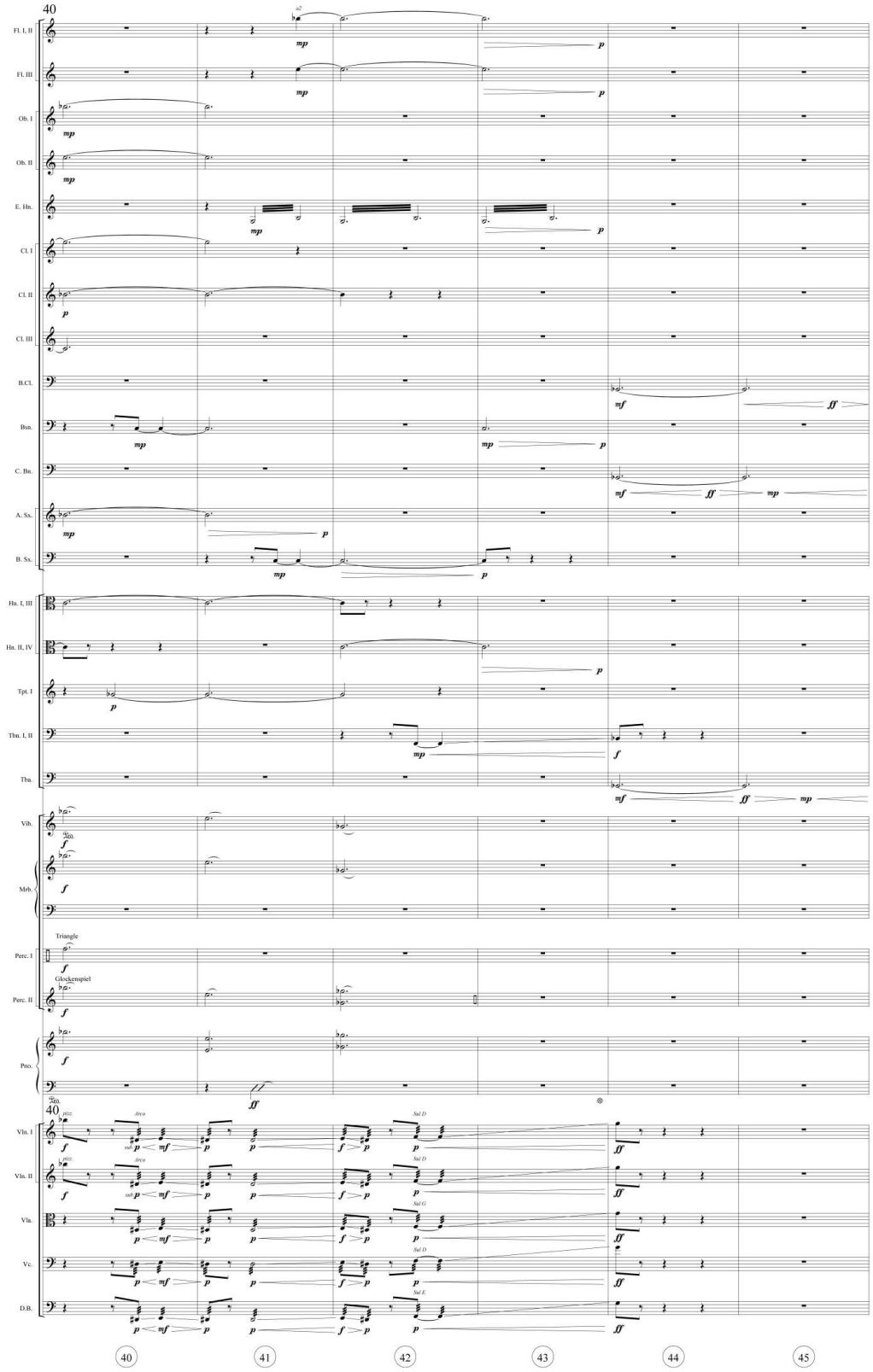

7
Fl. I, II, III
Ob. I, II
E. Hn.
Clar. I, II, III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I, II, III, IV
Tpt. I, II, III
Tbn. I, II
B. Tbn.
Perc. I
Rain Stick
Perc. II
Maracas
stirring both
Perc. III
Ocean Drum
7
Vln. I
Vln. II
Vla.
Vc.
D.B.
7
8
9
10
11
12

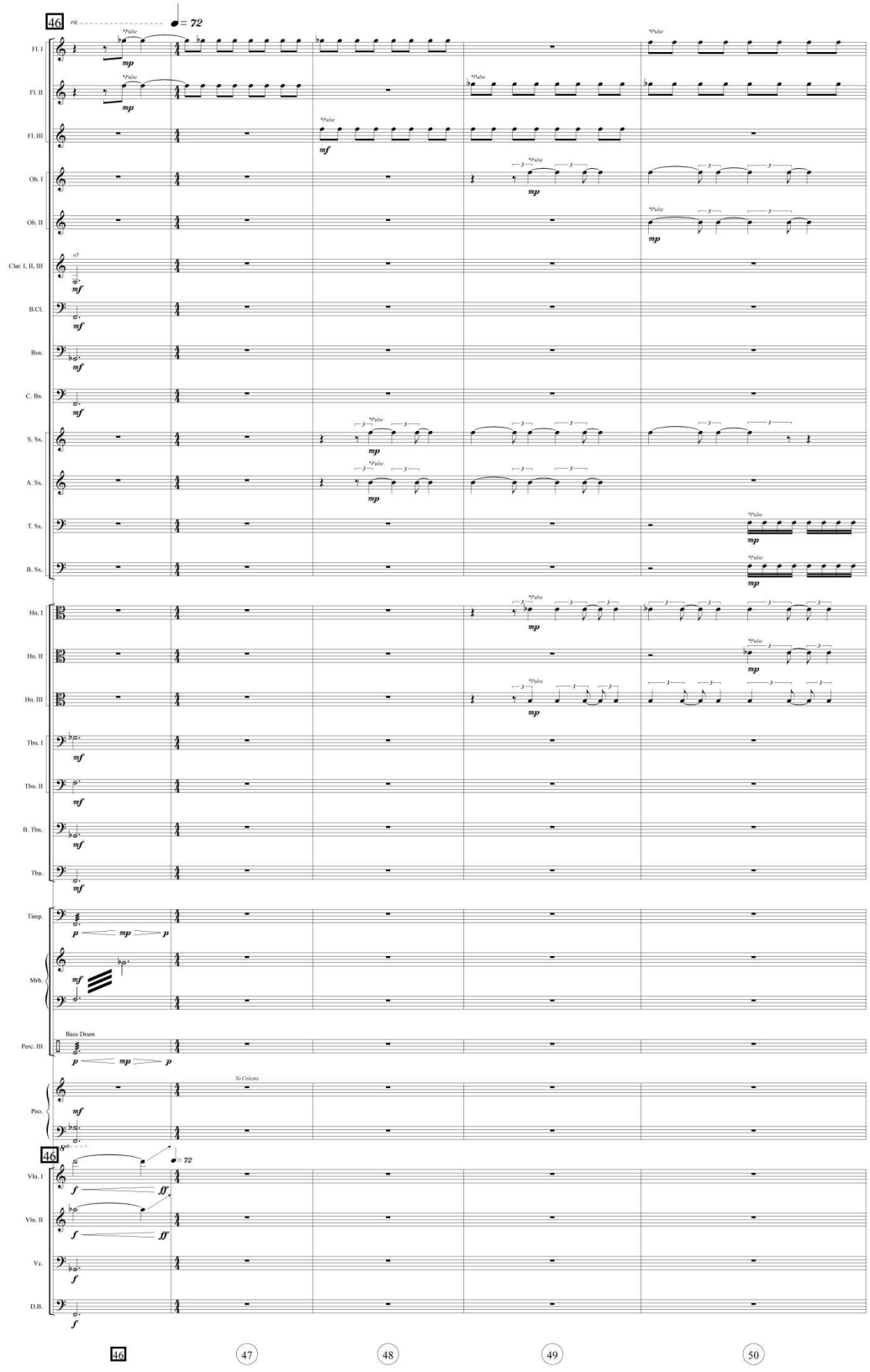

13
Fl. 1
Ob. 1
Cl. 1
B.Cl.
Bsn.
C. Bn.
B. Sx.
B. Tbn.
Tba.
Mrb.
If the lower octave is not available, transpose up by an octave
Pno.
13
Vc.
D.B.
13
14
15
16
17
18
19

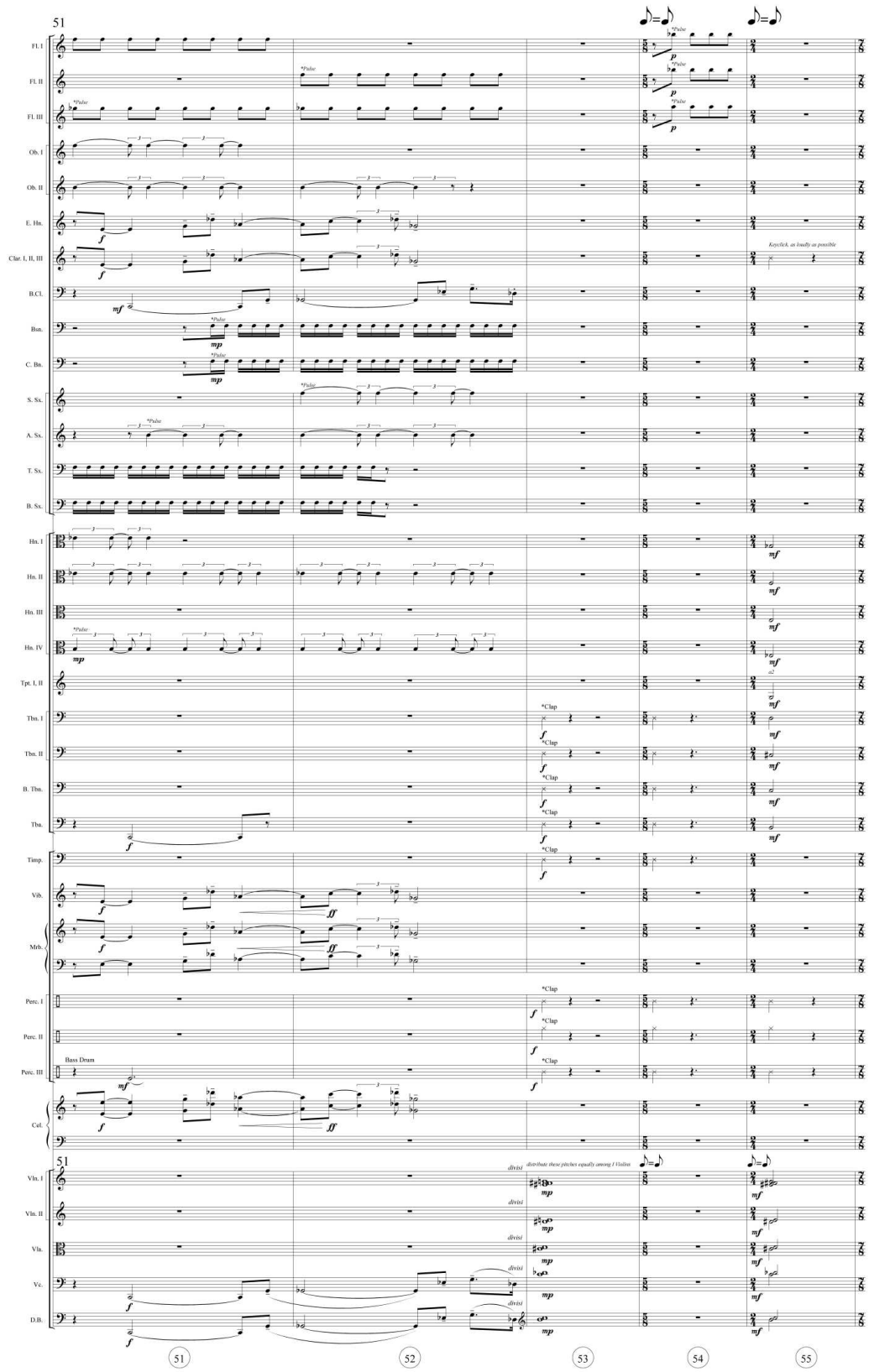

20
Fl. I
Fl. II
Ob. I, II
B.Cl.
Bsn.
C. Bn.
B. Sx.
B. Tbn.
Tba.
Mrb.
Pno.
20
Vc.
D.B.
p
mp
a2
20
21
22
23
24
25
26

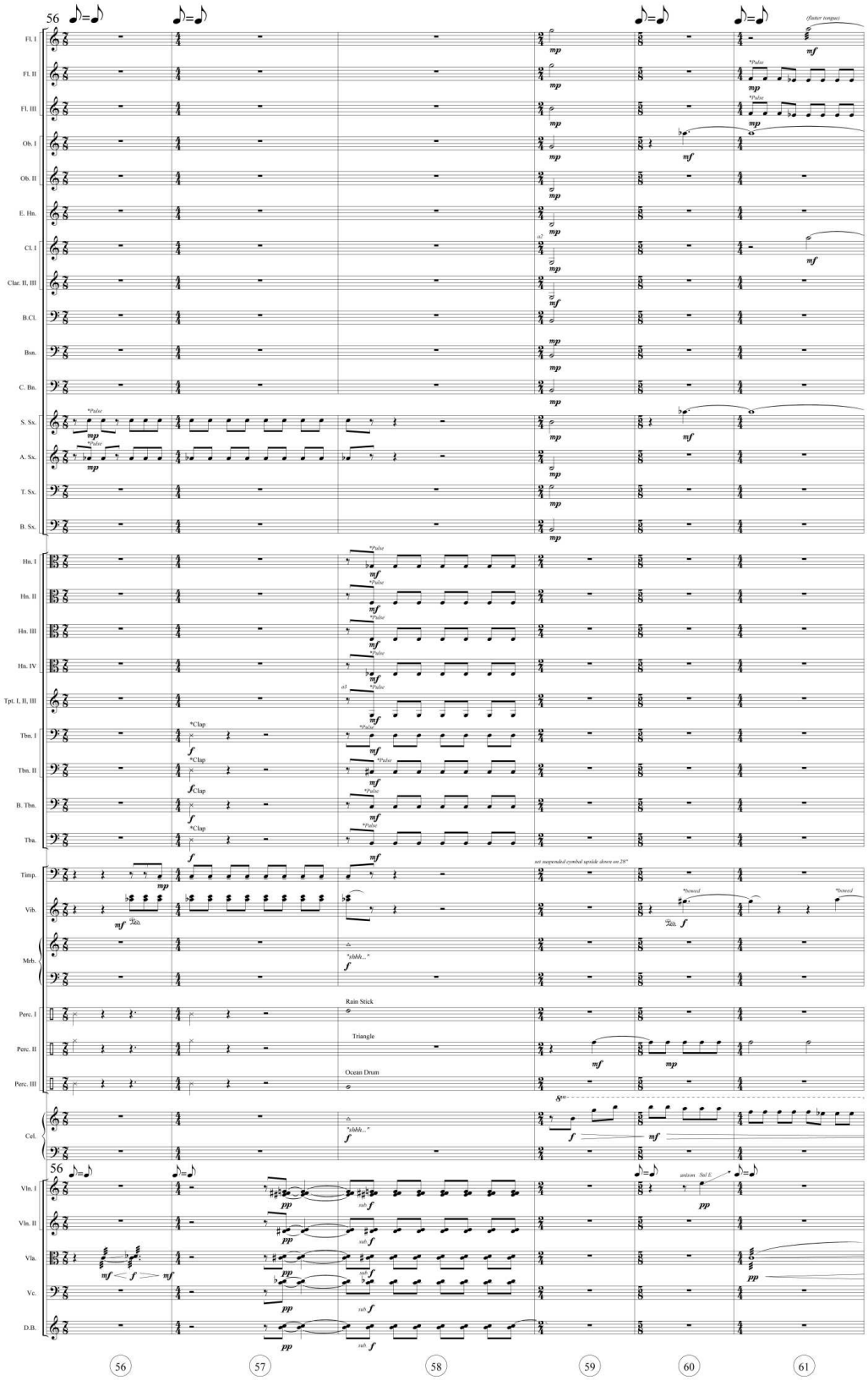

27
28
♩= 84
Fl. I
Fl. II
Fl. III
Ob. I, II
E. Hn.
Clar. I, II, III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I, III
Hn. II, IV
Tpt. I, II, III
Tbn. I, II
B. Tbn.
Tba.
Vib.
Mrb.
Perc. I
Rain Stick
Perc. II
Maracas
Pno.
Vln. I
Vln. II
Vla.
Vc.
D.B.
Keyclicks at random pitches and quick rhythms
"shhh..."
stirring both
* Strike the inside strings with soft bass bram mallets in the lowest possible range
Random, quick pizz. rhythms in the given range
Arco
27
28
29
30
31
32

