Now and Forever

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Part 1: Text

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Abstract

Now and Forever is a thesis in two parts: a twelve-minute piece for orchestra and a text providing an analysis of the piece. The orchestra consists of two flutes (flute 2 doubling piccolo), two oboes, two clarinets in B-flat, two bassoons, four horns in F, two trumpets in C, two tenor trombones, one bass trombone, two percussion and strings. The work features the use of an original text as the underlying program, the use of golden section proportions as a principal organisational device, a rising semitone motive as the foundation for melodic, harmonic and registral development, and the intermittent appearance of micropolyphonic textures. In some passages, the harmonic series is the basis of pitch field development, notably in section VI, which consists of an orchestral evocation of the sounds of an aeolian harp.

Now and Forever est une thèse en deux parties : une oeuvre pour orchestre de douze minutes et un texte comprenant une analyse de l'oeuvre. L'orchestre est composé de deux flûtes (flûte 2 doublant piccolo), deux clarinettes en si-bémol, deux hautbois, deux bassons, quatre cors en fa, deux trompettes en do, deux trombones ténors, une trombone basse, deux percussions et cordes. La pièce est marquée par l'utilisation d'un texte original comme programme, la proportion d'or comme stratagème organisationel principal, un motif d'un demi-ton ascendant comme base de développement pour le contenu mélodique, harmonique et régistral, et la présence intermittente de textures micropolyphoniques. Dans certains passages, le spectre harmonique est la base de développement des hauteurs, notamment dans la section VI, qui consiste d'une évocation orchestrale du son d'une harpe éolienne.

Acknowledgements

Thanks to all those who helped me take on and complete this work, in particular Brian Cherney, whose teachings have been invaluable. I am also grateful to Sean Ferguson for good advice, bad jokes, and crucial editorial contributions. I dedicate this work to Joan and Robert Dehler.

Table of Contents

Part I: Text

Part II: Score

1. Introduction

Now and Forever is a twelve-minute piece for an orchestra consisting of two flutes (one doubling on piccolo), two oboes, two clarinets in B-flat, two bassoons, four horns in F, two trumpets in C, two tenor trombones, one bass trombone, two percussion and strings. It features the use of an original text as the underlying program, the use of golden section proportions as a principal organisational device, a rising semitone motive as the foundation for melodic, harmonic and registral development, and the intermittent appearance of micropolyphonic textures. In some passages, the harmonic series is the basis of pitch field development, notably in section VI, which consists of an orchestral evocation of the sounds of an Aeolian harp.

2. Text

The underlying program of *Now and Forever* is the following text, written by the composer:

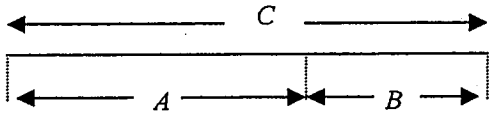
> … a silent flash, your beauty glimpsed,
> my purpose sparked, ignited.
> Oh, but the thunder:
> noise of jealous schemes to murder my intuition,
> my experience, my meaning.
> I hesitate.
> A moment.
> Forever.
> No return to the innocence of that instant
> when inspiration was pure and mysterious,
> and the mists converged to resonate my song.
> My castle becomes desolate but for need and dread,
> and my lips—dry and cracked from the drought—
> cannot shape the sounds to call your name.
> Then, wisdom's sudden edict stirs me
> and I climb to stillness
> and plunge into the shifting iridescence of immediacy.
> To celebrate transient reality…

sway to ephemeral symmetries...
to court each moment as my true love.
Does my voice now bridge the gorge of our separateness?
Each moment, forever...

While the poem can be understood on different levels, in general it attempts to evoke the ebb and flow of the creative impulse. More insight is given within the context of the discussion of musical form in section 4.

3. The Golden Section

Golden section proportions are fundamental to the form and content of this piece. The golden section (GS) is defined as the "division of [a finite] line so that [the] whole is to one part as that part is to the other part."[1] The example below serves to illustrate:



ex. 1: **The Golden Section**

Thus,

$$A{:}B \text{ as } C{:}A$$

[1] J. B. Sykes, ed., *The Concise Oxford Dictionary*, 6th edition, Oxford: Oxford University Press (1976), 459.

The golden section number, the ratio of *C/A* and *A/B*, is irrational (i.e. infinite): 1.618034... One can also express it in inversion, as *A/C* and *B/A*, yielding 0.618034.... For *C/A*, the equation for the golden section is:

$$GS=(\sqrt{5}+1)/2,$$

While for *A/C*, the equation is

$$GS=(\sqrt{5}-1)/2,$$

The universal equation, then, is:

$$GS=(\sqrt{5}\pm1)/2$$

In its purest geometrical form, the golden section defines the proportions of the crosscutting lines in a pentagram. Golden section proportions are not, however, only the product of mathematical abstraction; they exist in nature as well. Phenomena such as the spiral shells of the chambered nautilus and the snail, as well as the placement of leaves and branches around the trunks of poplars and palms all point to GS proportions. It is perhaps the crossover of the golden section into both the real and abstract worlds that has so fascinated artists from every discipline. One has only to consider the Cheops Pyramid, the Parthenon and the Pentagon in architecture, or the use of the golden section as the focal point in paintings to realise its influence and aesthetic value in our culture.

Because the golden section ratio is irrational, its use in music is problematic. Music for live performers relies on ratios of time and pitch expressed as integers. A useful compromise, then, is to isolate integer ratios that approximate golden section proportions. To this end, the Fibonacci series provides an infinite mathematical set related to the golden section:

(1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89, 144...)

In this series, the addition of two adjacent terms yields the next term in the series (e.g.21+34=55; 34+55=89, etc.). The ratio of two adjacent terms yields ever-closer approximations of GS proportions:

21/13=1.615384615
34/21=1.619047619
55/34=1.617647058
89/55=1.618181818

Note how the GS approximations fall alternately on each side of the golden section.

The Lucas series possesses some similar attributes to the Fibonacci series:

(1, 3, 4, 7, 11, 18, 29, 47, 76, 123, 199...)

The Lucas series differs, however, in that it begins with the anomalous addition of a value of 2 to the first term ("1"). While perhaps not as elegant as the Fibonacci series, it is useful in providing whole numbers that approximate golden section proportions.

While Fibonacci and Lucas numbers are used in the piece to create approximations of GS proportions and statements whose proprtions move towards and away from the golden section, it should be noted that they are also employed outside of the the 'A:B as C:A' ratio context, simply to generate and organise elements of rhythm and pitch.

4. Form

This piece contains seven sections whose durations relate to golden section proportions derived from multiples of numbers in the Fibonacci series. As shown below, the duration (in seconds) of each section corresponds to a Fibonacci number multiplied by 5.

	I	II	III	IV	V	VI	VII	
time:	105"	170"	40"	25"	105"	170"	105"	= 720"
Fib.# :	21	34	8	5	21	34	21	= 144

ex. 2: **Large-scale Formal Divisions in** ***Now and Forever***

The first and last sections provide a backdrop of metaphorical eternity for the action described in the poem, while the other sections relate to specifically expressed themes. Thus,

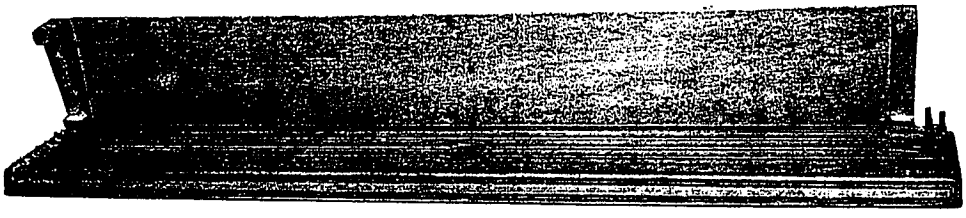
I	*Cosmic Breath I* (1 to 4)
II	*Purpose* (4 to 16)
III	*Hesitation* (16 to 19)
IV	*Cosmic Breath II* ("forever," line 8) (19 to 20)
V	*Drought* (20 to 23)
VI	*Wisdom's Edict* (23 to 28)
VII	*Cosmic Breath III* (28 to the end)

The cosmic breaths of the first section consist of long binary phrases of a rising semitone motive with an overall crescendo-decrescendo dynamic structure. The musical concept underlying *Purpose* is shifting momentum, and is rendered in four distinct phases: the use of gradually shortening phrases to evoke increasing momentum (4 to 11); a plateau phase where momentum is strong and maintained at a relatively steady pace (12 to 13); a "state-of-grace" phase (13 to 14) where chromatic movement evokes a free-falling body whose descent is mitigated by air resistance, such as the trajectory of a leaf falling from a tree; and, a second plateau phase, only this time the mood of foreboding is analogous to the plateau of the temperature of a liquid just before it reaches the boiling point (14 to 16). *Hesitation* (16 to 19) sets up two opposing forces, the chromatic movement of *Purpose*, representing momentum, and ostinato interjections, representing the "noise of jealous schemes." The interaction culminates at the end of the section, then drops suddenly to *Cosmic Breath II*, a shift in perspective to a grander scheme, analogous to a move from a close-up to a long shot in film (19). Section V, *Drought*, begins with three-note melodic statements with overlapping sustain, a construction of child-like simplicity to represent a fixation on the past. This is followed by a descent into the abyss (21 to 23). Out of the lingering tam-tam decay comes section VI, *Wisdom's Edict*, a through-composed section that represents a release from the past and a focus on living in the moment (23 to 28). Section VII begins with a retrograde of the descent in section V from 28 to 31 , then presents the final variations on the cosmic breath motive, with a new treatment of other material from the piece woven into the fabric, representing a new outlook and knowledge gained.

5. Aeolian Harp

Although section VI shares two common elements with other sections of the piece, namely the prominence of G and the use of material derived from the harmonic series (see explanation in section 2.2), it stands out from the other sections in almost every other way. Essentially, it is a representation of "wisdom's edict." Wisdom, "a vapour of the power of God,"[2] or in modern terms, "a breath of God's power,"[3] is musically realised by techniques that use the orchestra to evoke the sounds of an aeolian harp, a zither-type instrument whose 'music' is produced by the wind moving across its strings. The following excerpt outlines the typical design of a traditional Aeolian harp:

> The most common form is a rectangular closed box about three feet long, six inches wide and three inches deep. Three to twelve strings, tuned in unison, are stretched the length of the box between two bridges, and one or more sounding holes are cut in the top of the box below the strings.[4]



ex. 3: **Aeolian Harp**

[2] His Eminence James Cardinal Gibbons, ed., *The Holy Bible*, New York: John Murphy Company (1899), 7:25, 701.
[3] American Bible Society, *Good News Bible with Deuterocanonicals/Apocrypha*, "The Wisdom of Solomon," Toronto: G. Emmett Carter (1979), Deuterocanonicals/Apocrypha, 7:25, 58.
[4] Thomas L. Hankins and Robert J. Silverman, "The Aeolian Harp and the Romantic Quest for Nature," from *Instruments and the Imagination*, Princeton: Princeton University Press (1995), 87.

Set on a windowsill with the sash drawn down just above the strings, or placed on a porch or in a garden, the harp sounds one or more notes as the wind blows across its strings, the pitch(es) depending on the strength of the wind and the thickness of the strings.

The production of sound is caused by the formation of two symmetrical eddies behind the string. According to Hankins and Silverman,

> At higher velocities the eddies break away, first on one side then on the other, forming what is called a Von Karman trail. As each eddy breaks away, it causes lift on that side of the string. The string is thus driven from side to side at the frequency that the eddies break away. If that [frequency] corresponds to one of the harmonics of the string, the string will begin to vibrate strongly [on that pitch].[5]

Given the above, the process for generating musical material for section VI is two-fold: to establish the dynamic parameters of the wind that sets the strings in motion and to create a method that anticipates the causal link between the wind and the production of sound in the harp.

5.1 The Wind

The derivation of the musical material for the 'wind' was a multi-step process, beginning with the choosing and adaptation of excerpts from the *Book of Wisdom*, yielding:

> I am a vapour of the power of God,
> A pure emanation of the glory of the Almighty.
> She that awaketh early to seek me, shall not labour; for she will find me sitting at her door.[6]

The above lines were digitally recorded into the Pro Tools LE 5.1 digital-audio production system[7] and the Pro Tools' *Time Expansion* function was applied to stretch the audio content to

[5] Thomas L. Hankins and Robert J. Silverman, "The Aeolian Harp and the Romantic Quest for Nature," from *Instruments and the Imagination*, Princeton: Princeton University Press (1995), 98.
[6] His Eminence James Cardinal Gibbons, ed., *The Holy Bible* New York: John Murphy Company (1899), 7:25 and 6:15, 700-701
[7] a commercial software and hardware package by Digidesign/Avid

cover the prescribed length of the section (2'50"). The *Time Expansion* also slows down the dynamic ebb and flow of the text to better approximate gusts of wind.

The three lines were stretched separately to enable specific symmetries, in particular to set the utterance of the word "awaketh" at the golden mean of this section (m.256), and to flow the final word, "door," over into the final section of the piece (28). The time-stretch ratios for each of the three statements are approximately 4:1.

The time-stretched material was then imported into *Praat*[8], software that, among other things, enables the graphic representation of the amplitude envelope (in decibels or dBs) over time. A correspondence of dB values to musical dynamics was found in Wood's *The Physics of Music*, where the author cites a scale advanced by Stokovski in phons, which in the mid-to-high frequency range (the range of the harp) have a faitly direct relationship to dBs.[9] Here is a partial reproduction of the Stokovski scale, citing only the dynamics used in this section.

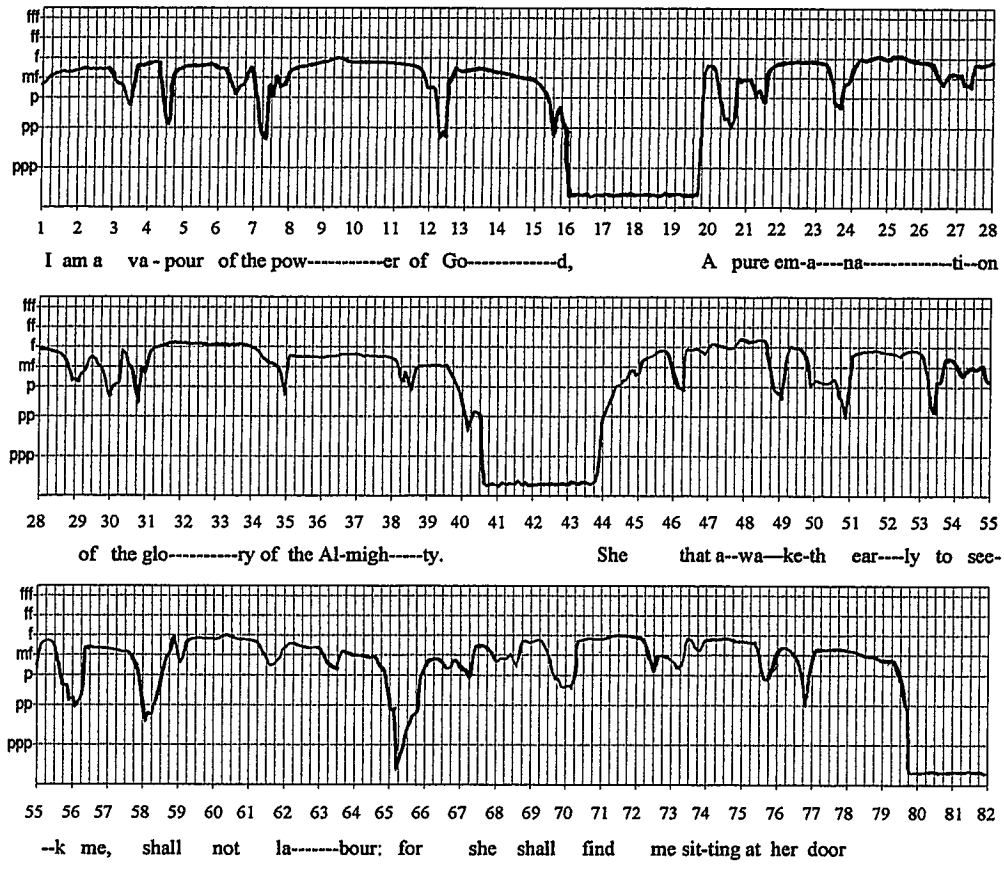
f	=	75 phons
mf	=	65 phons
p	=	55 phons
pp	=	40 phons
ppp	=	20 phons

***ex. 4:* Stokovski's Scale of Equivalence between Intensity and Music Dynamic Markings**

Note that the intervals between dynamic markings get smaller going from the softest to the loudest dynamic. Using these proportions, the following graph of dynamic intensity of the vocal samples over time was obtained:

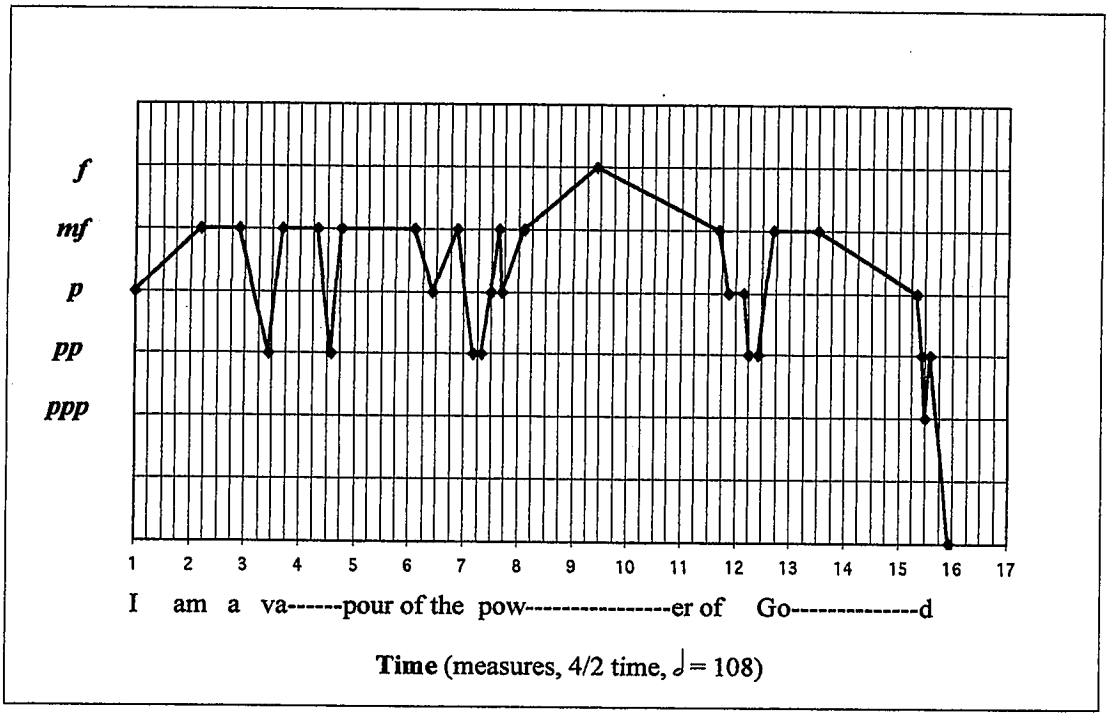
[8] freeware program for speech analysis and synthesis by Paul Boersma and David Weenink, downloaded from the *Praat* Web site at www.fon.hum.uva.nl/praat.
[9] Alexander Wood, *The Physics of Music*, New York: Dover (1962), 38.

Dynamic Intensity vs. Time (in measures, ♩= 108)



***ex. 5:* Praat Graph of Recorded Biblical Excerpts**

The points of arrival at each successive dynamic level were then isolated and extrapolated to produce a simplified representation that shows the change in intensity from one dynamic level to the next:



***ex. 6:* Graph of Dynamic Changes of Wind over Time for Line 1 of Biblical Excerpts**

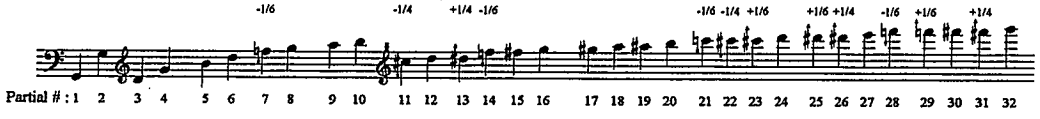
Graphs for each of the excerpts provide the dynamic contours for the 'wind', yielding the air tones played by the woodwinds and brass in 23 and 24, and the foundation for deriving the 'aeolian harp' material.

5.2 The Harp

To emulate a causal relationship between the movement of the wind and the production of sound in the Aeolian harp, an understanding of the basic principles of the harmonic series is necessary. It also serves to explain portions of the piece that will be examined later in more detail. The harmonic series is defined as

> the set of tones produced by a vibrating string or air-column, according to whether [it] is vibrating as a unit through its whole length or its aliquot parts (1/2, 1/3, 1/4, etc.). Vibration of the whole length gives the lowest ('fundamental') tone, or 'first harmonic'. The other tones, or 'upper partials', are at fixed intervals above the fundamental... ad infinitum.[10]

Thus, with the second G below middle-C (G2) as the fundamental, the harmonic series is:



ex. 7: Harmonic Series Based on G2

Note that some partials are significantly higher or lower than the corresponding pitches in equal temperament. The microtonal tunings are rounded to the nearest quarter or sixth of a tone (indicated above the partial), based on figures from "Introduction to the Pitch Organization of French Spectral Music."[11]

The sound of an Aeolian harp consists of such harmonics. While there is still no complete scientific model to explain all of the aspects that come into play in the production of its sound, there are general principles upon which to base an orchestral evocation of its 'music'. For the purposes of this piece, the following rules (some based on acoustics, others subjectively chosen) were set in order to define the musical parameters:

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[10] Arthur Jacobs, *A New Dictionary of Music*, Baltimore: Penguin Books Inc. (1958), 160.
[11] François Rose, "Introduction to the Pitch Organization of French Spectral Music," in *Perspectives of New Music*, Princeton, NJ: Princeton University Press, vol. 34, No. 2 (summer, 1996), 6.

- It is assumed that all of the strings of this fictitious harp are tuned to the same fundamental, G2, or the second G below middle C. This means that all of the harmonics triggered will be part of the same G2-harmonic-series chord. Note that the fundamental itself is not heard, except briefly in the bass trombone from mm.267-270.
- A direct relationship between wind intensity and the partials produced is assumed, that is to say, as the wind intensity increases, higher harmonics are triggered.
- In terms of pitch frequency, the chord is always present from the bottom up so that, for example, when the 7th overtone is sounding, the six lower overtones are already present, the building intensity of the wind having already excited the lower harmonics.
- As a higher partial begins to sound, it usurps intensity from the next lowest partial (i.e. that which was previously the highest note of the chord). This is a crude realisation of the cancellation effect of new nodal points on a string where formerly another node from another pitch was stronger.

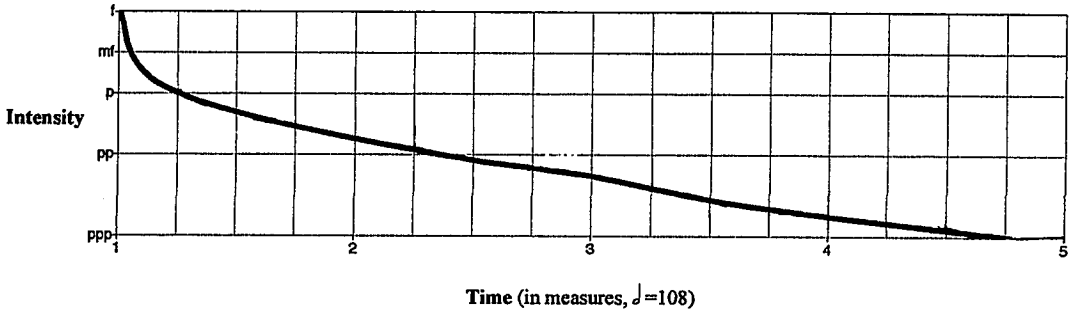
The pitch field is limited to the overtones of G2 up to the 9th partial, labelled G3, D3, G4, B4, D5, F5[12], G5 and A5. The precise relationship is:

[12] Note that F5 is actually approximately 1/6th of a semitone lower than F5 in equal temperament.

Wind Intensity	Pitch(es) Triggered
f	F5 (23, 24, 27) F5/G5 (26) F5/G5/A5 (25)
mf	D5
p	B4
pp	G4
ppp	G3/D4

***ex. 8:* Wind Intensity vs. Pitches Triggered**

Thus, for instance, when the wind intensity crosses the line of the dynamic level ***p***, B4 begins to sound. The dynamic level of B4 grows louder while the wind intensity remains in the '***p***-range', or the range between the ***p***-line and the ***mf***-line. If the wind intensity increases beyond the ***p***-range (i.e. crosses the ***mf***-line and enters into the next range, between ***mf*** and ***f***), the next pitch in the series, D4 begins to sound, and the dynamic level of B4 decreases as D4 swells. If the wind intensity falls below the ***p***-line, B4 enters a phase of natural decay. If at this point B4 is at ***f***, for example, the note moves relatively quickly from ***f*** to ***p*** then more slowly to ***pp***, then finally to ***n*** (see F5 harmonic in the double bass, mm.234-238). The shape and length of all decays throughout the section are fixed, and are based on audio samples of a plucked guitar string tuned to G2:



ex. 9:* Graph of the Decay of a Guitar String Tuned to G2 Plucked at *f

There are three types of shapes used, one for decays that start on ***f***, one for ***mf***, and one for ***p***. The decays that start on ***p*** are shorter and less dynamic than those on ***mf***, which in turn are shorter and less dynamic than those on ***f***.

While the above statements explain the general guidelines along which section VI is constructed, it must be said that licence was also taken on occasion to order things in a more workable way, given the limitations of the instrumentarium and of the traditional dynamic markings of music.

Finally, the orchestration of this section is in three parts. For the first two biblical excerpts at 23 and 24, the strings play natural harmonics, while the woodwinds and brass provide the 'wind' with air tones. As the third statement begins at 25, the strings switch to *ordinario* (except for the double bass, who provides flourishes of harmonics), and the woodwinds and brass begin to play notes of the harmonic series, adding emphasis to the crests of the ebb and flow of the strings. The percussion also enters, with gong splashes and the glockenspiel on higher-register harmonics, also punctuating the strings' dynamic crests. In the

final part of the orchestration (27 and 28), the woodwinds and brass are silent, leaving only the percussion and the strings divided into two groups, one playing *ordinario*, the other playing harmonics.

6. Rising Semitone Motive and Its Derivatives

One of the central anchors of the piece is an extended rising semitone motive in the 'cosmic breath' sections. The first statements of the piece consist of the motive played on G. The languid swell-and-recede phrases of the cosmic breaths are a metaphor for eternity and its inherent dualities—stasis and movement, sameness and difference, now and forever. In terms of the pitch content of the whole piece, it provides material along three lines:

- motion by rising semitone and its inverse (falling semitone); thus, chromatic movement
- harmonic intervals of a semitone (i.e. semitone clusters)
- G and G# as points of arrival and departure for melodic and harmonic material, as axes of symmetry and as registral boundaries.[13]

After the motive's first expression on G to G#, the pitches branch out across a wider register, culminating in a G#6 harmonic in the violas overlapping G1 in the double bass (mm. 19-29).

G and G# are the basis of development in sections II and III. The string and horn cluster that begins section II is symmetric around G# (E, F, G#, A#, C), falling to G at 5 in the strings,

[13] G and G# also figure prominently in the micropolyphonic structures throughout the piece; this is addressed separately in section VII of this paper.

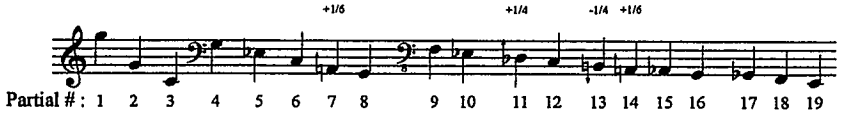
while the flutes and clarinets take over from the horns up the octave. The same movement is repeated in GS durational diminution from 6 to 8 before the cluster moves up a p4, then a m3, eventually widening out registrally through to 11. There, the semitone motive becomes the chromatic movement in the brass and defines the tone cluster of three pairs of semitones in the woodwinds and strings.

At 12, the motive takes the form of semitone trills in the woodwinds, and is also expanded melodically to the chromatic movement in the violins and violas. At 13, the flutes and clarinets assume the chromatic movement, with bassoon 1 entering at m.92. The violas and cellos complete the antithesis to the original (rising) motive with a slow, falling semitone motion from m.95 to the end of 13.

Through 14, G#3 figures as the fundamental of a harmonic series construct that includes partials 5 to 9 sounded in the flutes and clarinets, while the horns and strings circle around the fundamental on pitches a semitone apart (F#3 to B-flat). At 15, the brass join in a semitone cluster built on G and move up chromatically to 16, at which point a long chromatic slide downward begins on G# in the violins and violas. The upper woodwinds support the motion with descending motives that alternate between intervals of a semitone and a whole tone and weave through the rhythmically regular, falling-semitone string texture. The flutes, oboes and clarinets swirl chromatically back upwards in a semitone cluster at 17, while the upper strings, in a six-note semitone cluster, glissando up a M3, and the lower strings, in a three-note semitone cluster, glissando down a M3. The chromatic, downward slide is then resumed in the upper strings, while the semitone/tone falling motion of the upper woodwinds is passed to the bassoons and brass at m.135. The section ends with short, heavily accented chromatic melodic fragments in the flutes, oboes, clarinets, trumpets and trombones from m.140 to the end of 18, culminating on G# at *fff*.

Section IV, *Cosmic Breath II*, comprises a single occurrence of the rising semitone motive transposed to F/F# (double bass) and D/D# (cellos). In section V, the omnipresence of G is more theoretical than real. Pitches up to the 27th partial of the harmonic series based on G2 are the basis for the section (see ex. 7 in section 5.2). Only the notes that conform to equal temperament are used here, however; partials #7, 11, 13, 14, 21, 22, 23, 25 and 26, representing 4 pitch classes are reserved for the 4-note piccolo figure in the first and last sections of the piece (mm.15-17 and mm.314-319).

The pitches are played in the reverse order of their occurrence in the harmonic series, in groups of three (mm.163 to 21). While the upper woodwinds play the pitches in the register of G4-F#5, the strings sound the pitches at the same time as the woodwinds, but in the register in which they naturally occur in the G2 series (only one pitch from each pitch class is represented, and its placement is freely-chosen). The strings do not reinforce the pitches that occur as partials within the range of the woodwinds (G4, A4, F #5). At 22, the pitch material transforms into its mirror image, becoming the elements of an 'undertone' series based on G5:



***ex. 10:* 'Undertone' Series on G5**

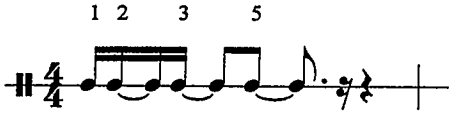
A thick, low texture is created with partials 9 through 14 stated consecutively in the lower strings, while partials 9 through 12 sound in the bassoons, horns, trombone 2 and bass trombone. Meanwhile, in trombone 1, partials 14 through 19 appear transposed up one octave, and partial 17, also up one octave, is heard first in cello 1 (m.190-192), then intermittently in the bassoons,

horns 2, 3 and 4, and trombone 1. At m.197, the double bass descends to partial 19 (E0), the lowest note of the piece.

As section VI has already been discussed, there is nothing to add save to reiterate its connection to G in light of the material presented here. The final section, VII, begins with a retrograde of 22, with minor changes. At 31, there is a return to the G6 harmonic from section I in the violins with G#2 in the cellos, followed by a narrowing of the register to G5 (m.318) and G#3 (m.320), and a final statement of G and G# together at m.324 in the octave above middle C.

7. Micropolyphony

Another prominent aspect of this piece is the use of micropolyphonic structures to create a variety of textures throughout the music. All of the micropolyphony consists of patterns based on the permutations of 4 or 5 elements of rhythm and pitch. Rhythmically, the 4-element permutations are based on the first numbers of the Fibonacci series, 1, 2, 3 and 5. For example, by ascribing a basic note value of a 16th-note, the Fibonacci numbers become:



ex. 11: **Rhythm Based on Fibonacci Numbers**

The 24 possible permutations (4 x 3 x 2 x 1) of rhythm are:

1, 2, 3, 5	2, 1, 3, 5	3, 1, 2, 5	5, 1, 2, 3
1, 2, 5, 3	2, 1, 5, 3	3, 1, 5, 2	5, 1, 3, 2
1, 3, 2, 5	2, 3, 1, 5	3, 2, 1, 5	5, 2, 1, 3
1, 3, 5, 2	2, 3, 5, 1	3, 2, 5, 1	5, 2, 3, 1
1, 5, 2, 3	2, 5, 1, 3	3, 5, 1, 2	5, 3, 1, 2
1, 5, 3, 2	2, 5, 3, 1	3, 5, 2, 1	5, 3, 2, 1

ex. 12: **Permutations of Rhythms Based on Fibonacci Numbers**

There are two principal ways in which the rhythms of this table are used in the piece, which will now be explored in detail in the sections that follow.

7.1 Rhythms and Pitches of the *Col Legno* Strings Micropolyphonic Texture

The first instance of micropolyphonic activity in the piece is the *col legno* string section at 3. The rhythmic motives are drawn from the following table:

	1		2		3		4		5		6	
R1	5, 1, 3, 2	3	5, 2, 1, 3	2	1, 5, 2, 3	0	5, 3, 2, 1	2	3, 2, 5, 1	0	5, 2, 3, 1	2
R2	3, 1, 2, 5	0	1, 3, 2, 5	0	3, 5, 2, 1	2	3, 5, 1, 2	0	5, 1, 2, 3	2	3, 2, 1, 5	3
R3	2, 3, 5, 1	2	3, 1, 5, 2	0	5, 3, 1, 2	1	2, 5, 1, 3	2	1, 3, 5, 2	1	1, 5, 3, 2	0
R4	1, 2, 5, 3	0	2, 5, 3, 1	1	2, 1, 3, 5	0	1, 2, 3, 5	0	2, 3, 1, 5	3	2, 1, 5, 3	0

ex. 13: **Rhythms of the *Col Legno* Strings Micropolyphonic Texture**

where each row, read from left to right signifies the rhythmic activity of a micropolyphonic voice. The 4-digit boxes labelled as columns 1, 2, 3, etc. represent the rhythmic values of 4-note patterns, and the single-digit boxes are the values of intervening rests. Note that the table

exhausts all possible 4-element permutations. Furthermore, the rest values are such that when one is added to the last value of the previous set of notes, the sum is still equal to a Fibonacci number. This is of particular importance when the rhythmic motive is played by an instrument like the xylophone, where the rapid decay makes rests redundant; the listener hears only the rhythm of each new attack. Because the patterns appear in retrograde later in the piece, the sum of each rest value and the first value of the number set that follows it is also a Fibonacci number. Since the sum of all the note values in each row is the same, the total value of the rests is set to different values for each row (9, 7, 6 and 4, respectively) to ensure that each voice remains out of synchronisation with the others.

The pitches are based on permutations of five elements (1, 2, 3, 4, and 5). There are 120 permutations possible, but as there was neither the need nor the desire to use them all, the patterns were derived through a random selection process[14]. The result:

	1	2	3	4	5	6
P1	5, 3, 1, 2, 4	1, 5, 4, 2, 3	3, 2, 5, 1, 4	2, 1, 3, 5, 4	4, 5, 2, 1, 3	5, 2, 4, 3, 1
P2	3, 2, 1, 4, 5	4, 5, 3, 1, 2	1, 4, 3, 2, 5	5, 1, 4, 3, 2	2, 1, 3, 5, 4	2, 4, 3, 5, 1
P3	5, 1, 3, 4, 2	4, 3, 5, 1, 2	2, 3, 1, 4, 5	1, 5, 3, 2, 4	3, 5, 4, 2, 1	1, 4, 2, 5, 3
P4	5, 1, 2, 3, 4	3, 2, 1, 5, 4	2, 5, 4, 1, 3	4, 3, 5, 2, 1	1, 2, 4, 3, 5	3, 5, 4, 1, 2

ex. 14: **Pitches of the *Col Legno* Strings Micropolyphonic Texture**

where P1, P2, etc. read from left to right represent melodic lines, and columns 1, 2, 3, etc., are individual 5-note melodic fragments. The actual pitches and pitch relationships vary from one micropolyphonic segment to the next. What does remains constant is that '1' always signifies the

[14] ... a process involving numbered pennies and a glass of sherry

lowest pitch, '2' the next-lowest pitch, etc. In the first *col legno* section (3), then, the pitch field comprises five pitches a semitone apart, with G#3 as the lowest note. Violin I-1 plays the pitches of P1 to the 24th note (column 5, or P1-5) then proceeds through P2 to the 24th note (number 5 of P2-5). The rhythms are R1 and R2, where 1=16th note. Violin I-2 follows the same procedure, but with pitches from P2 and P3 played on rhythms R2 and R3. Because the latter enters later than violin I-1, it does not get as far along in the series. The same procedure is applied to violin I-3 and violin I-4, using P3/P4 on R3/R4 and P4/P1 on R4/R1, respectively. As for the second violins, they are canonic echoes of the first violins, 12 beats apart.