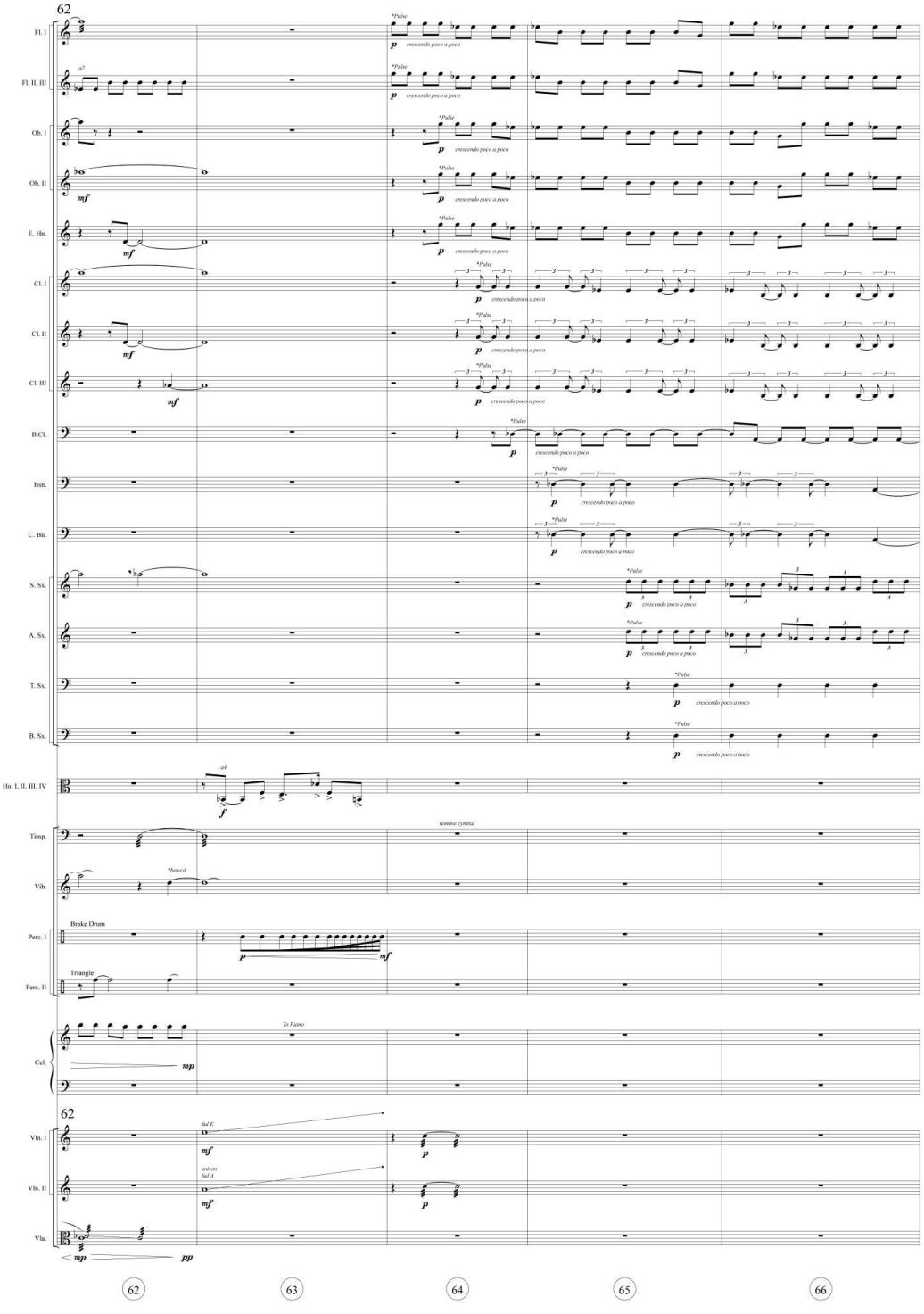

33
Fl. I, II, III
Ob. I
Cl. I
Cl. III
S. Sx.
Hn. I, III
Hn. II, IV
Pno.
33
Vln. I
Vln. II
Vla.
Vc.
D.B.
Sul D
Sul G
Arco
33
34
35
36
37
38
39

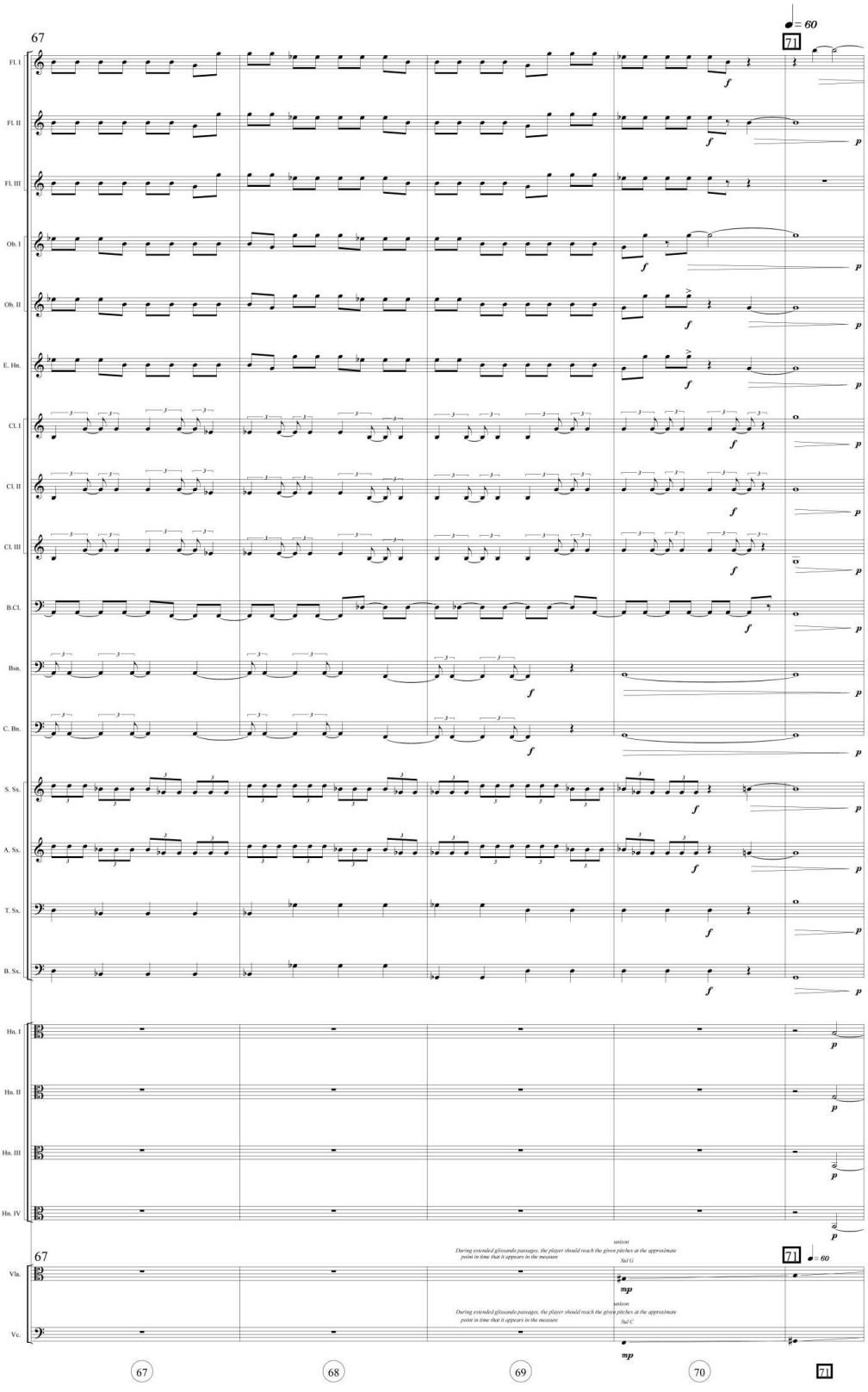

40
Fl. I, II
Fl. III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
B.Cl.
Bsn.
C. Bn.
A. Sx.
B. Sx.
Hn. I, III
Hn. II, IV
Tpt. I
Tbn. I, II
Tba.
Vib.
Mrb.
Triangle
Perc. I
Glockenspiel
Perc. II
Pno.
40
Vln. I
Vln. II
Vla.
Vc.
D.B.
Arco
Sul D
Sul G
Sul E
40
41
42
43
44
45

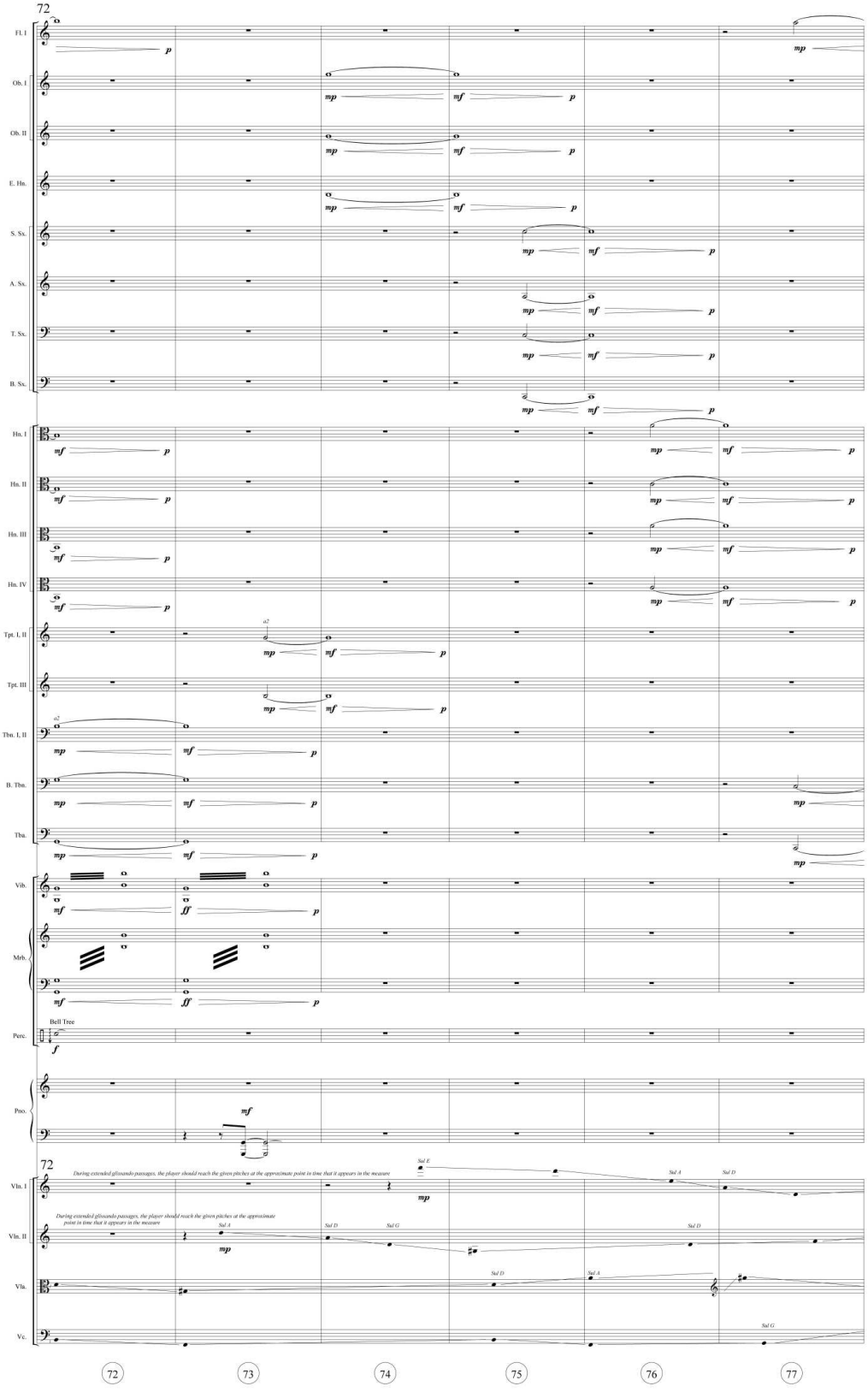

46
rit.
♩ = 72
Fl. I
Fl. II
Fl. III
Ob. I
Ob. II
Clar. I, II, III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Tbn. I
Tbn. II
B. Tbn.
Tba.
Timp.
Mrb.
Perc. III
Bass Drum
Pno.
To Celesta
46
8va
♩ = 72
Vln. I
Vln. II
Vc.
D.B.
46
47
48
49
50

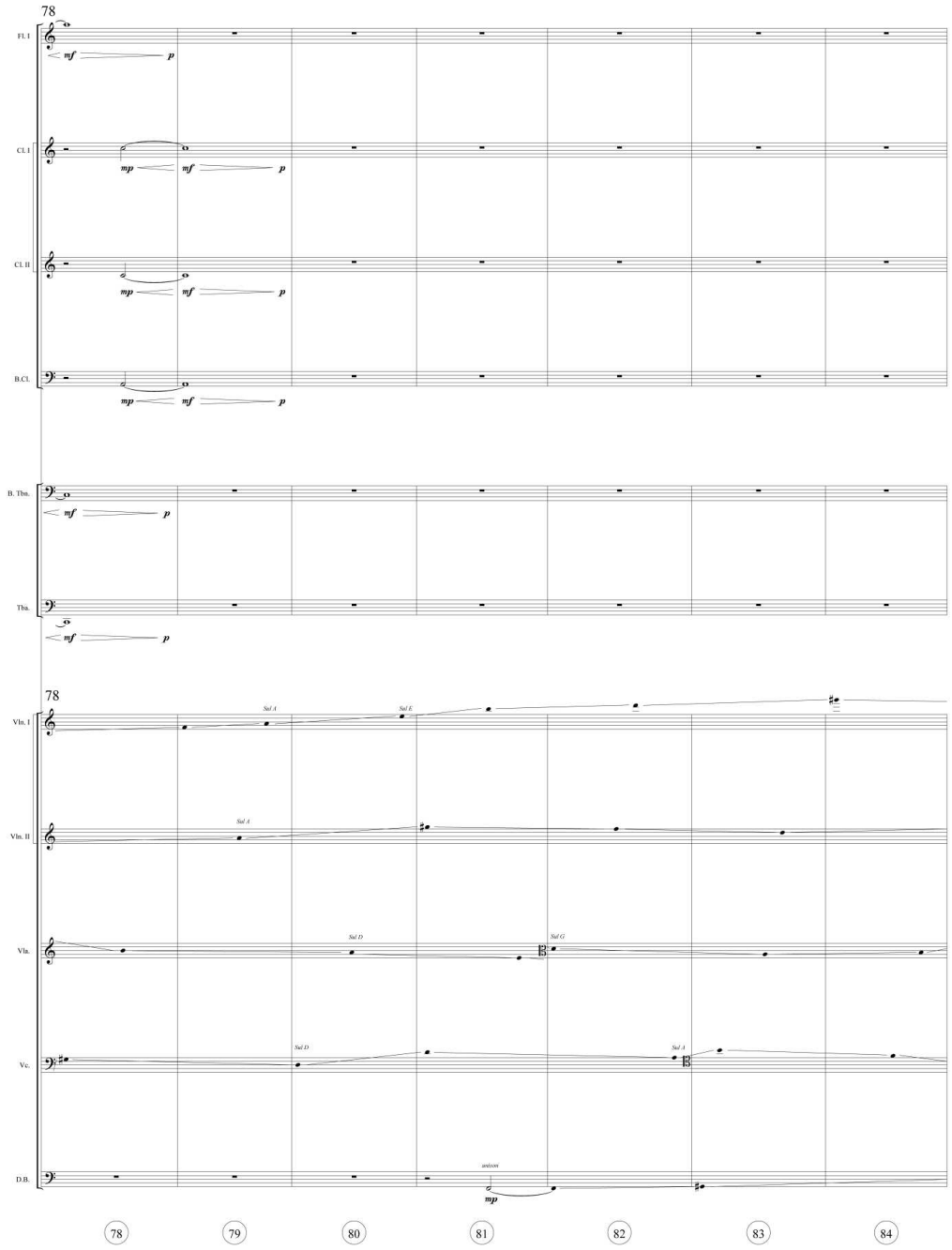

51
Fl. I
Fl. II
Fl. III
Ob. I
Ob. II
E. Hn.
Clar. I, II, III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I, II
Tbn. I
Tbn. II
B. Tbn.
Tba.
Timp.
Vib.
Mrb.
Perc. I
Perc. II
Perc. III
Bass Drum
Cel.
51
Vln. I
Vln. II
Vln.
Vc.
D.B.
*Pulse
*Clap
Keyclick, as loudly as possible
divisi
distribute these pitches equally among I Violins
51
52
53
54
55