The second instance of the *col legno* string texture is similar to the first, in that it is based on the tables of rhythms and pitches produced above. It varies, however, for as a voice completes a row and moves to the next, the basic note value is augmented. For example, violin I-1's first rhythmic pattern is R1 and based on 1=16th note (mm.190-193). At m.193, it begins R2 on B-flat, with 1=8th note. At m.198, it moves to R3 with 1=quarter. The same augmentation occurs in the other violins, and violas 1, 2 and 3 add new density to the texture, starting at m.200 on R1, R2 and R3 respectively (1=half note).

The third appearance of the *col legno* micropolyphony is at m.293 and is simply a retrograde of the second instance just described. While the structure does not reappear again as such, the material returns one last time at m.316 in flute1, clarinet 1 and vibraphone. The flute plays R4 and R3 on P4 and P3 (1=16th-note quintuplet), the clarinet plays R2 and R1 on P2 and P1 (1=8th-note triplet), and the vibraphone plays R3 and R2 on P3 and P2 in the upper register (1=8th note), and R1 and R4 on P1 and P4 in the lower register (1=quarter note). The difference here is not only in the basic note values of each, but also that for the first and only time, the voices are sounded in different registers, and in three different timbres, so that each voice is

heard individually. Furthermore, they are arranged so that registrally, they together take up all the pitches from D4 to D-flat6, except for G and G#, which are left for the strings to fill.

7.2 Rhythms and Pitches of the Horn Micropolyphonic Texture and Its Derivatives

The other micropolyphonic textures in *Now and Forever* are derived from the horn passage that begins at 4. The 4-voice texture consists of 8-note patterns, whose randomly selected[15] rhythms and pitches are:

Horn Rhythms				
Hn.1	0	1, 2, 3, 5	3	2, 3, 1, 5
Hn.2	1	2, 1, 5, 3	0	3, 2, 5, 1
Hn. 3	2	3, 2, 1, 5	0	5, 3, 1, 2
Hn. 4	3	5, 2, 3, 1	2	1, 5, 3, 2

ex. 15: **Rhythm Numbers for Horn Motives**

and:

Horn Pitches		
Hn.1	3, 5, 4, 2	1, 5, 2, 4
Hn.2	5, 4, 2, 1	5, 2, 4, 3
Hn. 3	4, 2, 1, 3	2, 4, 3, 5
Hn. 4	2, 1, 3, 5	4, 3, 5, 1

ex. 16: **Pitch Numbers for Horn Motives**

where 1=16th note and the pitches are from a 5-note pitch field centered on G#3 (pitch #3 from

[15] ... more pennies, more sherry...

the table), yielding E3, F#3, G#3, A#3 and C4. As the horns sound, the strings play a tremolo figure on the same notes, creating a nebulous, swelling whole-tone cluster. At 5, the peak of the crescendo, the horns trade off to the flutes and clarinets, who take the micropolyphony up the octave, but play the rhythm and pitch patterns in retrograde and in decrescendo. The glockenspiel introduces a new permutation, played 3 times (at 1=16th note, 1=8th-note triplet and 1=8th note) on the following rhythm and pitches:

R = | 1 rest | 1, 3, 5, 2 | 1 rest | 2, 3, 5, 1 |

P = 1, 3, 5, 4 | 3, 5, 1, 2 |

ex. 17: **Glockenspiel Rhythm and Pitches**

The whole process is repeated from 6 through 7, with the flute and clarinet patterns in rhythmic diminution (from 1=16th note to 1=16th-note triplet) and up a M2, and violin I's upper note up a M3. The horns drop out temporarily while the swells continue with only the flutes, clarinets and strings until 10, when they re-enter in high tessitura and slowly descend in register as they repeat their patterns. The horns return at m.69 with two single statements of their patterns on the original 16th-note rhythms, but this time the two 4-note motives of each pattern are juxtaposed and some notes are omitted (omissions are shown in brackets):

2, 3, 1, 5	1, 2, 3, 5
2, 1, 5, 3	3, 2, [5, 1]
[5], 3, 1, 2	2	3, 2, 1, 5
1, 5, 3, 2	5, 2, 3, [1]

ex. 18: Horn Rhythms at m. 69

The intervals between pitches alternates between of 1, 2 and 3 semitones to cover 6 pitches — E, F, G#, A, C and C# — the same pitches as the upper woodwinds' sustained-note cluster.

Micrpolyphony returns emphatically at 14, as the horns resume their original rhythmic patterns at the level of 16th-note triplets, with pitches a semitone apart and symmetrical around G# (F#, G, G#, A and B-flat). At 15, the xylophone borrows the original horn 3 rhythmic pattern and plays it retrograde 3 times, shortening each note and rest by one 16th until the value reaches 1 (the rest goes down to 0). The patterns move up chromatically in the trumpets and trombones, as the strings tremolo on a semitone cluster. The upper strings leap to meet the woodwinds at 16, creating the sliding micropolyphonic soundscape already described in section III. New, randomly selected[16] rhythmic motives based on Fibonacci numbers are introduced, based on permutations of five elements, 1, 2, 3, 5 and 8:

[16] ... numbered pennies, a glass of water, and two aspirins.

Flute 1 = 2, 8, 1 | 3 rests | 5, 3
Flute 2 = 1, 8, 5, 3 | 2 rests | 2
Oboe 1 = 5 | 3 rests | 8, 2, 3, 1
Oboe 2 = 1, 2, 5, 8 | 5 rests | 3
Clarinet 1 = 5 | 3 rests | 8, 2, 3, 1
Clarinet 2 = 2, 8 | 2 rests | 3, 5, 1

***ex. 19:* Rhythmic Patterns of the Descending Micropolyphonic Soundscape at 16**

As the pitches fall in intervals that alternate between a semitone and a tone, a value of one 16th note is added to each note and rest with each subsequent repetition of the pattern, to flatten the rhythm and slow the pulse. The voices are passed to the bassoons and brass at m.134.

At m.153, the clarinets and bassoons play another micropolyphonic derivative over the double bass/cello cosmic breath in section IV. This time the intervals between pitches (from low to high) correspond to the first numbers of the Fibonacci series: 1, 1, 2, and 3.

At 22, a low sound mass stretches ever further downward to produce a dense micropolyphonic texture. The patterns in the bassoons, horns and brass (except trombone 1) are based on the original horn rhythms and pitches from 4 (see ex.15 and 16), but here they are split into two 4-note motives and reversed:

	Rhythm	Pitches
Bsn.1	5 ,1, 3, 2	4, 2, 5, 1
Bsn.2	5, 3, 2, 1	2, 4, 5, 3
Hn.1	5, 1, 2, 3	3, 1, 2, 4
Hn.2	2, 1, 3, 5	5, 3, 4, 2
Hn. 3	1, 3, 2, 5	5, 3, 1, 2
Hn. 4	2, 3, 5, 1	1, 5, 3, 4
Trb. 2	3, 5, 1, 2	1, 2, 4, 5
Trb. 3	1, 5, 2, 3	3, 4, 2, 5

ex. 20: **Original Horn Rhythms and Pitches, Split and Reversed**

As the patterns sound, trombone 1 plays a repeated descending figure, and the cellos and double bass execute an overlapping descent to the low E, all of which serve to cloud the perception of pitch, while the overall register expands downwards. The final appearance of micropolyphony appears at 28, a retrograde of the sound mass at 22, with the four horn motives played in their original order, split in two and redistributed among the bassoons, horns, trombone 2 and bass trombone.

8. Other Uses of Golden Section Proportions and Numbers from the Fibonacci and Lucas Series

As mentioned in the introduction, golden section (GS) proportions are the basis of the large-scale formal divisions of *Now and Forever*. Beyond this, GS proportions and numbers from the Fibonacci and Lucas series also help determine small-scale formal divisions and phrasing throughout the work. For example, with one exception, all of section I (1, 2 & 3) is organised using phrase lengths determined by Fibonacci and Lucas numbers (1=quarter note for 1 & 2 and 1=half note for 3, due to augmentation):

Rehearsal Number	1			2			3
Phrase Length	11	13	21 18	8	5	11 :	18
Divisions within the Phrase	6:5	5:8	8:13/11:7[17]	3:5	3:2	4:7 :	11:7[18]

ex. 21: **Phrase Lengths of *Cosmic Breath I***

Thus, only the length of the first phrase is not a Fibonacci or Lucas ratio. This is intentional, to indicate that while it may be the beginning of the piece, it is only an arbitrarily chosen point along a greater continuum.

The underlying concept for section II, *Purpose*, is a "revolving spinning body." The binary, crescendo-decrescendo structural aspect of phrases is again present from 4 to 16, this time as part of the recurring micropolyphonic segments that feature the horns and woodwinds as described in section 7.2. Over the course of the first part of the section, from 4 to the end of the first beat of m.65, the lengths of the binary middle-ground phrases gradually become shorter according to numbers in the Fibonacci series, reversed (1=quarter note):

Location	4 - 5	6 - 7	8	9	10	m.62	m.64
Phrase length	55	34	21	13	8	5	3
Binary Division of Phrase	34:21	21:13	13:8	8:5	5:3	3:2	2:1

ex. 22: **Phrase Lengths From 4 to m.65, Beat 1**

The shortening phrase structure, the tremolo strings, the general rise in pitch with each new

[17] This is actually a 3-note phrase (i.e. not binary).
[18] Here two binary phrases overlap.

phrase, the diminution in the horn, flute and clarinet rhythms and the "Doppler effect"[19] sounded in the trombones and violins at the first two dynamic peaks at 15 and 17 all serve to evoke the impression of a spinning body moving in a circular path towards and away from the listener with ever-greater speed.

At 11, the phrase length of the upper woodwinds and strings is twenty-one 16th-notes, with the strings on a downwards glissando through the last five 16th-note beats, a varied echo of the Doppler effect of the previous passage. The motive is repeated up a major 3rd, ending with a downward string glissando of eight 16th-note beats. The vibraphone solo that follows ends precisely at the GS of section II at 13, punctuated by the arrival of the first violins on the registral high note, G#6. Five-eighths (5:3) of the way through 13 (m. 85, beat 3), the flutes and clarinets arrive at their high point of the passage, E6 and C6, respectively.

Starting at 14, GS proportions are musically expressed with a return to gradually-shortening phrases, but this time there is no binary aspect to the phrasing, only the division of segments along GS lines. The upper woodwinds, horns and strings play at *ff*, then after 21 quarter-note beats, the bassoons and timpani enter (m.110), followed by the trumpets and trombones, 13 beats later. The values, in quarter notes, of the ensuing chromatic rise in the brass are 5, 3, 3, 2, 2, 1, resulting in the following overall structure:

Location	14 (m.105)	Bsn./Timp. Entrance (m.110)	Tpt./Trb. Entrance 15 (m.113)					
Segment Length	21	13	8		5		3	
Note Values of Chromatic Rise	-	-	5	3	3	2	2	1

ex. 23: **Segmentation of 14 and 15 in Quarter-note Beats According to Fibonacci Numbers**

[19] the lowering in pitch of the sound of a moving object as it passes by the listener

Section III, *Hesitation*, begins at 16, and its subdivisions are all based on Fibonacci numbers. The voicing is divided into two opposing factions, the falling pitch/rising pitch/falling pitch passages, first sounded in the woodwinds and strings (m.117), and the ostinato interjections spearheaded by the trumpets. The overall segmentation, in quarter notes, is:

Location	m.117 beat 2	m.125 beat 4	m.128 beat 4	m.132 beat 1	m.134 beat 1	m.137 beat 1	m.138 beat 1	m.140 beat 1
Falls/Rises	34 (falling pitches in W.W. and Str.)	(fall ends m.126, beat 2; Str. sustained)	21 (rising pitches in W.W.)	(W.W. and upper Str. sustained; Vc., D.B. glissando)	13... (falling pitches in Bsn. & Brass; Str. join descent)	...cont'd...	...8...	...cont'd. (upper W.W. join Tpts; Str. sustained)
Trumpet Interjections	-	5	-	8	-	3	-	13

***ex. 24:* Segmentation of Section III According to Fibonacci Numbers**

Not only is the duration of each segment equal to a Fibonacci number, but in addition, the trumpet interjections come at intervals equal to Fibonacci numbers in reverse order (34, 21, 13, 8). At the end of the section, starting at m.144, the timpani rhythm outlines Fibonacci numbers in quarter-note values (5, 2, 3, 1, 2 and 1).

Section IV, or *Cosmic Breath II*, follows at 19 with one binary phrase at a ratio of 19:31. Although the numbers are not part of the Fibonacci or Lucas series, it divides the section into the closest approximation of a GS proportion to the nearest 16th note. In Section V, from 20 to the

first two measures of 21, the overlapping 13-beat phrases (1=quarter) crescendo over five beats and decrescendo over eight. Section VI, bearing wisdom's message and the winds of change, begins precisely at the golden section of the piece. The final appearance of GS binary macro-phrasing begins at 31, where the movement from G6 and G#2 to G4 and G#3 is in overlapping phrases that highlight 8:5 and 7:11 at the half-note beat level. The final phrase, a crescendo and decrescendo on G4 and G#4, ceases before its logical end, forming a ratio of 8:11 instead of 8:13, leaving out two beats to mirror the missing beats in the first phrase of the piece.

While the use of rhythms based on Fibonacci numbers has already been discussed in section 7, two additional instances of rhythmic motives based on Fibonacci and Lucas numbers are noteworthy. One is the rhythm of the trumpets, from m.125 to 19. Throughout this passage, all of the rhythms are based on Fibonacci numbers, in that the distance between the attacks of two adjacent notes is always one of 1, 2, 3, 5 or 8 (16^{th} notes). The other is the use of the Fibonacci and Lucas series to set up rhythmic ratios, sounded either simultaneously or consecutively. These ratios permeate the rhythmic fabric from m.74 to the end of 13, first, by way of the 8:5 ratio in the violins, then, through all of 13 with regular and irregular subdivisions of the beat into 1, 2, 3, 4, 5, 7, 8 and 11 parts.

9. Conclusion

This analysis has outlined some of the main compositional devices used in the creation of *Now and Forever*. While not exhaustive, it has attempted to show how the musical material was derived and organised, with particular reference to the rising semitone motive, the harmonic series, golden section proportions and micropolyphony. These techniques have proven useful and will likely form the basis of future projects. Possible directions for research include explorations

of the harmonic series and golden section proportions as organising principles in the composition of electronic music, which offers new avenues of flexibility and refinement for the use of non-traditional tunings and musical material based on values that cannot be expressed as integers.

Now and Forever

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Part 2: Score

A thesis submitted to McGill University in partial fulfilment of the requirements of the degree of M.Mus. (composition)

Instrumentation

2 Flutes (Flute 2 doubling Piccolo)
2 Oboes
2 Clarinets in B-flat
2 Bassoons
4 Horns in F
2 Trumpets in C
2 Tenor Trombones with F-attachment
1 Bass Trombone with E-trigger
Percussion 1: Vibraphone*
Antique Cymbals*
Glockenspiel *
Sizzle Cymbal
Xylophone
Small, Medium and Large Cymbals*
Snare*
Tubular Bells
Large Tam-tam*
Percussion 2: Glockenspiel*
Glass Wind Chimes
Medium and Large Cymbal*
Timpani
Snare*
Crash Cymbal
Antique Cymbals *
Bass Drum
G2 Gong
Medium Tam-tam
Large Tam-tam*
Vibraphone*
Strings

* These instruments are shared

This score is in C (crotales and glockenspiel sound two octaves higher; piccolo and xylophone sound one octave higher; double bass sounds one octave lower, except harmonics, which sound as written)

Accidentals have been applied in the traditional manner, indicated once for the duration of the measure.

The microtonal tunings that occur in the piece should be played as follows:

- notes in the piccolo figure in 2 and 31 :

  C♮ : 1/6th of a tone lower than equal temperament

  D♯ : 1/6th of a tone higher than equal temperament

  C♯ : 1/4 of a tone higher than equal temperament

  F♮ : 1/6th of a tone lower than equal temperament

- oboe trills on D♮ and E♭ in 12 : 1/6th of a tone lower than equal temperament

- $G^{\flat}$ in the flutes and clarinets in 14 and 15 : $1/6^{th}$ of a tone lower than equal temperament
- notes in the bassoons, brass, cellos and double bass in 22 :

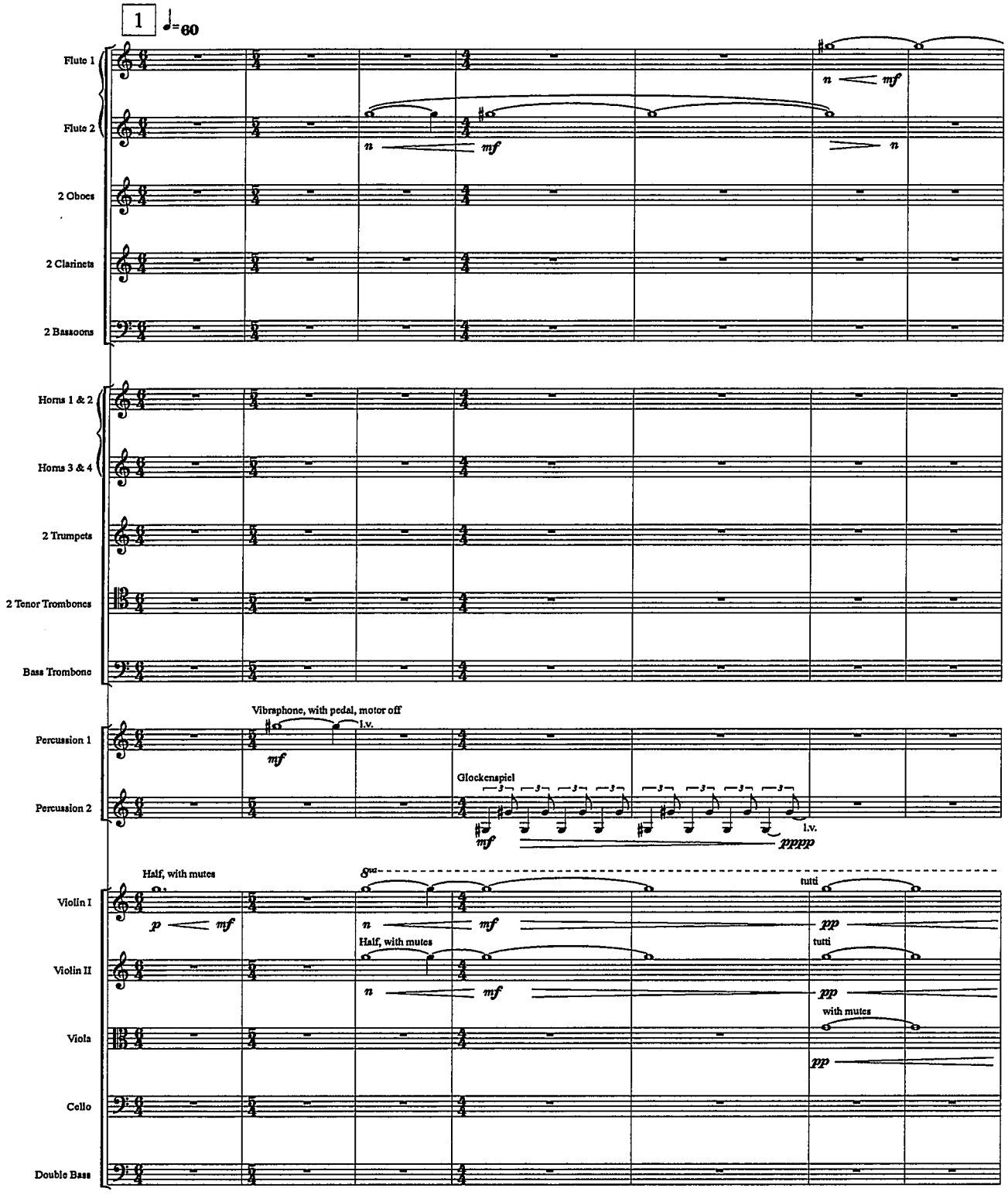
  $A^{\natural}$: $1/6^{th}$ of a tone higher than equal temperament

  $D^{\flat}$: 1/4 of a tone higher than equal temperament

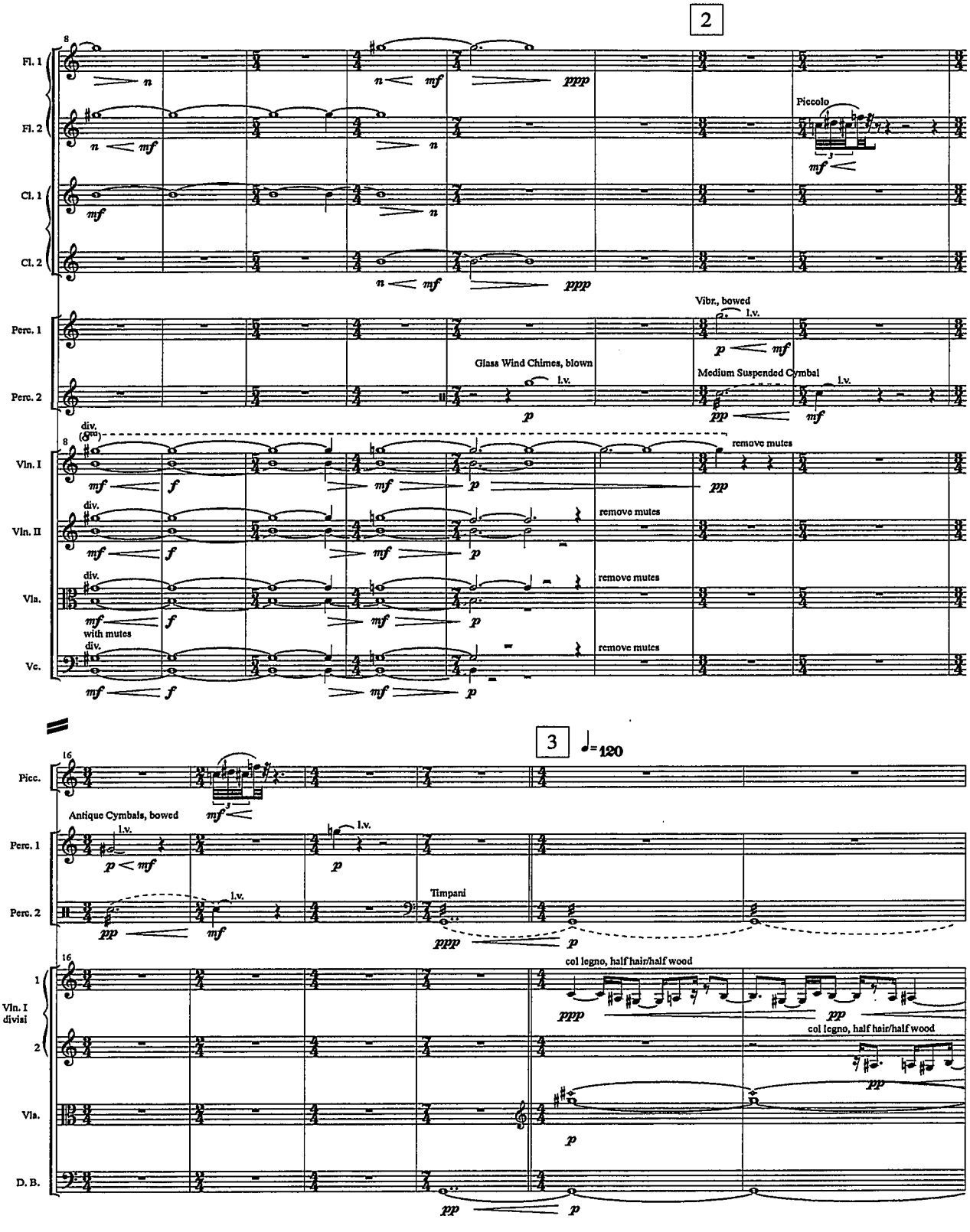
  $B^{\natural}$: 1/4 of a tone lower than equal temperament

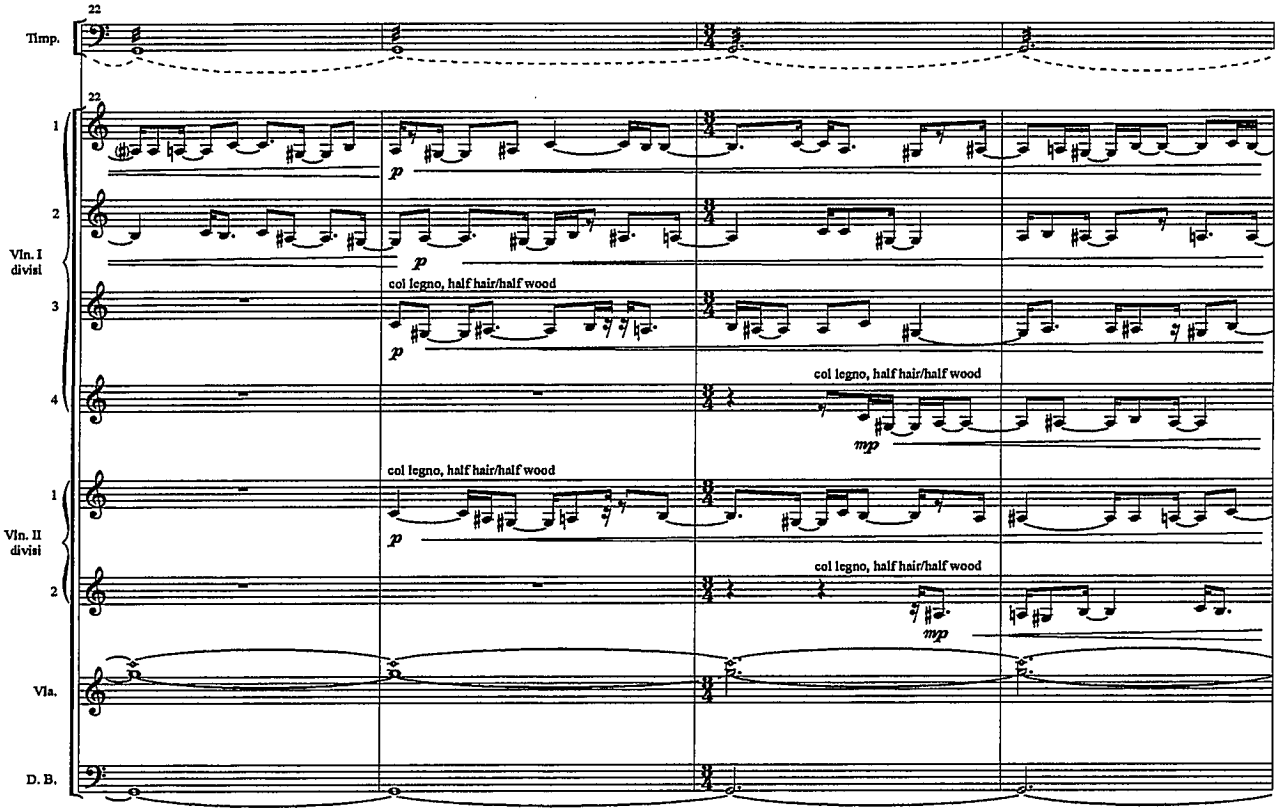
Now and Forever

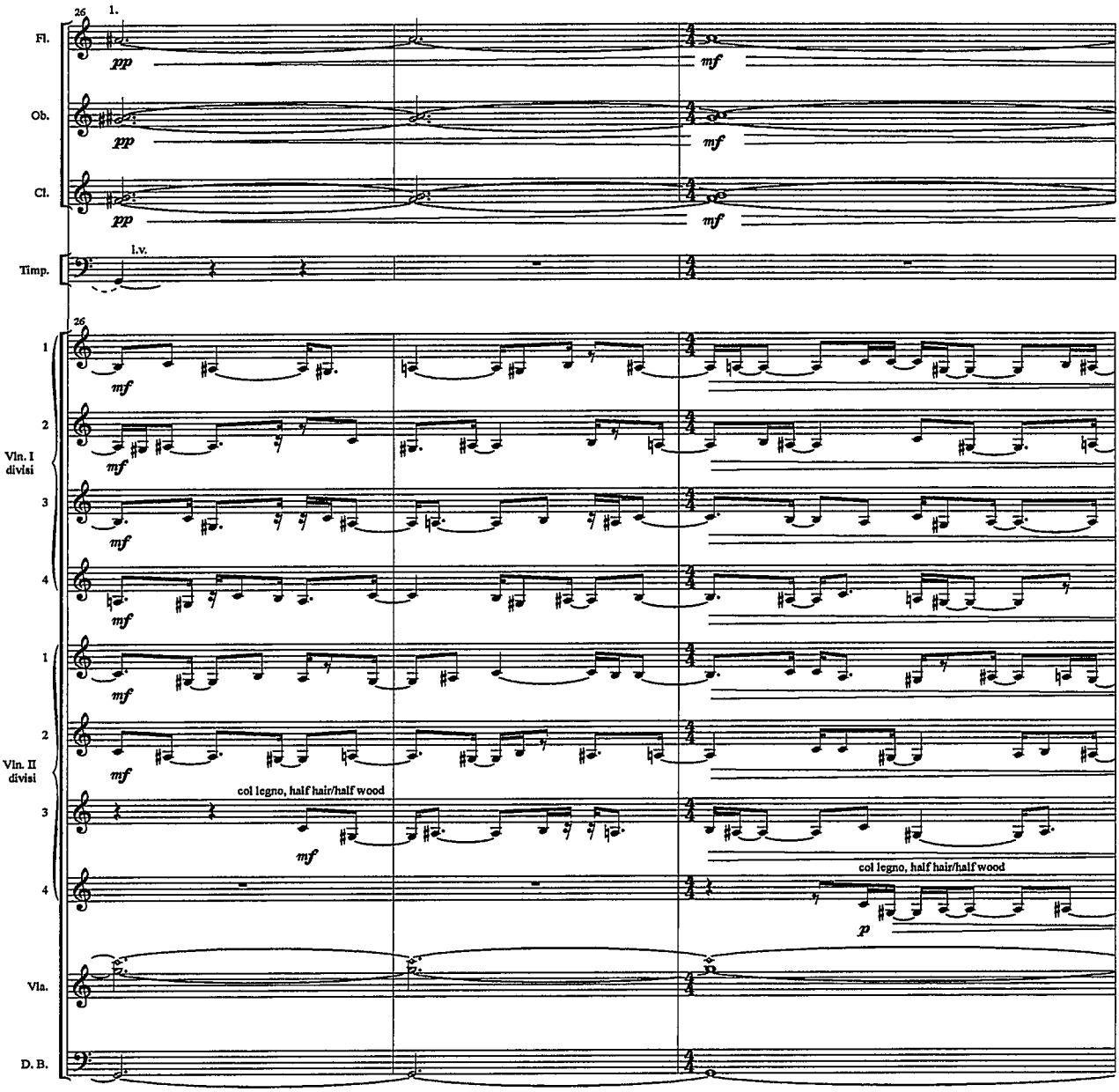
Elizabeth Dehler (2002)

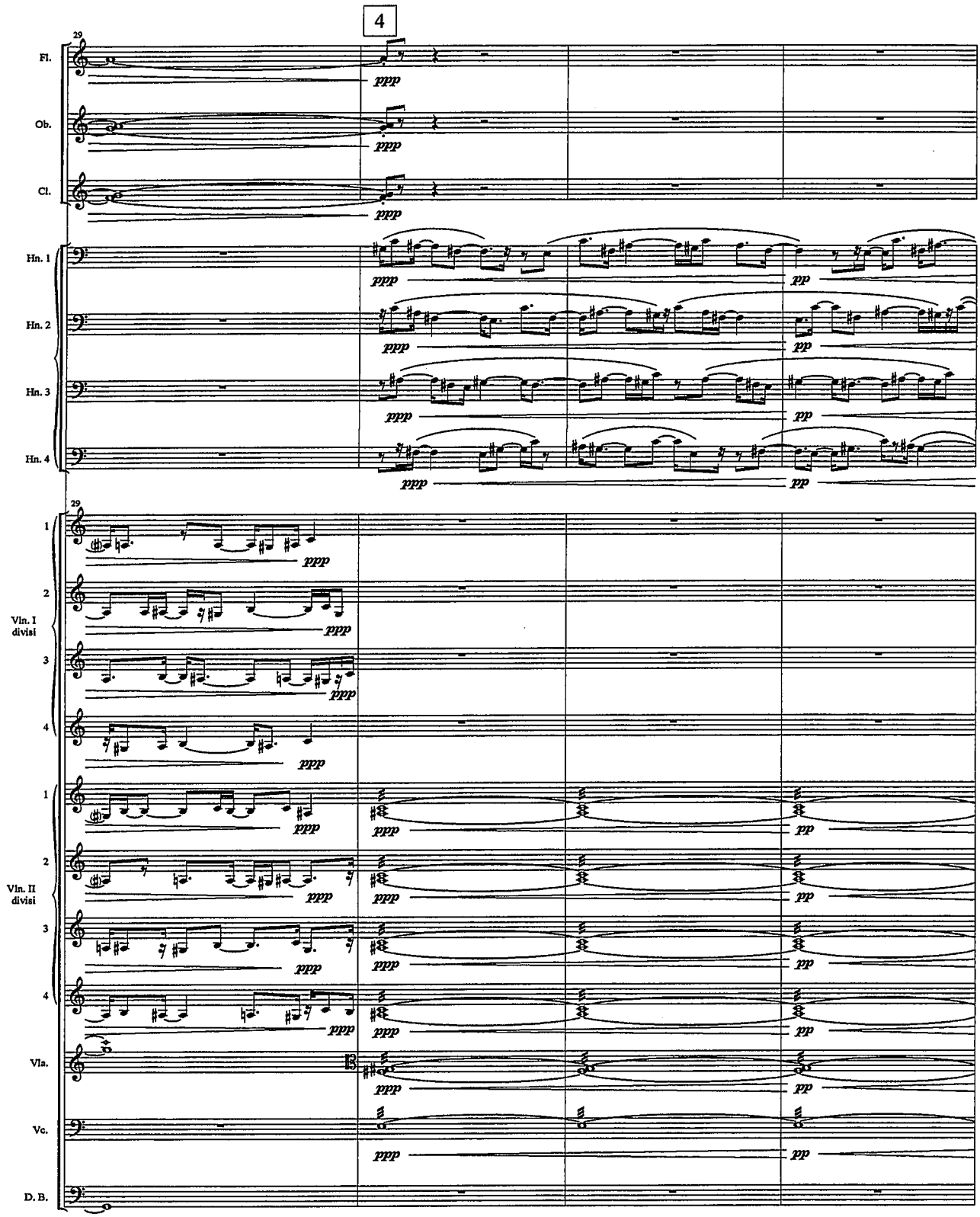


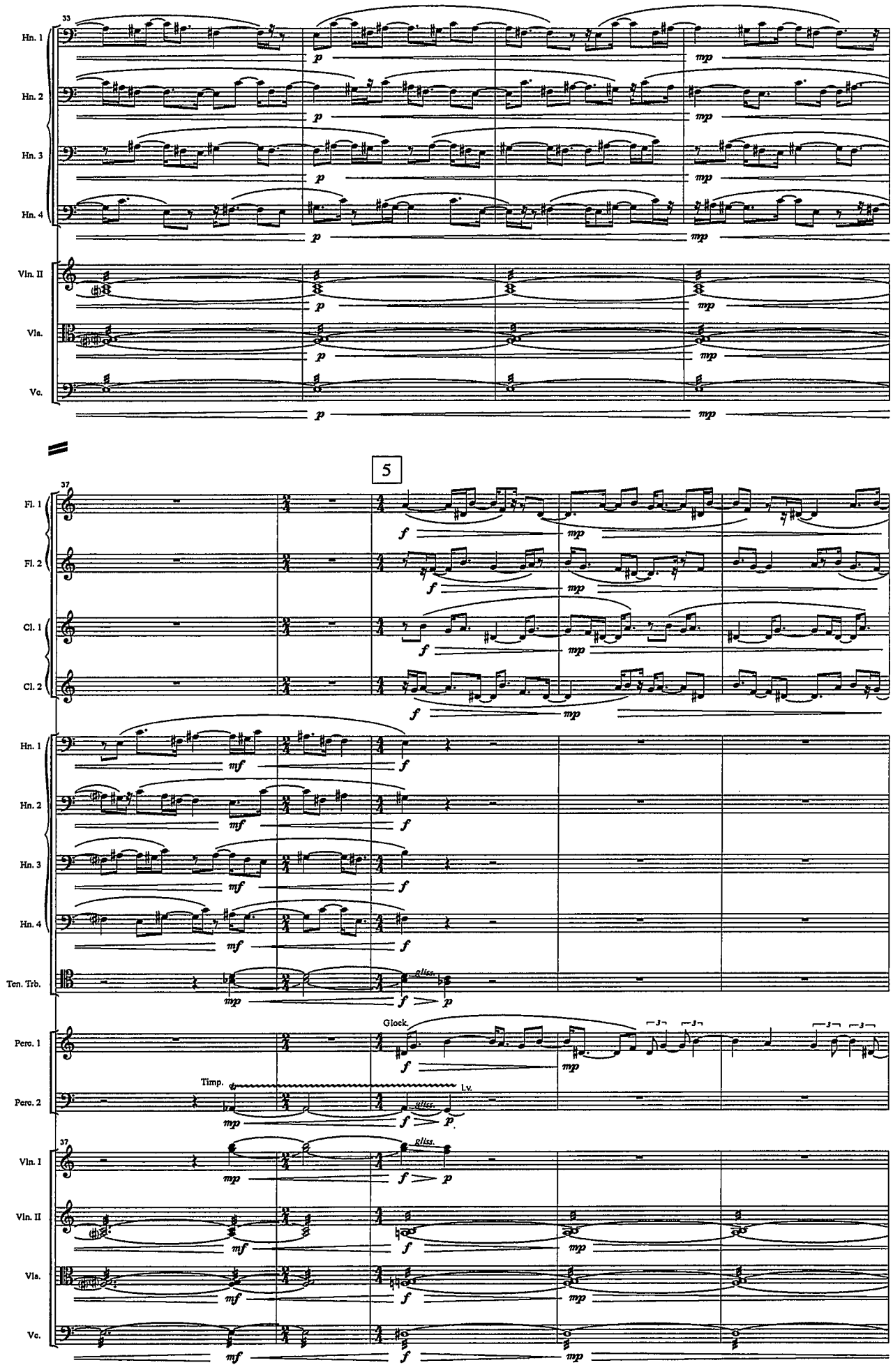
N.B. This score is in C (crotales and glockenspiel sound two octaves higher; piccolo and xylophone sound one octave higher; double bass sounds one octave lower, except harmonics, which sound as written).

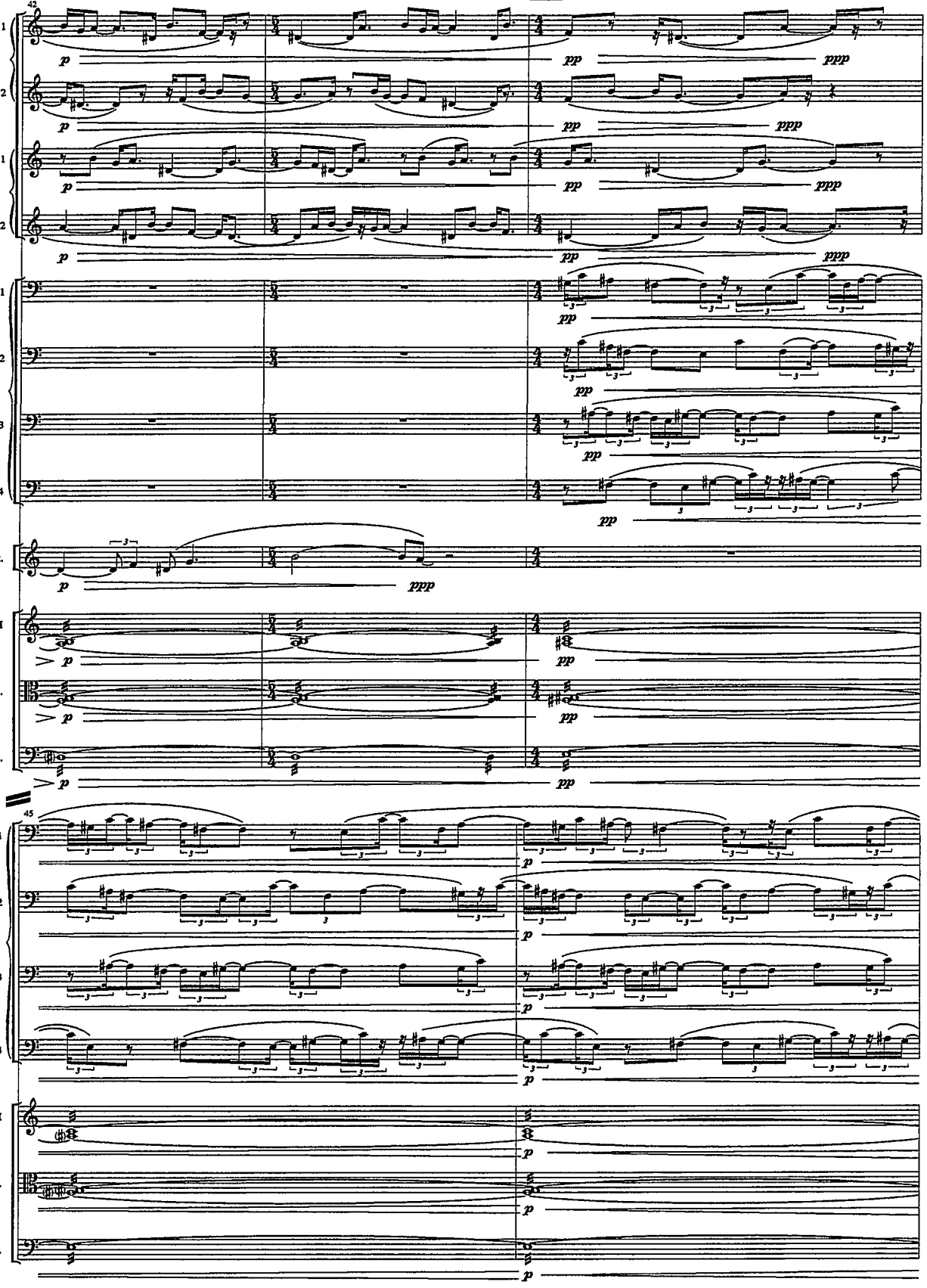

2
Fl. 1
Fl. 2
Piccolo
Cl. 1
Cl. 2
Perc. 1
Vibr., bowed
l.v.
Perc. 2
Glass Wind Chimes, blown
Medium Suspended Cymbal
Vln. I
div.
remove mutes
Vln. II
Vla.
with mutes
Vc.
3
♩= 120
Picc.
Antique Cymbals, bowed
Timpani
Vln. I divisi
col legno, half hair/half wood

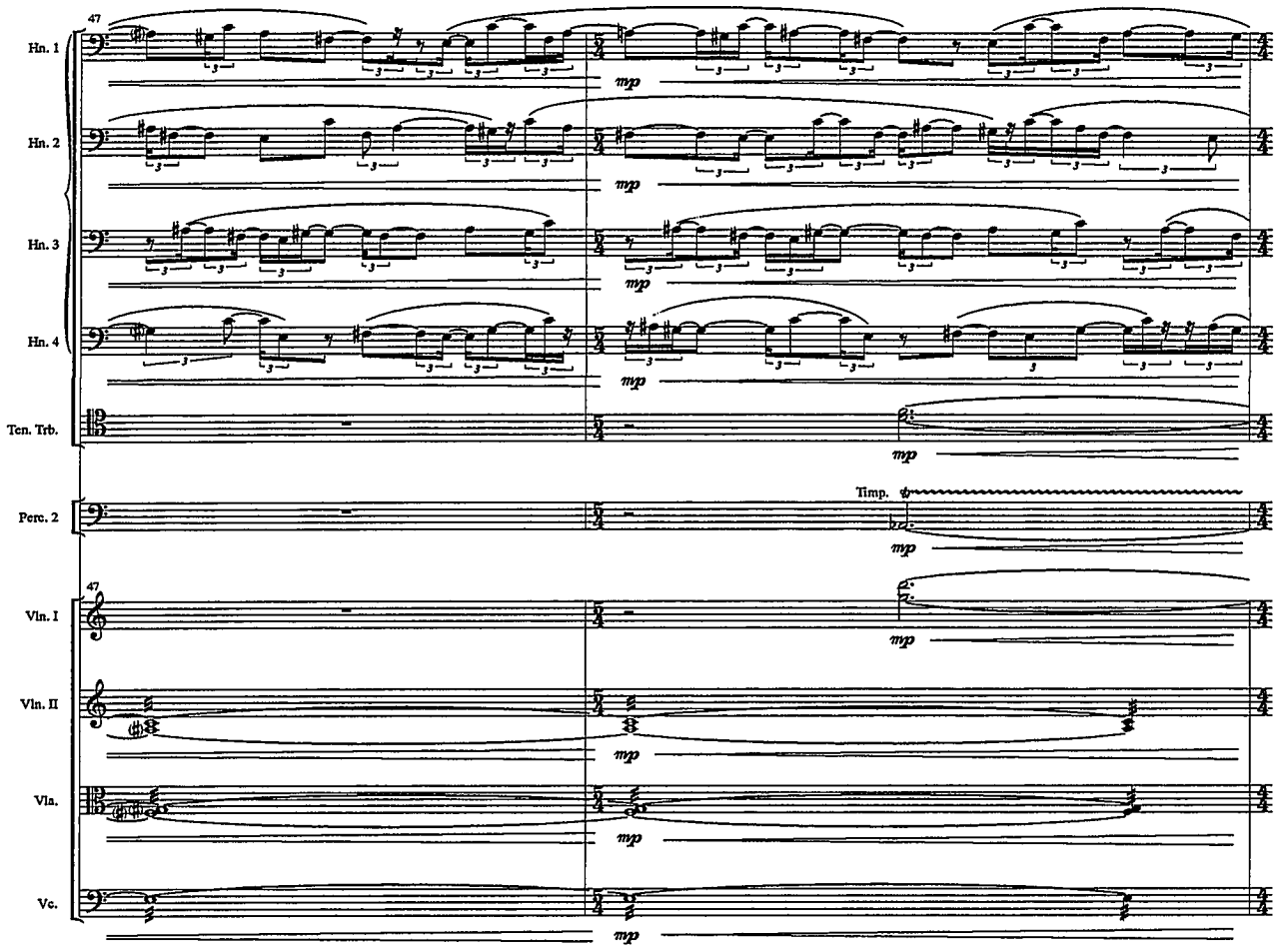

22
Timp.
22
1
2
Vln. I divisi
3
4
col legno, half hair/half wood
p
col legno, half hair/half wood
mp
1
Vln. II divisi
2
col legno, half hair/half wood
p
col legno, half hair/half wood
mp
Vla.
D. B.

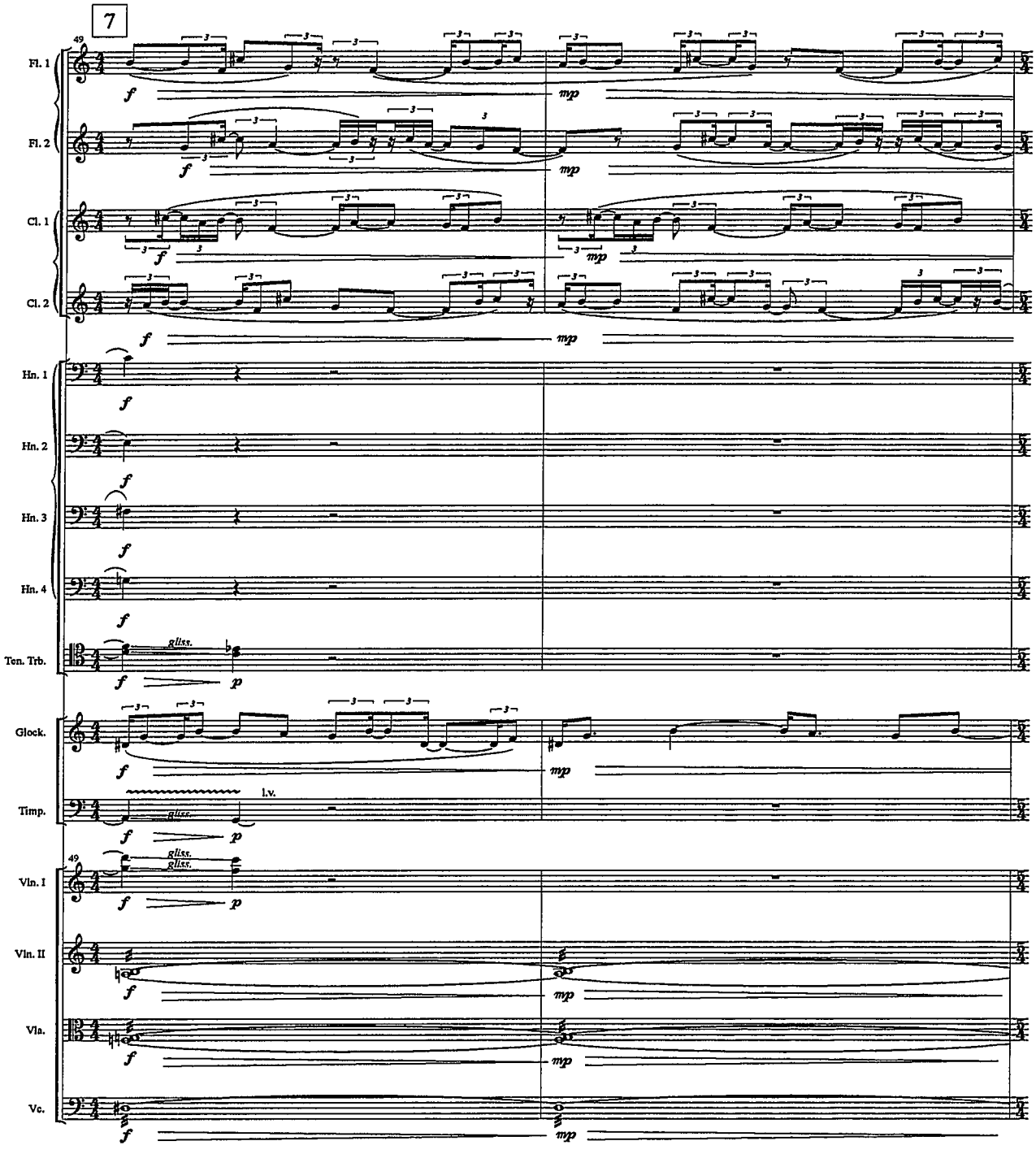

26
1.
Fl.
pp
mf
Ob.
pp
mf
Cl.
pp
mf
l.v.
Timp.
26
1
mf
2
mf
Vln. I divisi
3
mf
4
mf
1
mf
2
mf
Vln. II divisi
col legno, half hair/half wood
3
mf
col legno, half hair/half wood
4
p
Vla.
D. B.

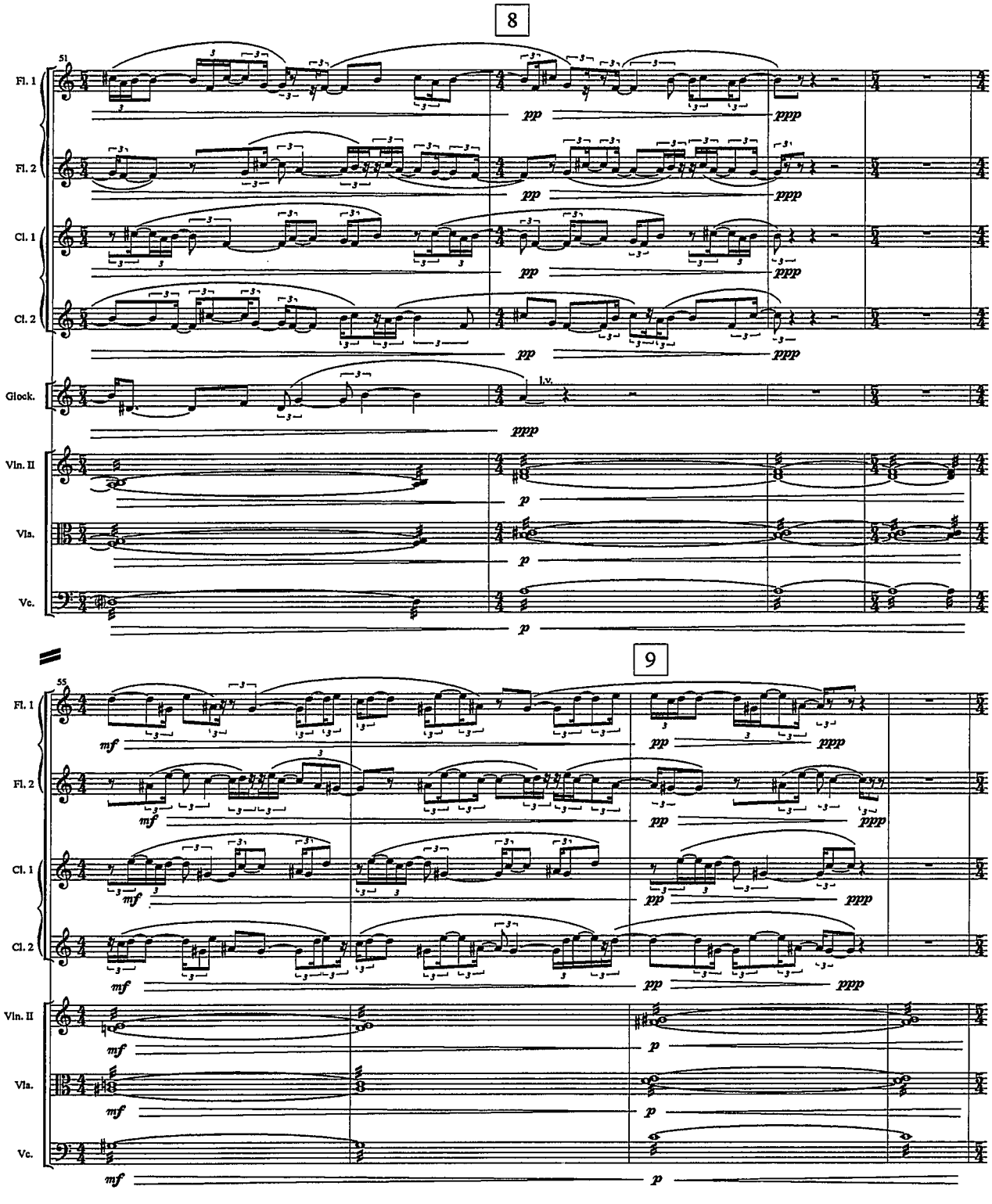

4
29
Fl.
Ob.
Cl.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
1
2
Vln. I divisi
3
4
1
2
Vln. II divisi
3
4
Vla.
Vc.
D. B.
ppp
pp

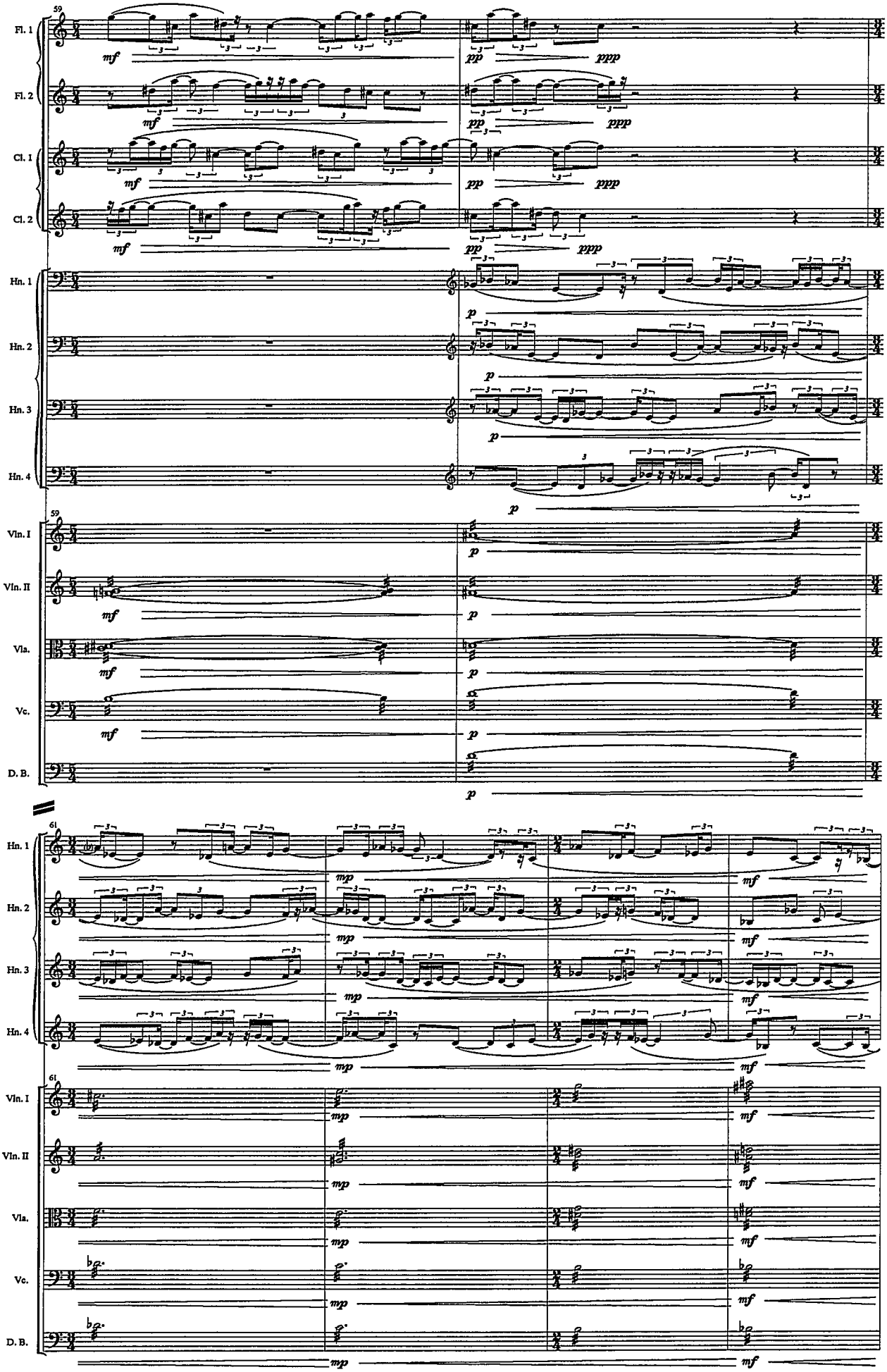

33
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Vln. II
Vla.
Vc.
p
mp
5
37
Fl. 1
Fl. 2
Cl. 1
Cl. 2
f
mf
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Ten. Trb.
gliss.
Perc. 1
Perc. 2
Glock.
Timp.
l.v.
Vln. I
Vln. II
Vla.
Vc.

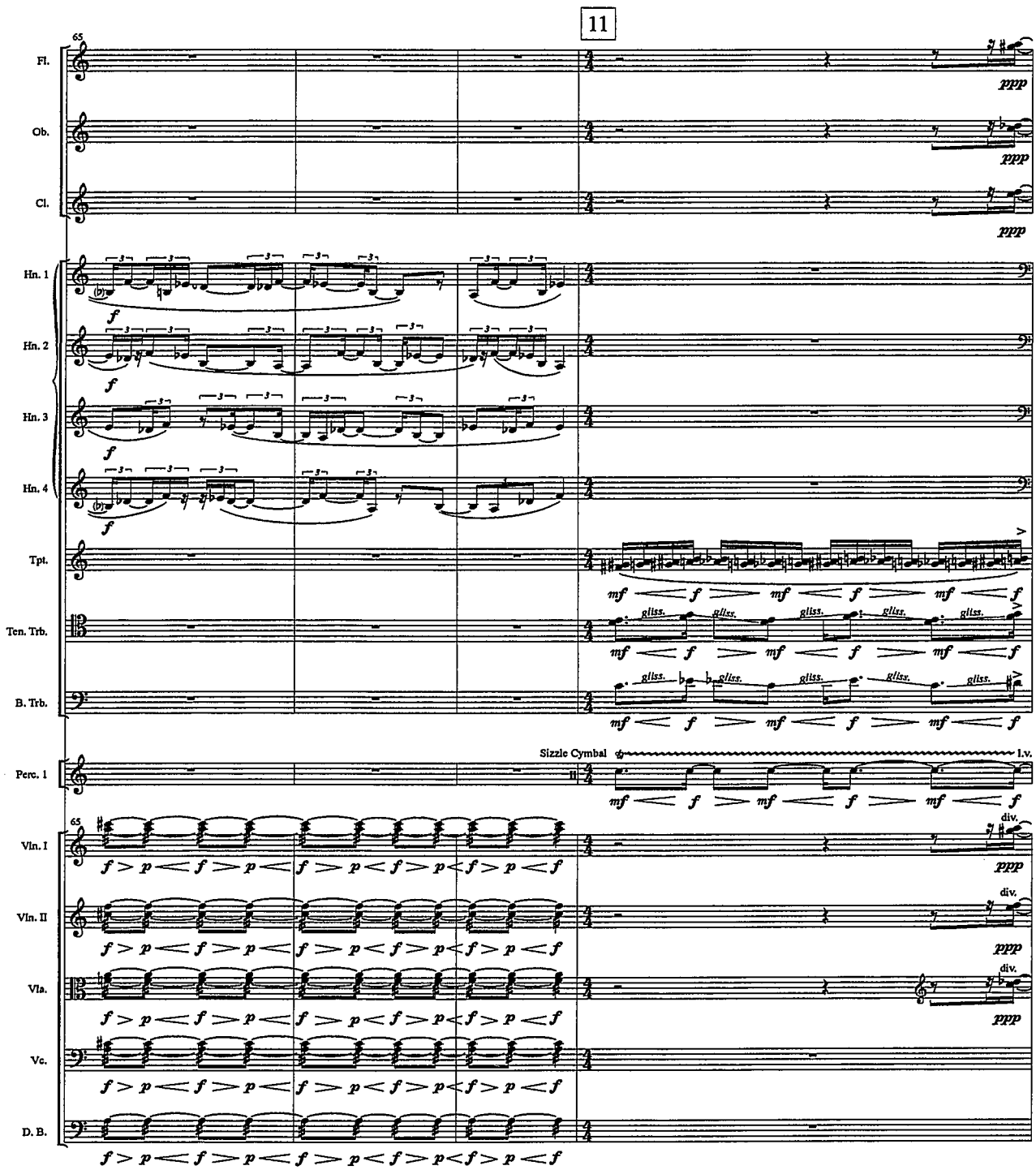

42
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Glock.
Vln. II
Vla.
Vc.
45
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Vln. II
Vla.
Vc.

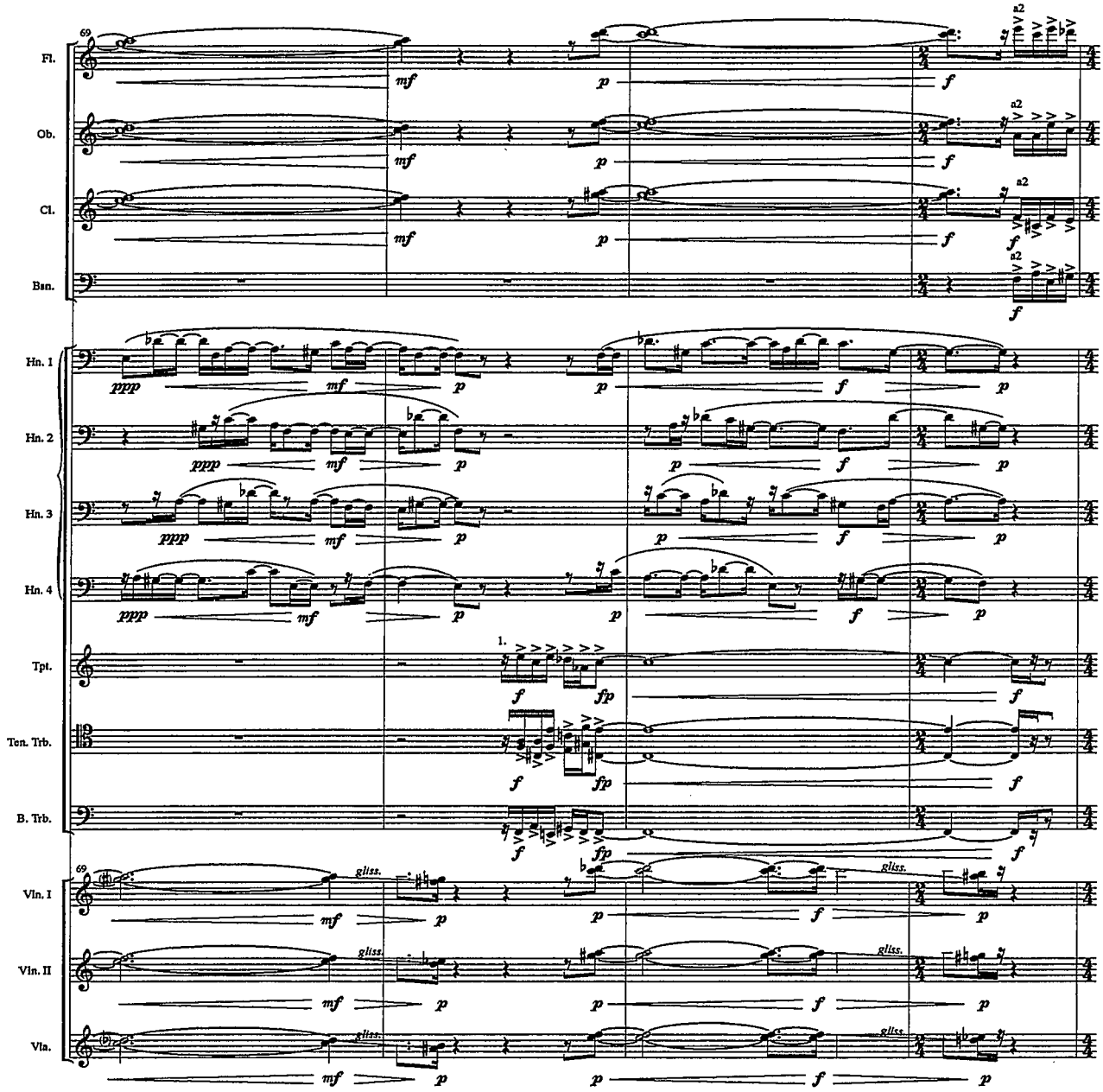

47
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Ten. Trb.
Timp.
Perc. 2
47
Vln. I
Vln. II
Vla.
Vc.
mp

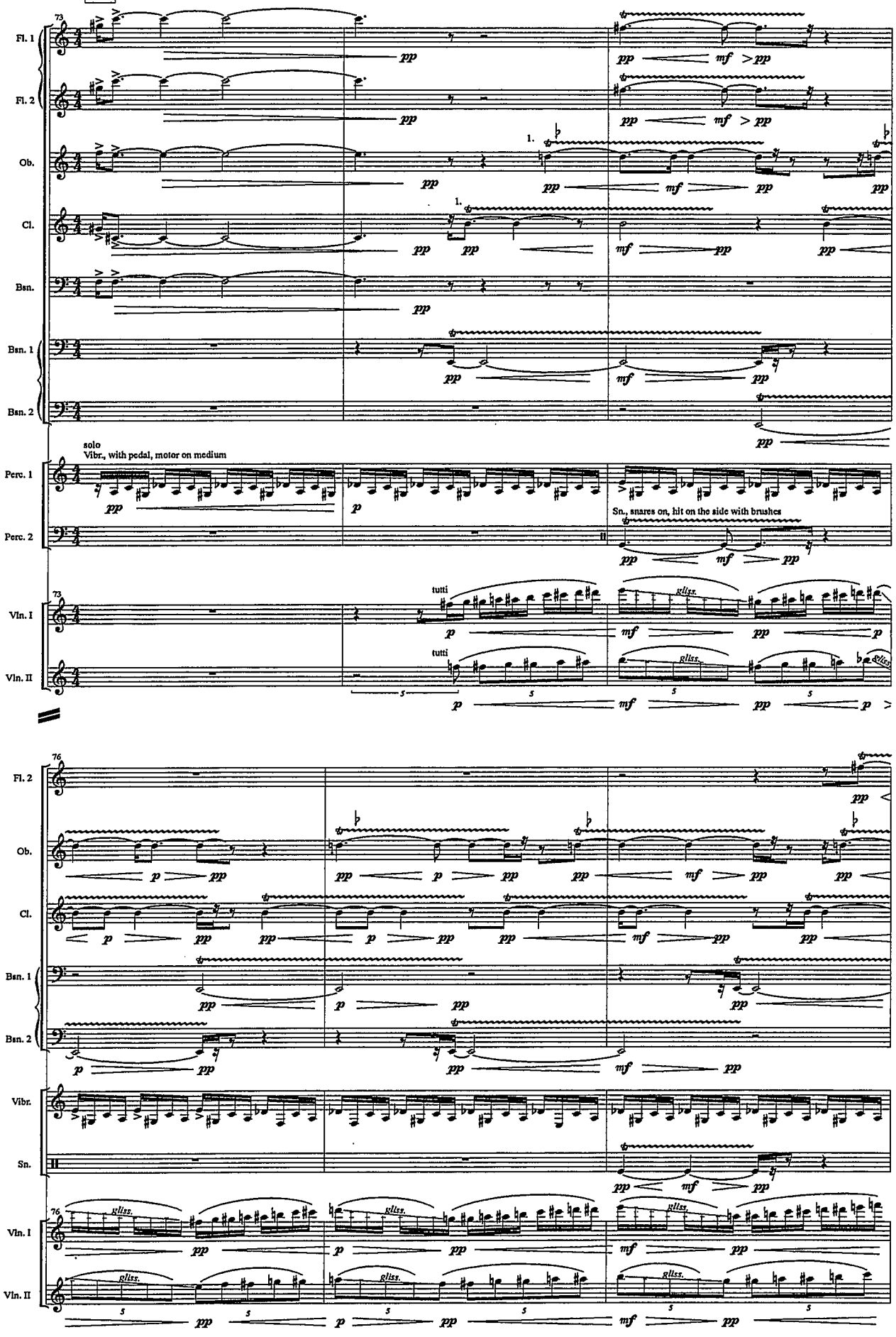

7
49
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Ten. Trb.
Glock.
Timp.
Vln. I
Vln. II
Vla.
Vc.
f
mp
p
gliss.
l.v.