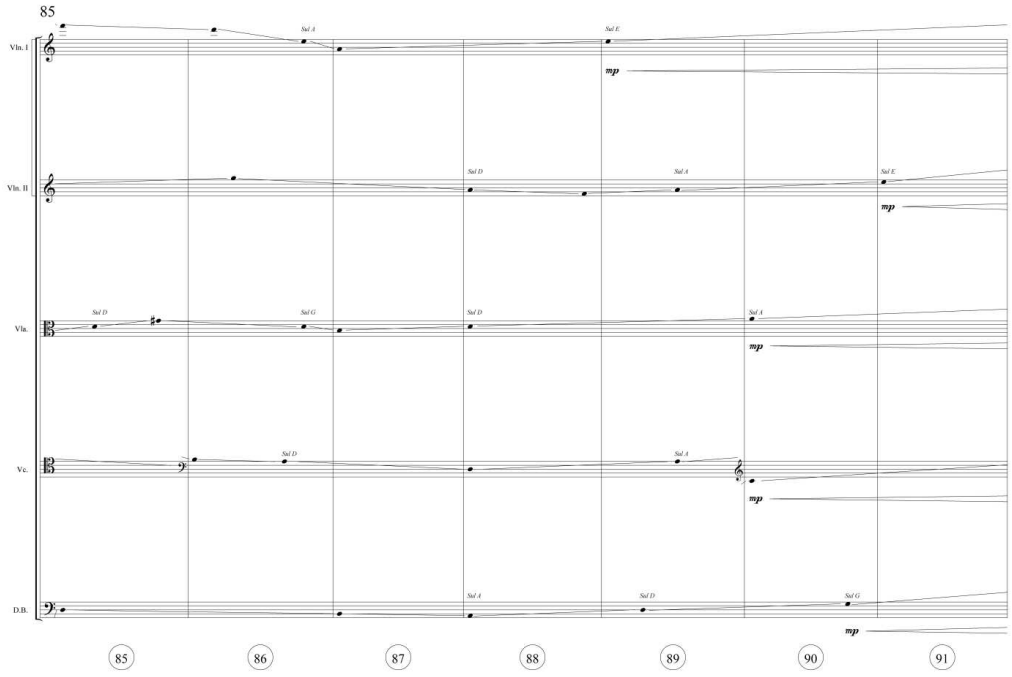

56
Fl. I
Fl. II
Fl. III
Ob. I
Ob. II
E. Hn.
Cl. I
Clar. II, III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I, II, III
Tbn. I
Tbn. II
B. Tbn.
Tba.
Timp.
Vib.
Mrb.
Perc. I
Perc. II
Perc. III
Cel.
Vln. I
Vln. II
Vla.
Vc.
D.B.
Rain Stick
Triangle
Ocean Drum
56
57
58
59
60
61

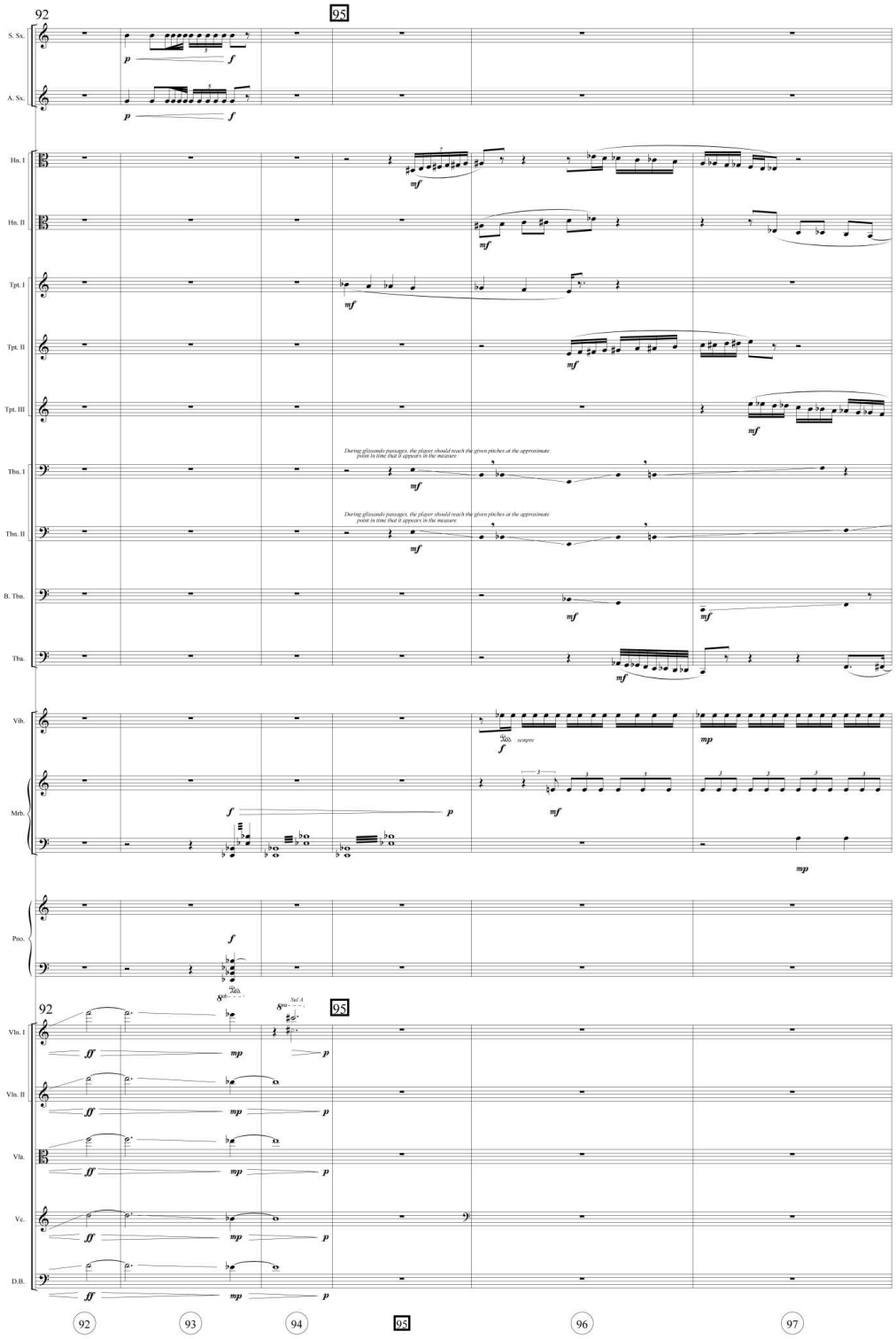

62
Fl. I
Fl. II, III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I, II, III, IV
Timp.
Vib.
Perc. I
Perc. II
Cel.
62
Vln. I
Vln. II
Vln.
*Pulse
crescendo poco a poco
a2
mf
p
f
mp
pp
remove cymbal
*bowed
Brake Drum
Triangle
To Piano
Sul E
unison
Sul A
62
63
64
65
66

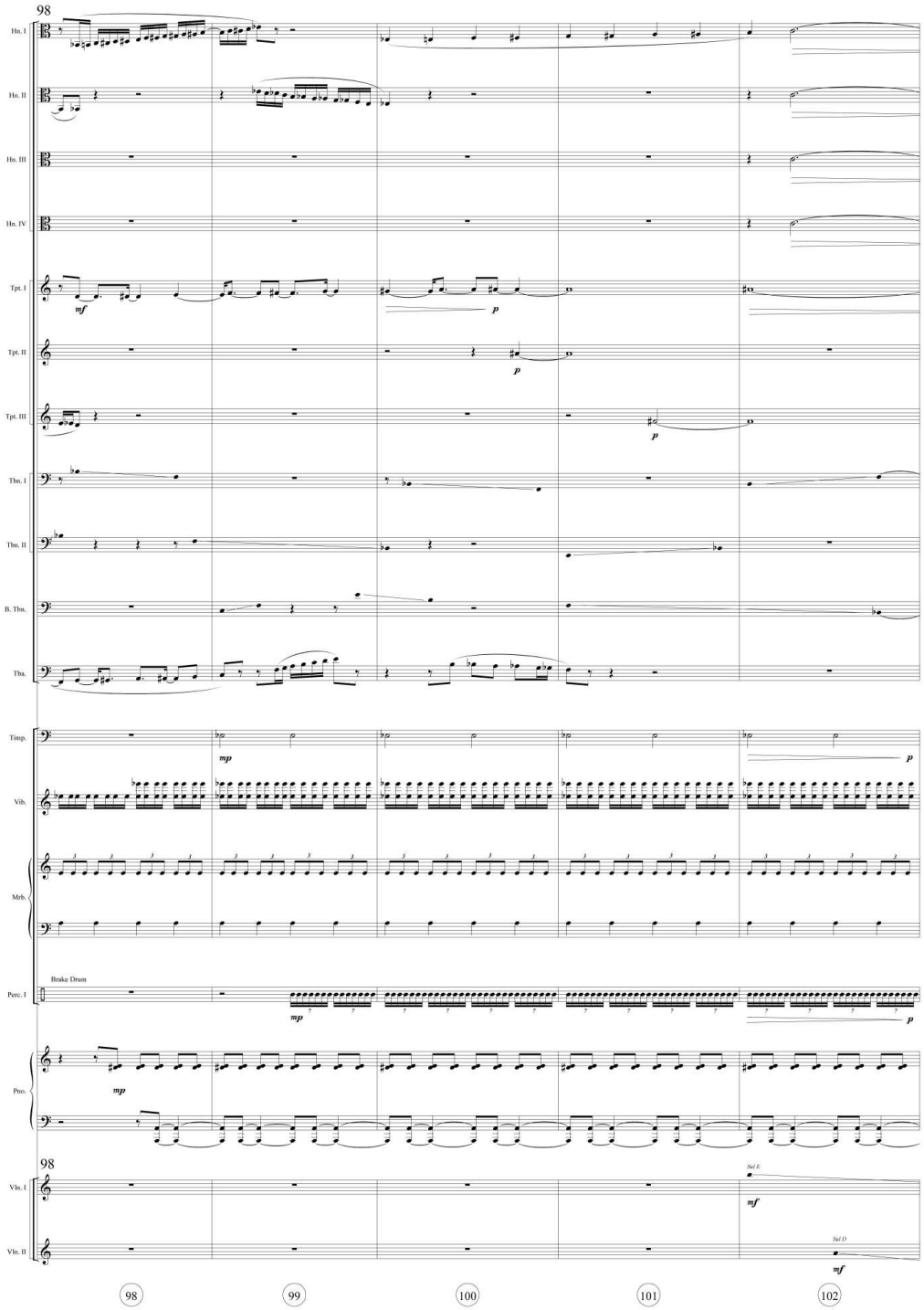

67
71
♩= 60
Fl. I
Fl. II
Fl. III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Vla.
Vc.
unison
During extended glissando passages, the player should reach the given pitches at the approximate point in time that it appears in the measure
Sul G
Sul C
67
68
69
70
71

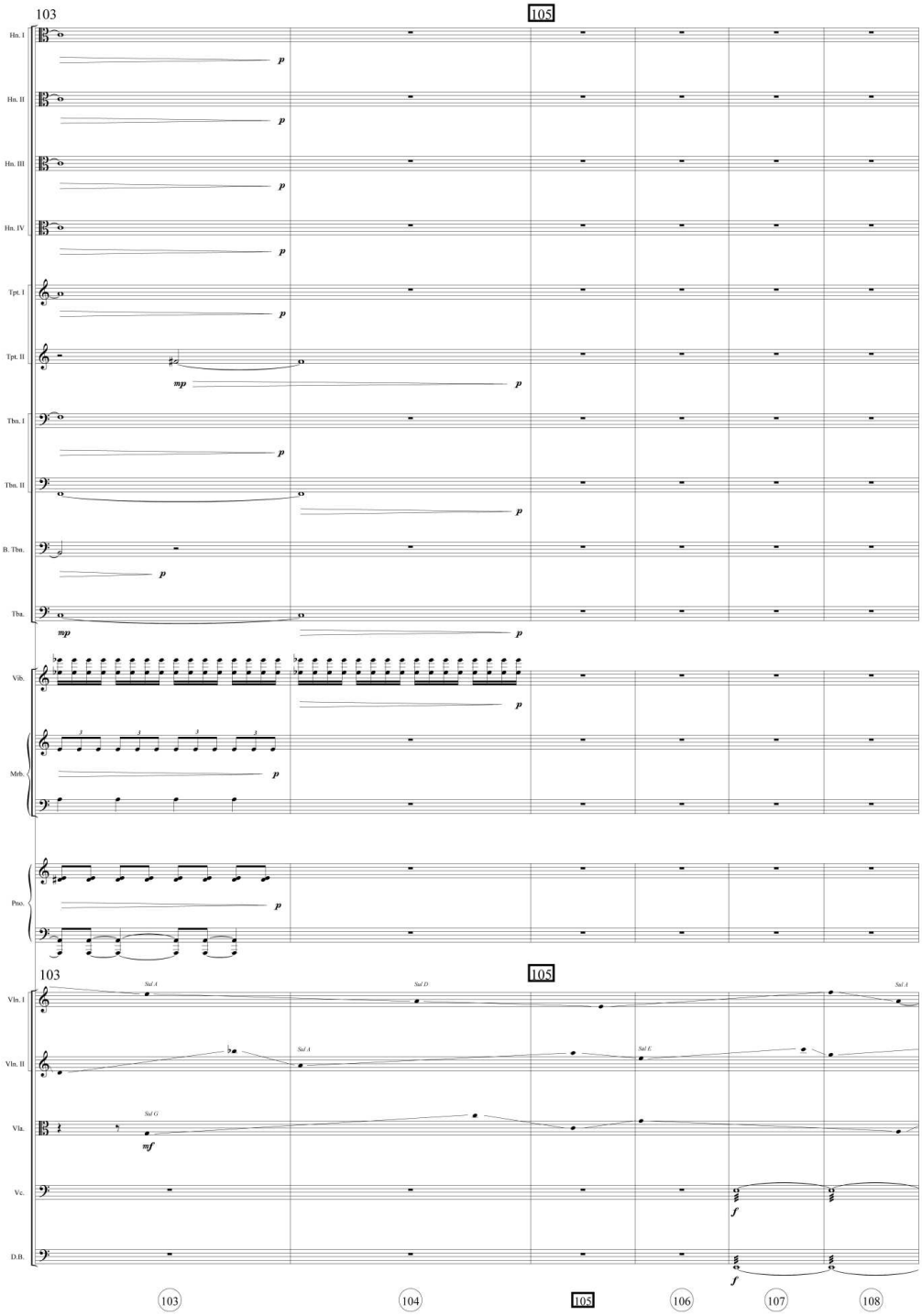

72
Fl. I
Ob. I
Ob. II
E. Hn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I, II
Tpt. III
Thn. I, II
B. Thn.
Tba.
Vib.
Mrb.
Perc.
Bell Tree
Pno.
72
Vln. I
Vln. II
Vla.
Vc.
During extended glissando passages, the player should reach the given pitches at the approximate point in time that it appears in the measure
Sul E
Sul A
Sul D
Sul G
72
73
74
75
76
77

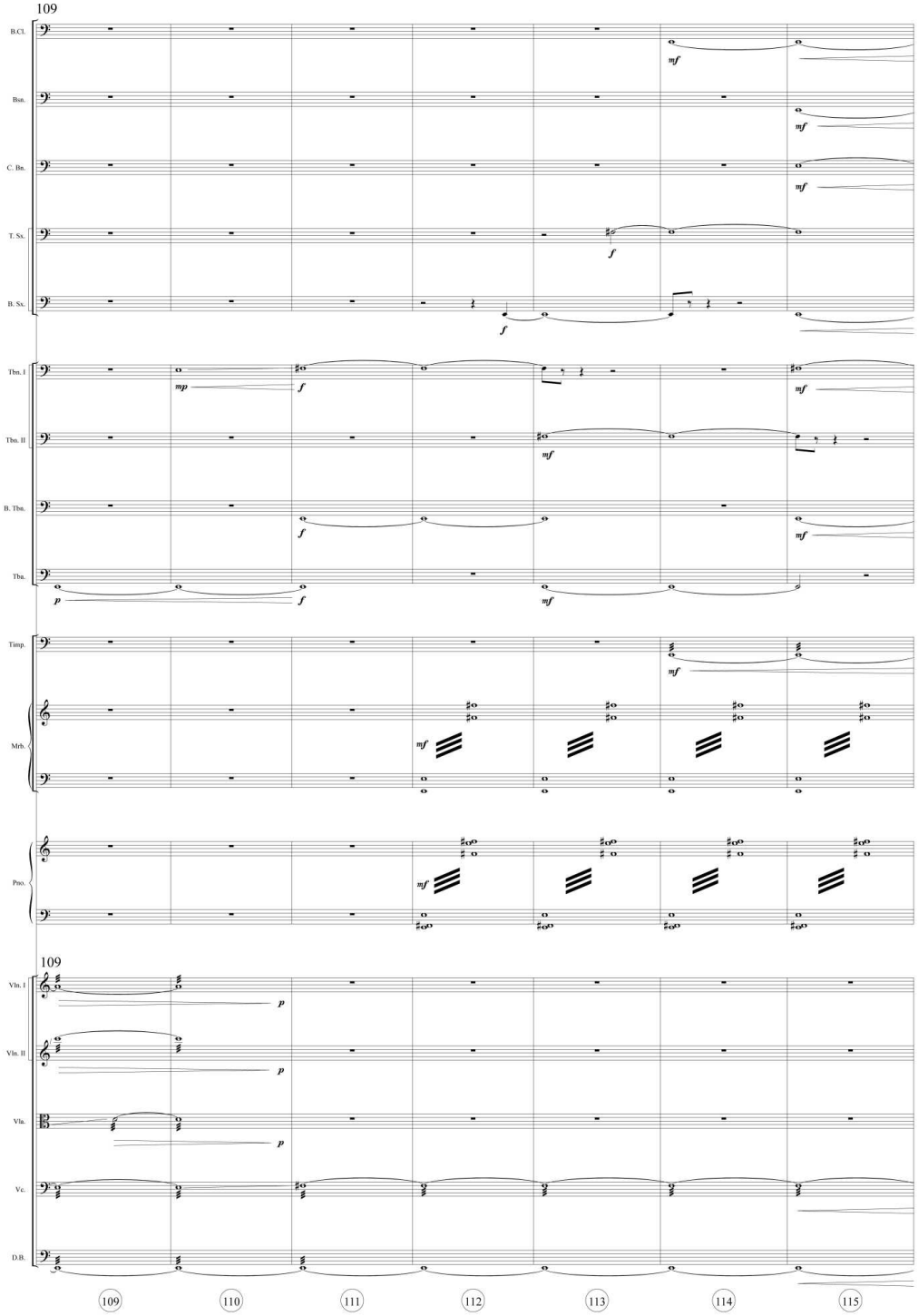

78
Fl. I
Cl. I
Cl. II
B.Cl.
B. Tbn.
Tba.
78
Vln. I
Vln. II
Vla.
Vc.
D.B.
Sul A
Sul E
Sul A
Sul D
Sul G
Sul D
Sul A
unison
mf
p
mp
78
79
80
81
82
83
84