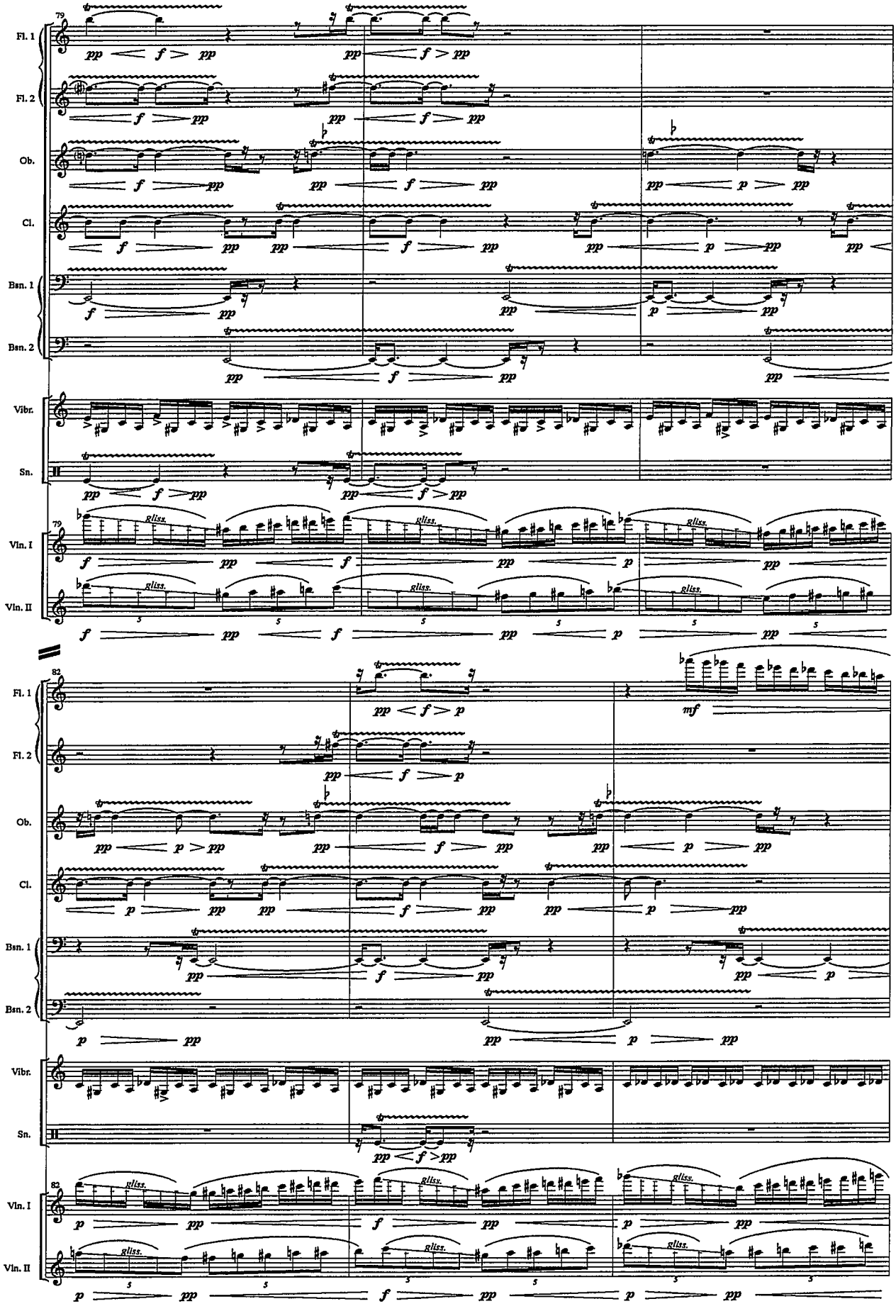

8
51
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Glock.
Vln. II
Vla.
Vc.
pp
ppp
l.v.
p
9
55
mf

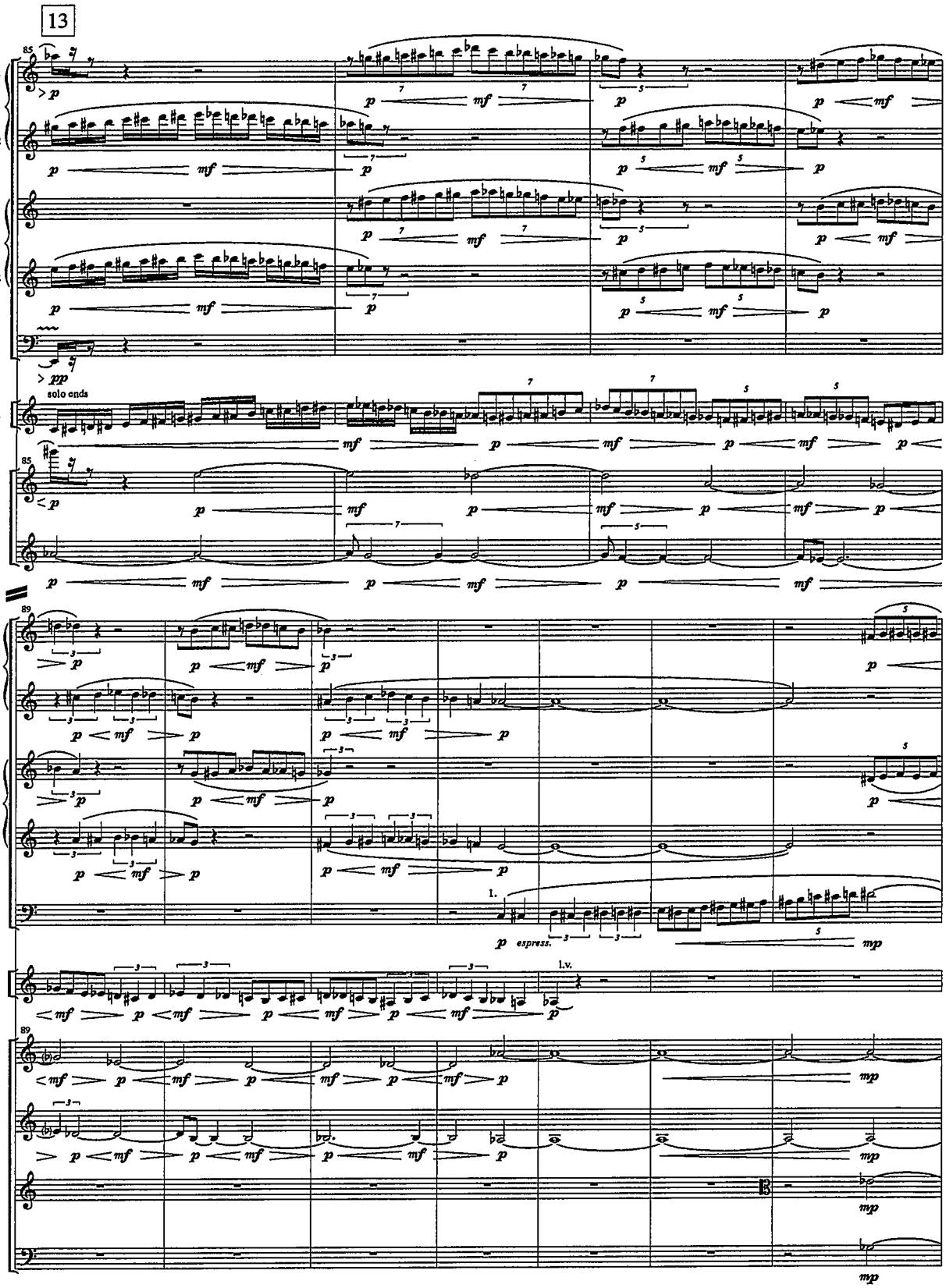

59
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Vln. I
Vln. II
Vla.
Vc.
D. B.
mf
pp
ppp
p
61
mp

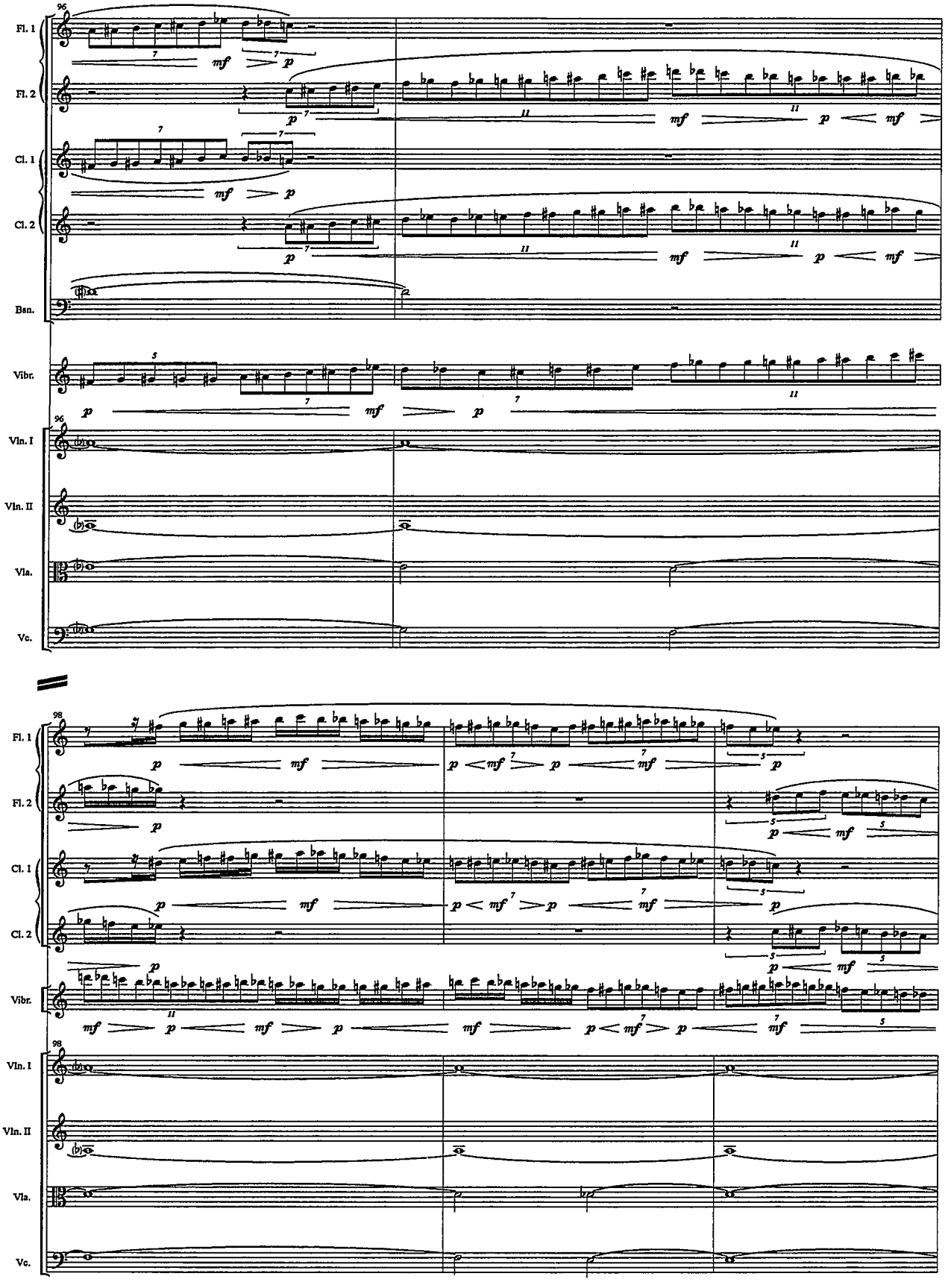

11
65
Fl.
Ob.
Cl.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Tpt.
Ten. Trb.
B. Trb.
Perc. 1
Sizzle Cymbal
l.v.
Vln. I
Vln. II
Vla.
Vc.
D. B.
div.
gliss.
ppp
f
mf
p

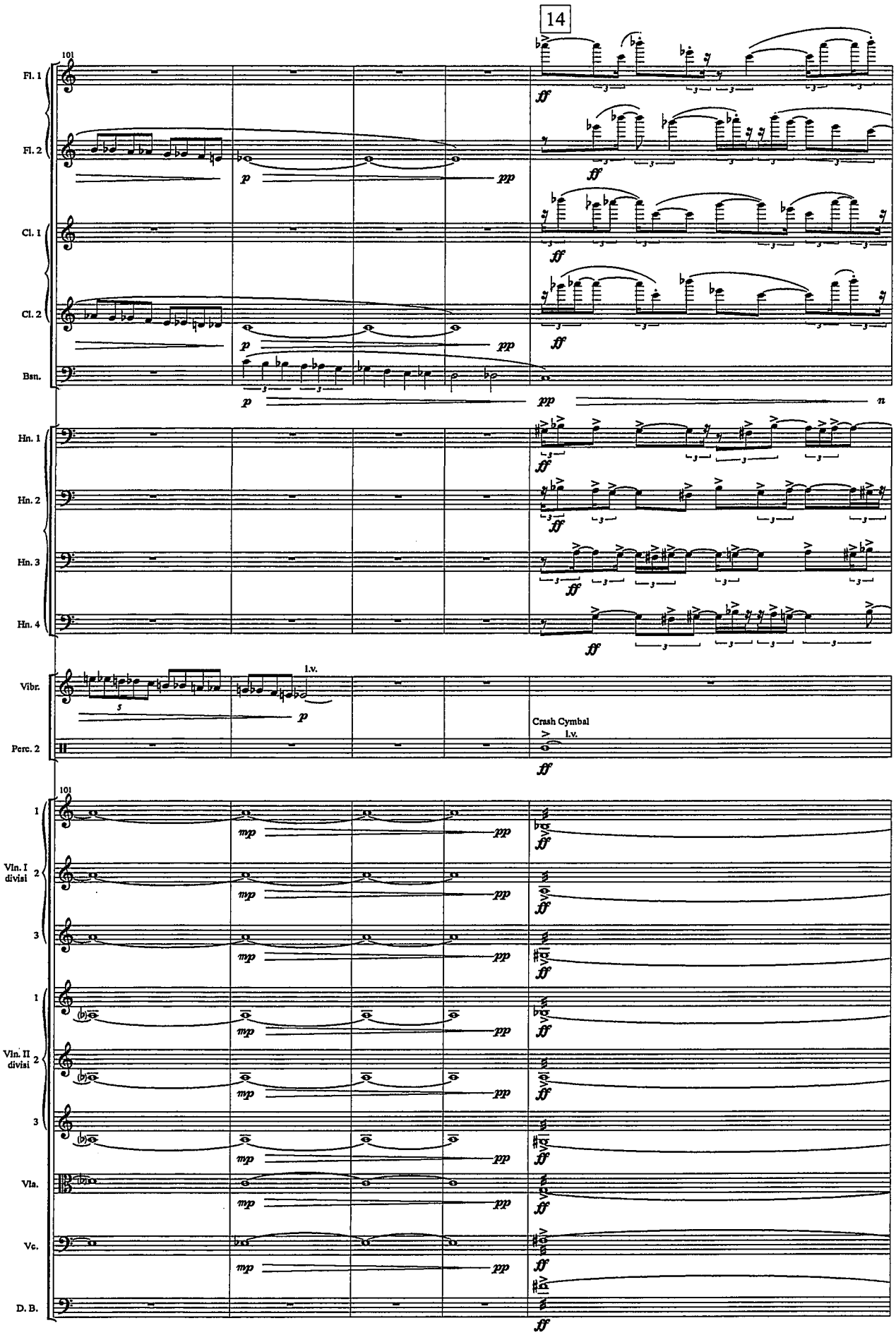

69
Fl.
Ob.
Cl.
Bsn.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Tpt.
Ten. Trb.
B. Trb.
Vln. I
Vln. II
Vla.
a2
1.
gliss.
ppp
mf
p
f
fp

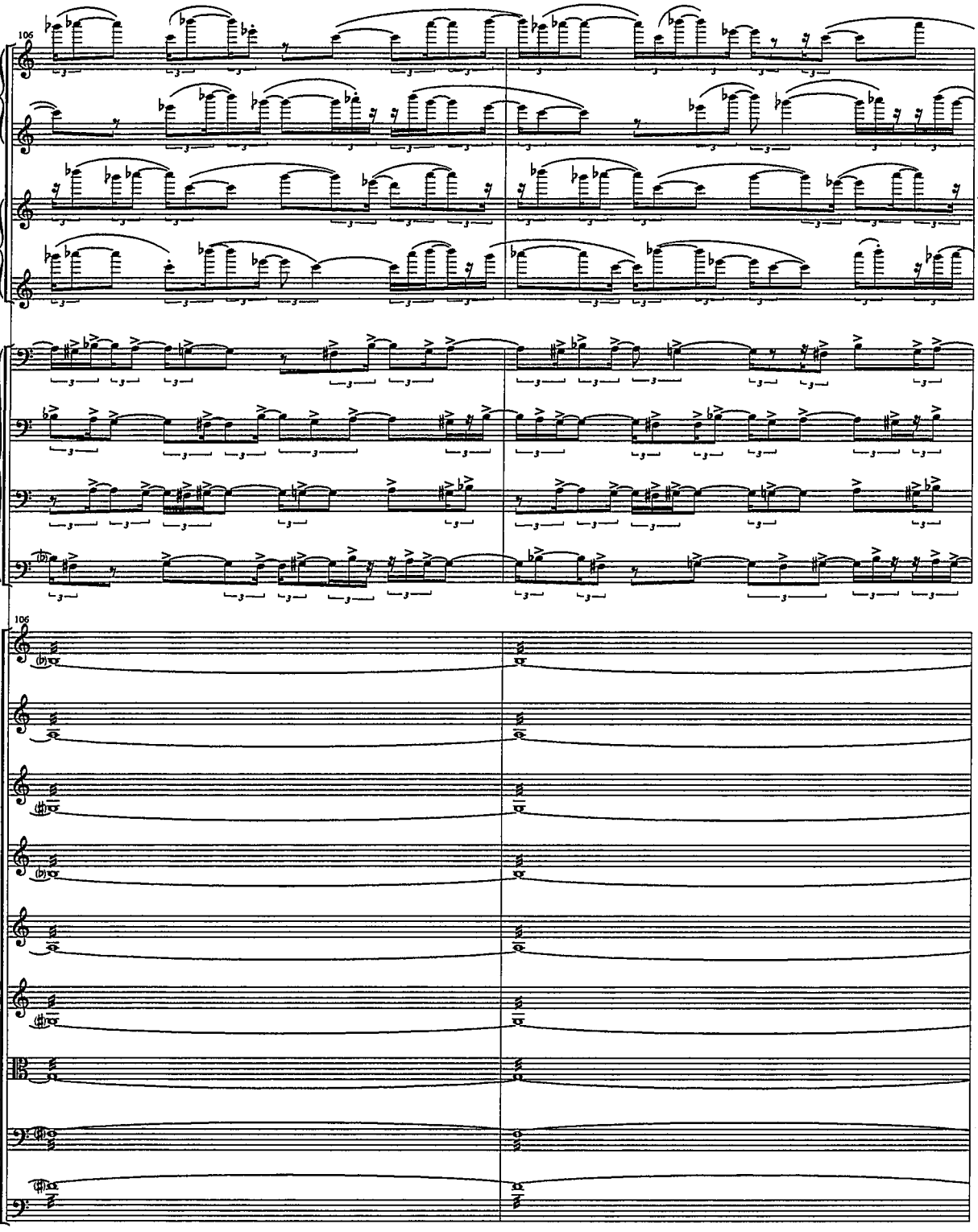

Fl. 1
Fl. 2
Ob.
Cl.
Bsn.
Bsn. 1
Bsn. 2
solo
Vibr., with pedal, motor on medium
Perc. 1
Perc. 2
Sn., snares on, hit on the side with brushes
Vln. I
Vln. II
tutti
gliss.
Vibr.
Sn.

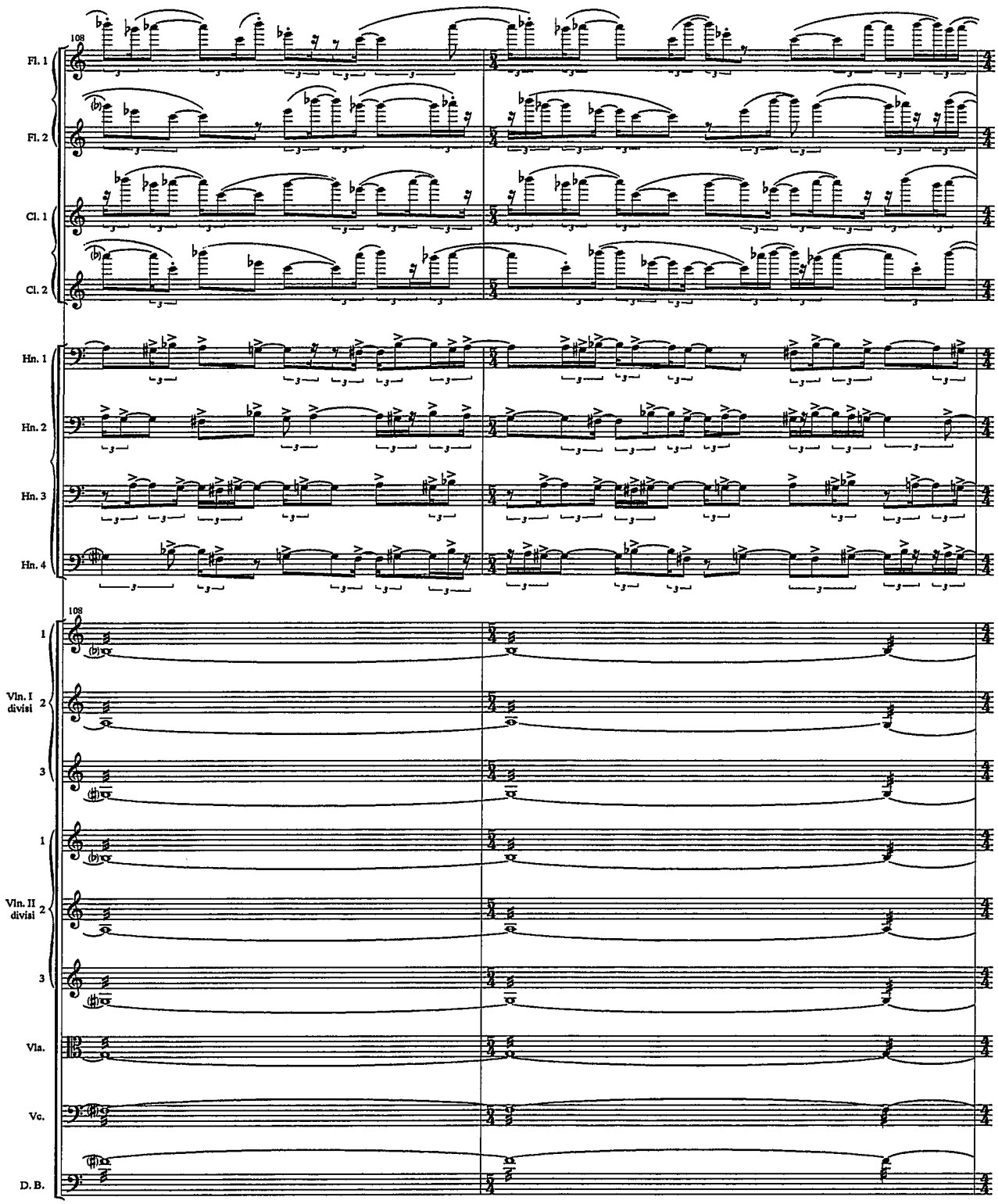

79
Fl. 1
Fl. 2
Ob.
Cl.
Bsn. 1
Bsn. 2
Vibr.
Sn.
Vln. I
Vln. II
gliss.
82
mf

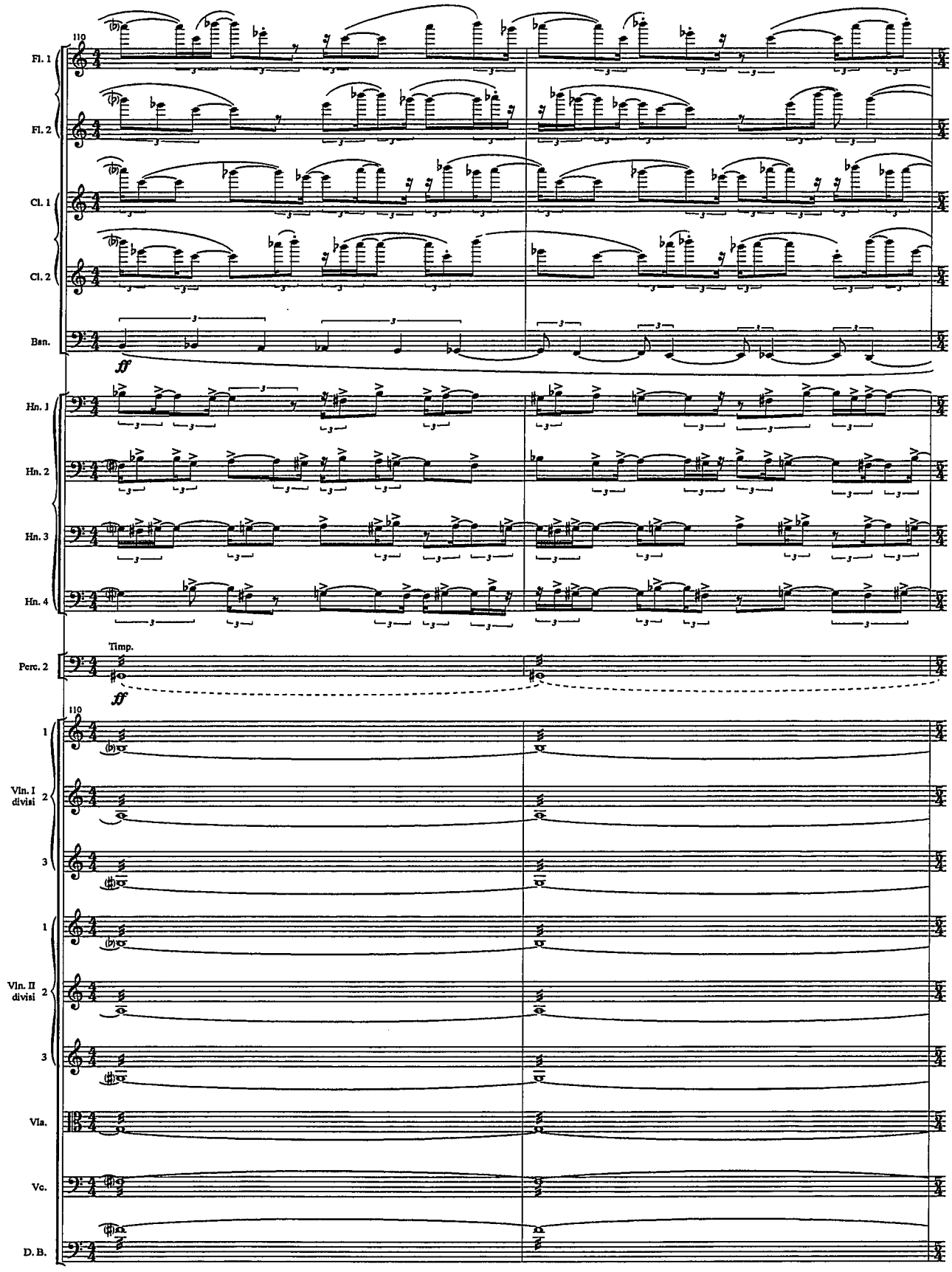

13
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Bsn. 1
Vibr.
solo ends
Vln. I
Vln. II
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Bsn.
espress.
l.v.
Vibr.
Vln. I
Vln. II
Vla.
Vc.

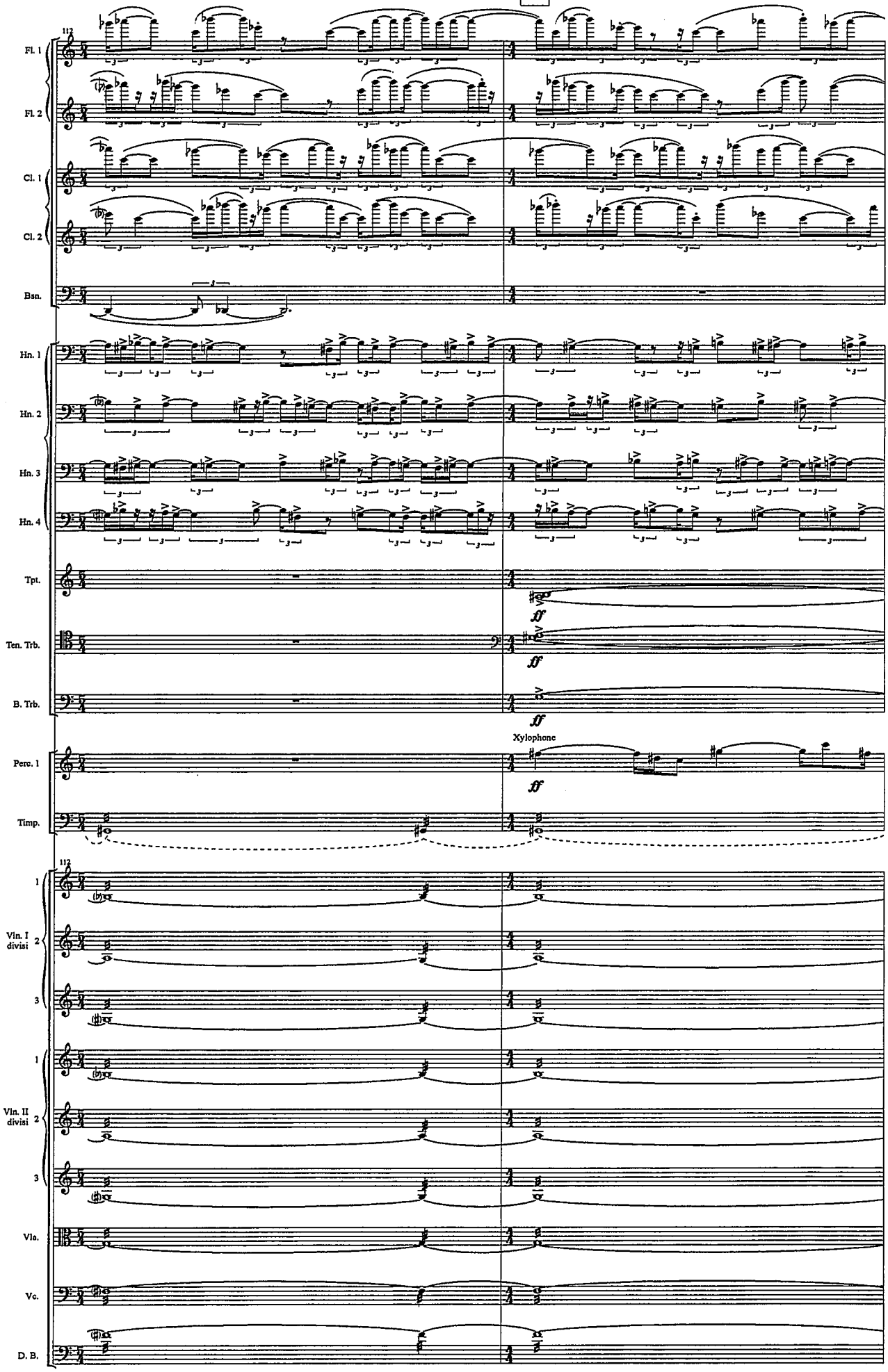

96
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Bsn.
Vibr.
96
Vln. I
Vln. II
Vla.
Vc.
98
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Vibr.
98
Vln. I
Vln. II
Vla.
Vc.

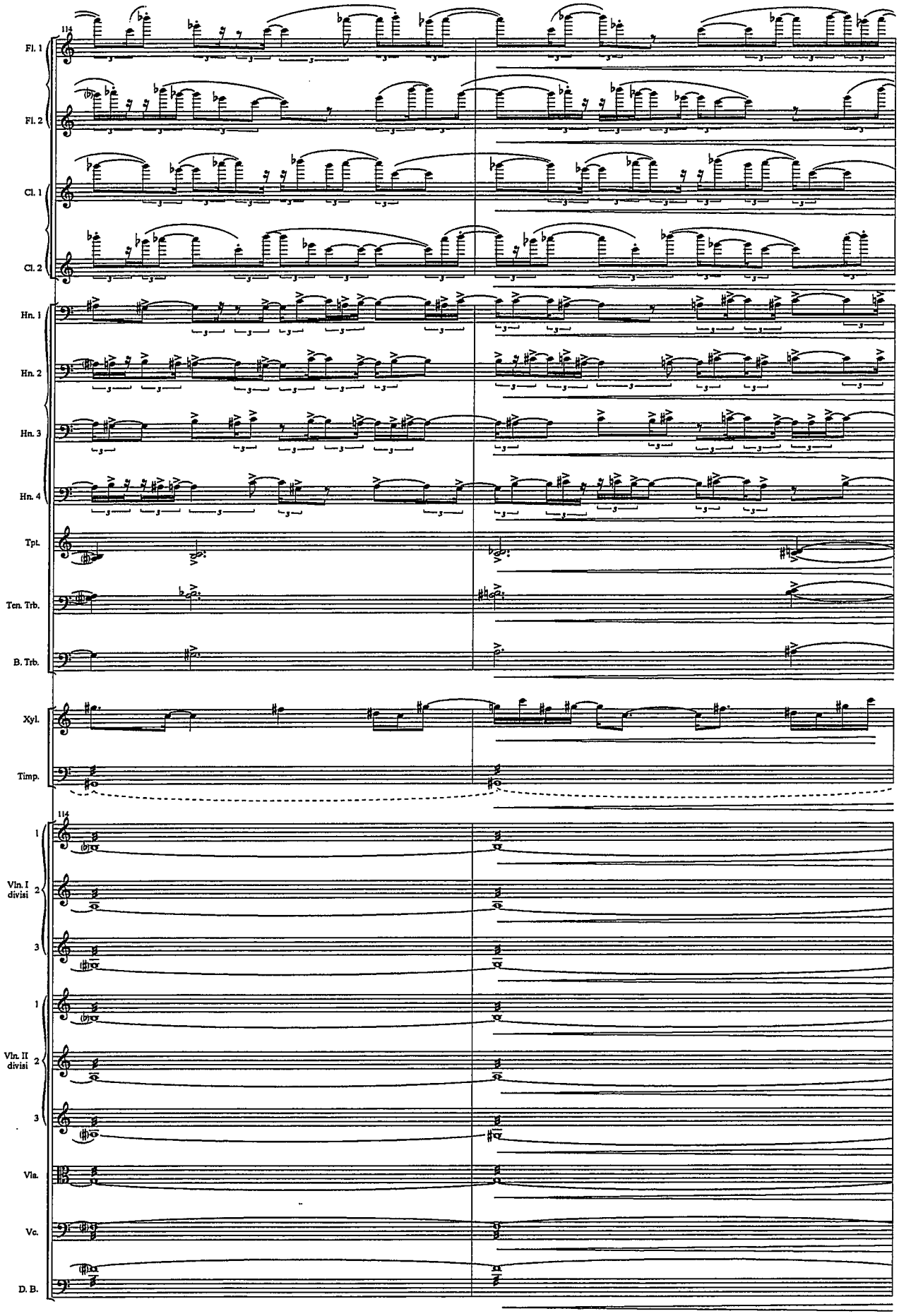

14
101
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Bsn.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Vibr.
l.v.
Perc. 2
Crash Cymbal
l.v.
Vln. I divisi
Vln. II divisi
Vla.
Vc.
D. B.

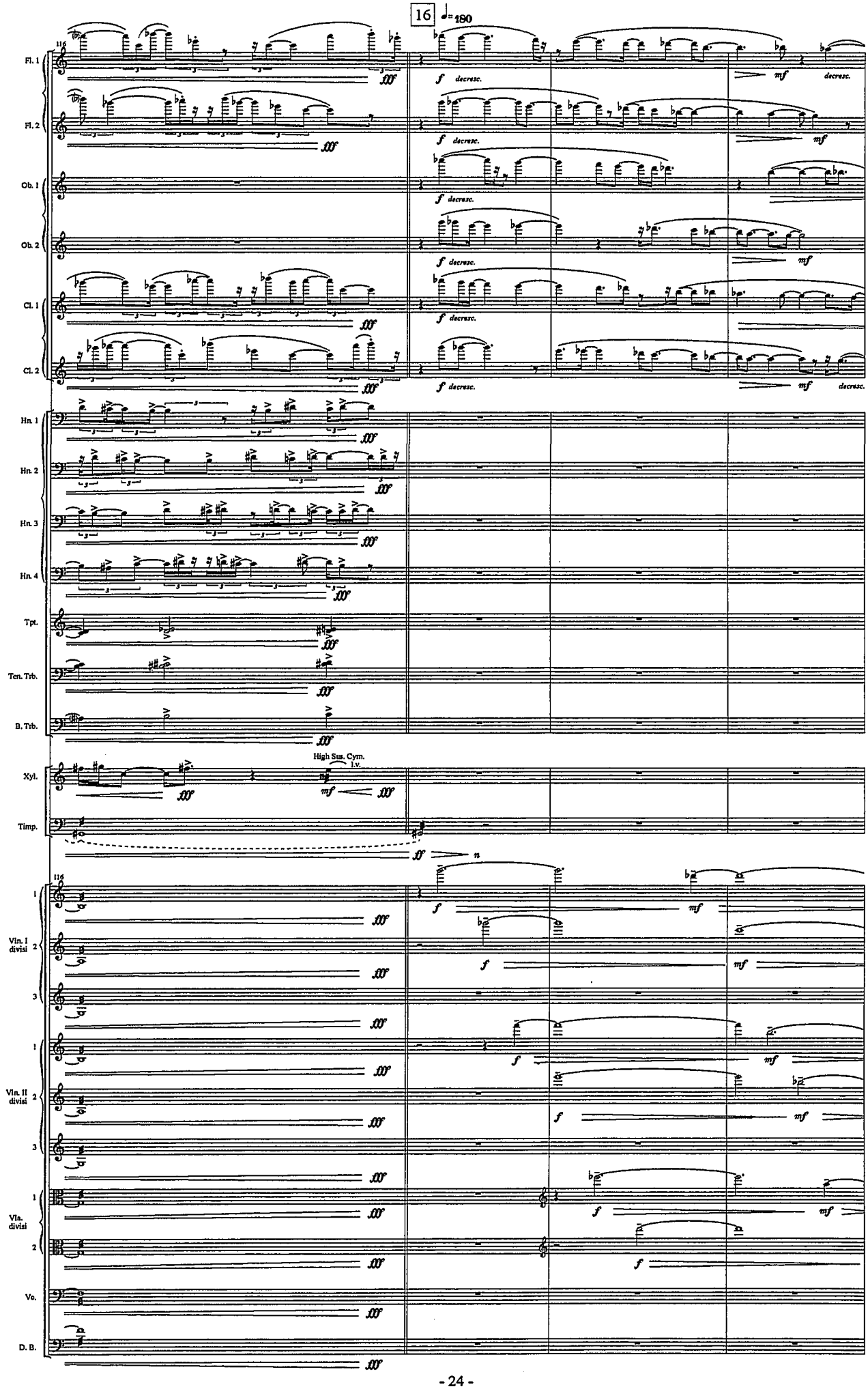

106
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
106
1
Vln. I divisi
2
3
1
Vln. II divisi
2
3
Vla.
Vc.
D. B.