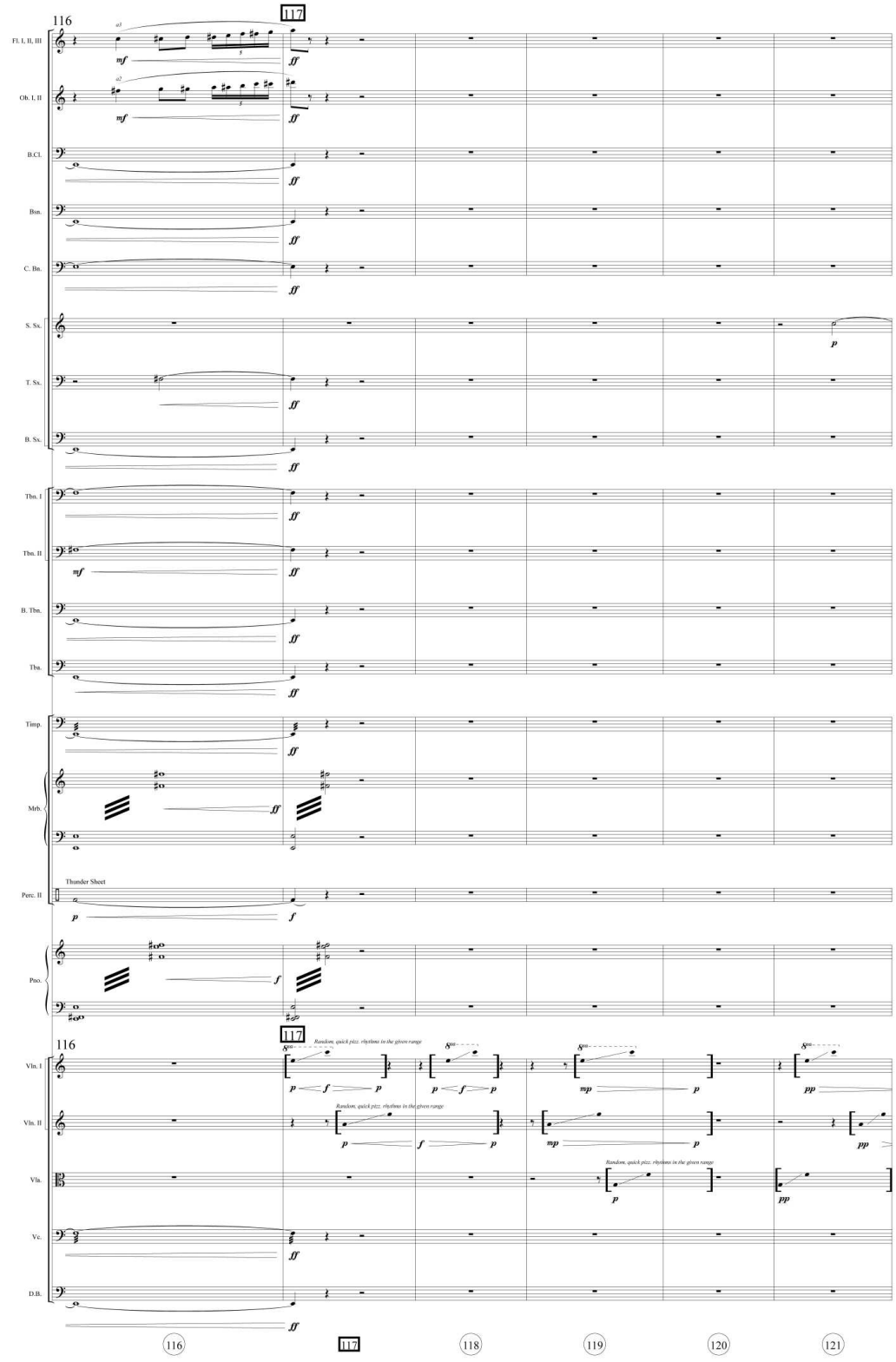

85
Vln. I
Vln. II
Vla.
Vc.
D.B.
Sul A
Sul E
Sul D
Sul A
Sul E
Sul D
Sul G
Sul D
Sul A
Sul D
Sul A
Sul A
Sul D
Sul G
mp
mp
mp
mp
mp
85
86
87
88
89
90
91

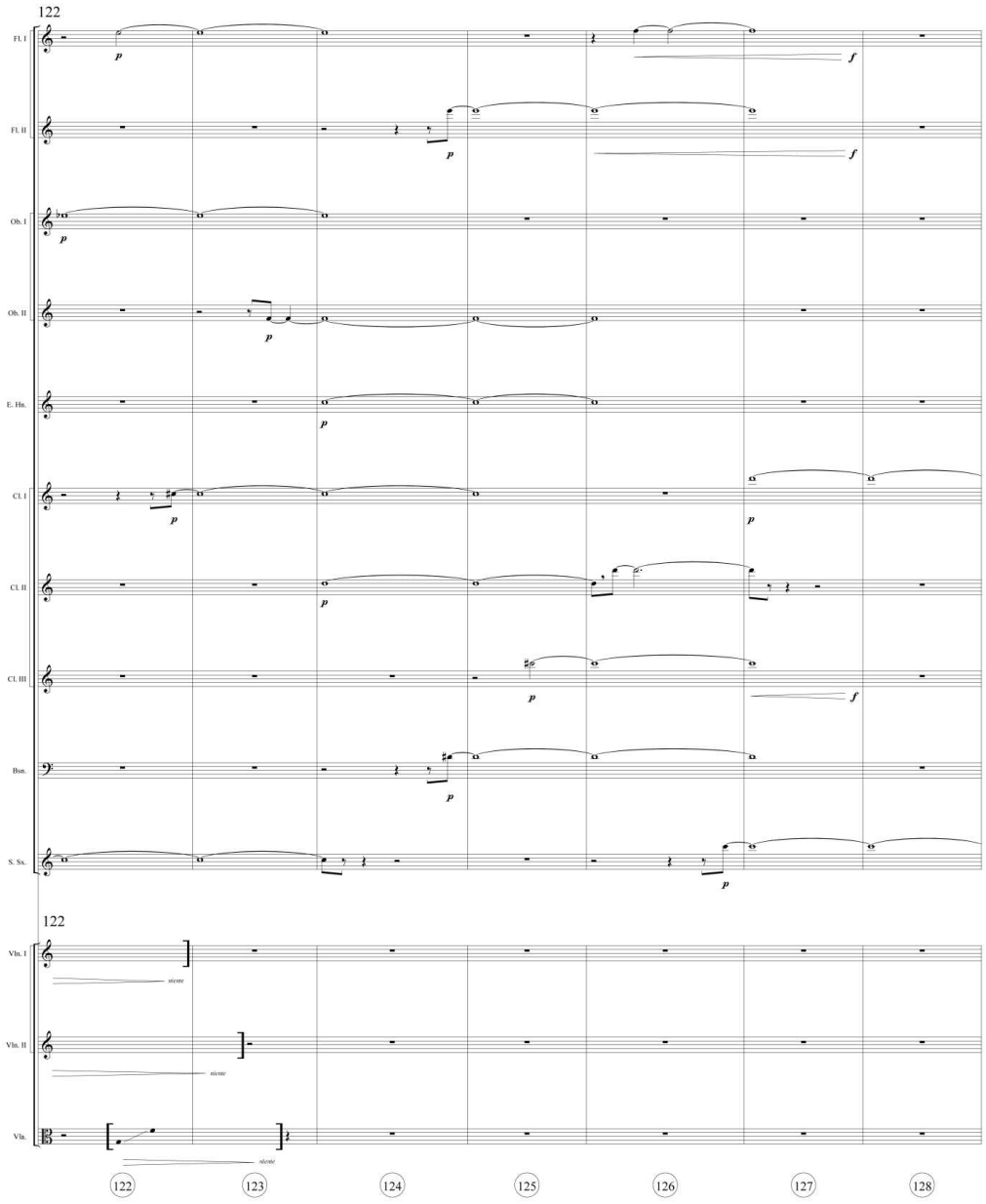

92
95
S. Ss.
A. Ss.
Hn. I
Hn. II
Tpt. I
Tpt. II
Tpt. III
Tbn. I
Tbn. II
B. Tbn.
Tba.
During glissando passages, the player should reach the given pitches at the approximate point in time that it appears in the measure
Vib.
Mrb.
Pno.
Vln. I
Vln. II
Vla.
Vc.
D.B.
sempre
Sul A
92
93
94
95
96
97

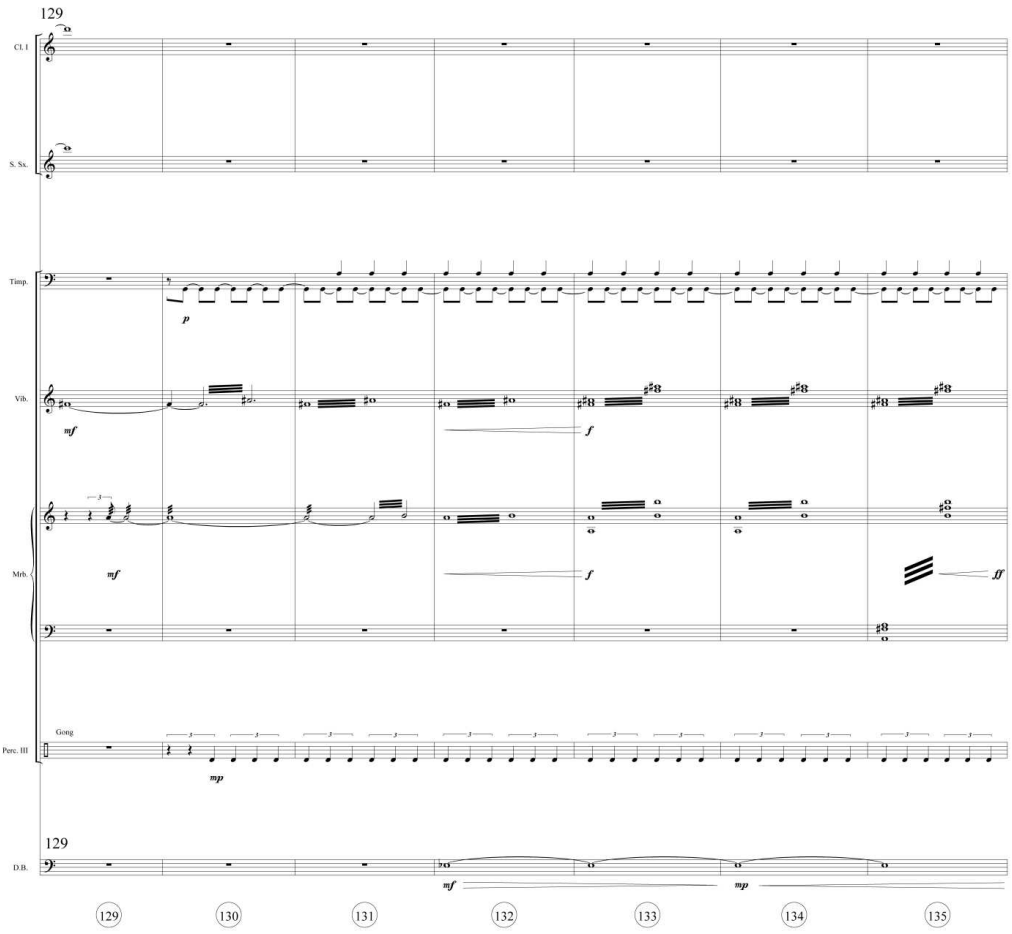

98
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I
mf
p
Tpt. II
p
Tpt. III
p
Tbn. I
Tbn. II
B. Tbn.
Tba.
Timp.
mp
p
Vib.
Mrb.
Brake Drum
Perc. I
mp
p
Pno.
mp
98
Vln. I
Sul E
mf
Vln. II
Sul D
mf
98
99
100
101
102

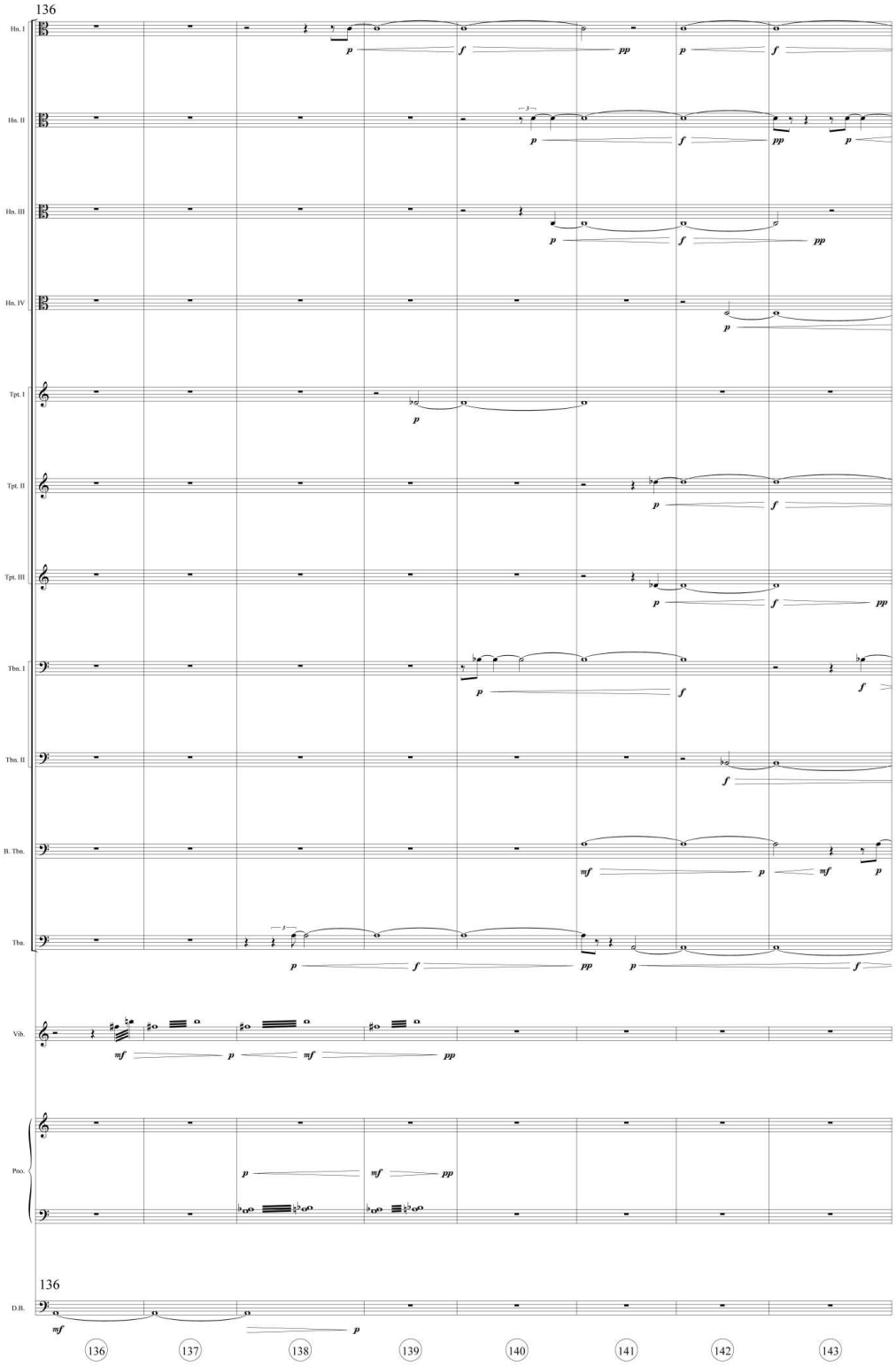

103
105
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I
Tpt. II
Tbn. I
Tbn. II
B. Tbn.
Tba.
Vib.
Mrb.
Pno.
Vln. I
Vln. II
Vla.
Vc.
D.B.
Sul A
Sul D
Sul E
Sul G
p
mp
mf
f
103
104
105
106
107
108

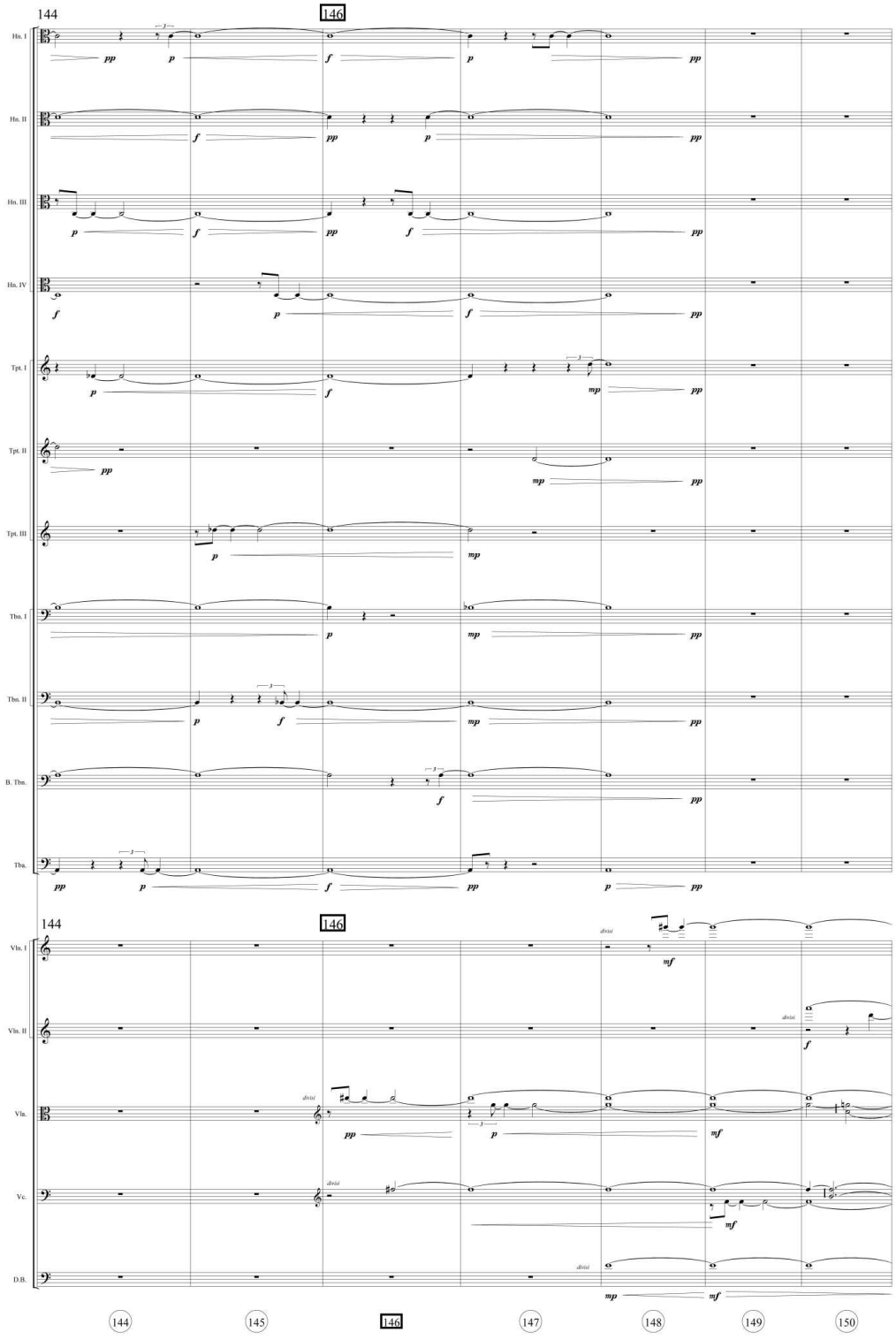

109
B.Cl.
Bsn.
C. Bn.
T. Sx.
B. Sx.
Tbn. I
Tbn. II
B. Tbn.
Tba.
Timp.
Mrb.
Pno.
109
Vln. I
Vln. II
Vla.
Vc.
D.B.
109
110
111
112
113
114
115

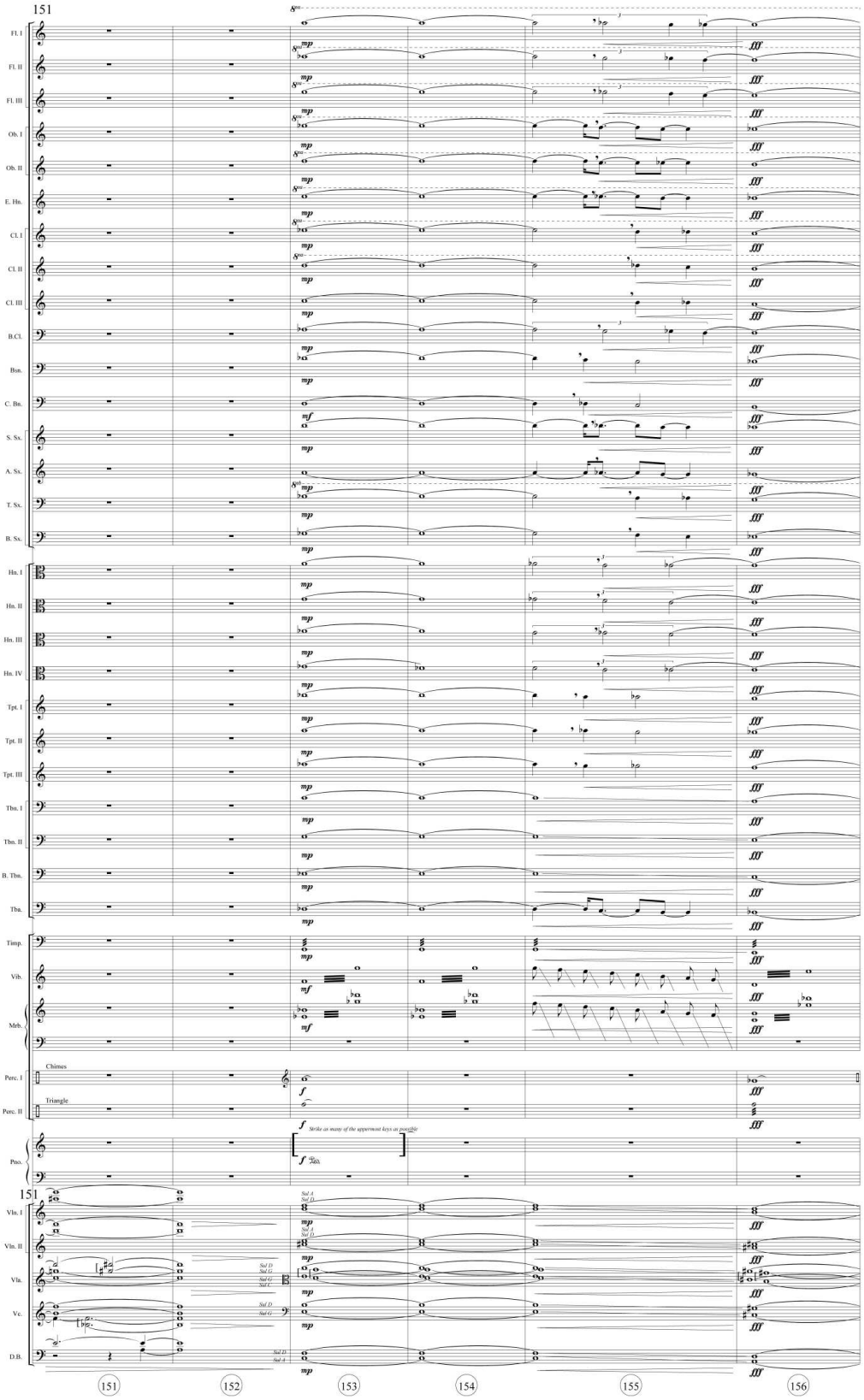

116
117
Fl. I, II, III
Ob. I, II
B.Cl.
Bsn.
C. Bn.
S. Sx.
T. Sx.
B. Sx.
Tbn. I
Tbn. II
B. Tbn.
Tba.
Timp.
Mrb.
Thunder Sheet
Perc. II
Pno.
Vln. I
Vln. II
Vla.
Vc.
D.B.
Random, quick pizz. rhythms in the given range
116
117
118
119
120
121

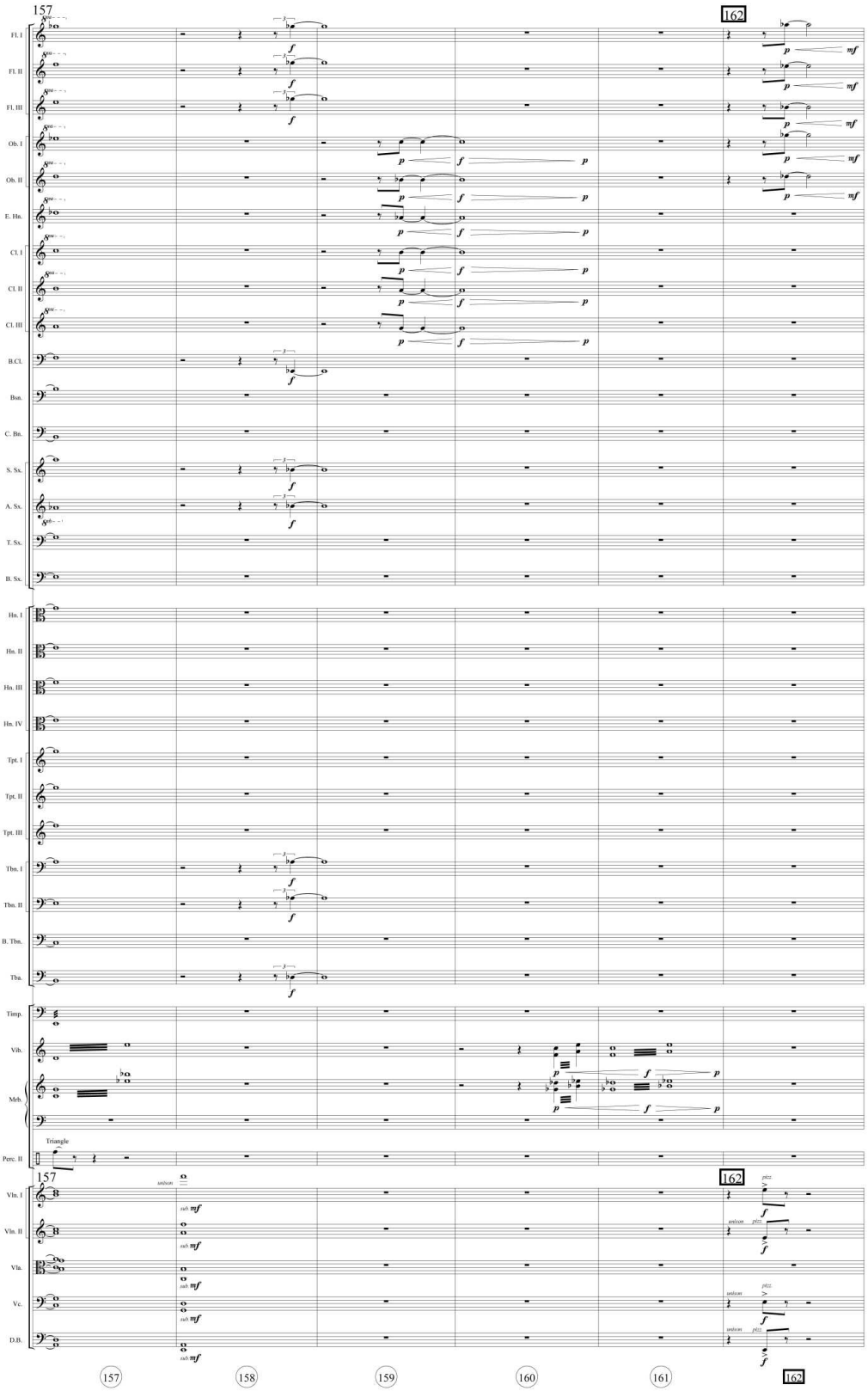

122
Fl. I
Fl. II
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
Bsn.
S. Sx.
122
Vln. I
Vln. II
Vla.
niente
niente
niente
122
123
124
125
126
127
128