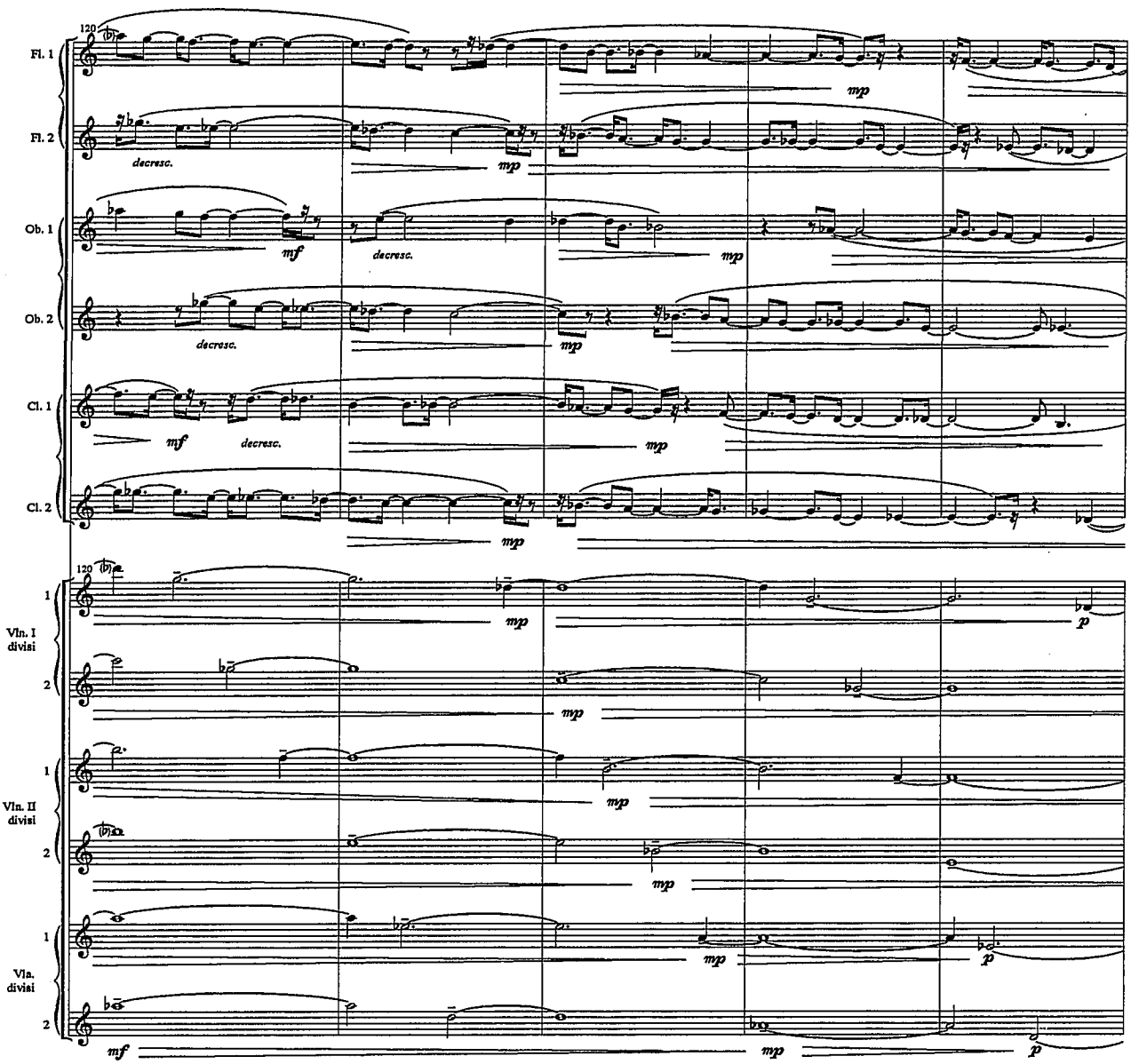

108
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
108
1
Vln. I divisi
2
3
1
Vln. II divisi
2
3
Vla.
Vc.
D. B.

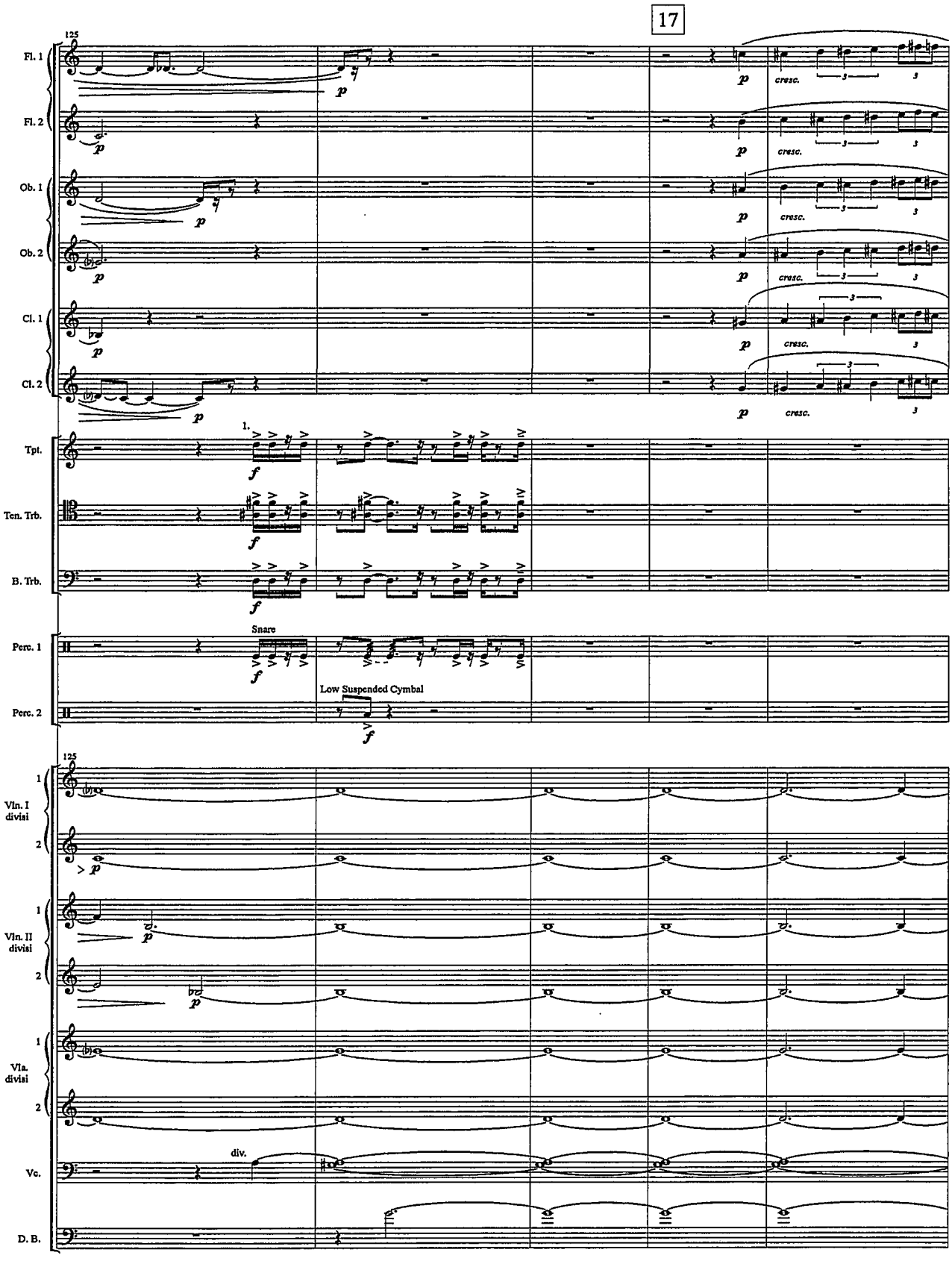

110
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Bsn.
ff
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Timp.
Perc. 2
ff
110
1
Vln. I divisi
2
3
1
Vln. II divisi
2
3
Vla.
Vc.
D.B.

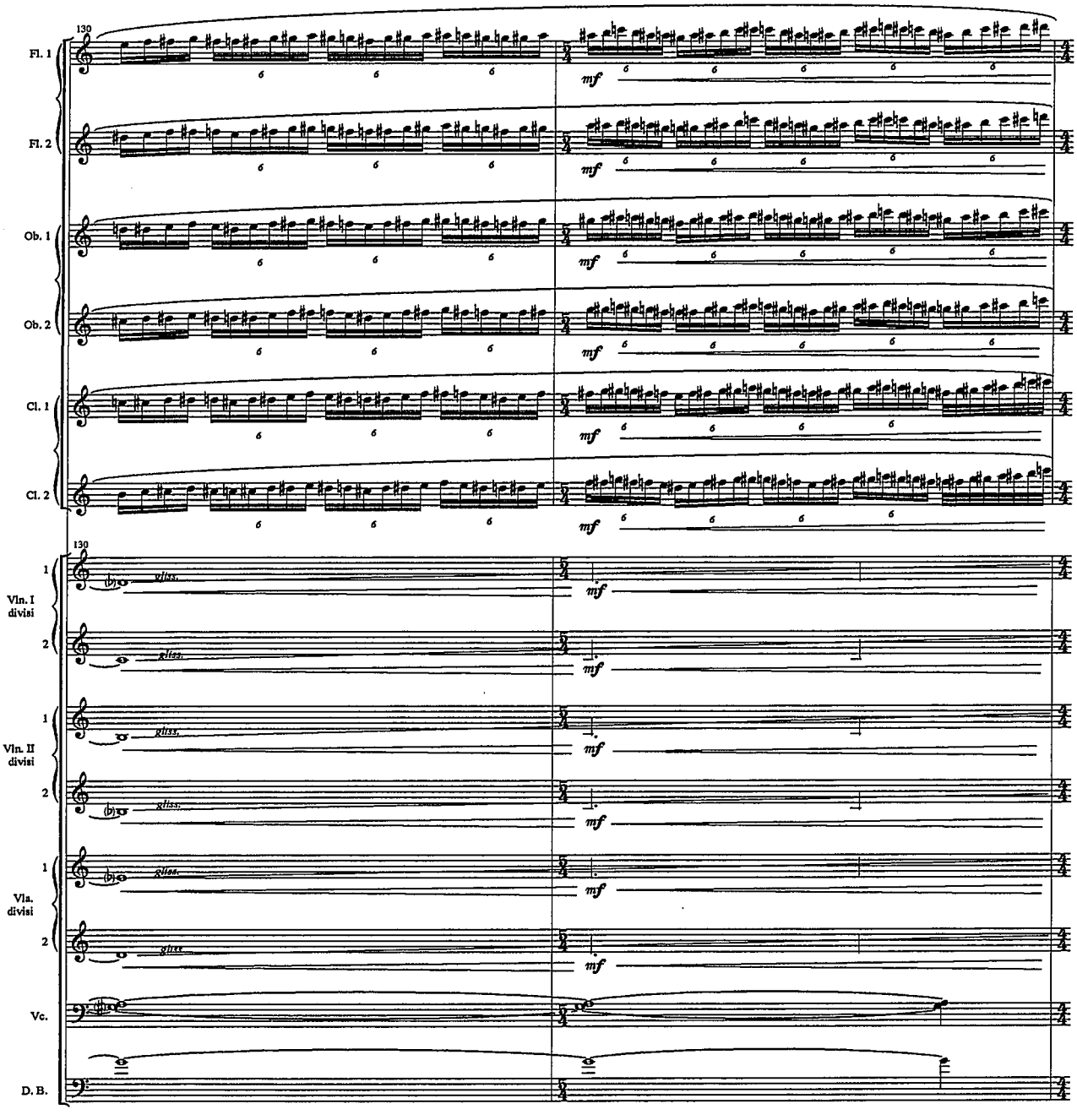

112
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Bsn.
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Tpt.
ff
Ten. Trb.
ff
B. Trb.
ff
Xylophone
Perc. 1
ff
Timp.
112
1
Vln. I divisi 2
3
1
Vln. II divisi 2
3
Vla.
Vc.
D. B.

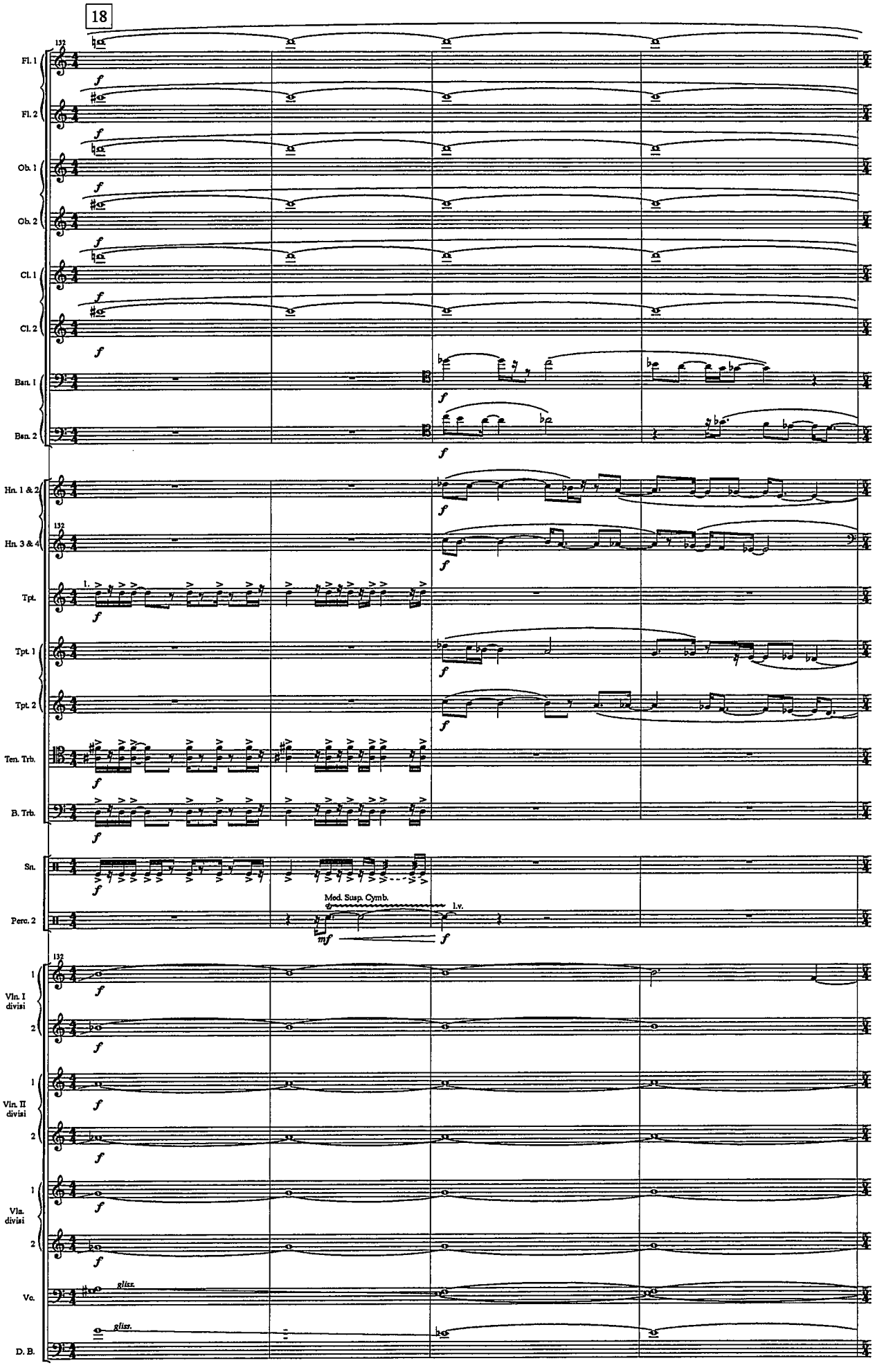

114
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Tpt.
Ten. Trb.
B. Trb.
Xyl.
Timp.
114
1
Vln. I divisi
2
3
1
Vln. II divisi
2
3
Vla.
Vc.
D. B.

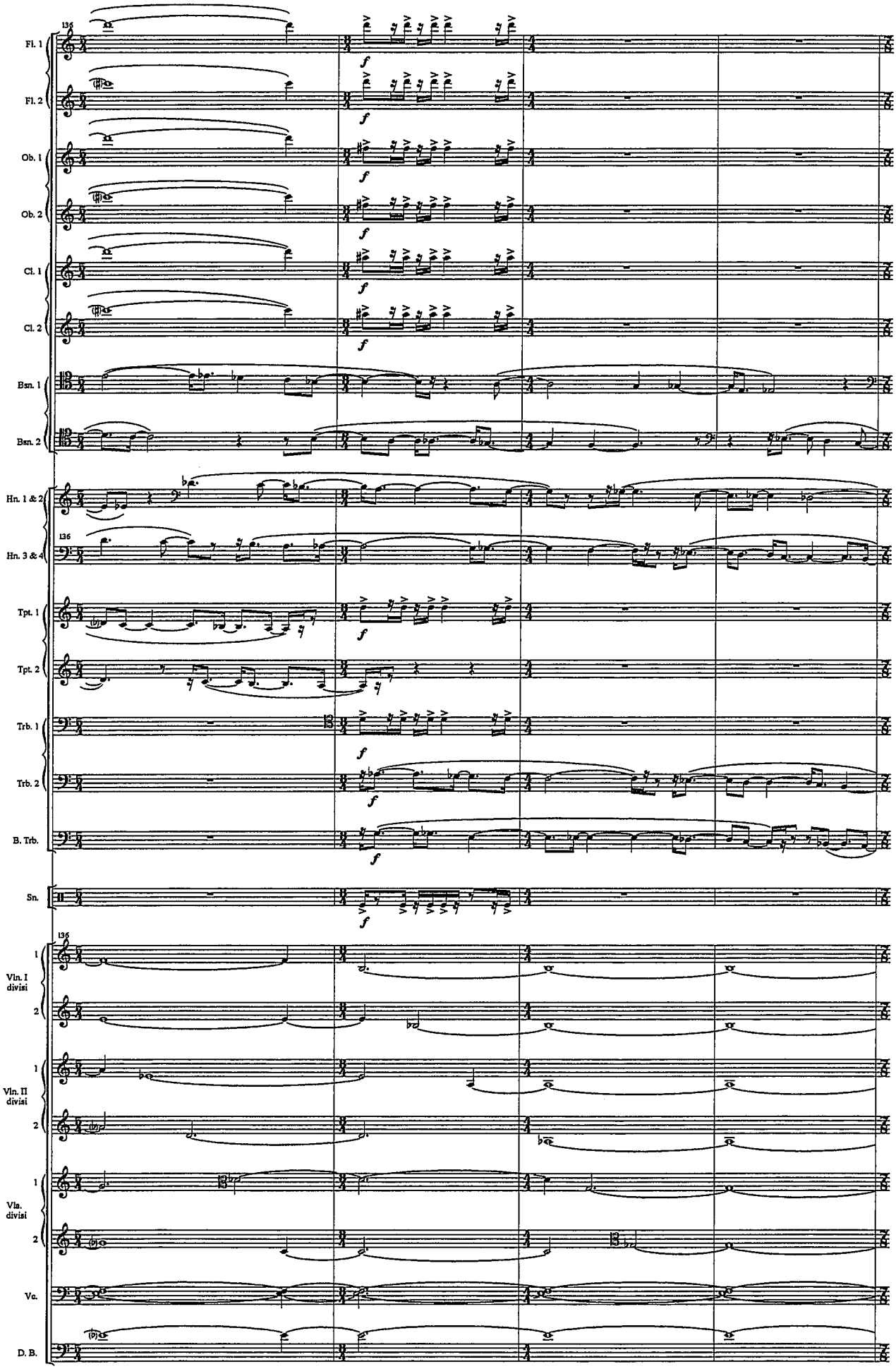

16
♩= 180
116
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Tpt.
Ten. Trb.
B. Trb.
Xyl.
High Sus. Cym.
l.v.
Timp.
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc.
D. B.
ff
f decresc.
mf
decresc.

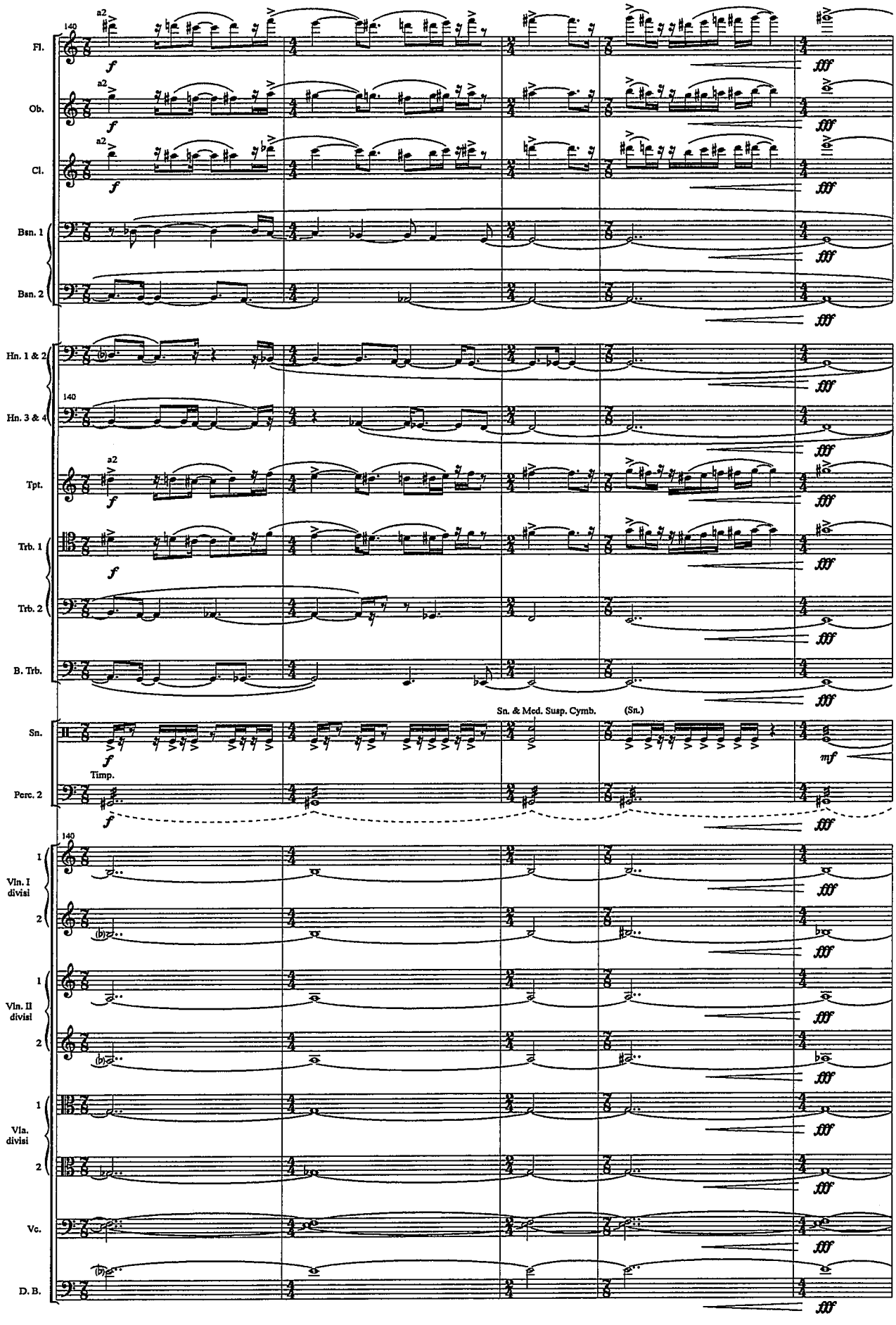

120
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Vln. I divisi
Vln. II divisi
Vla. divisi
decresc.
mf
mp
p

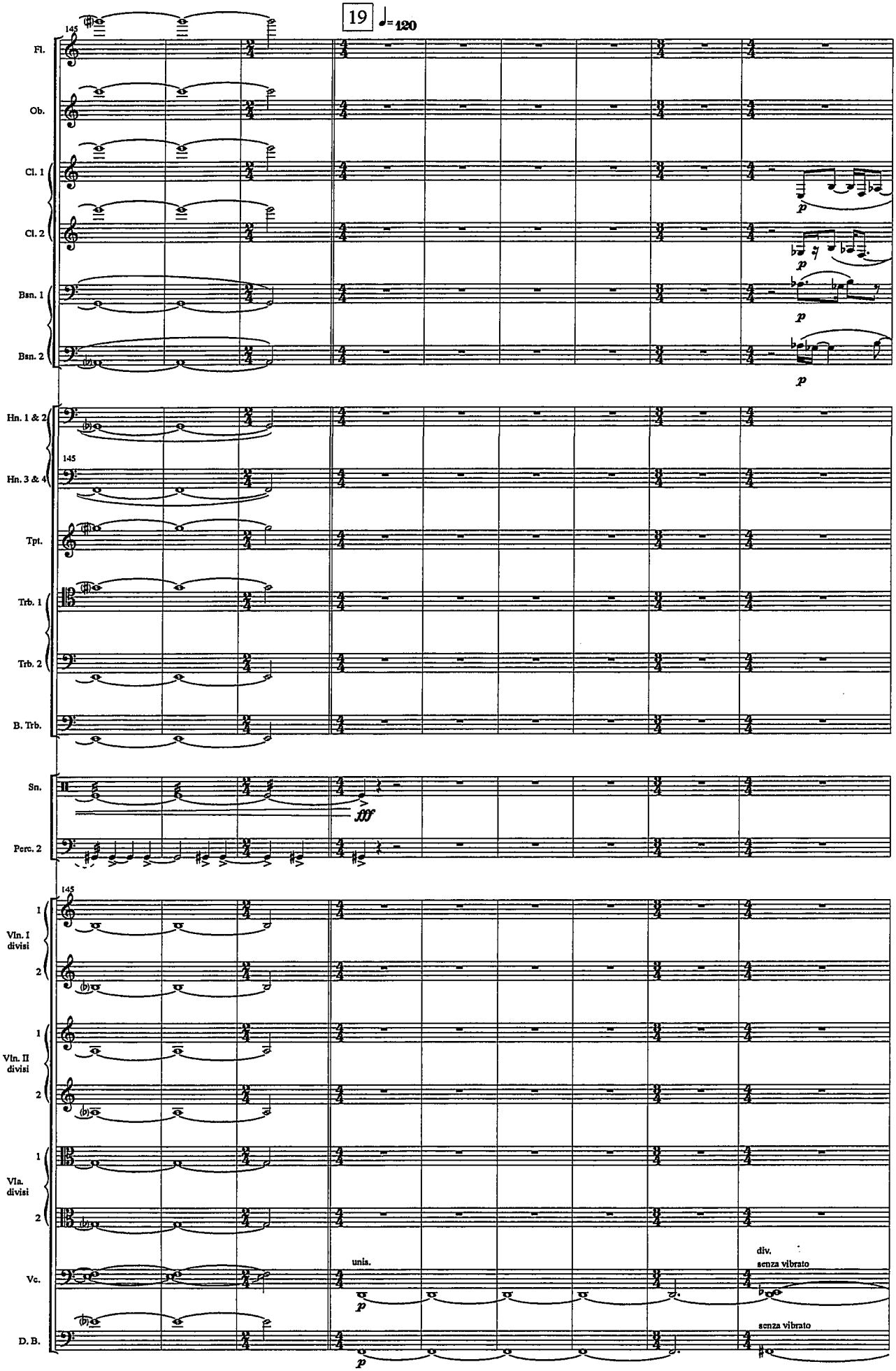

17
125
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
p
cresc.
Tpt.
Ten. Trb.
B. Trb.
1.
f
Perc. 1
Perc. 2
Snare
Low Suspended Cymbal
Vln. I
divisi
Vln. II
Vla.
Vc.
D. B.
div.

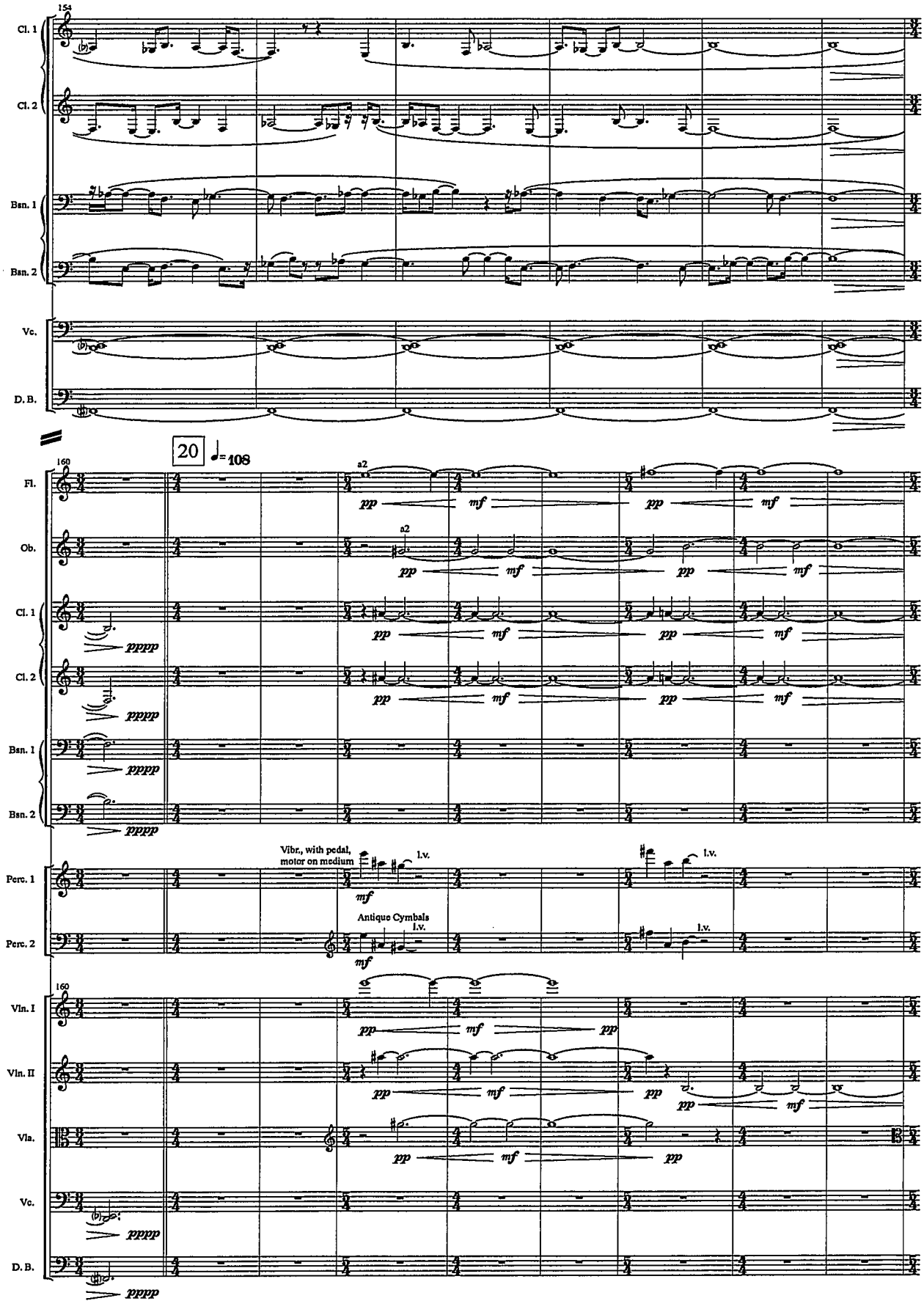

130
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
mf
130
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc.
D. B.
gliss.

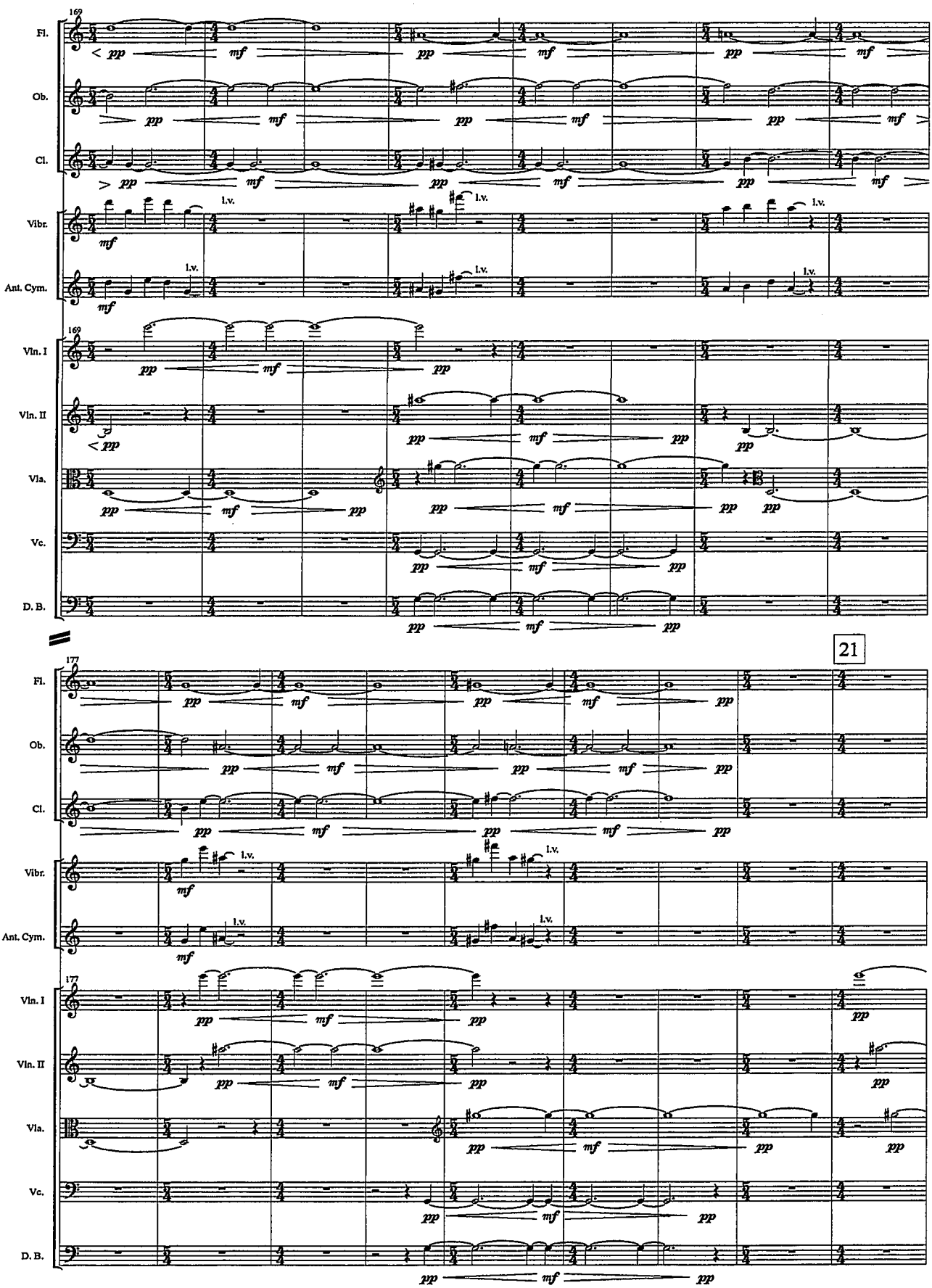

18
132
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt.
Tpt. 1
Tpt. 2
Ten. Trb.
B. Trb.
Sn.
Perc. 2
Mod. Susp. Cymb.
l.v.
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc.
D. B.
gliss.