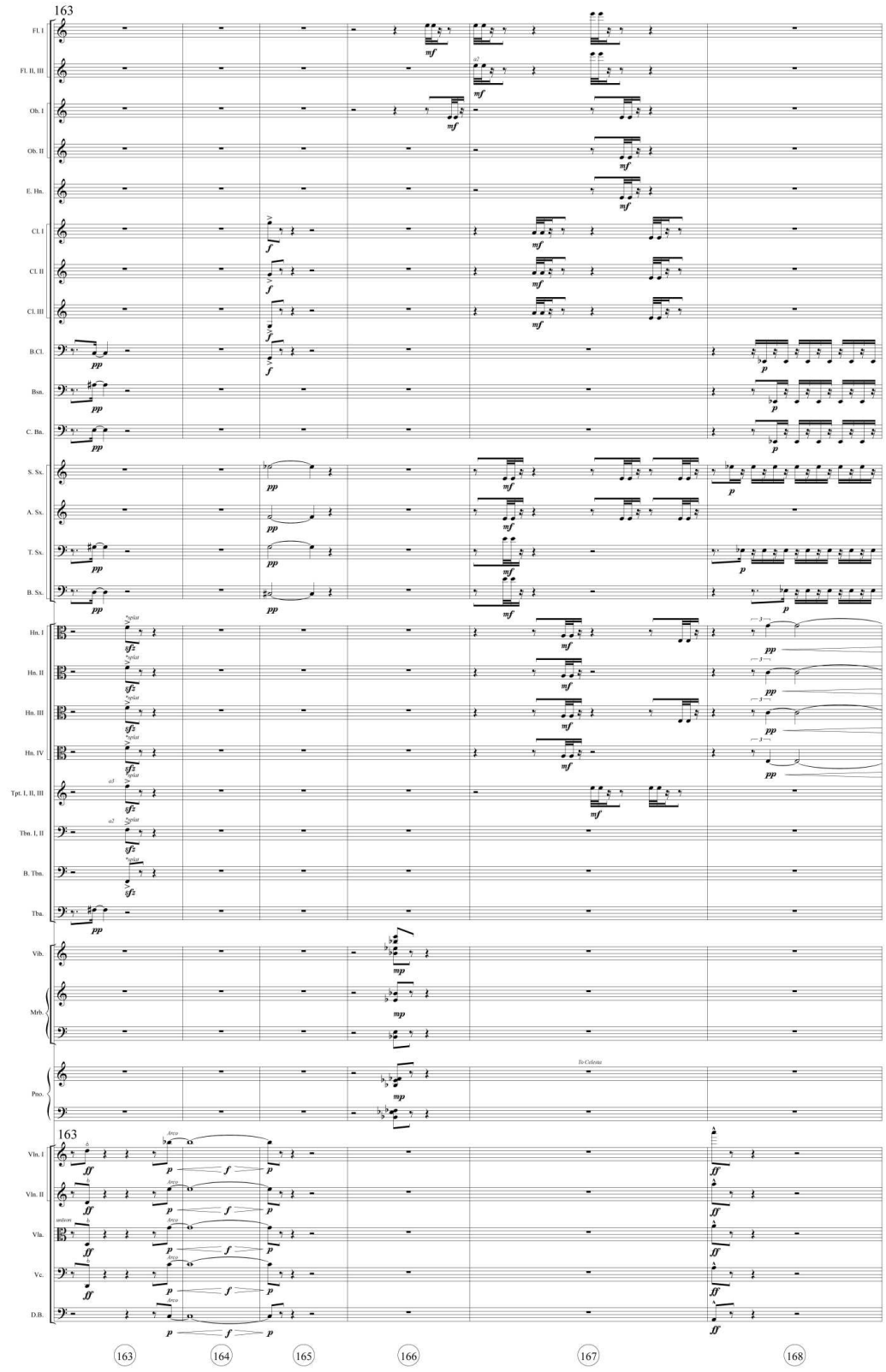

129
Cl. I
S. Sx.
Timp.
Vib.
Mrb.
Gong
Perc. III
129
D.B.
p
mf
f
mf
f
ff
mp
mf
mp
129
130
131
132
133
134
135

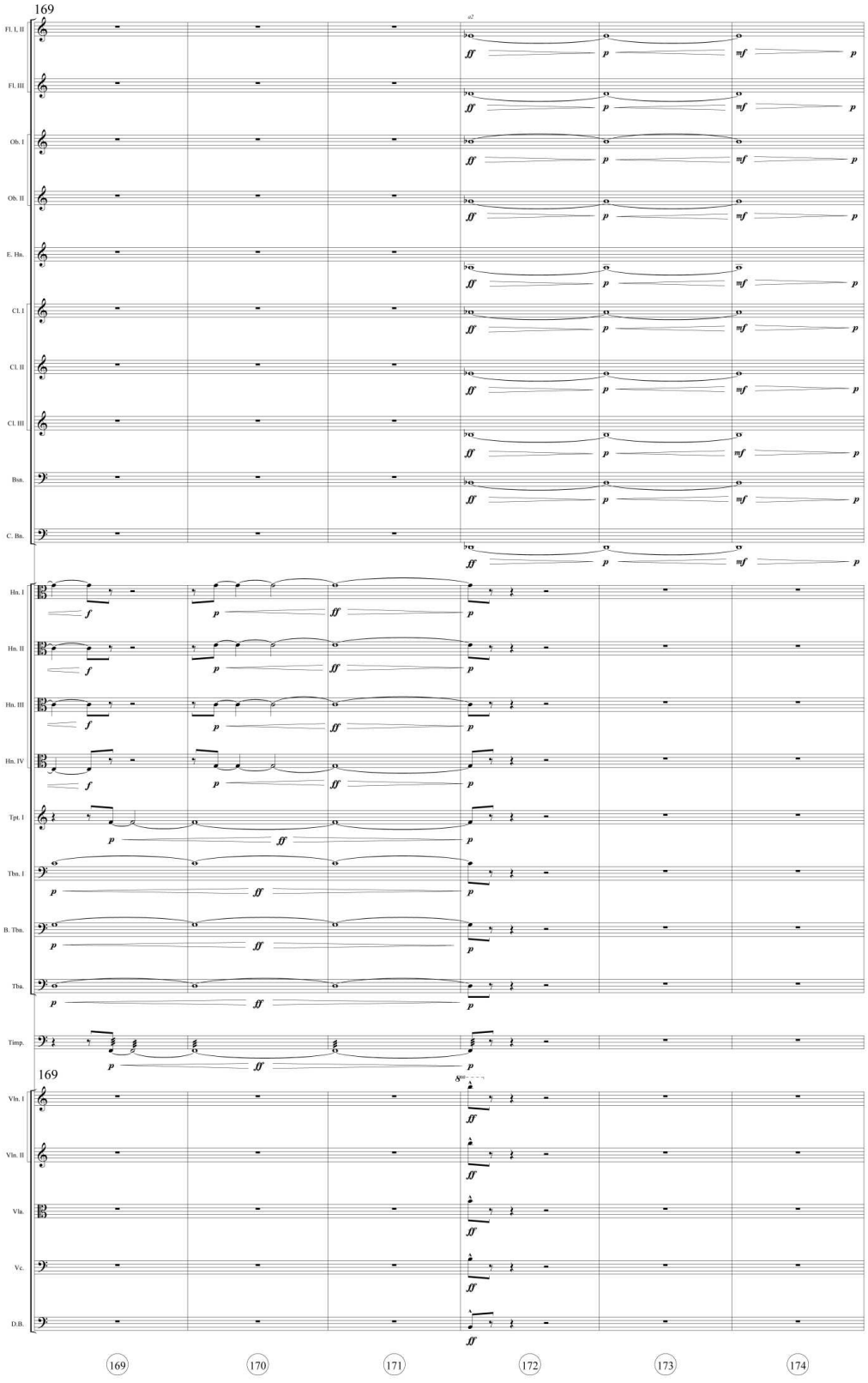

136
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I
Tpt. II
Tpt. III
Tbn. I
Tbn. II
B. Tbn.
Tba.
Vib.
Pno.
136
D.B.
136
137
138
139
140
141
142
143

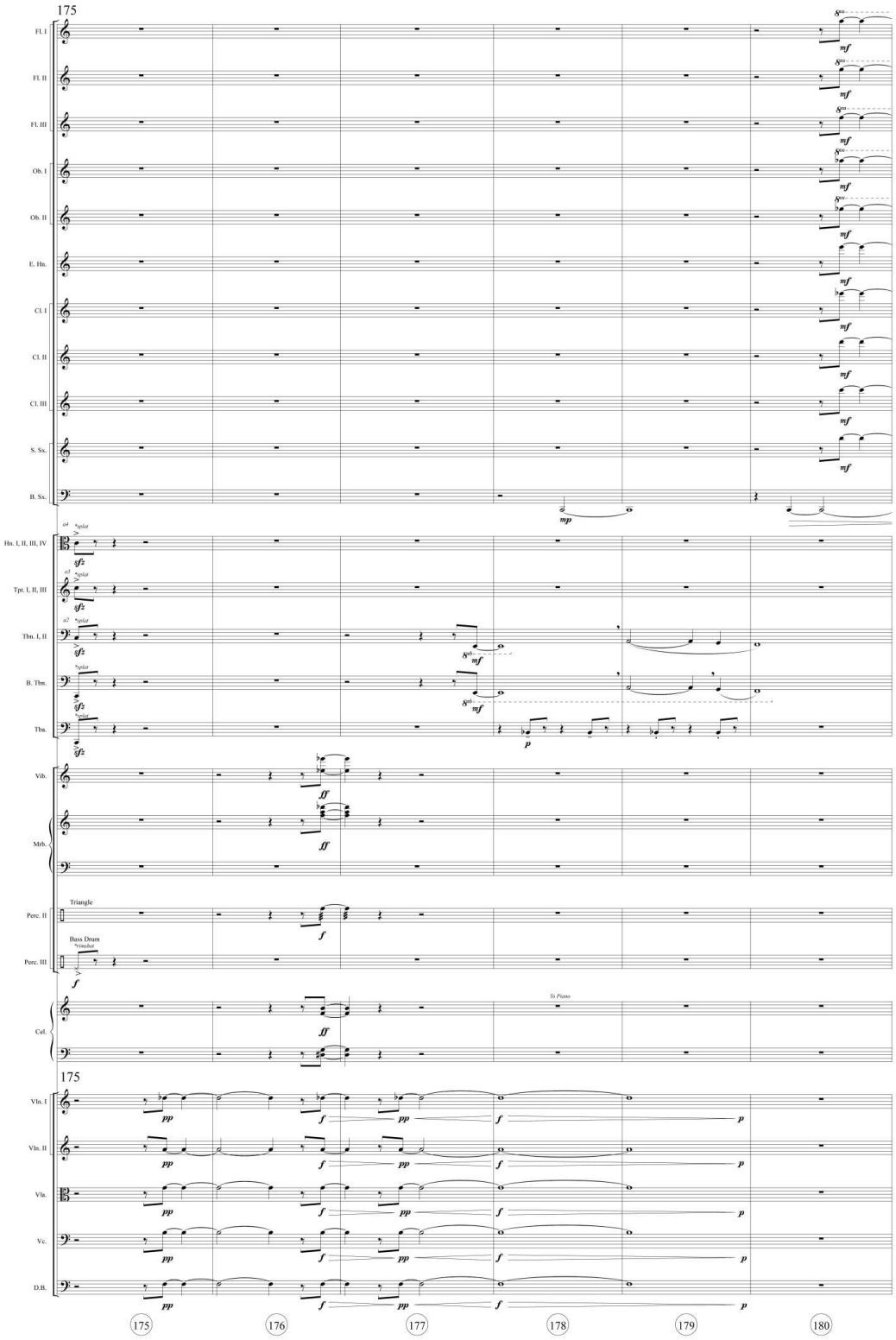

144
146
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I
Tpt. II
Tpt. III
Tbn. I
Tbn. II
B. Tbn.
Tba.
144
146
Vln. I
Vln. II
Vla.
Vc.
D.B.
divisi
144
145
146
147
148
149
150

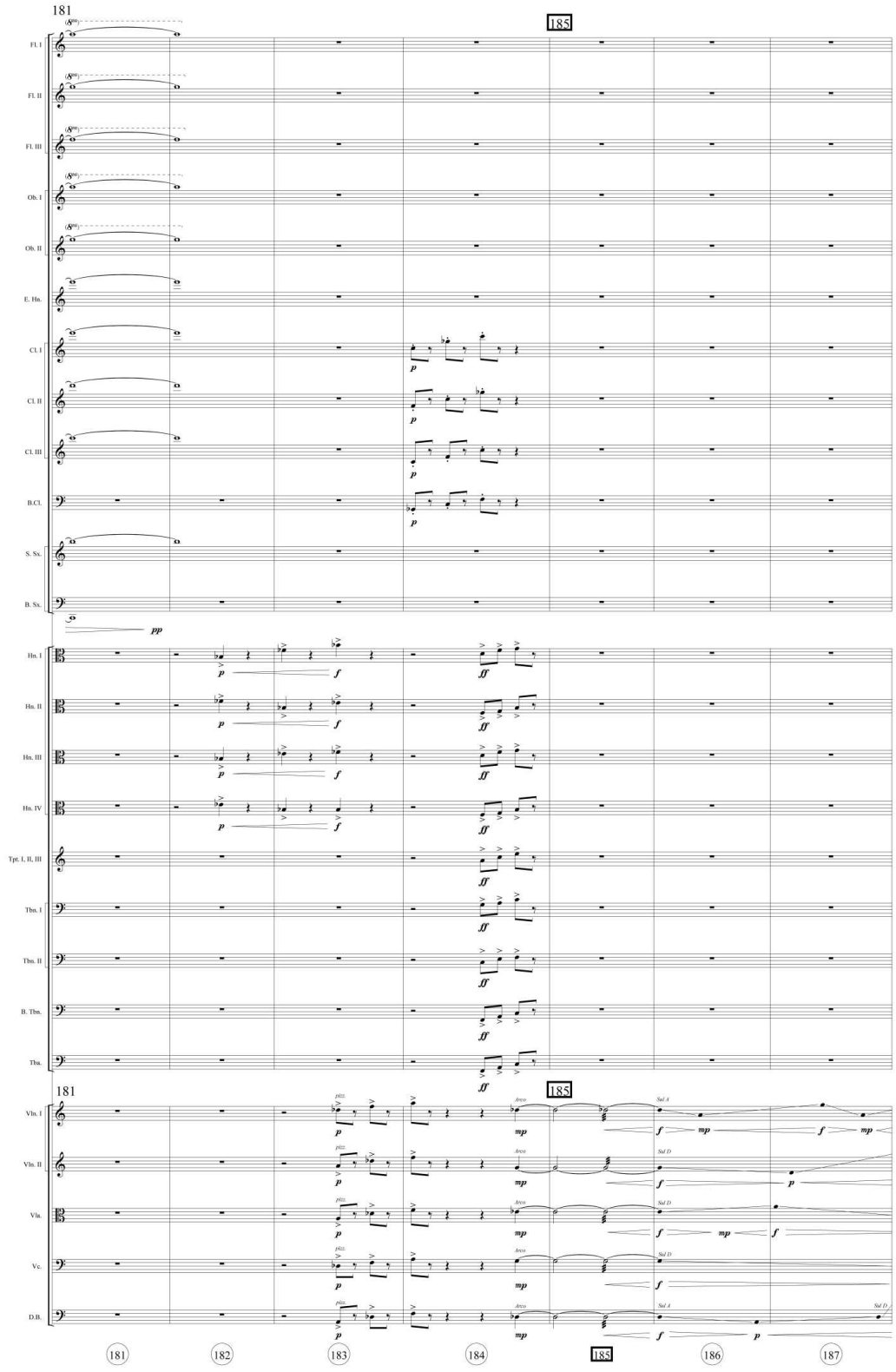

151
Fl. I
Fl. II
Fl. III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I
Tpt. II
Tpt. III
Tbn. I
Tbn. II
B. Tbn.
Tba.
Timp.
Vib.
Mrb.
Perc. I
Chimes
Perc. II
Triangle
Pno.
Strike as many of the uppermost keys as possible
151
Vln. I
Vln. II
Vla.
Vc.
D.B.
151
152
153
154
155
156

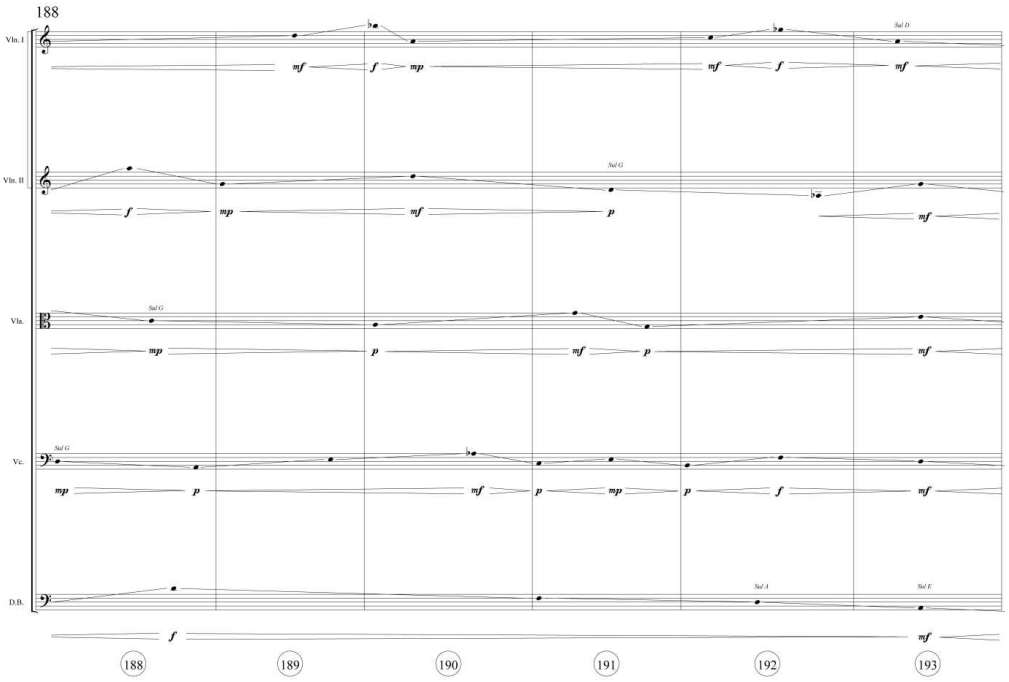

157
162
Fl. I
Fl. II
Fl. III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I
Tpt. II
Tpt. III
Tbn. I
Tbn. II
B. Tbn.
Tba.
Timp.
Vib.
Mrb.
Triangle
Perc. II
Vln. I
Vln. II
Vla.
Vc.
D.B.
unison
sub mf
pizz.
157
158
159
160
161
162

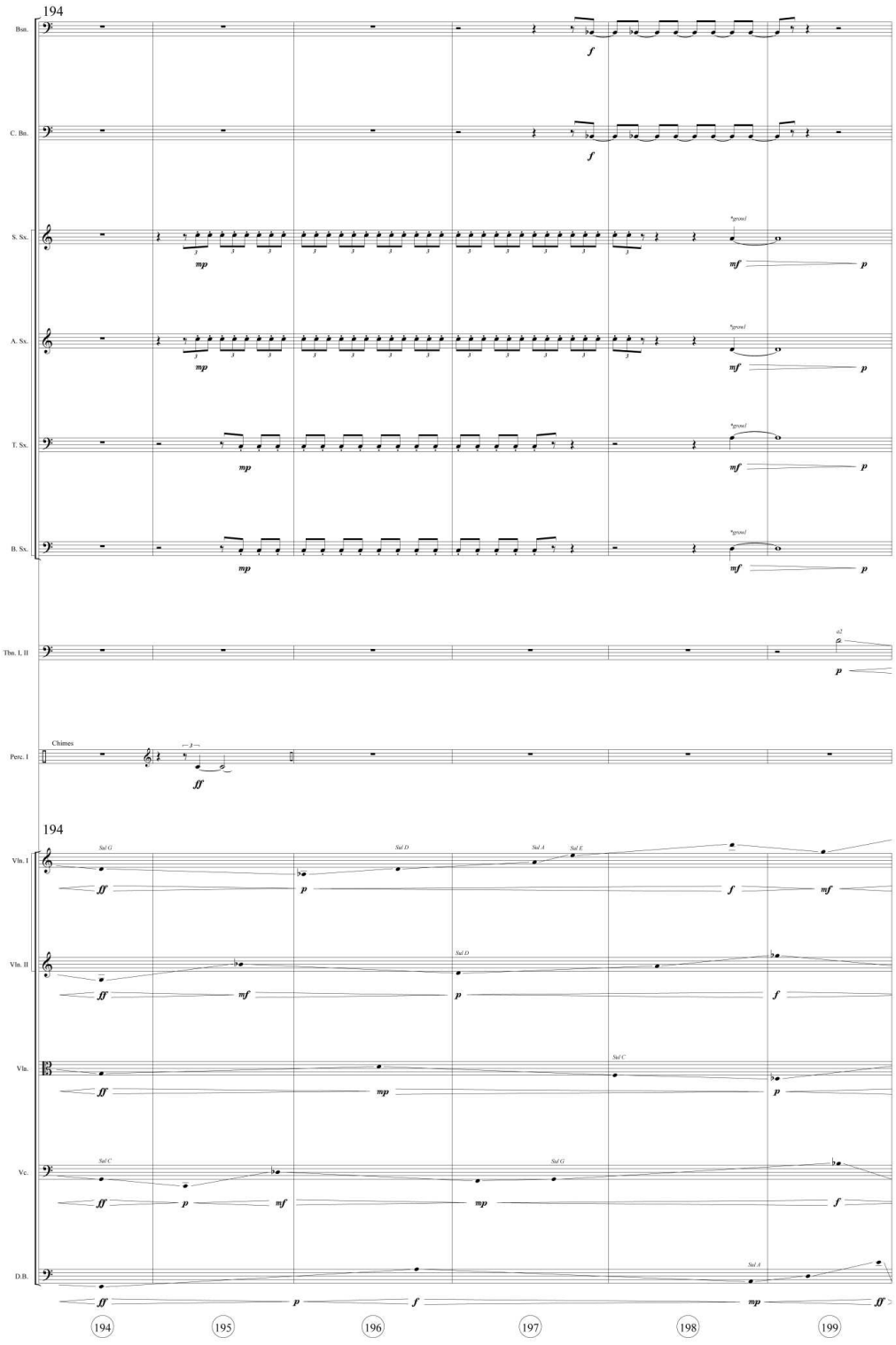

163
Fl. I
Fl. II, III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I, II, III
Tbn. I, II
B. Tbn.
Tba.
Vib.
Mrb.
Pno.
To Celesta
163
Vln. I
Vln. II
Vla.
Vc.
D.B.
arco
unison
163
164
165
166
167
168