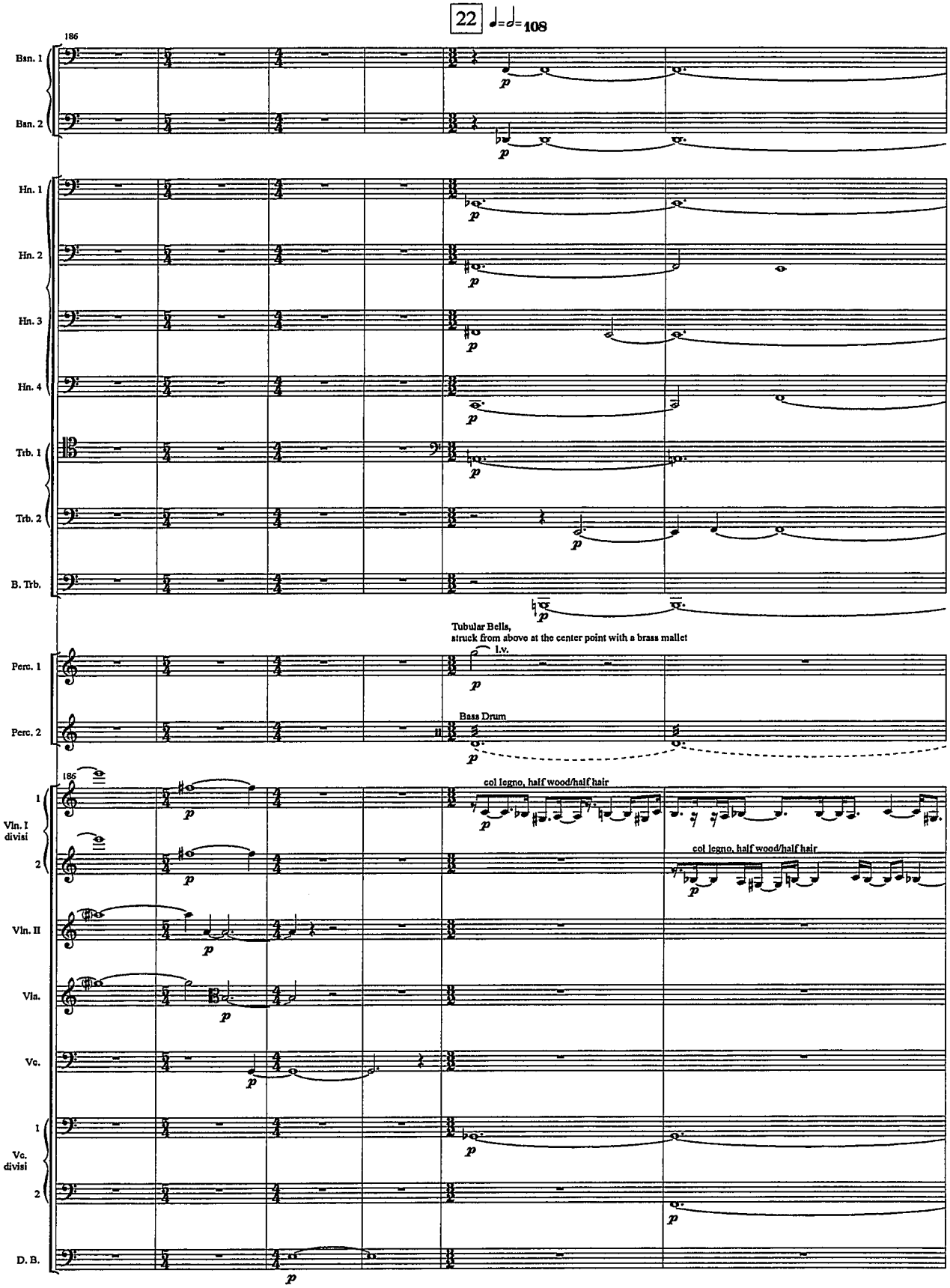

136
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt. 1
Tpt. 2
Trb. 1
Trb. 2
B. Trb.
Sn.
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc.
D. B.
f

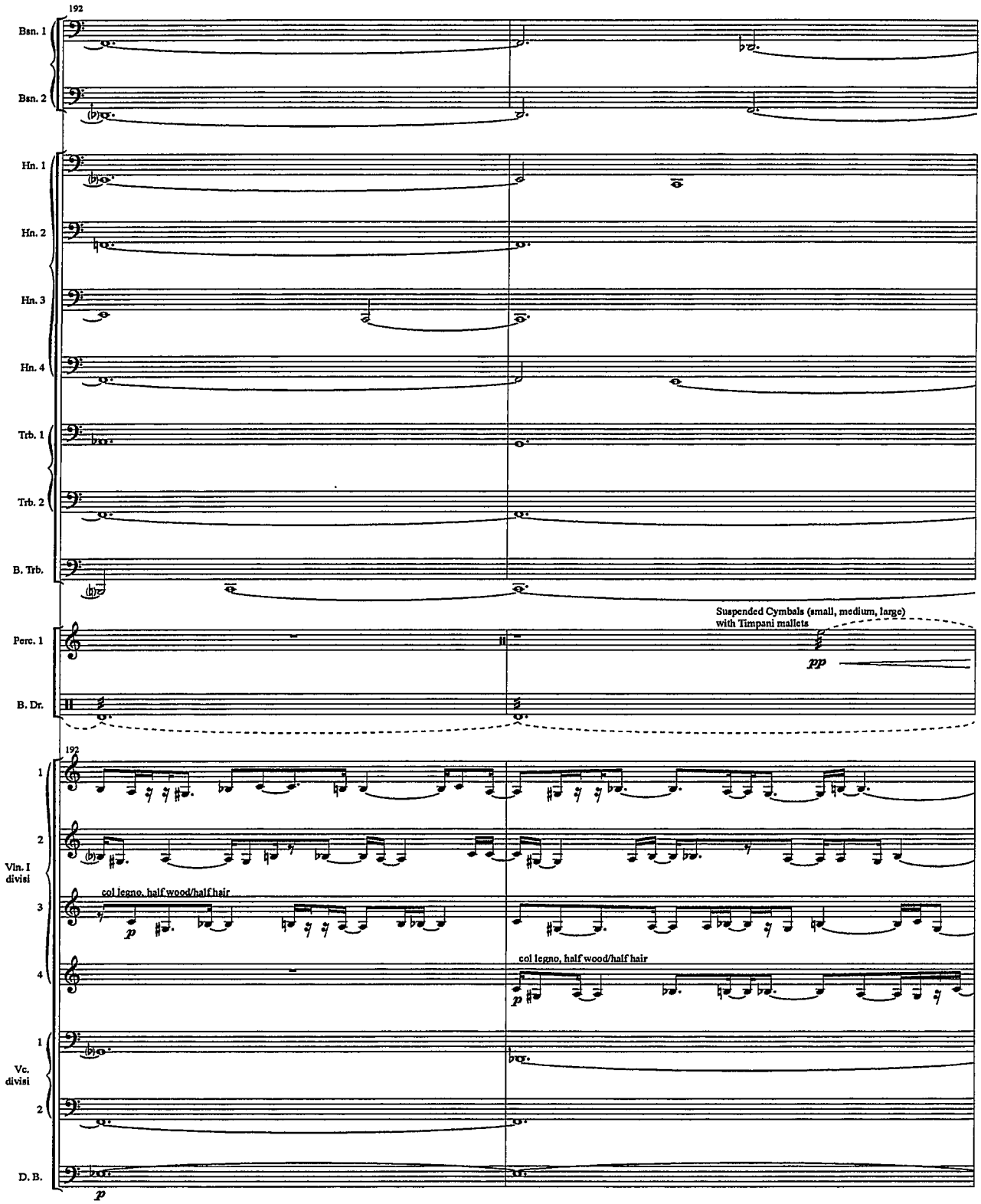

Fl.
Ob.
Cl.
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt.
Trb. 1
Trb. 2
B. Trb.
Sn.
Perc. 2
Timp.
Sn. & Med. Susp. Cymb.
(Sn.)
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc.
D. B.
a2
140
f
mf
fff

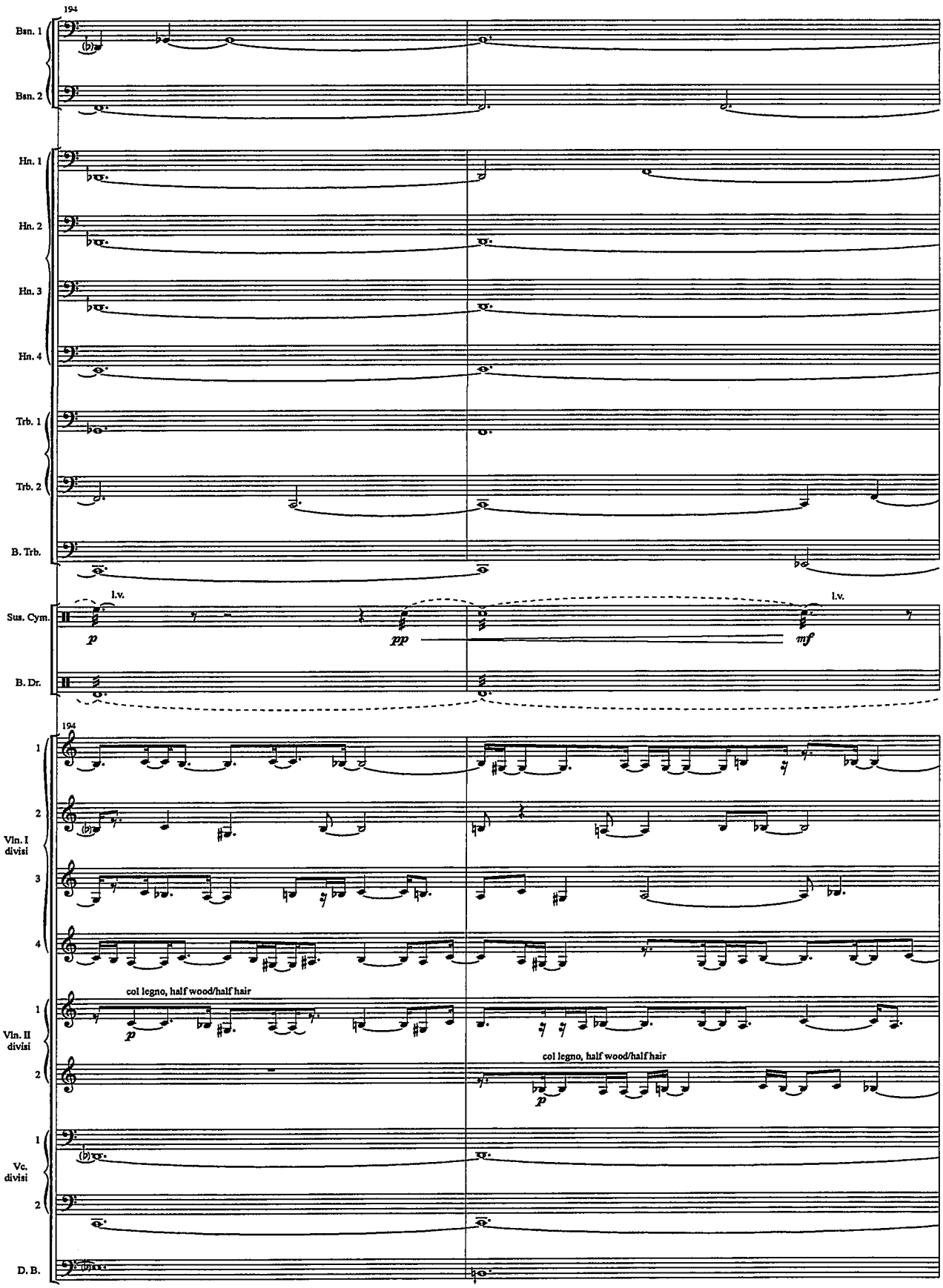

19
♩= 120
145
Fl.
Ob.
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
p
Hn. 1 & 2
Hn. 3 & 4
Tpt.
Trb. 1
Trb. 2
B. Trb.
Sn.
Perc. 2
fff
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc.
D. B.
unis.
div.
senza vibrato
senza vibrato

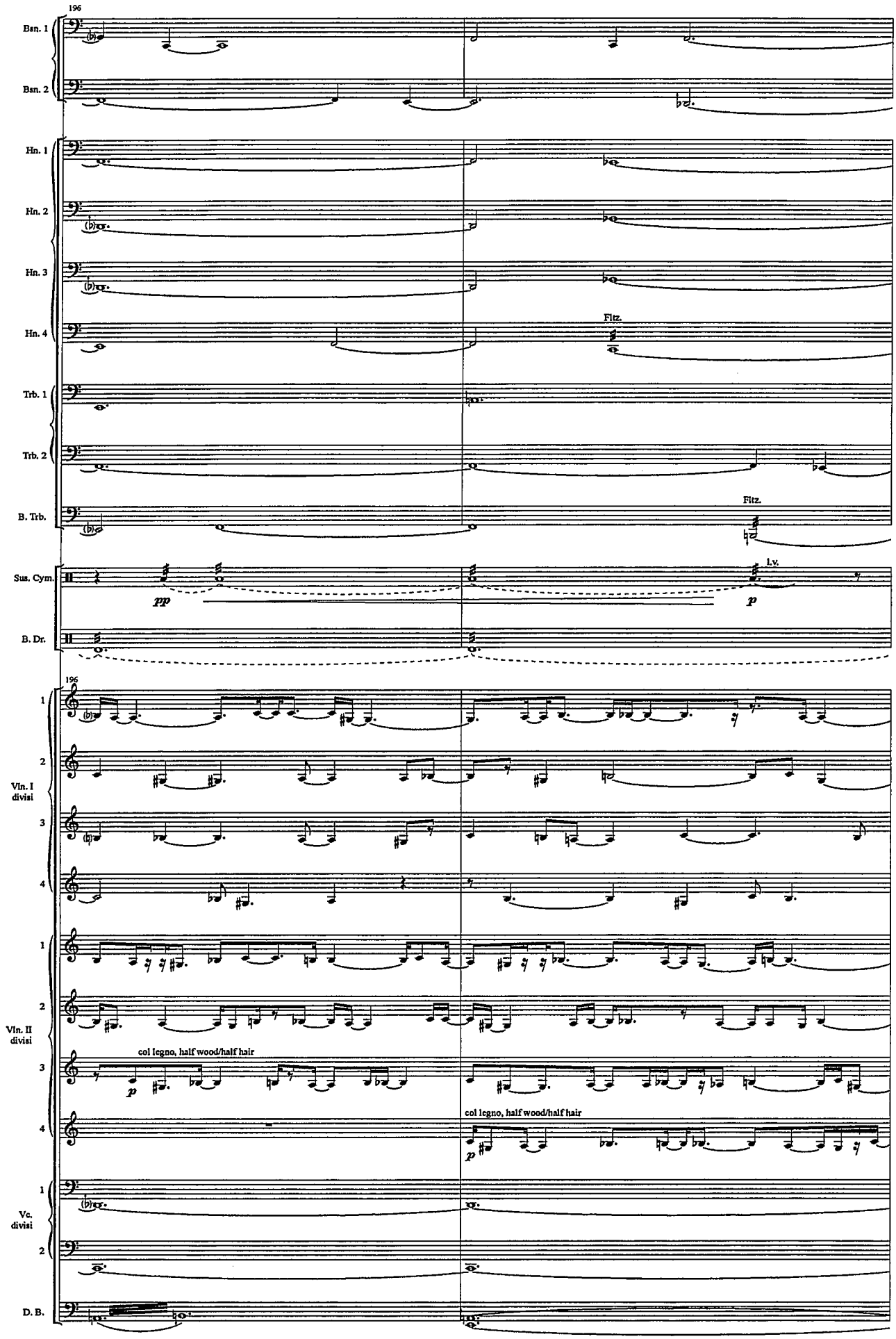

153
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Vc.
D. B.
20
♩= 108
160
Fl.
Ob.
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
a2
pp
mf
pppp
Perc. 1
Perc. 2
Vibr., with pedal, motor on medium
l.v.
Antique Cymbals
Vln. I
Vln. II
Vla.
Vc.
D. B.

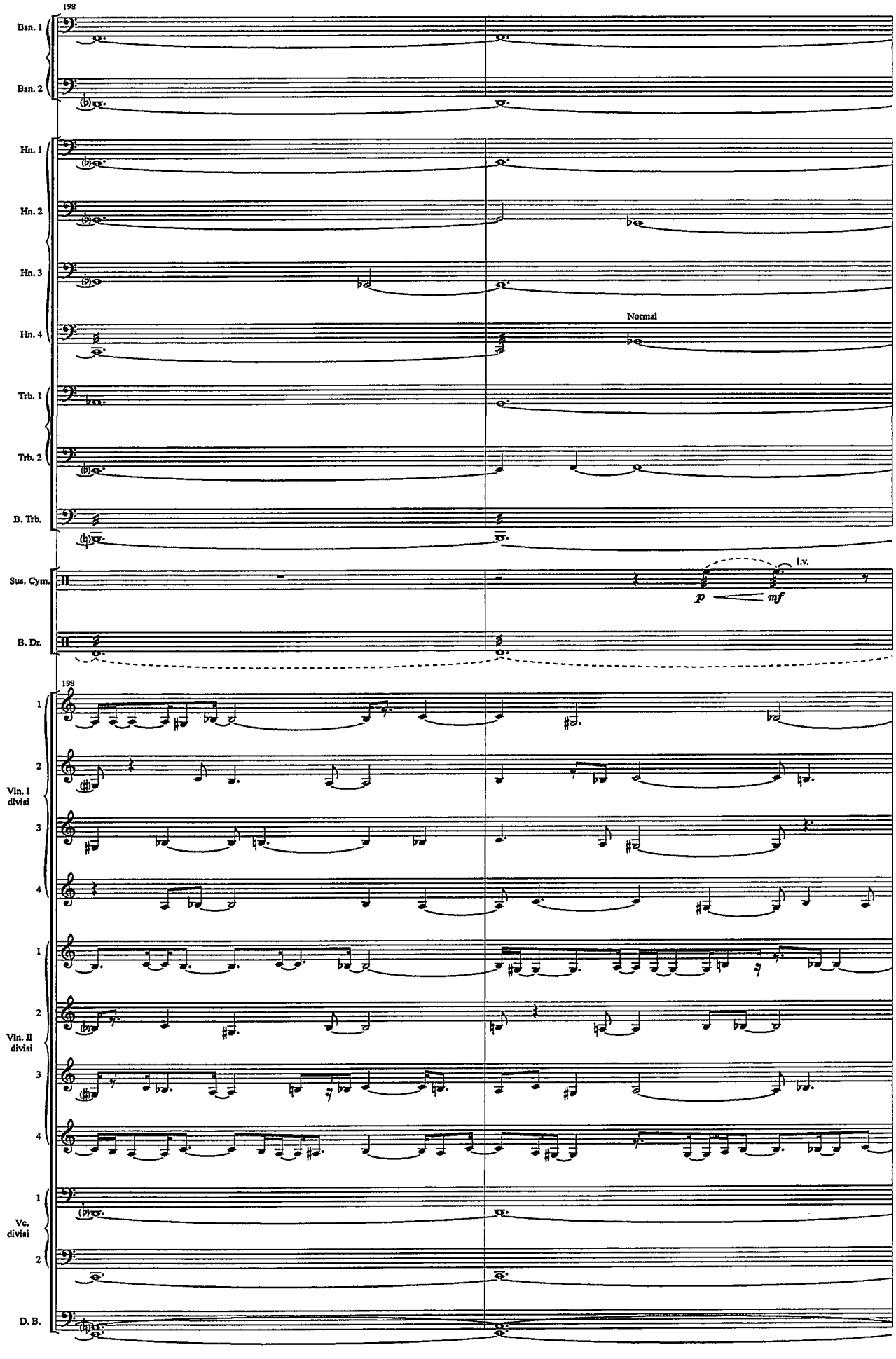

169
Fl.
Ob.
Cl.
Vibr.
Ant. Cym.
Vln. I
Vln. II
Vla.
Vc.
D. B.
l.v.
pp
mf
21
177

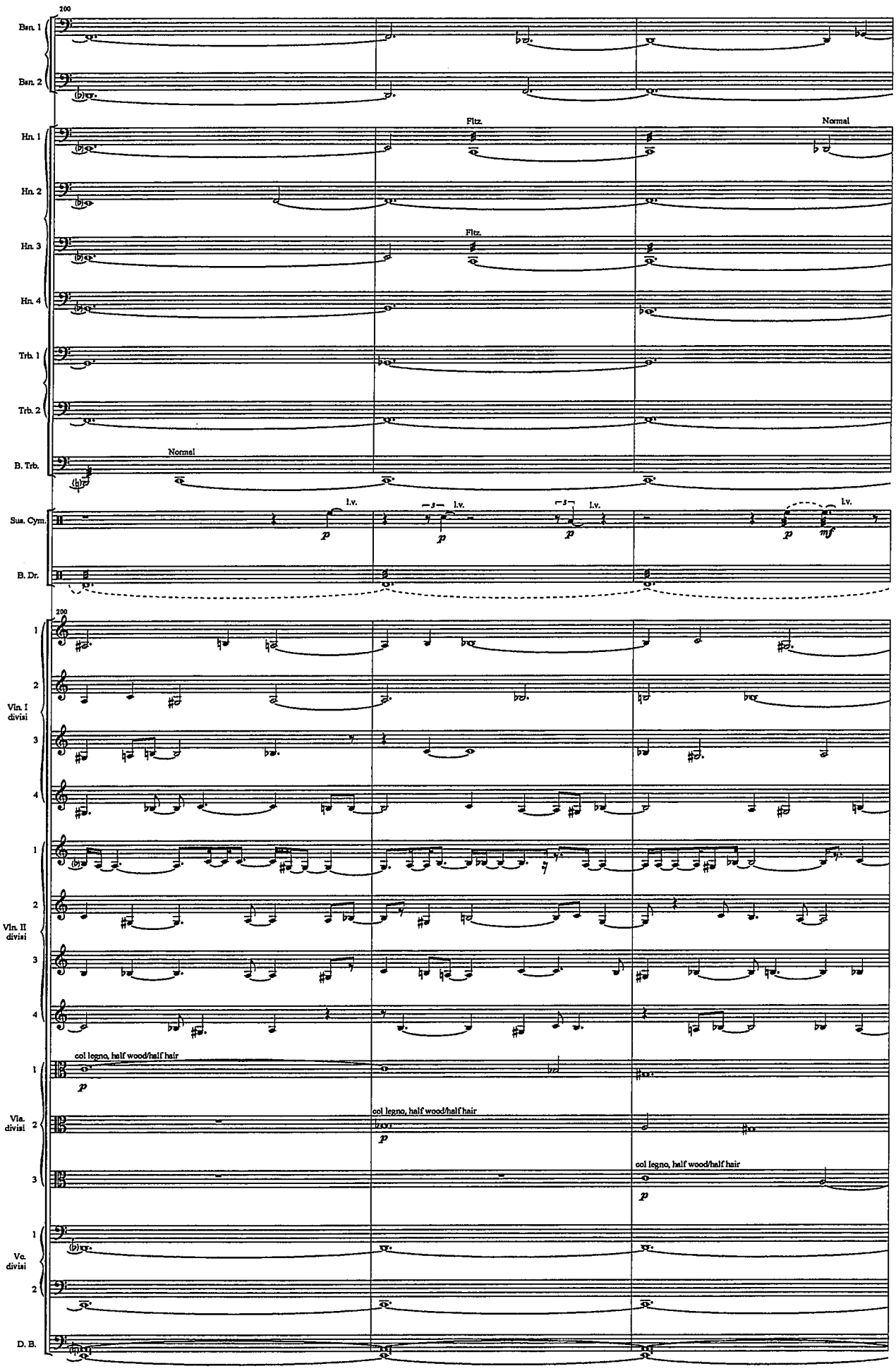

22
♩=♩=108
186
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
Tubular Bells,
struck from above at the center point with a brass mallet
l.v.
Perc. 1
Bass Drum
Perc. 2
186
col legno, half wood/half hair
1
Vln. I
divisi
2
col legno, half wood/half hair
Vln. II
Vla.
Vc.
1
Vc.
divisi
2
D. B.

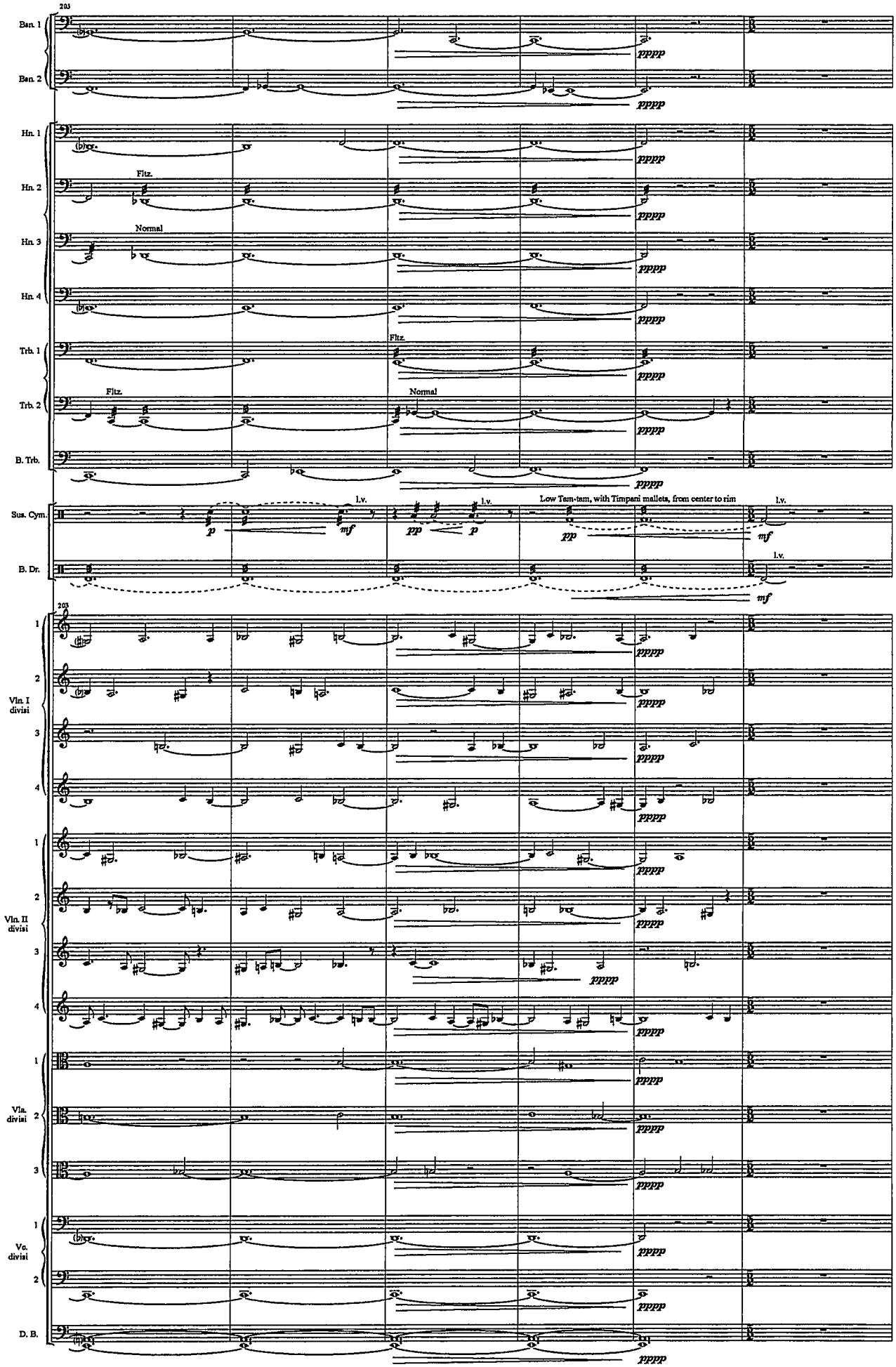

192
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
Perc. 1
B. Dr.
Suspended Cymbals (small, medium, large)
with Timpani mallets
pp
192
1
2
Vln. I
divisi
3
col legno, half wood/half hair
p
4
col legno, half wood/half hair
p
1
Vc.
divisi
2
D. B.
p

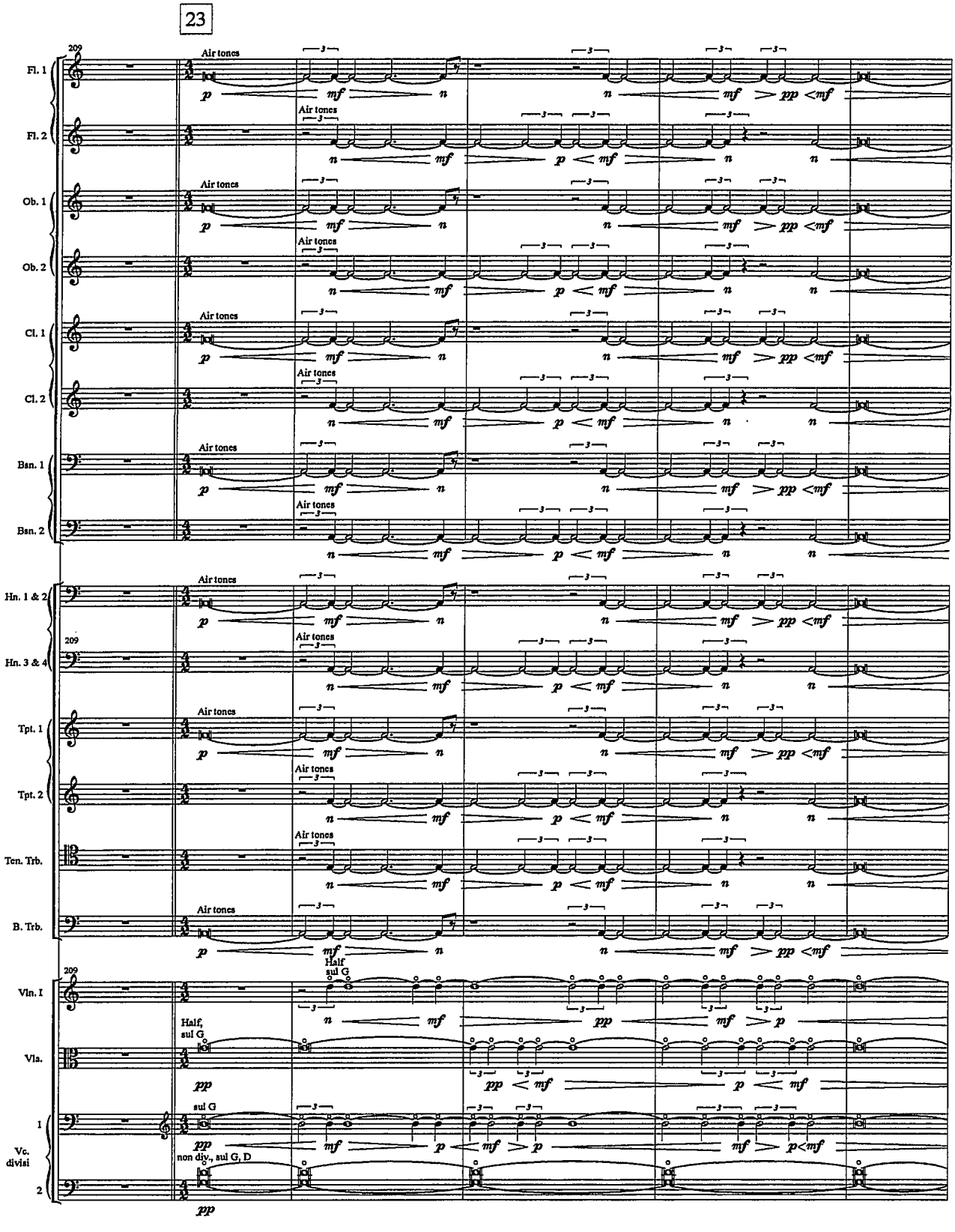

194
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
Sus. Cym.
B. Dr.
l.v.
p
pp
mf
l.v.
194
Vln. I divisi
Vln. II divisi
col legno, half wood/half hair
p
col legno, half wood/half hair
p
Vc. divisi
D. B.

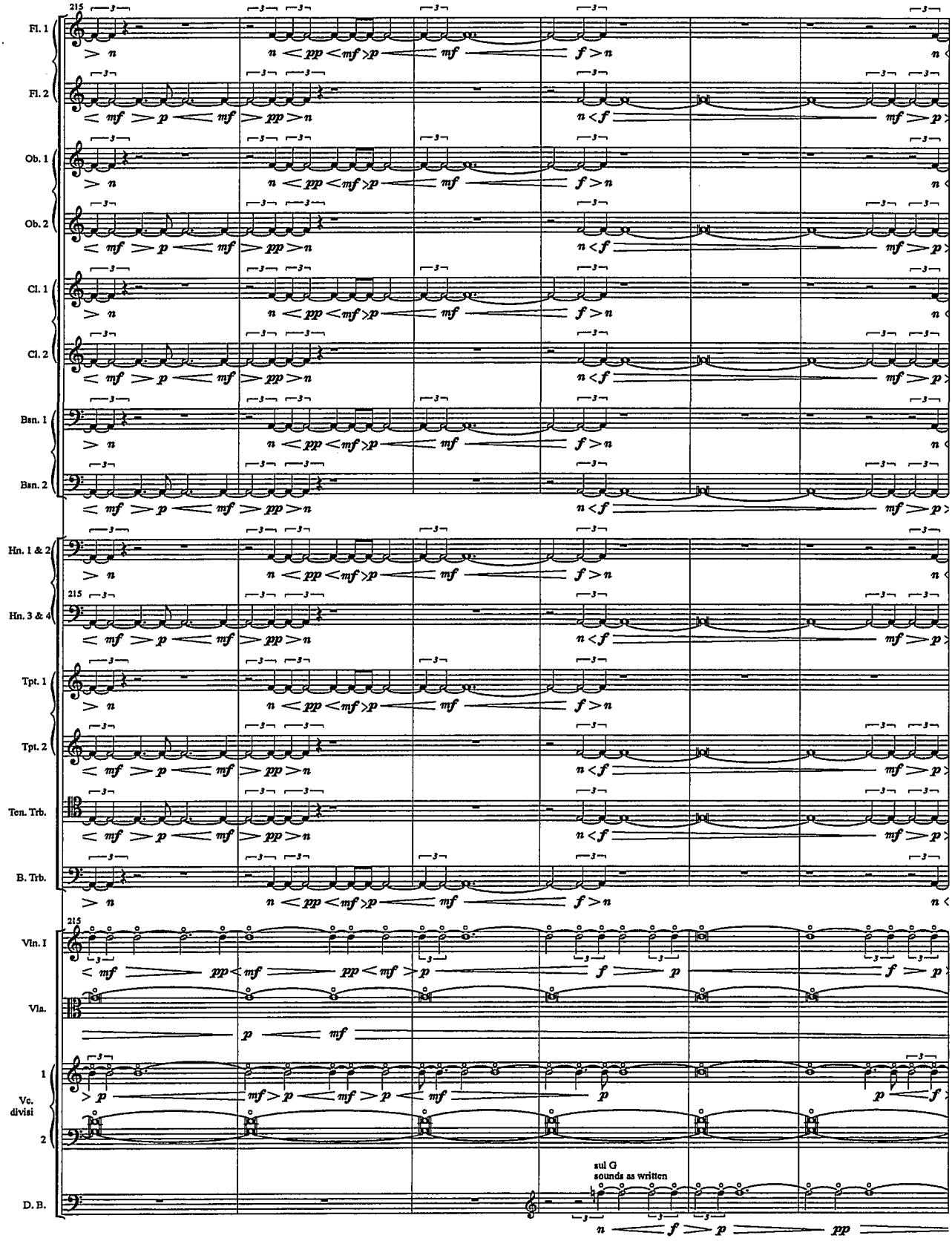

196
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Fltz.
Trb. 1
Trb. 2
B. Trb.
Fltz.
Sus. Cym.
pp
l.v.
p
B. Dr.
196
1
2
Vln. I
divisi
3
4
1
2
Vln. II
divisi
col legno, half wood/half hair
p
3
col legno, half wood/half hair
4
p
1
Vc.
divisi
2
D. B.

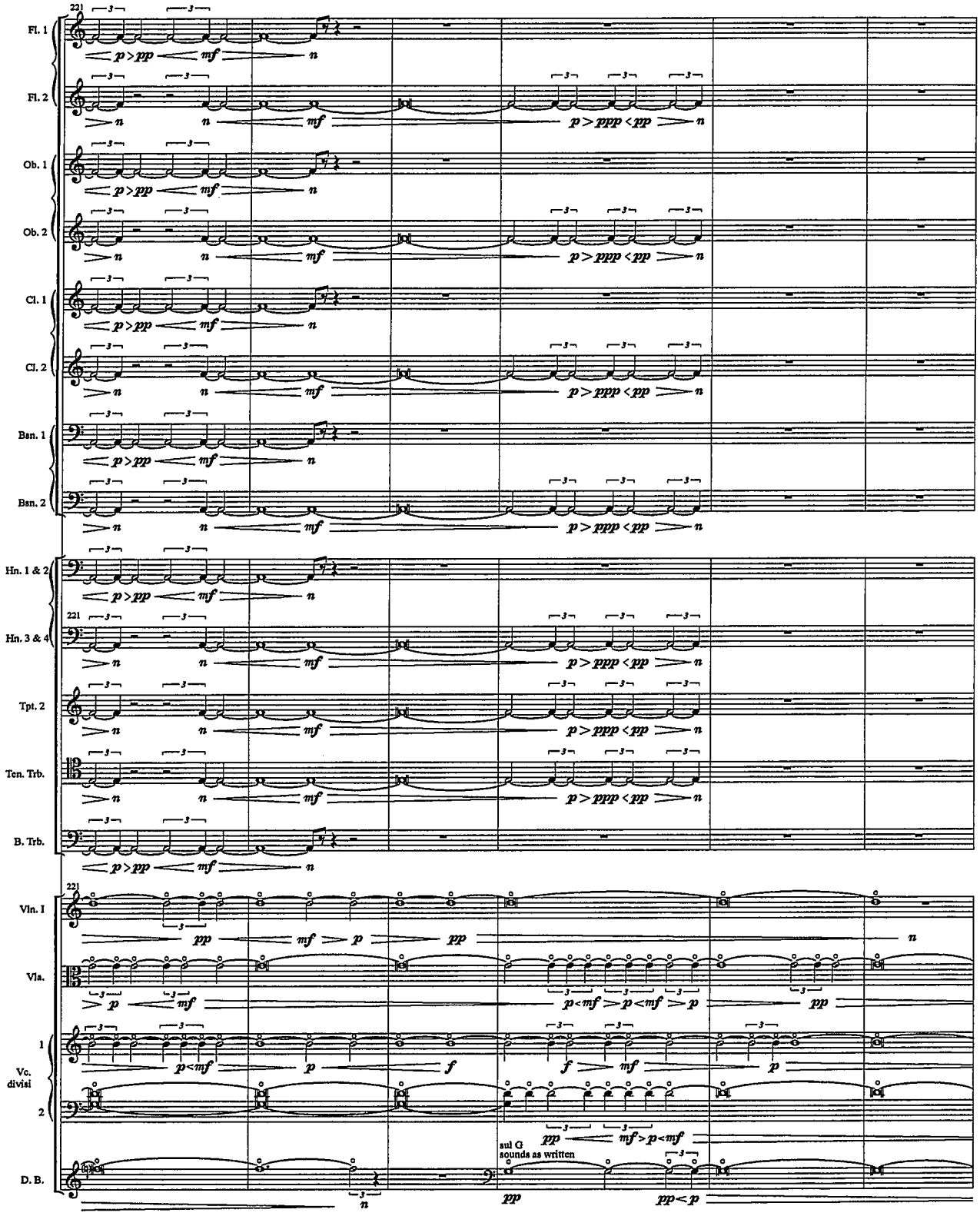

198
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Normal
Trb. 1
Trb. 2
B. Trb.
Sus. Cym.
l.v.
p
mf
B. Dr.
198
1
2
Vln. I
divisi
3
4
1
2
Vln. II
divisi
3
4
1
Vc.
divisi
2
D. B.

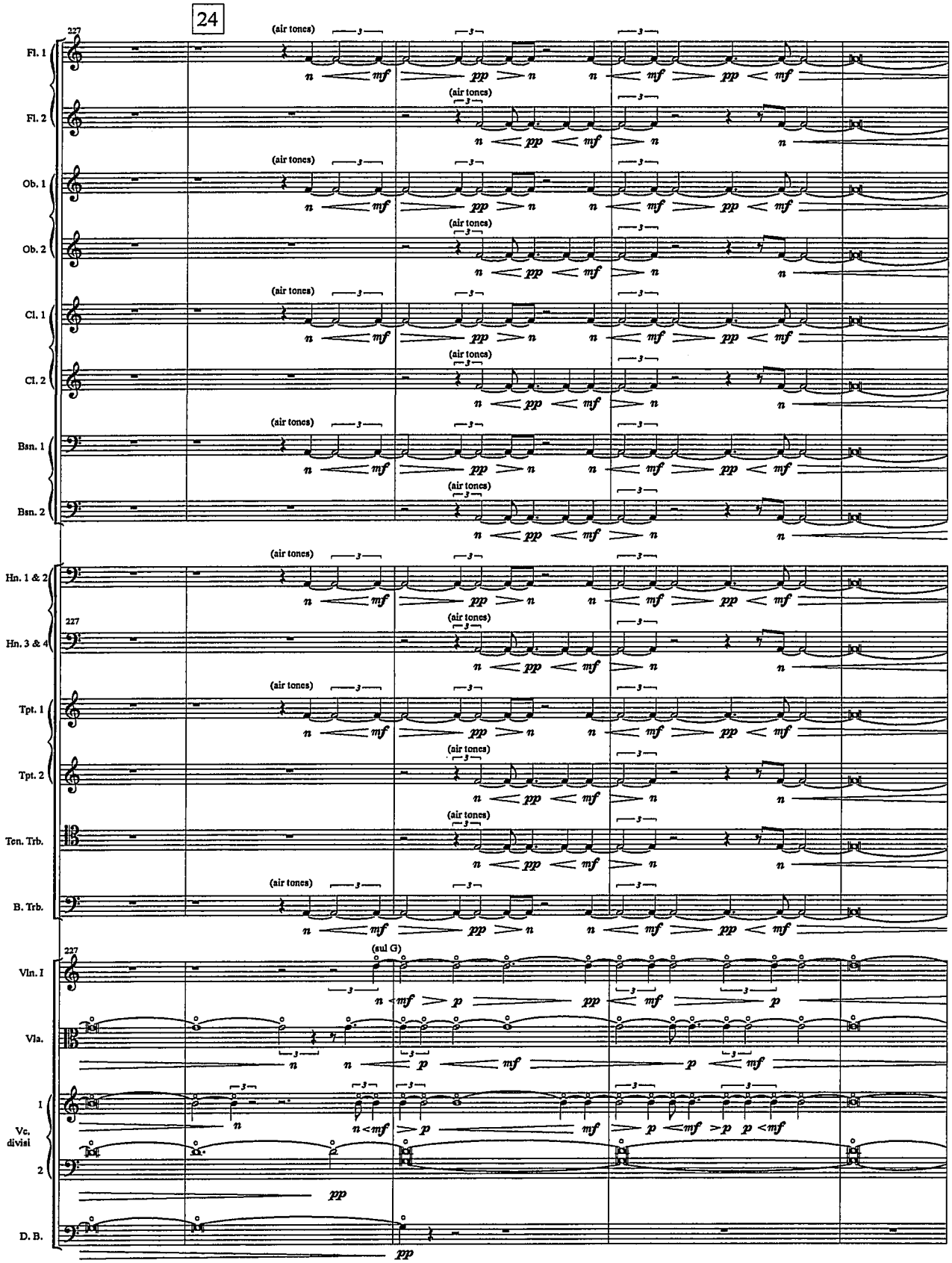

200
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
Flttz.
Normal
Sus. Cym.
B. Dr.
l.v.
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc. divisi
D. B.
col legno, half wood/half hair

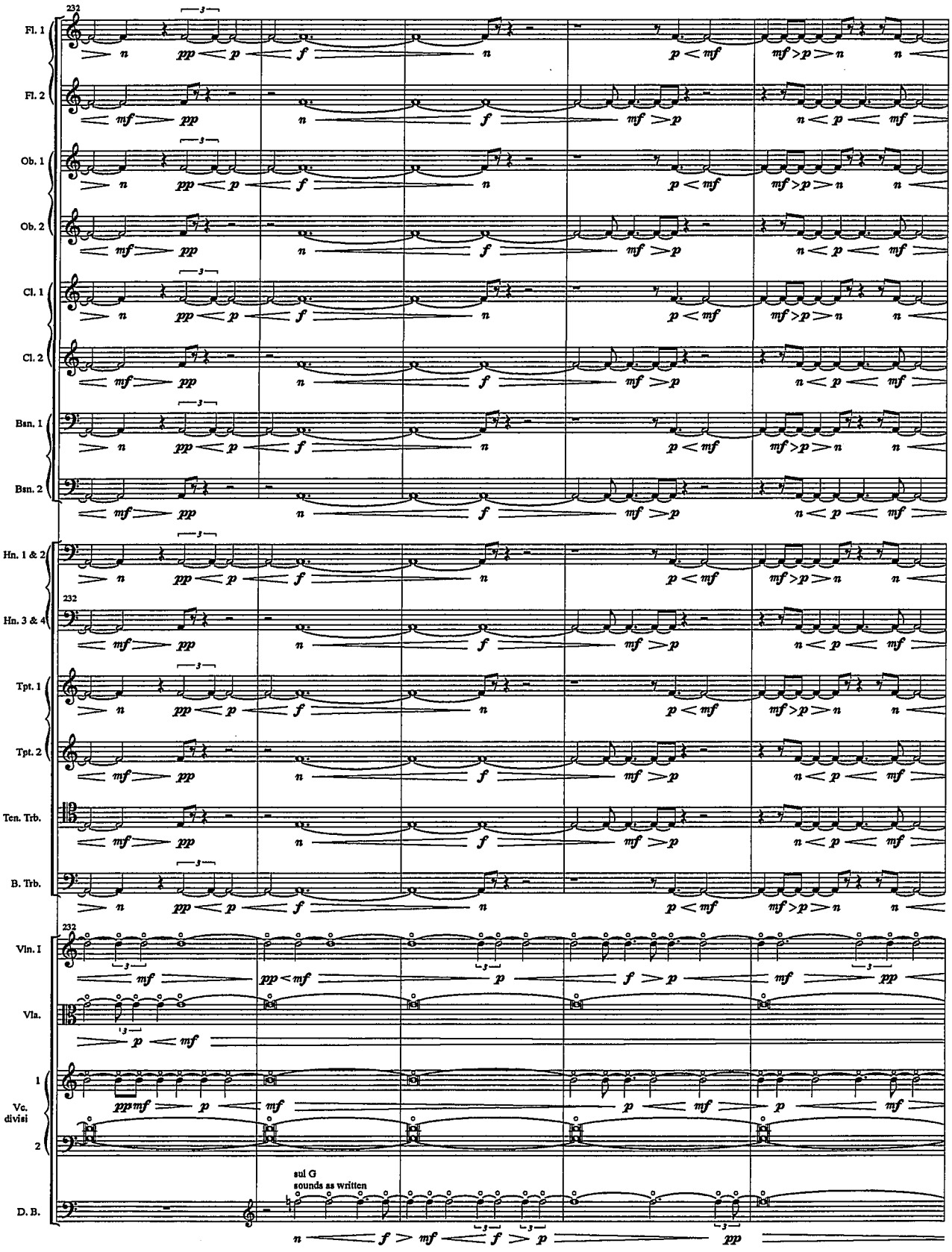

203
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Fltz.
Hn. 3
Normal
Hn. 4
Trb. 1
Fltz.
Trb. 2
Fltz.
Normal
B. Trb.
Sus. Cym.
l.v.
Low Tam-tam, with Timpani mallets, from center to rim
B. Dr.
203
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc. divisi
D. B.
pppp
p
mf
pp

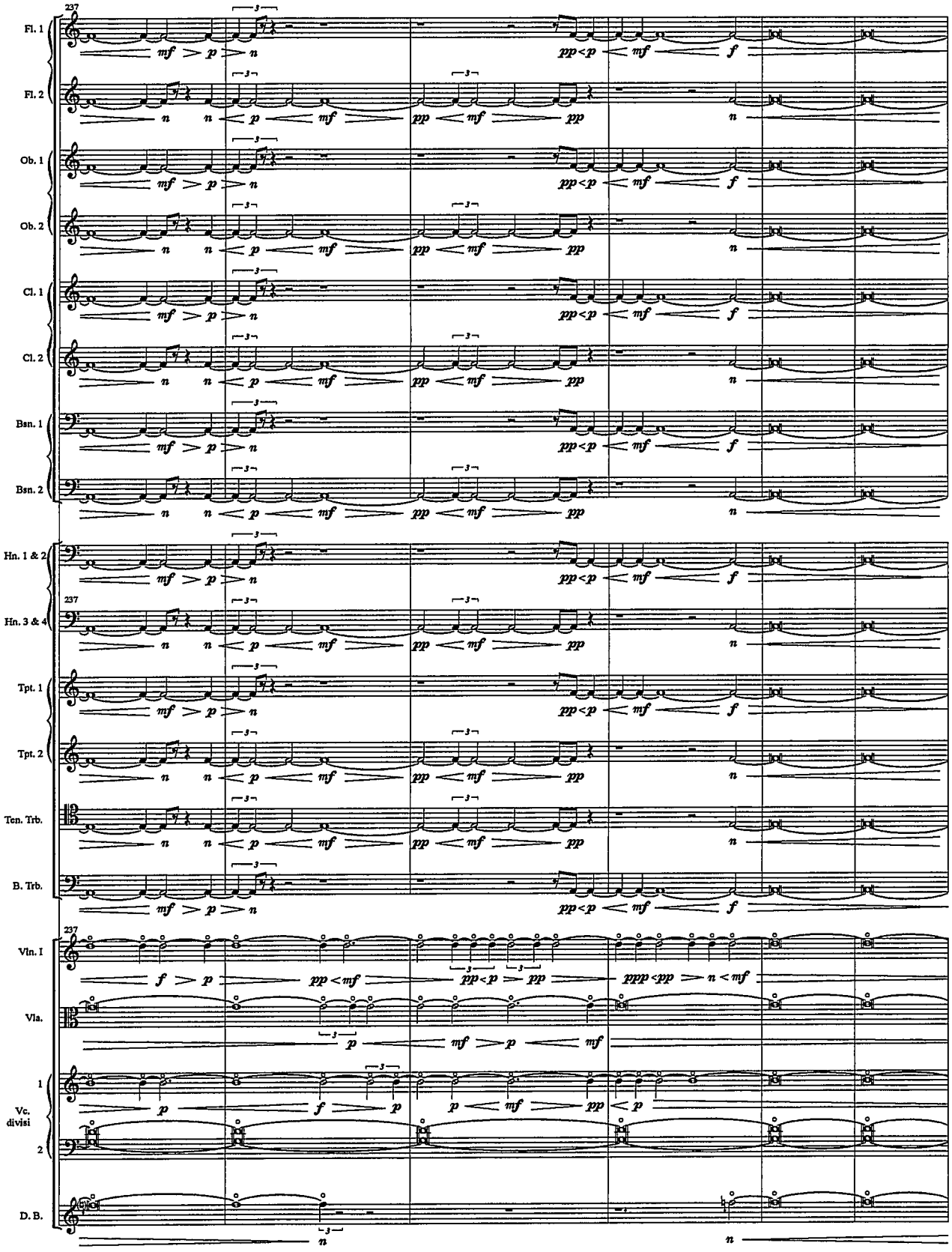

23
209
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt. 1
Tpt. 2
Ten. Trb.
B. Trb.
Vln. I
Vla.
Vc. divisi
1
2
Air tones
Half sul G
Half, sul G
sul G
non div., sul G, D
p
mf
n
pp

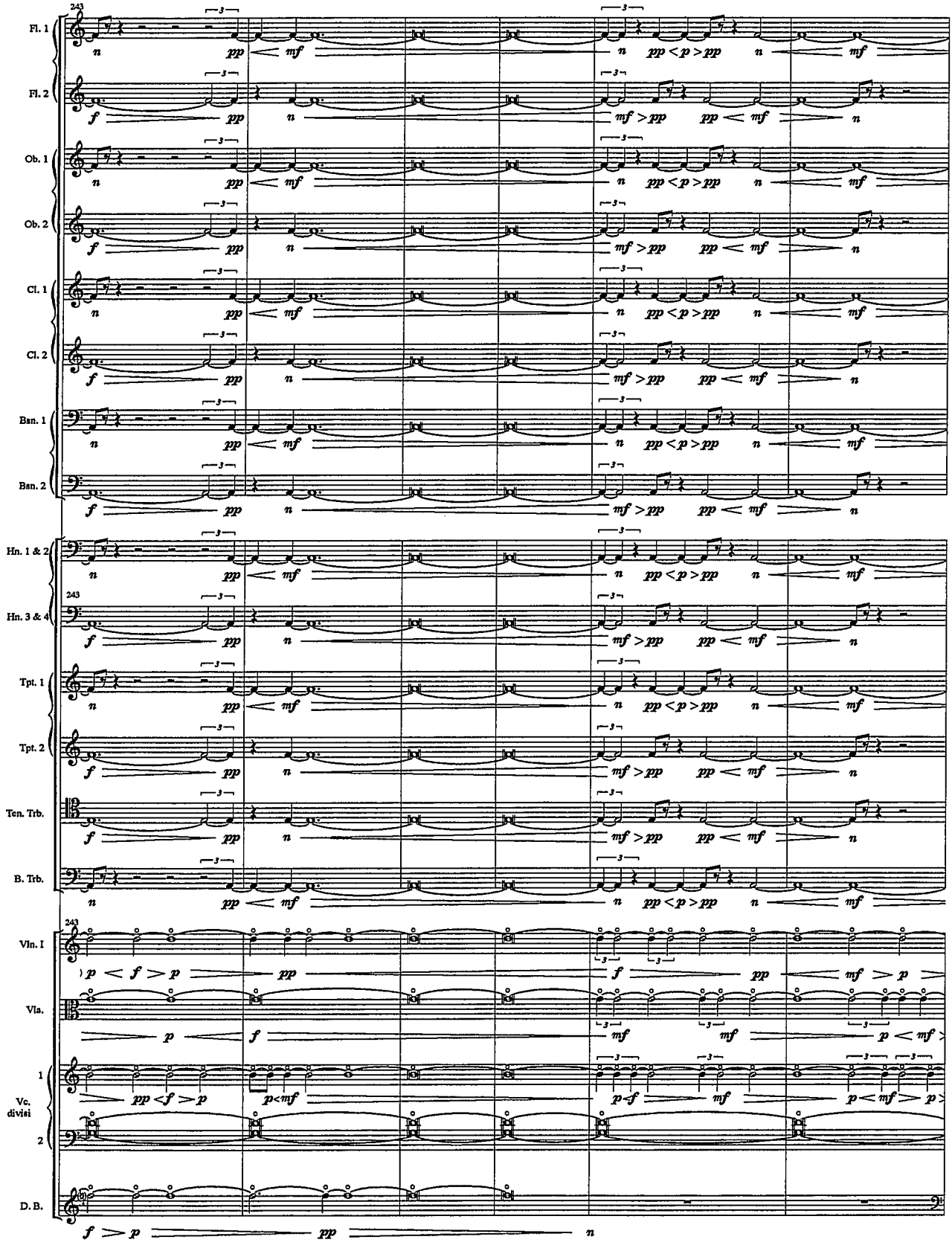

215
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt. 1
Tpt. 2
Ten. Trb.
B. Trb.
Vln. I
Vla.
1
Vc.
divisi
2
D. B.
sul G
sounds as written

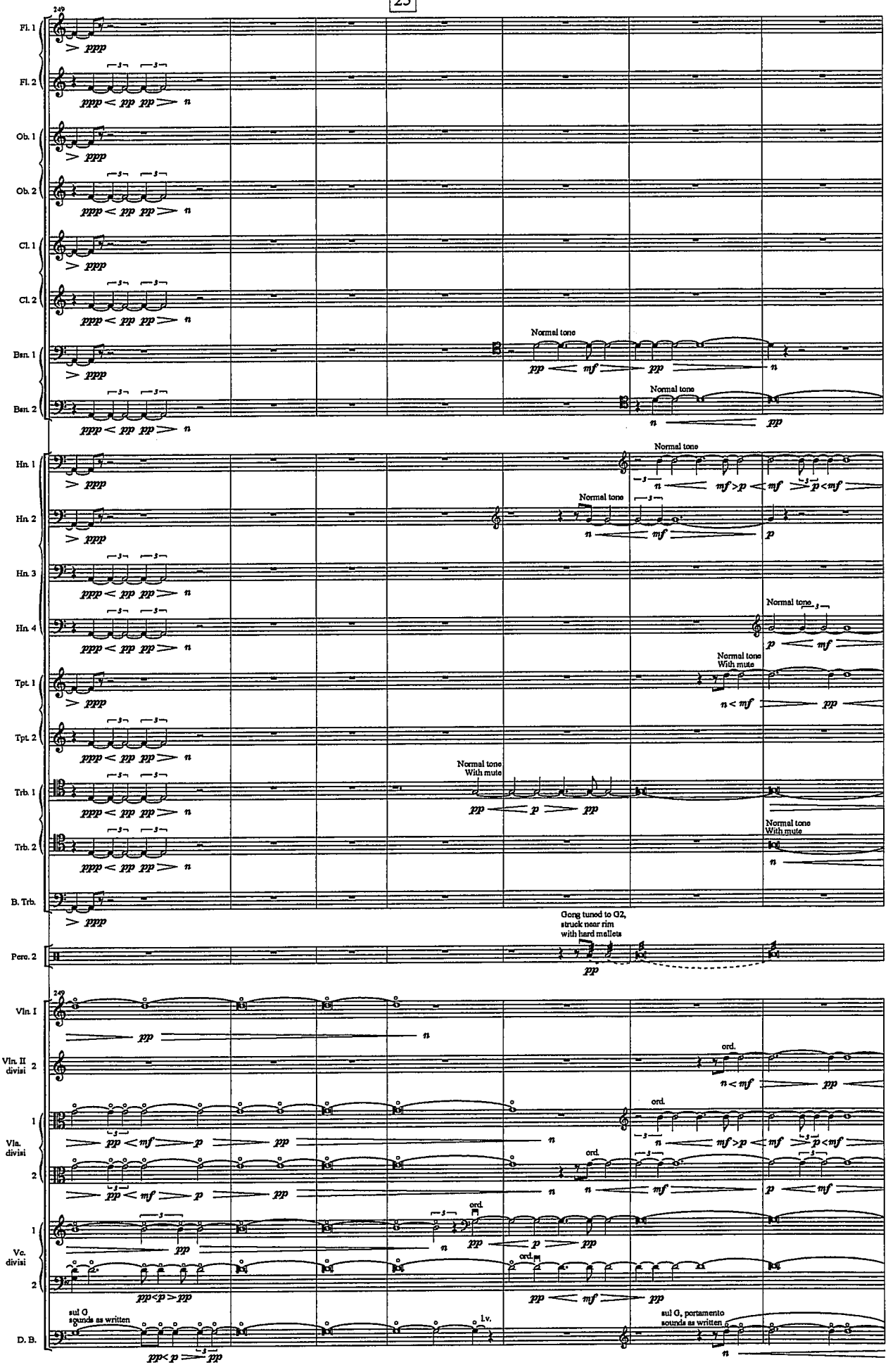

221
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt. 2
Ten. Trb.
B. Trb.
Vln. I
Vla.
Vc. divisi
1
2
D. B.
sul G
sounds as written

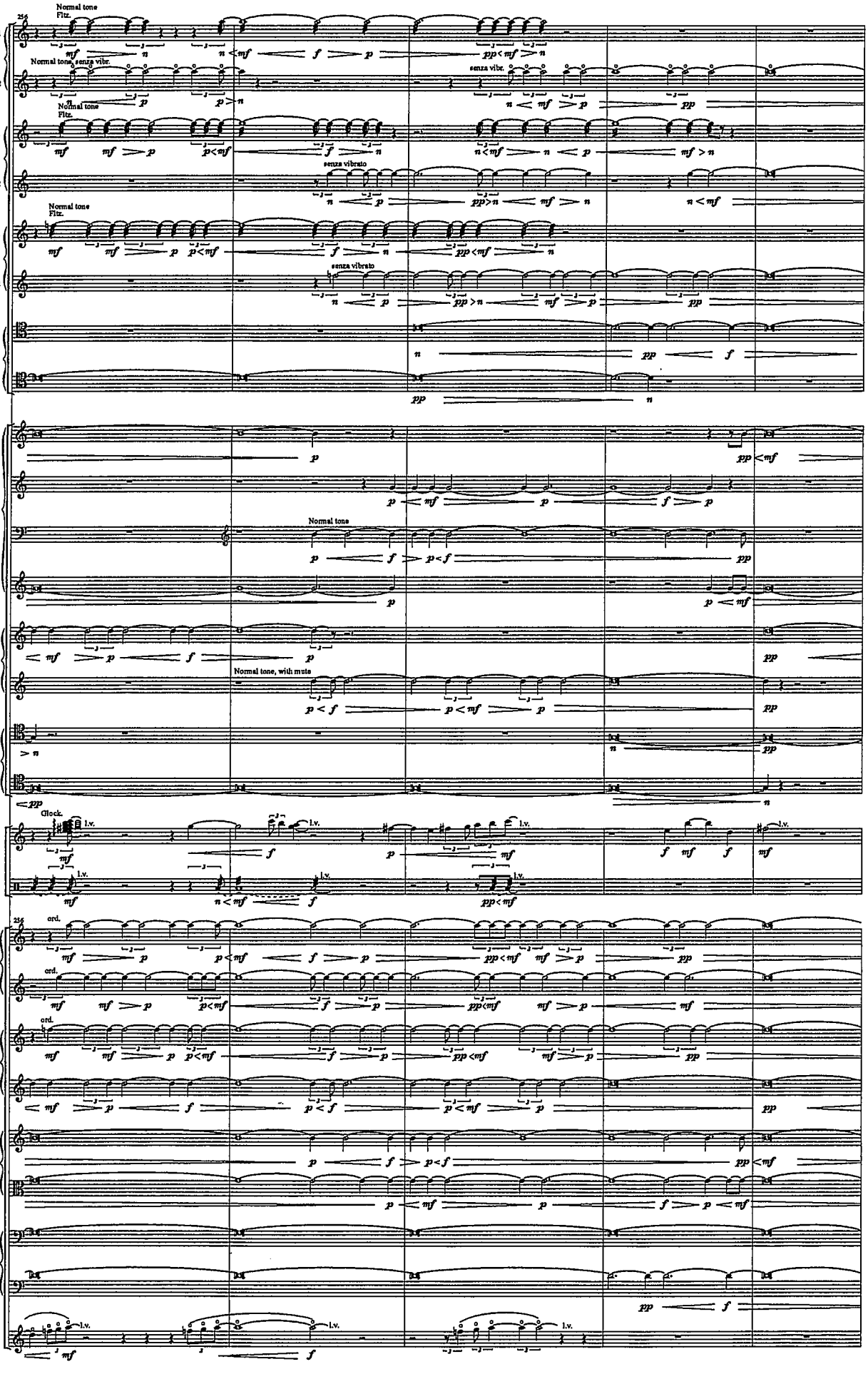

24
227
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt. 1
Tpt. 2
Ten. Trb.
B. Trb.
Vln. I
Vla.
Vc. divisi
1
2
D. B.
(air tones)
(sul G)
n
mf
pp
p

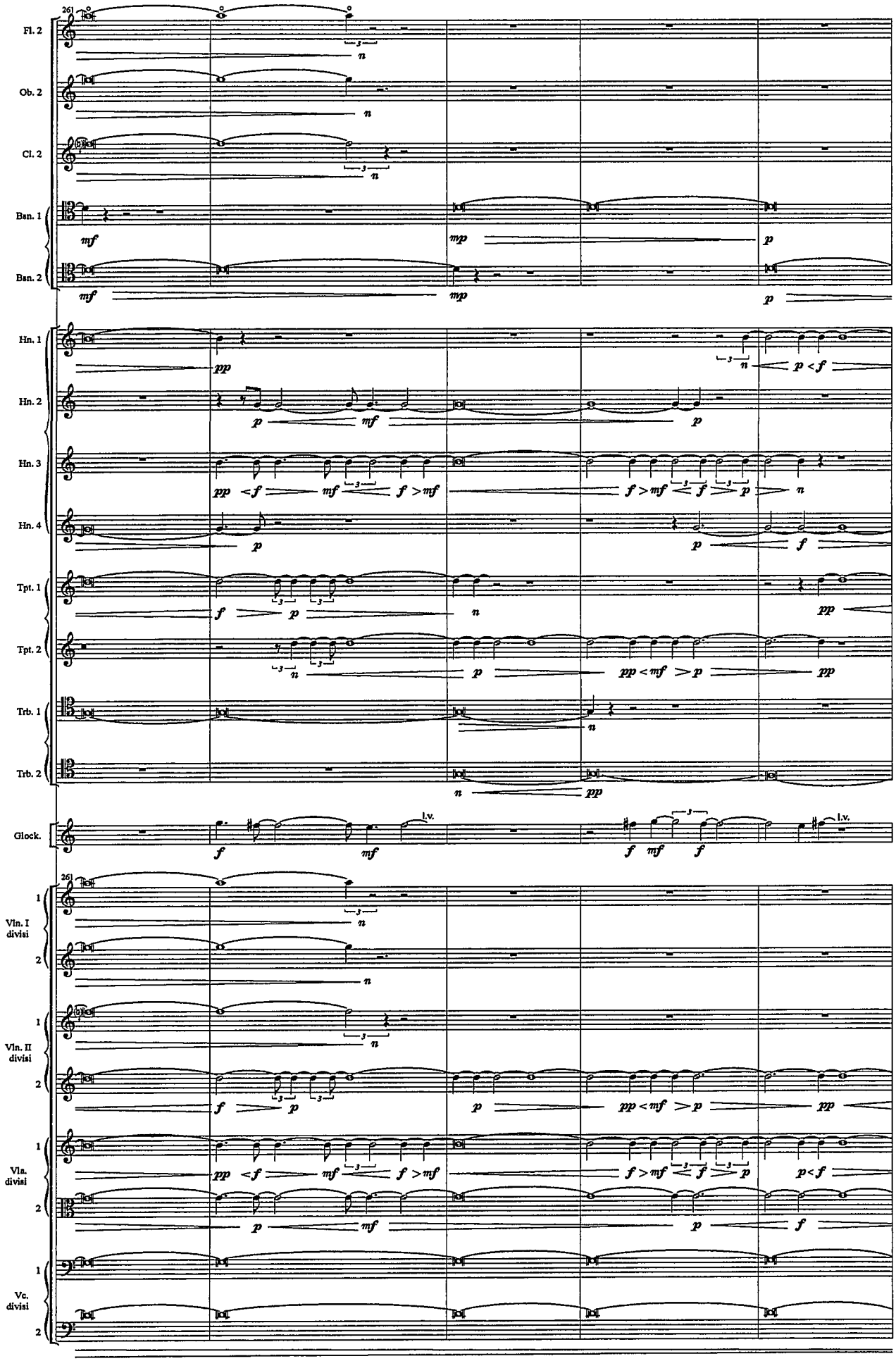

232
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt. 1
Tpt. 2
Ten. Trb.
B. Trb.
Vln. I
Vla.
Vc. divisi
1
2
D. B.
sul G
sounds as written

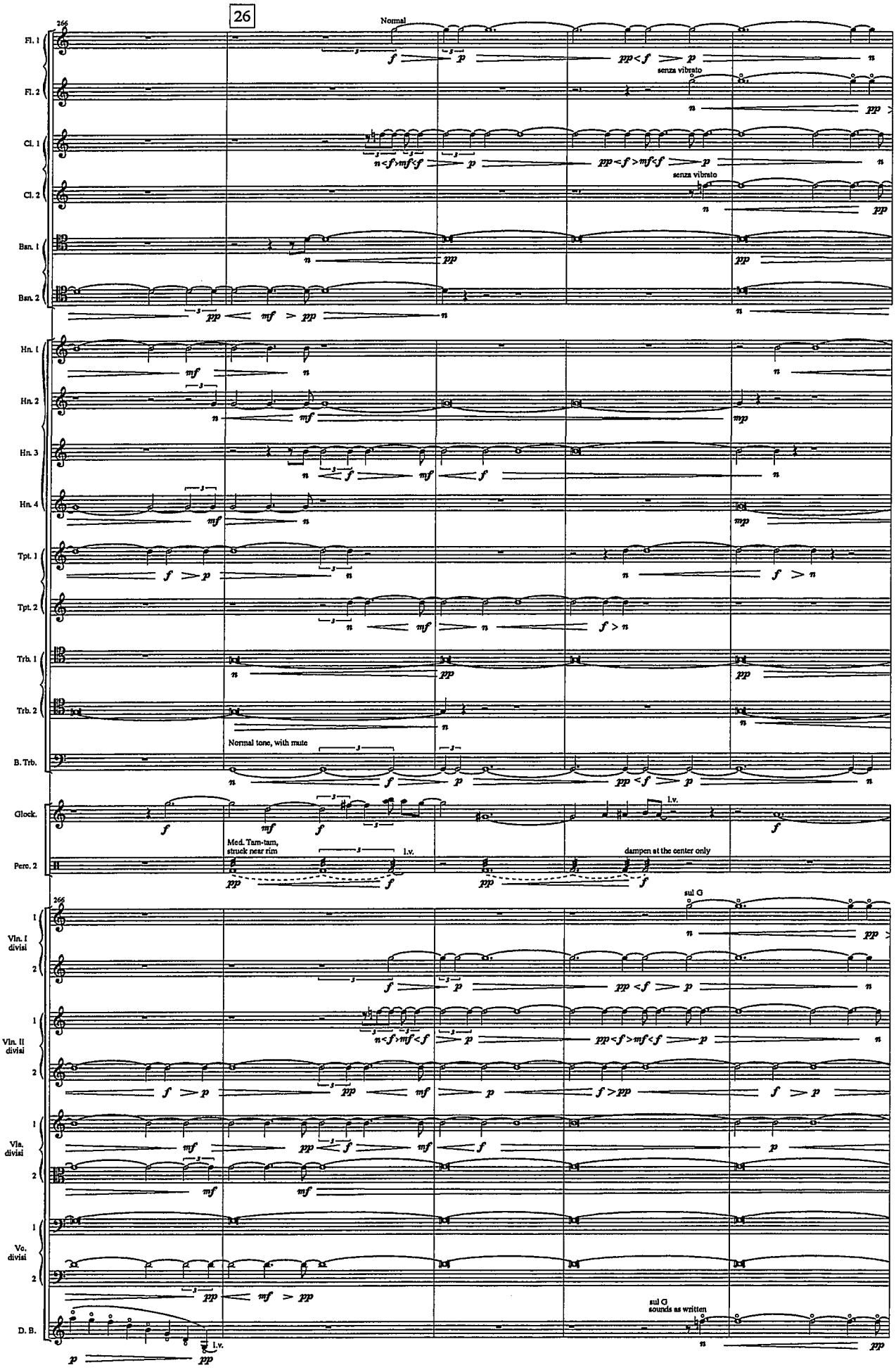

237
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt. 1
Tpt. 2
Ten. Trb.
B. Trb.
Vln. I
Vla.
Vc. divisi
1
2
D. B.