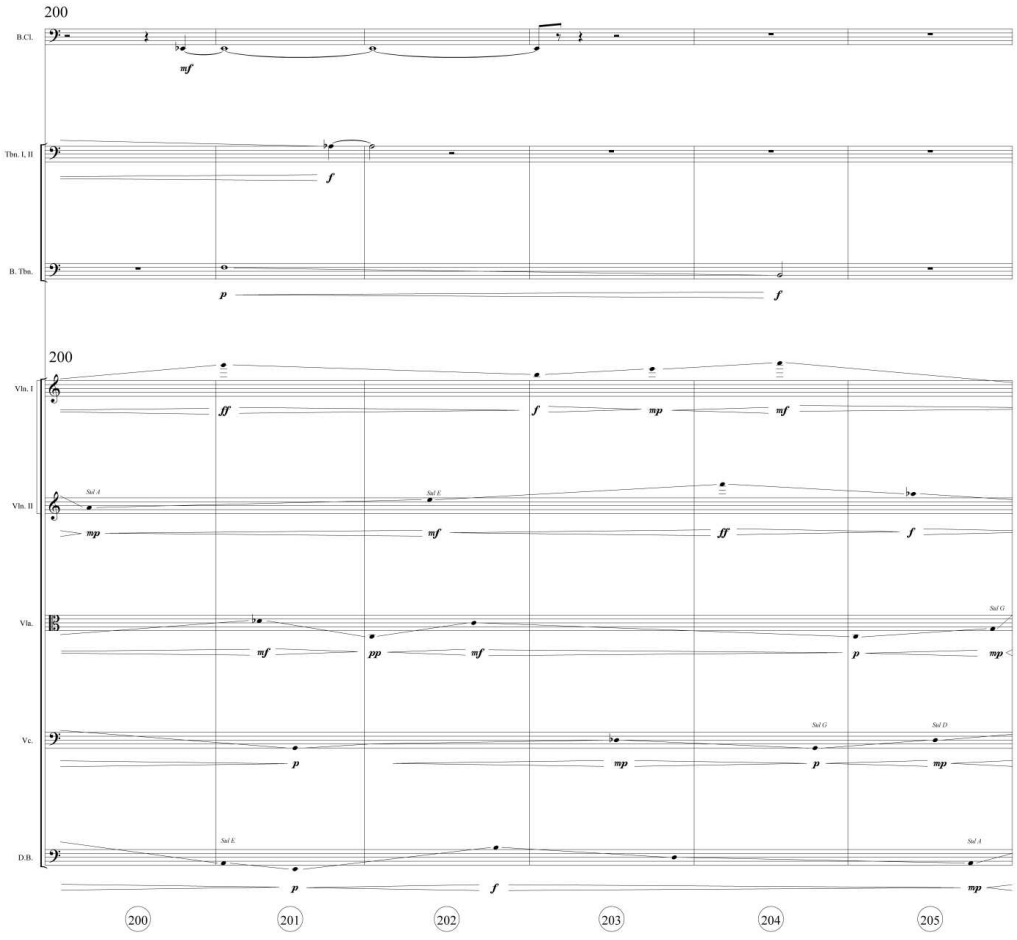

169
Fl. I, II
Fl. III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
Bsn.
C. Bn.
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I
Tbn. I
B. Tbn.
Tba.
Timp.
169
Vln. I
Vln. II
Vla.
Vc.
D.B.
169
170
171
172
173
174

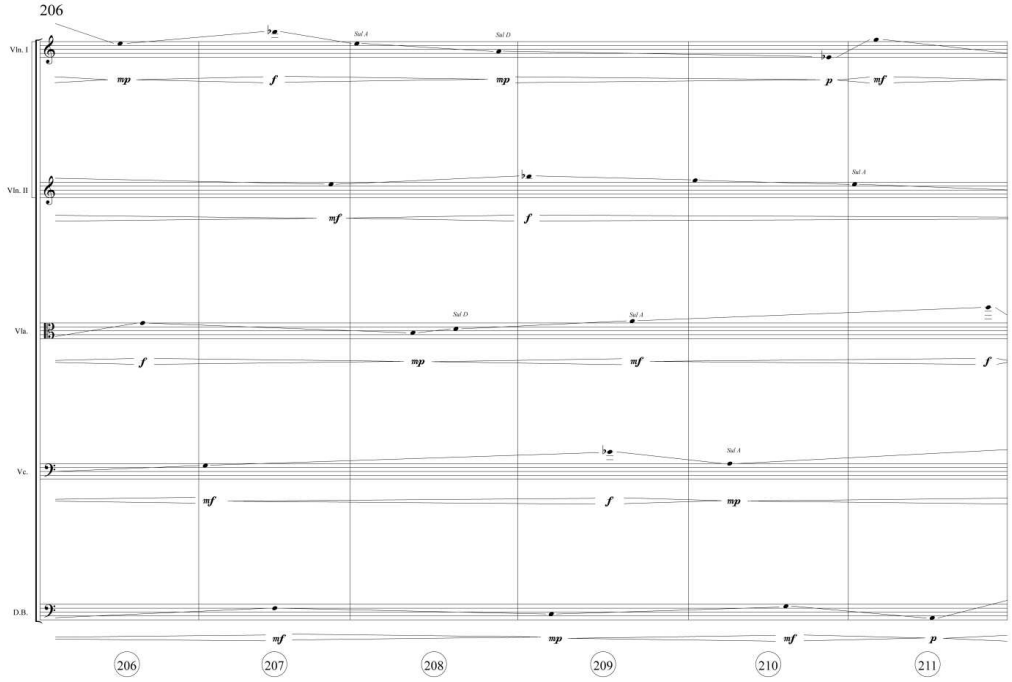

175
Fl. I
Fl. II
Fl. III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
S. Sx.
B. Sx.
Hn. I, II, III, IV
Tpt. I, II, III
Tbn. I, II
B. Tbn.
Tbn.
Vib.
Mrb.
Perc. II
Triangle
Perc. III
Bass Drum
Cel.
To Piano
175
Vln. I
Vln. II
Vla.
Vc.
D.B.
175
176
177
178
179
180

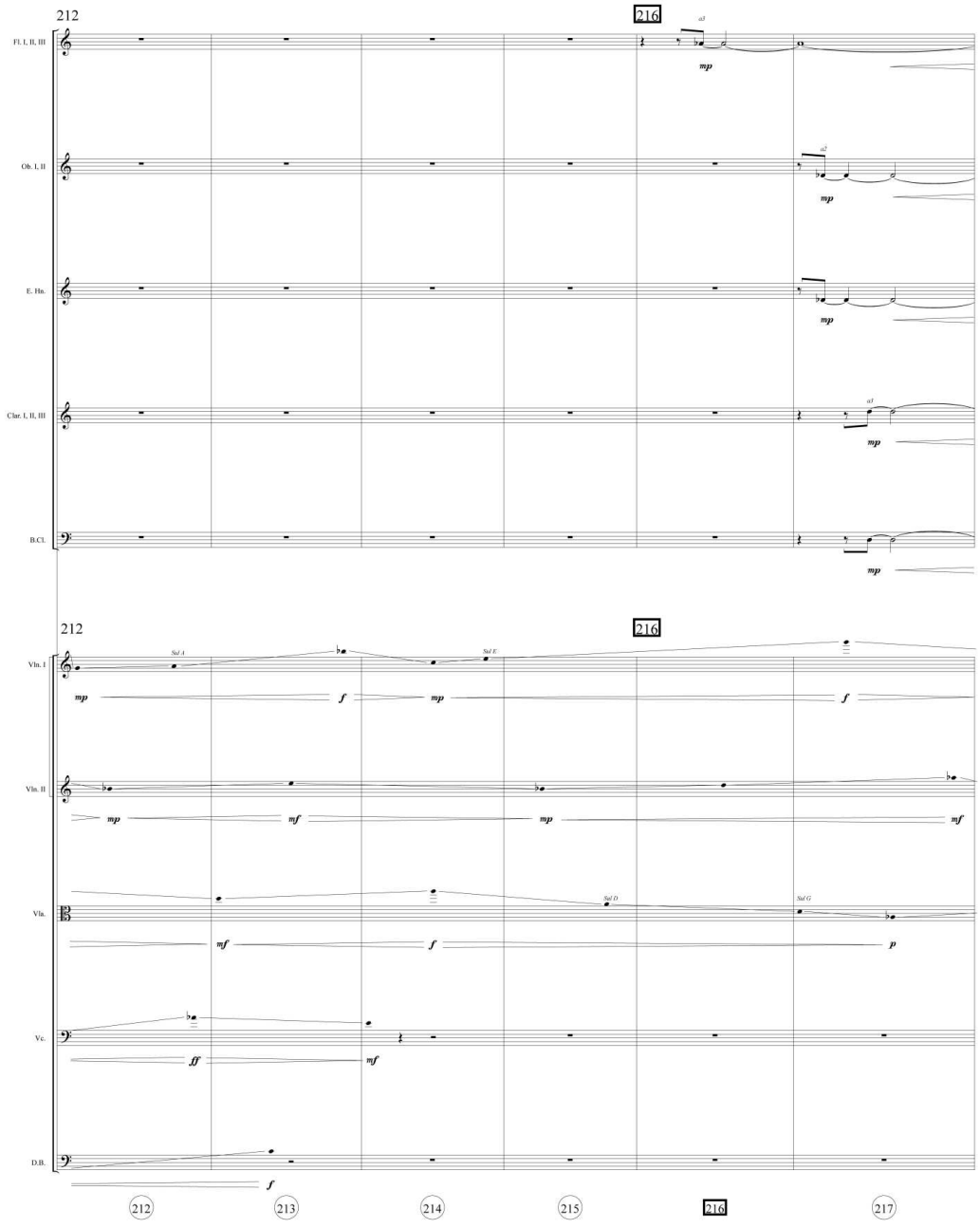

181
185
Fl. I
Fl. II
Fl. III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
B.Cl.
S. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I, II, III
Tbn. I
Tbn. II
B. Tbn.
Tba.
Vln. I
Vln. II
Vla.
Vc.
D.B.
pizz.
Arco
Sul A
Sul D
181
182
183
184
185
186
187

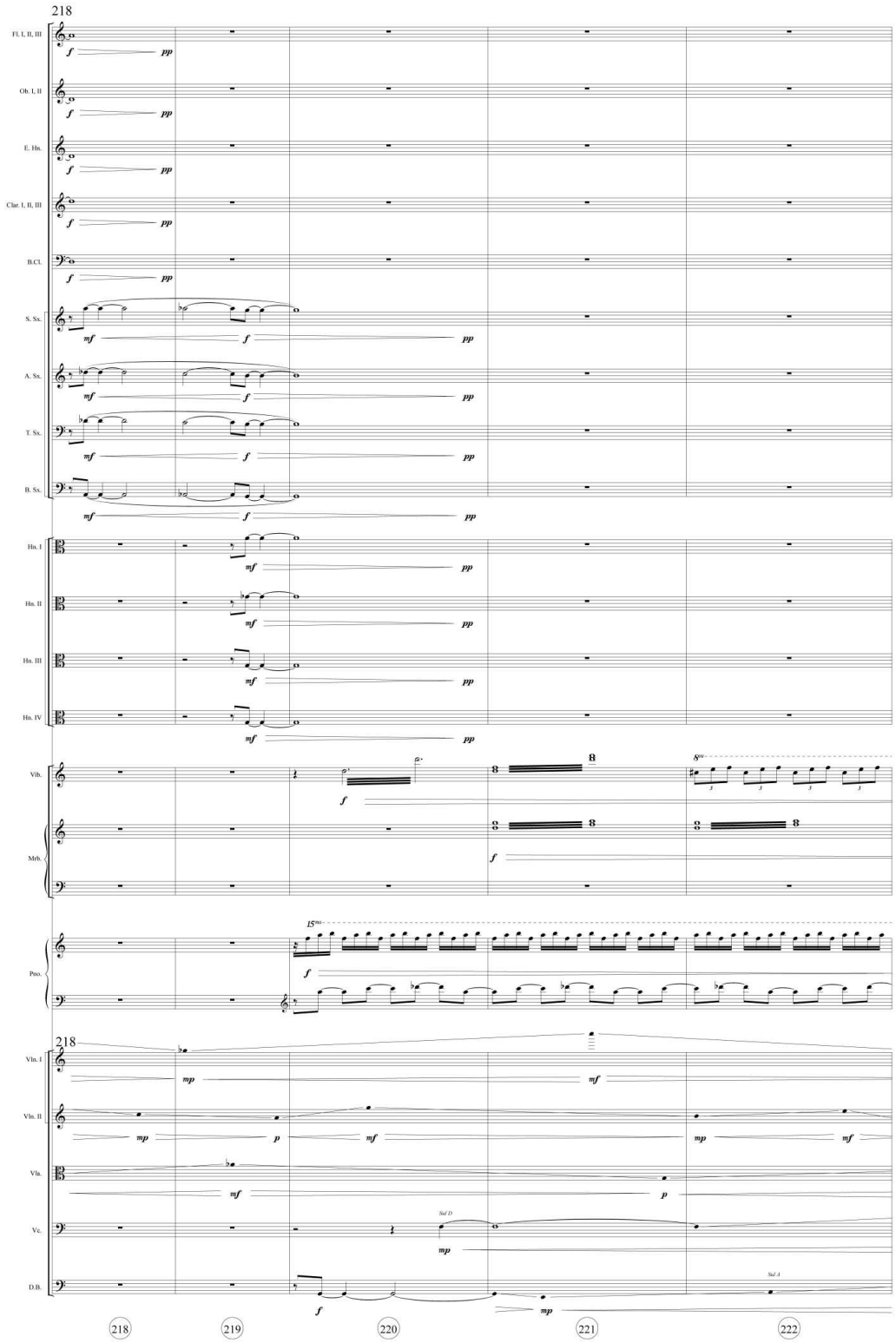

188
Vln. I
Vln. II
Vla.
Vc.
D.B.
Sul G
Sul A
Sul E
188
189
190
191
192
193

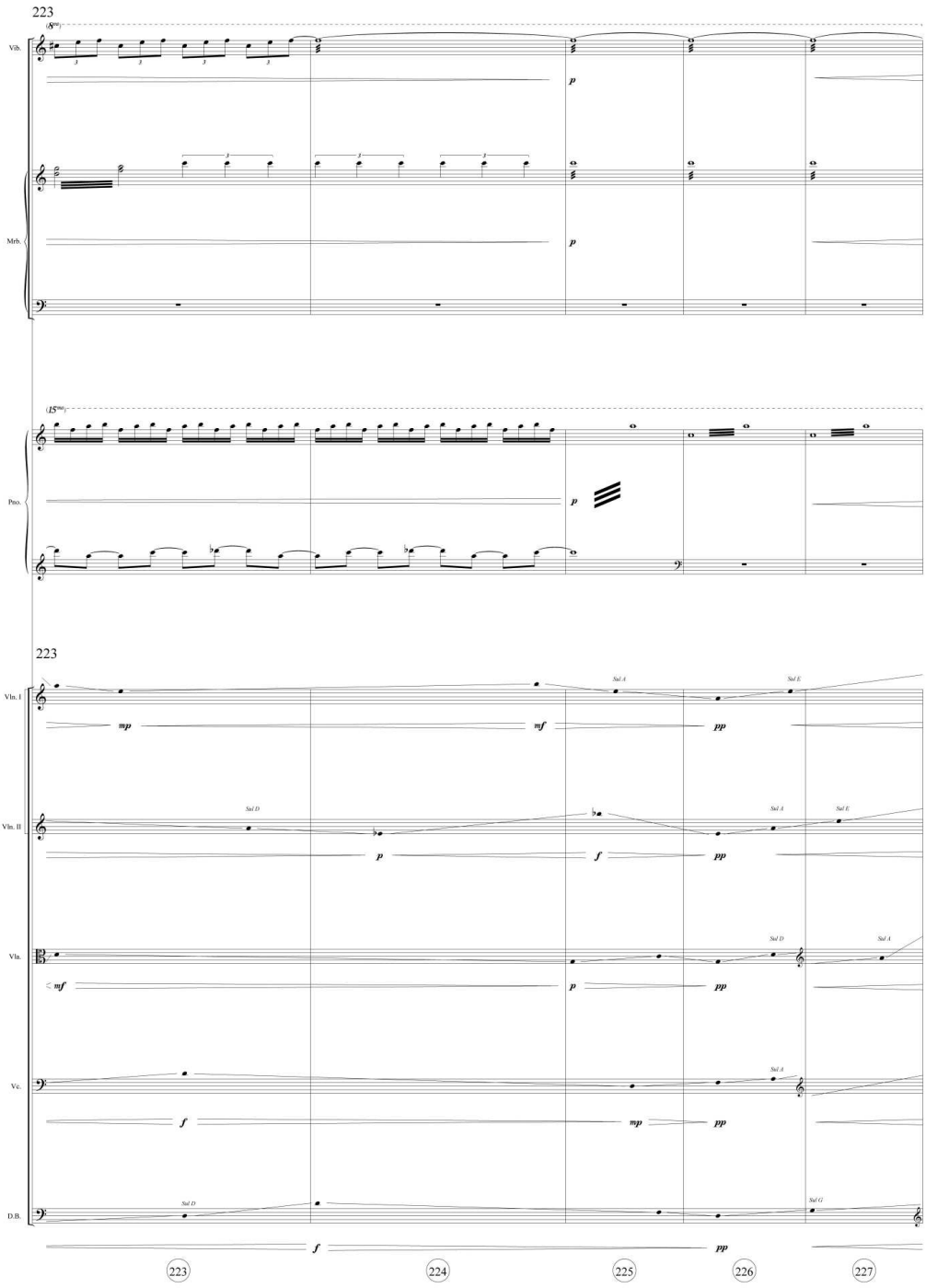

194
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Tbn. I, II
Perc. I
Chimes
194
Vln. I
Vln. II
Vla.
Vc.
D.B.
194
195
196
197
198
199

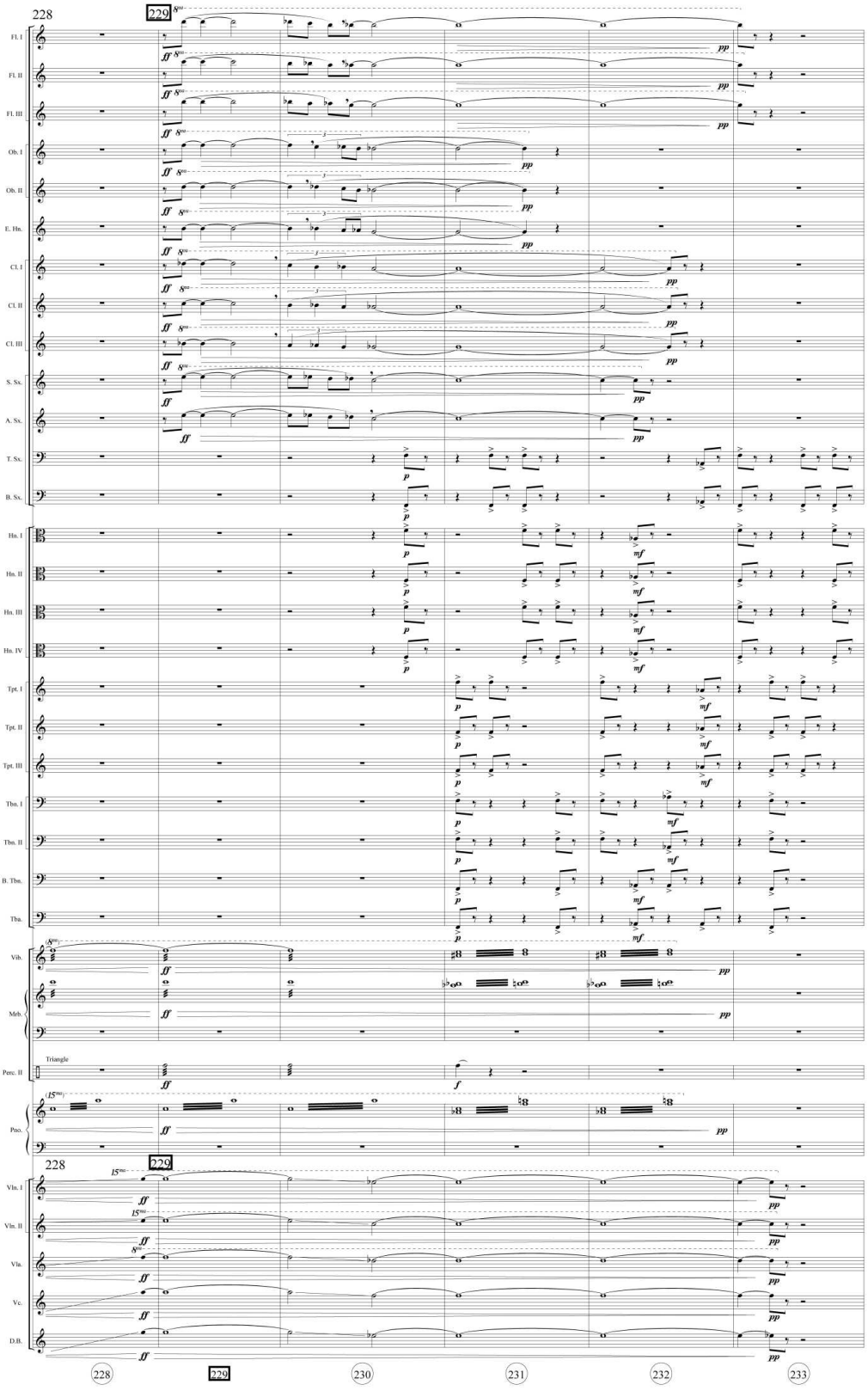

200
B.Cl.
mf
Tbn. I, II
f
B. Tbn.
p
f
200
Vln. I
ff
f
mp
mf
Vln. II
Sul A
Sul E
mp
mf
ff
f
Vla.
Sul G
mf
pp
mf
p
mp
Vc.
Sul G
Sul D
p
mp
p
mp
D.B.
Sul E
Sul A
p
f
mp
200
201
202
203
204
205

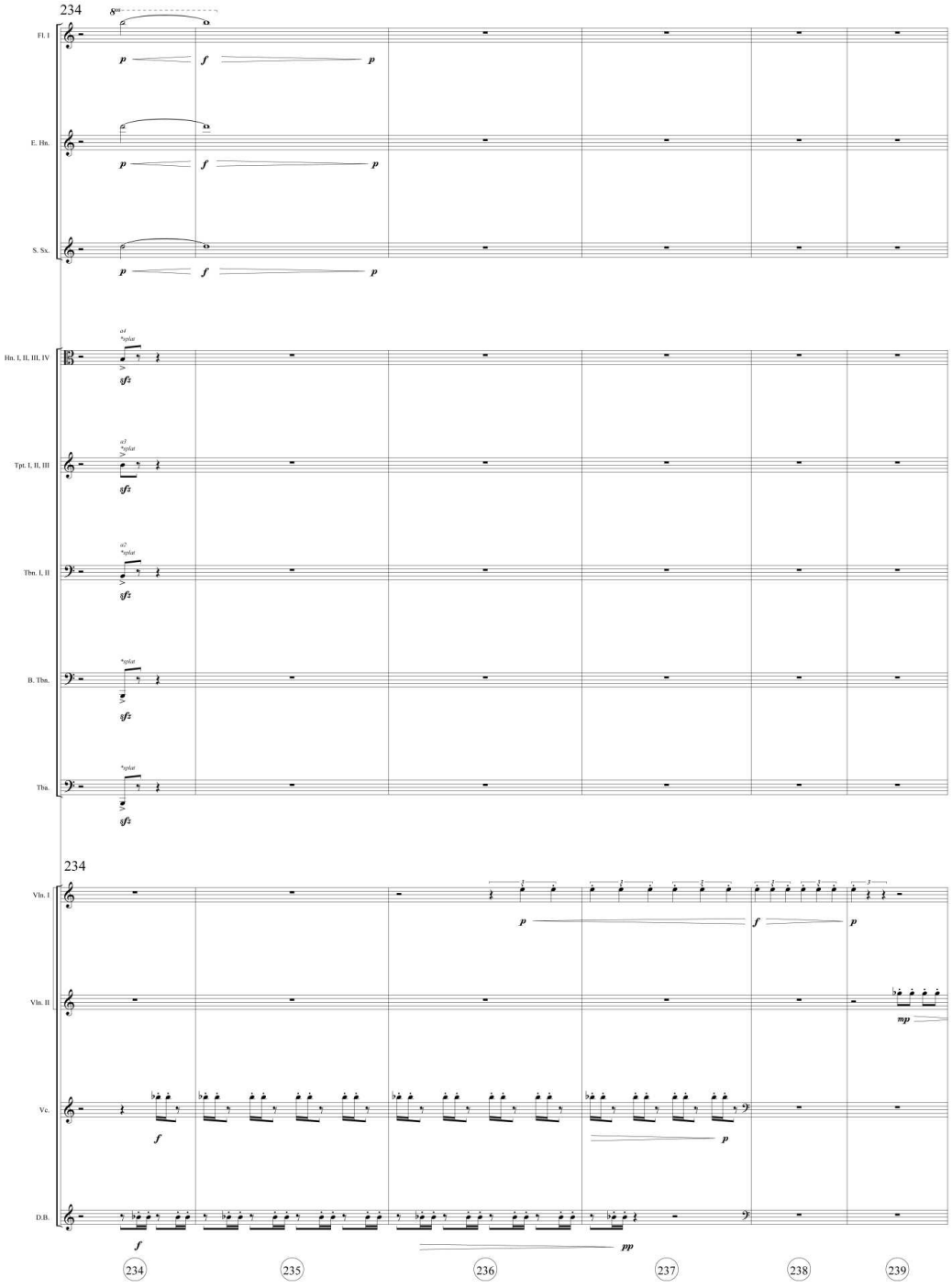

206
Vln. I
Vln. II
Vla.
Vc.
D.B.
Sul A
Sul D
mp
f
mf
p
206
207
208
209
210
211

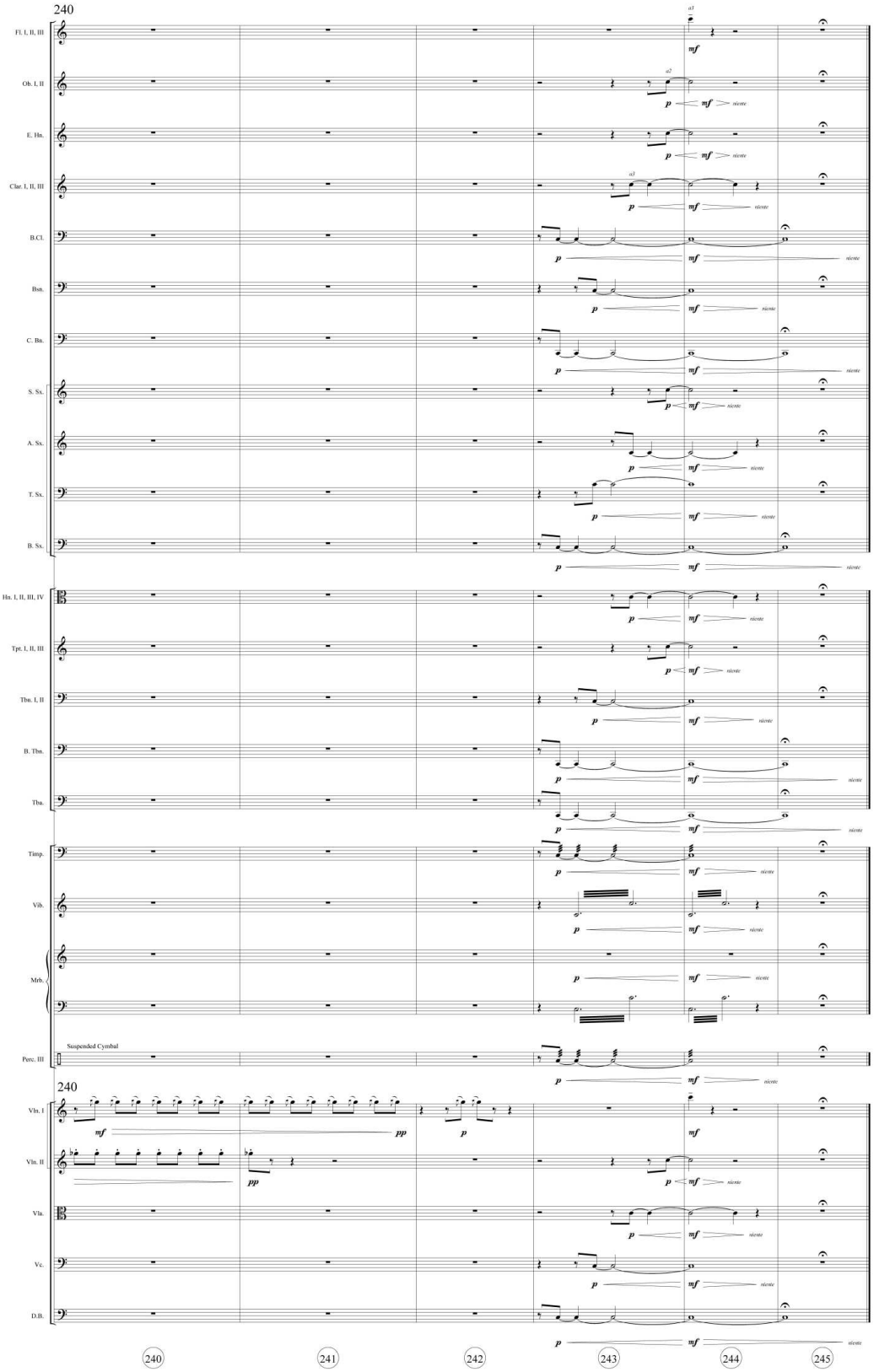

212
216
Fl. I, II, III
Ob. I, II
E. Hn.
Clar. I, II, III
B.Cl.
Vln. I
Vln. II
Vla.
Vc.
D.B.
Sul A
Sul E
Sul D
Sul G
mp
mf
f
ff
p
212
213
214
215
216
217


218
Fl. I, II, III
Ob. I, II
E. Hn.
Clar. I, II, III
B.Cl.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Vib.
Mrb.
Pno.
218
Vln. I
Vln. II
Vla.
Vc.
D.B.
Sul D
Sul A
218
219
220
221
222


223
Vib.
Mrb.
Pno.
223
Vln. I
Vln. II
Vla.
Vc.
D.B.
Sul A
Sul E
Sul D
Sul G
223
224
225
226
227


228
229
Fl. I
Fl. II
Fl. III
Ob. I
Ob. II
E. Hn.
Cl. I
Cl. II
Cl. III
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I
Hn. II
Hn. III
Hn. IV
Tpt. I
Tpt. II
Tpt. III
Tbn. I
Tbn. II
B. Tbn.
Tba.
Vib.
Mrb.
Triangle
Perc. II
Pno.
Vln. I
Vln. II
Vla.
Vc.
D.B.
228
229
230
231
232
233


234
8va
Fl. 1
E. Hn.
S. Sx.
Hn. I, II, III, IV
Tpt. I, II, III
Tbn. I, II
B. Tbn.
Tba.
a1
a2
*splat
sfz
234
Vln. I
Vln. II
Vc.
D.B.
p
f
mp
pp
234
235
236
237
238
239


240
Fl. I, II, III
Ob. I, II
E. Hn.
Clar. I, II, III
B.Cl.
Bsn.
C. Bn.
S. Sx.
A. Sx.
T. Sx.
B. Sx.
Hn. I, II, III, IV
Tpt. I, II, III
Tbn. I, II
B. Tbn.
Tba.
Timp.
Vib.
Mrb.
Suspended Cymbal
Perc. III
240
Vln. I
Vln. II
Vla.
Vc.
D.B.
mf
p
pp
niente
240
241
242
243
244
245