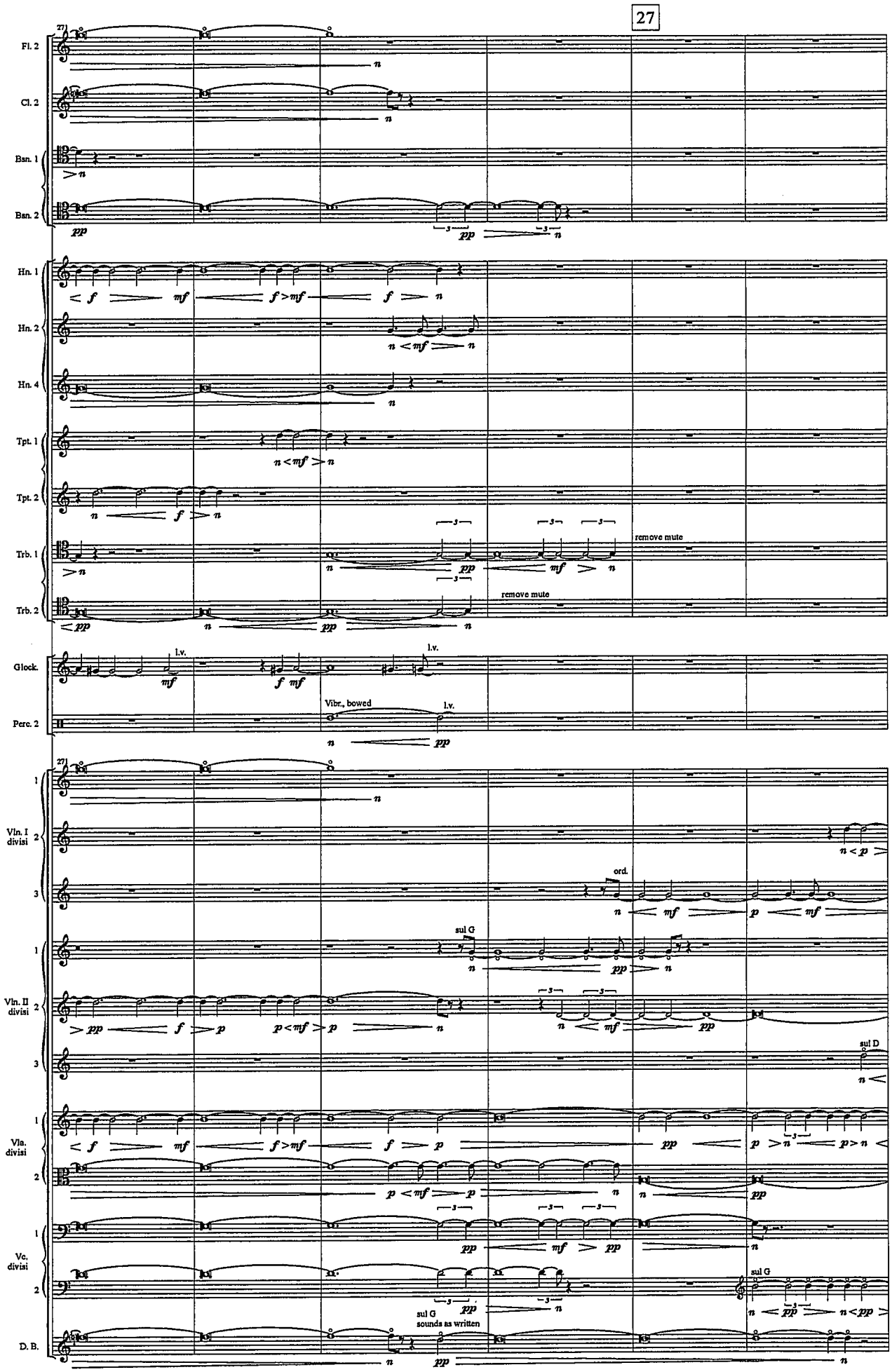

243
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1 & 2
Hn. 3 & 4
Tpt. 1
Tpt. 2
Ten. Trb.
B. Trb.
Vln. I
Vla.
Vc. divisi
1
2
D. B.

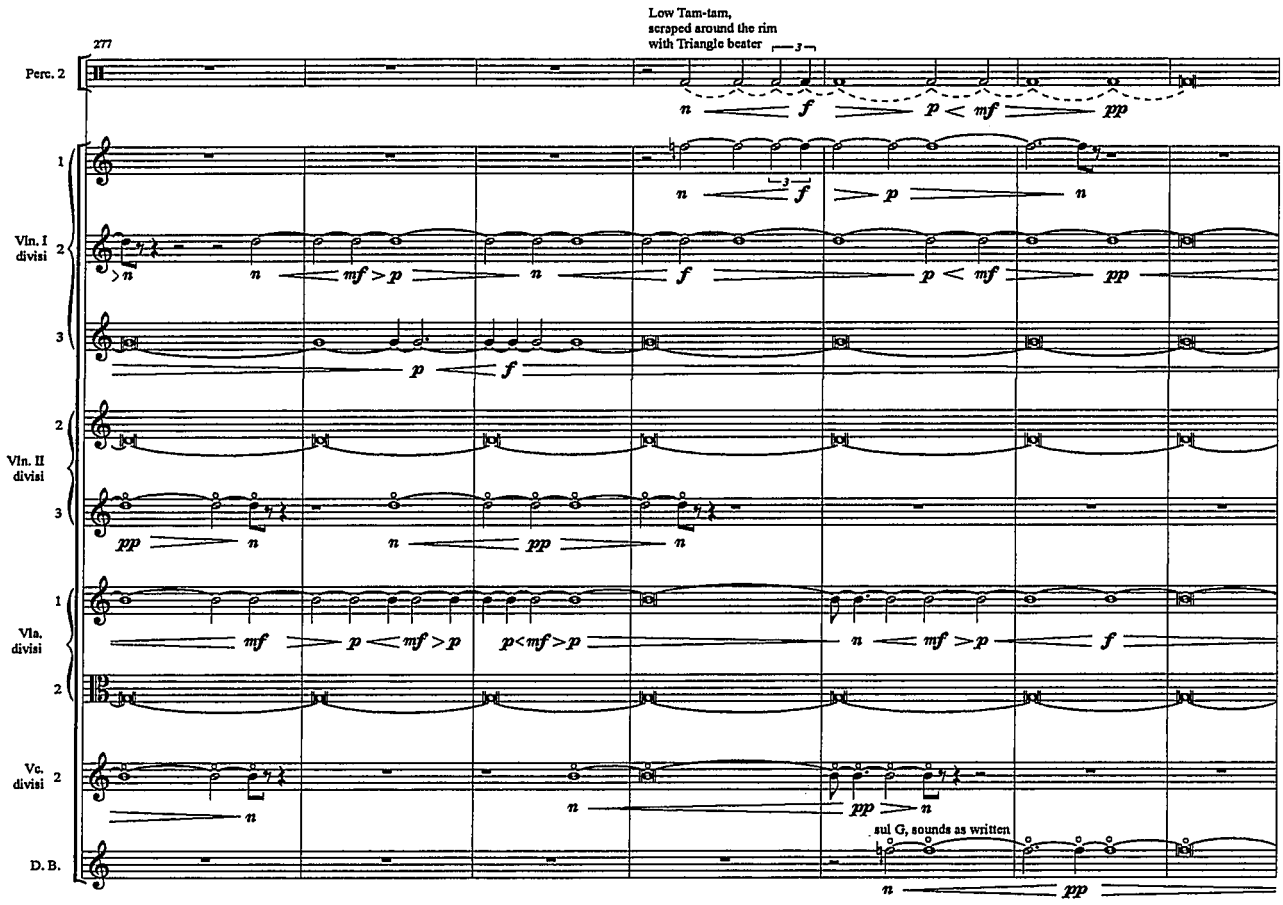

249
Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Normal tone
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Tpt. 1
Tpt. 2
Trb. 1
Trb. 2
B. Trb.
Normal tone With mute
Gong tuned to G2, struck near rim with hard mallets
Perc. 2
Vln. I
Vln. II divisi
Vla. divisi
Vc. divisi
D. B.
ord.
sul G sounds as written
l.v.
sul G, portamento sounds as written

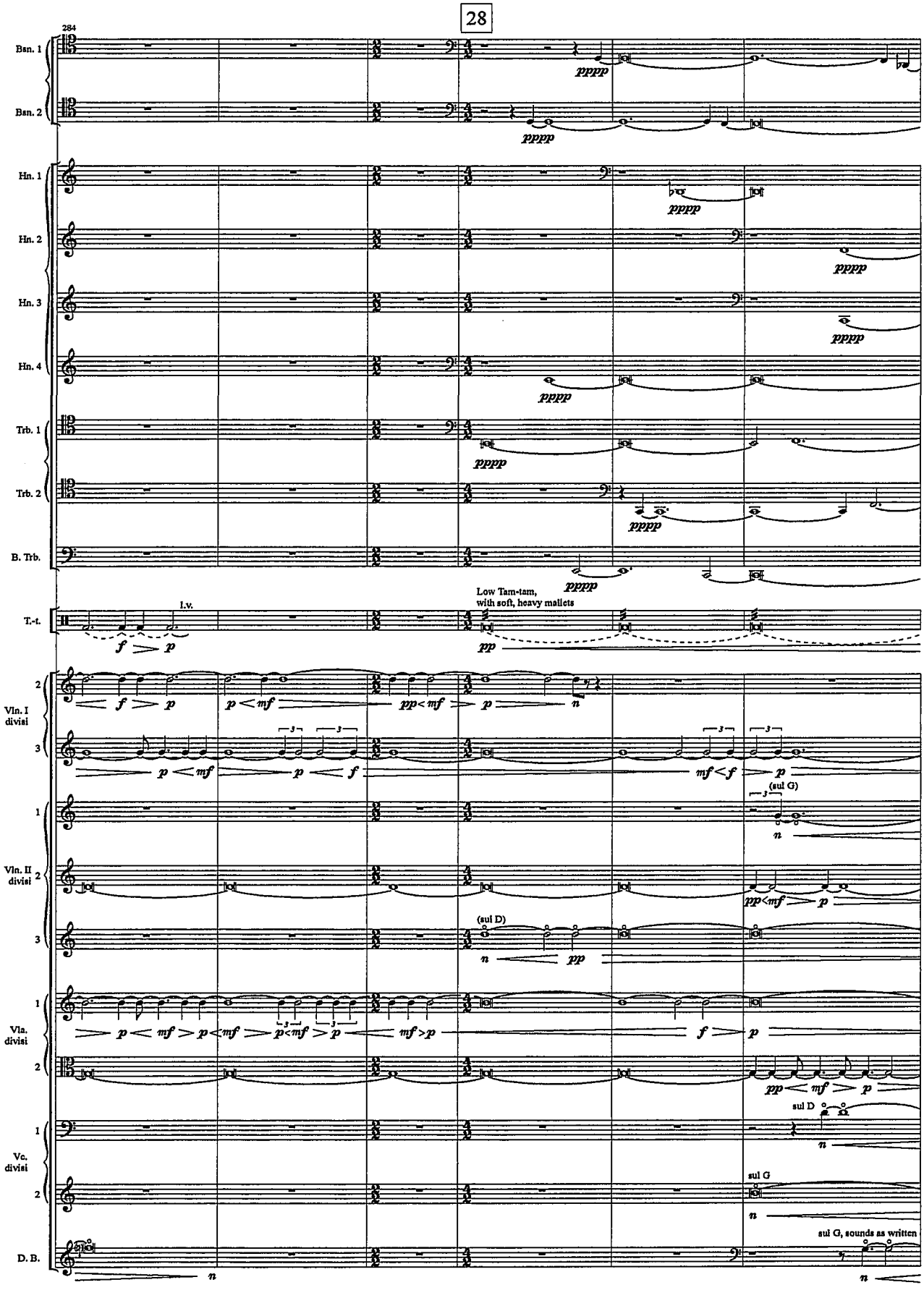

Fl. 1
Fl. 2
Ob. 1
Ob. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Tpt. 1
Tpt. 2
Trb. 1
Trb. 2
Perc. 1
Gong
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc. divisi
D. B.
Normal tone
Fltz.
Normal tone, senza vibr.
senza vibrato
Clock.
l.v.
ord.
Normal tone, with mute

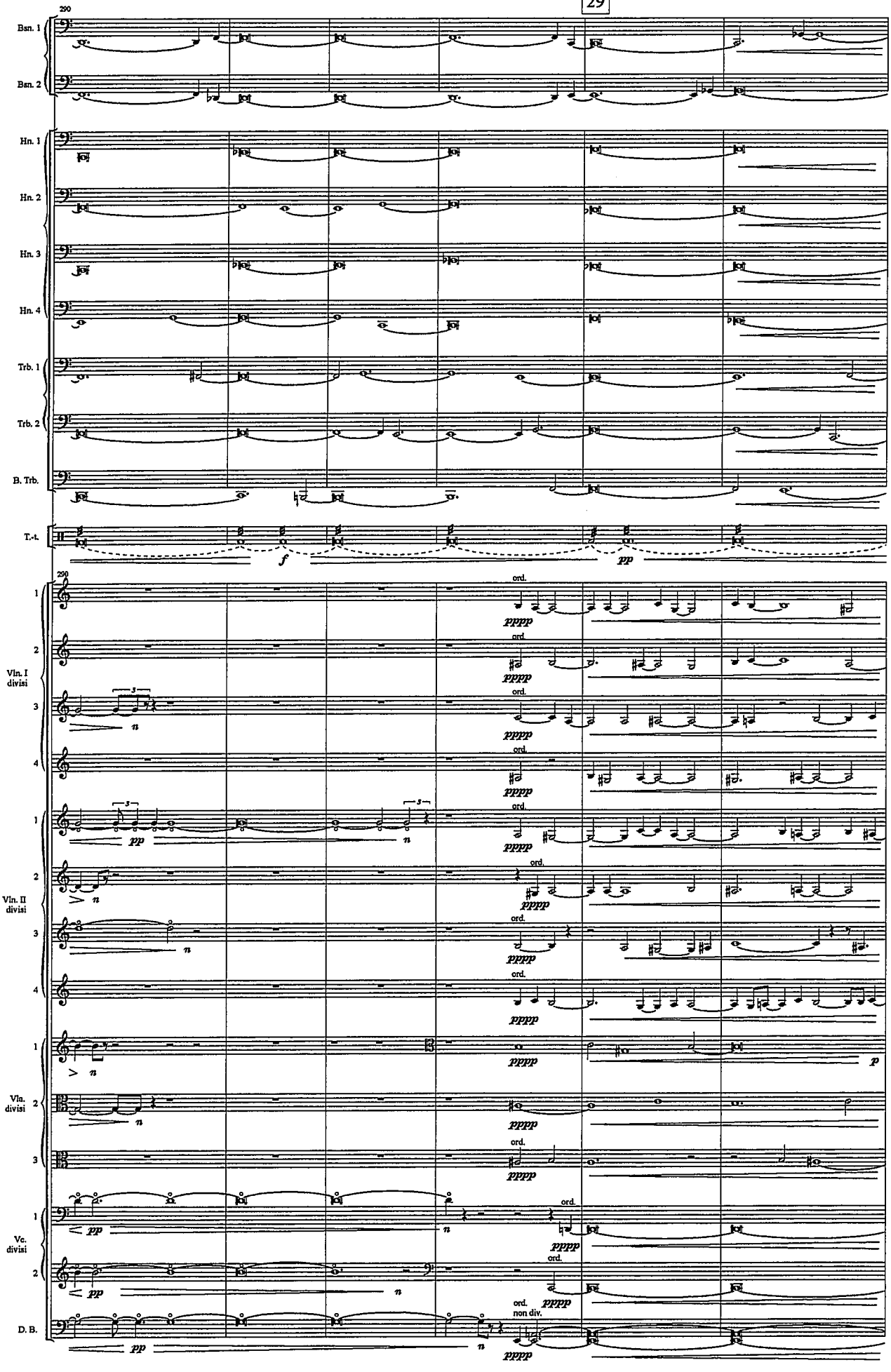

261
Fl. 2
Ob. 2
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Tpt. 1
Tpt. 2
Trb. 1
Trb. 2
Glock.
l.v.
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc. divisi

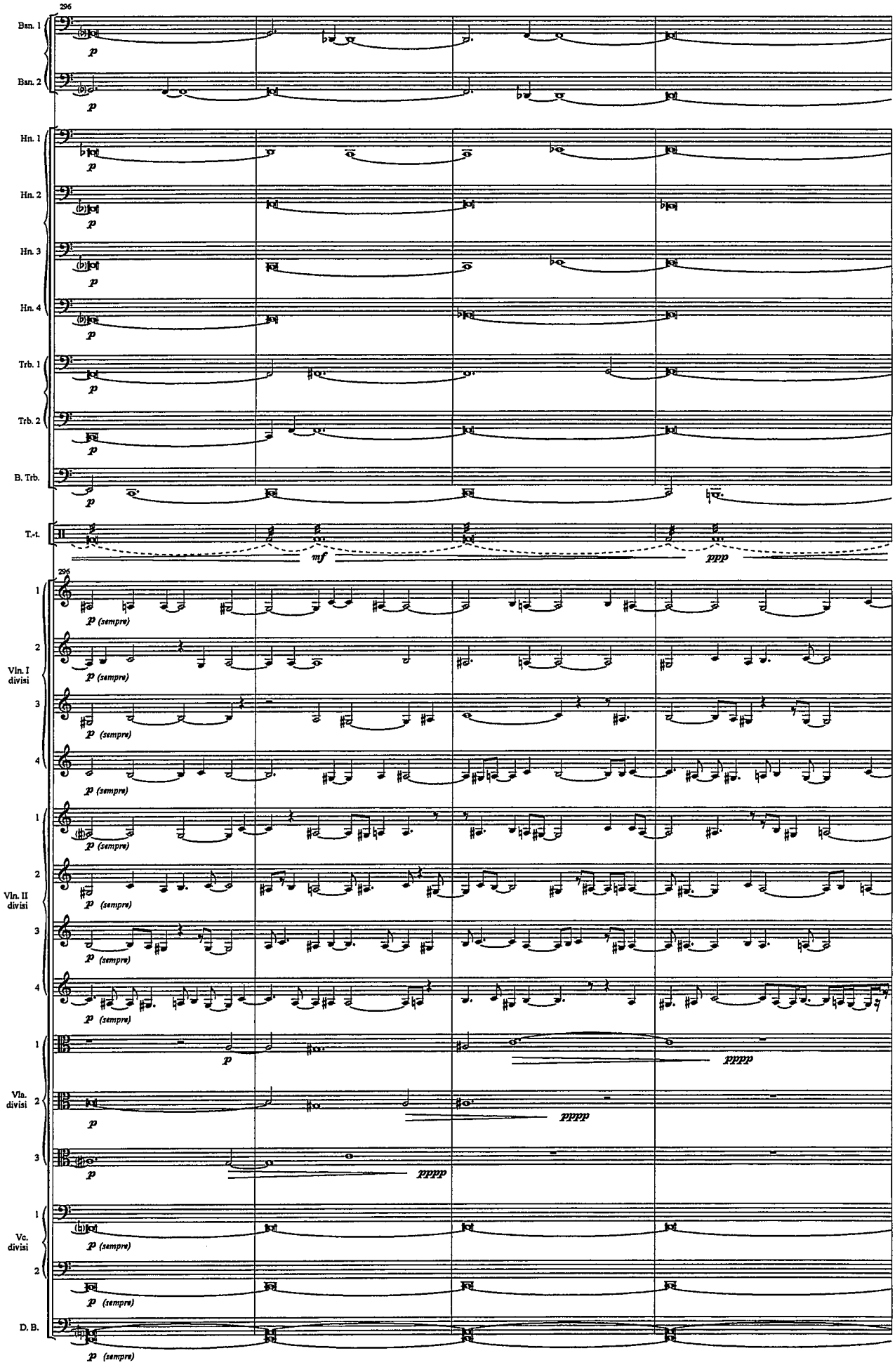

26
Normal
senza vibrato
Normal tone, with mute
Med. Tam-tam, struck near rim
l.v.
dampen at the center only
sul G
sul G sounds as written
Fl. 1
Fl. 2
Cl. 1
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Tpt. 1
Tpt. 2
Trb. 1
Trb. 2
B. Trb.
Glock.
Perc. 2
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc. divisi
D. B.

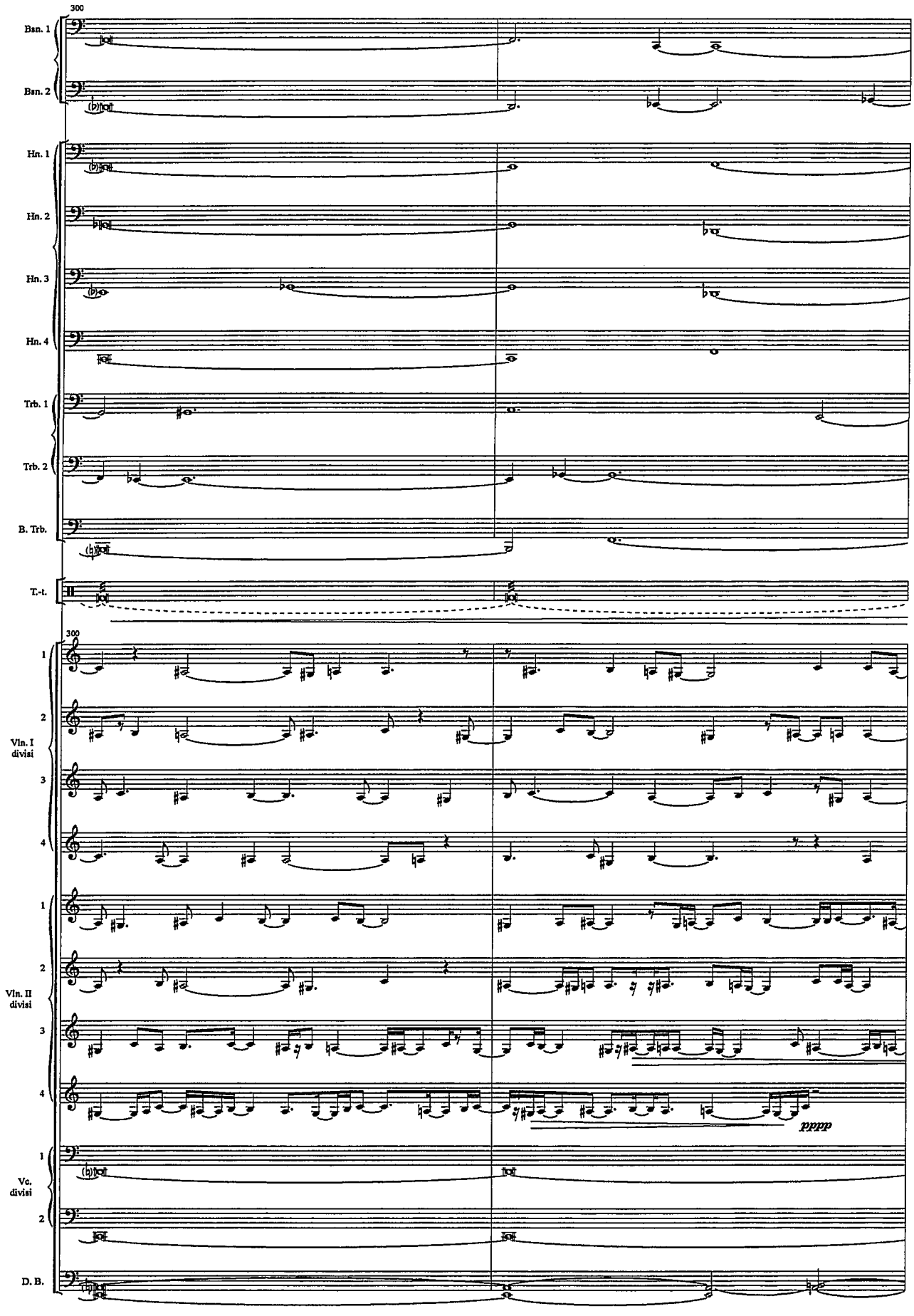

27
Fl. 2
Cl. 2
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 4
Tpt. 1
Tpt. 2
Trb. 1
Trb. 2
remove mute
remove mute
Glock.
l.v.
Perc. 2
Vibr., bowed
l.v.
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc. divisi
D. B.
ord.
sul G
sul D
sul G
sul G
sounds as written

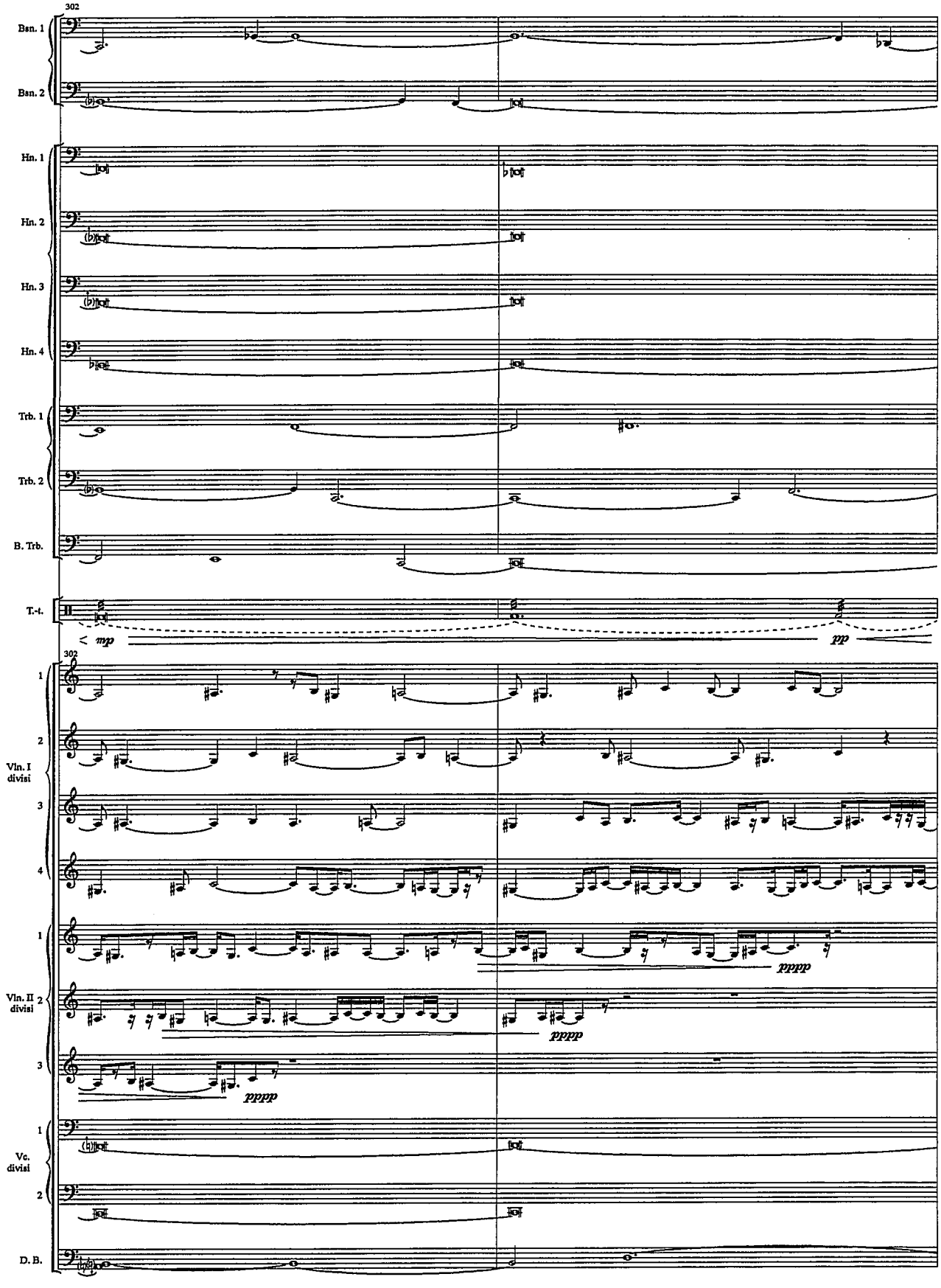

277
Low Tam-tam,
scraped around the rim
with Triangle beater
Perc. 2
Vln. I
divisi
Vln. II
divisi
Vla.
divisi
Vc.
divisi
D. B.
sul G, sounds as written

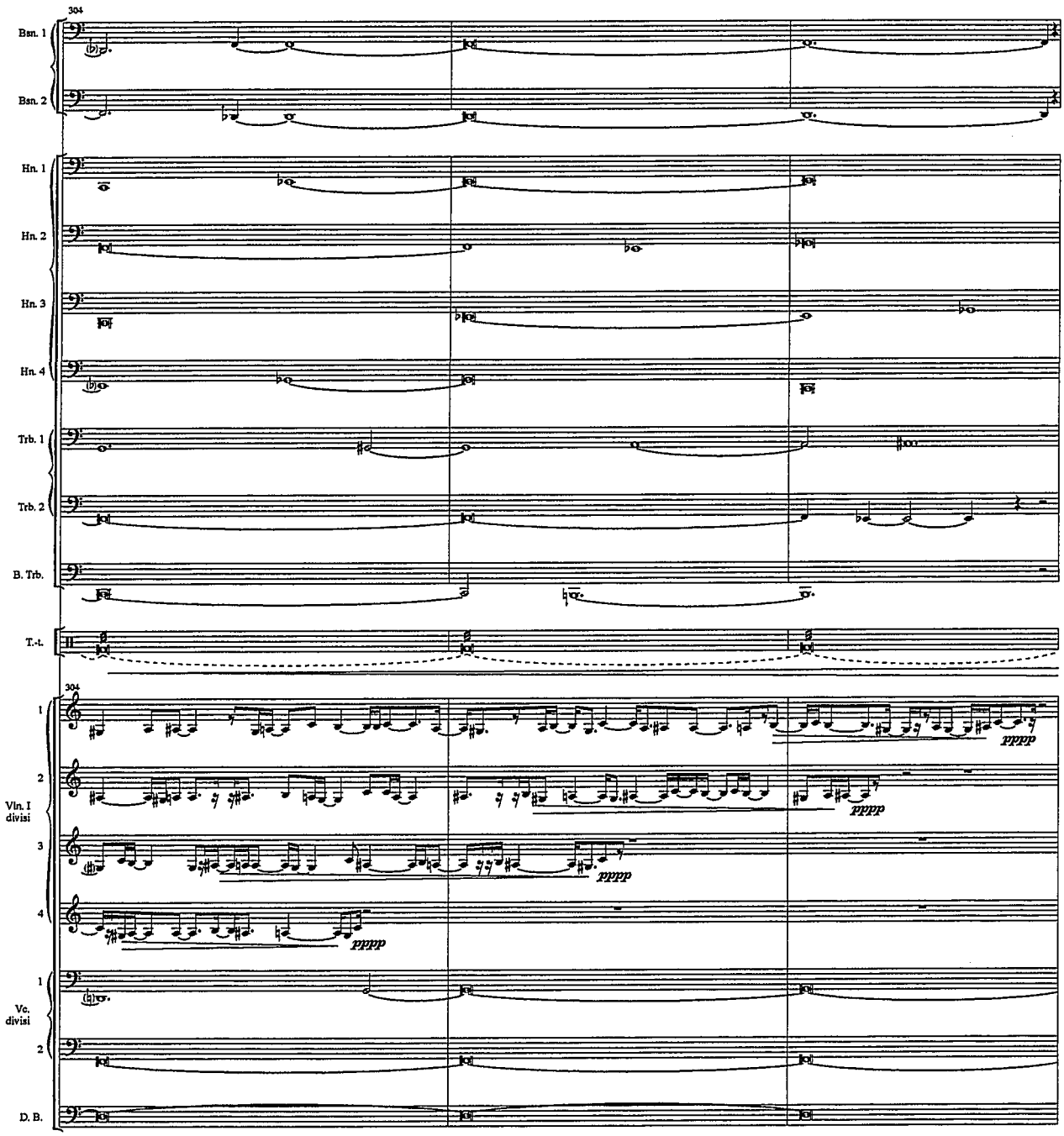

28
284
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
T.-t.
l.v.
Low Tam-tam, with soft, heavy mallets
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc. divisi
D. B.
(sul G)
(sul D)
sul D
sul G
sul G, sounds as written

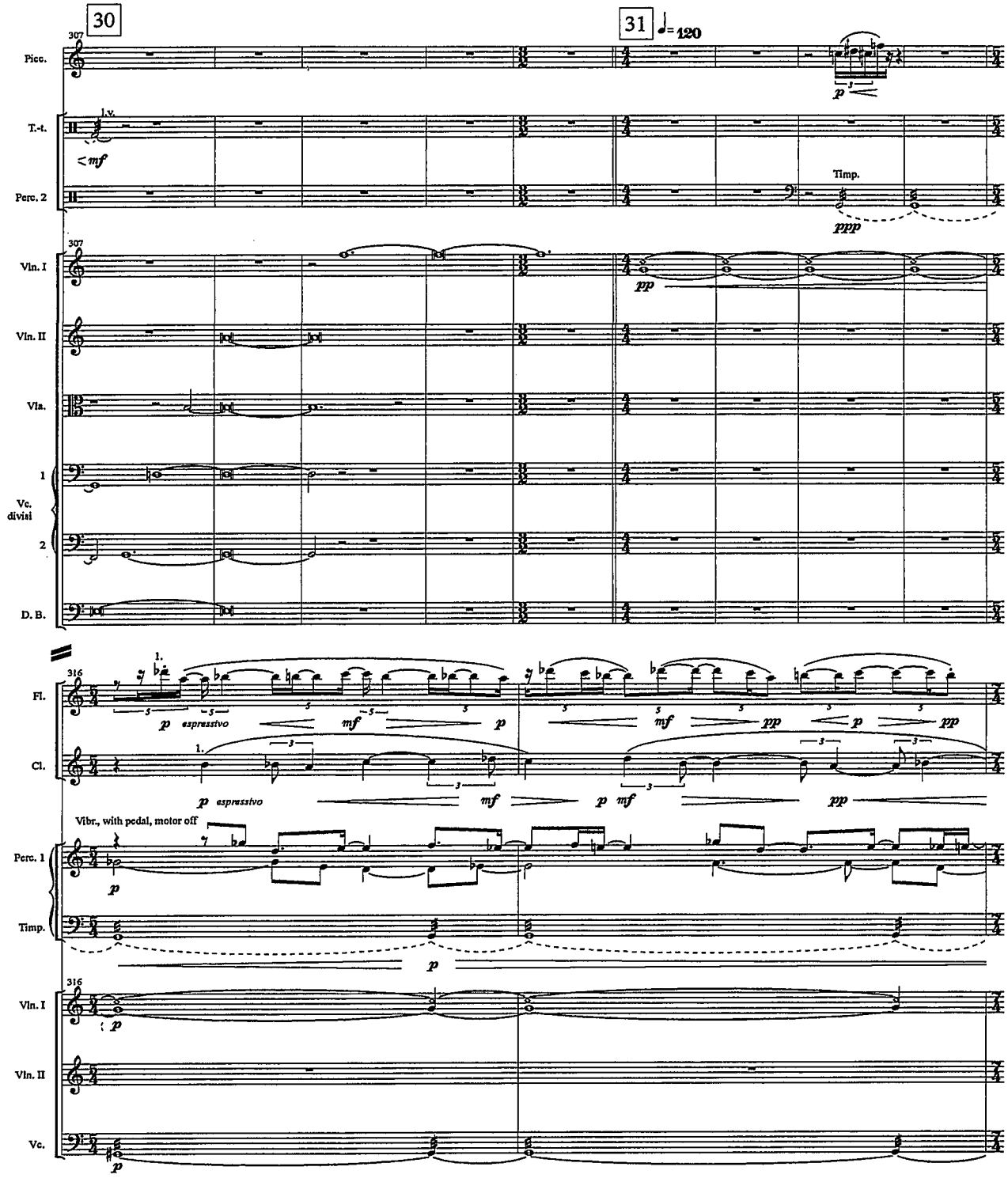

290
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
T.-t.
f
pp
290
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc. divisi
D. B.
ord.
pppp
p
non div.

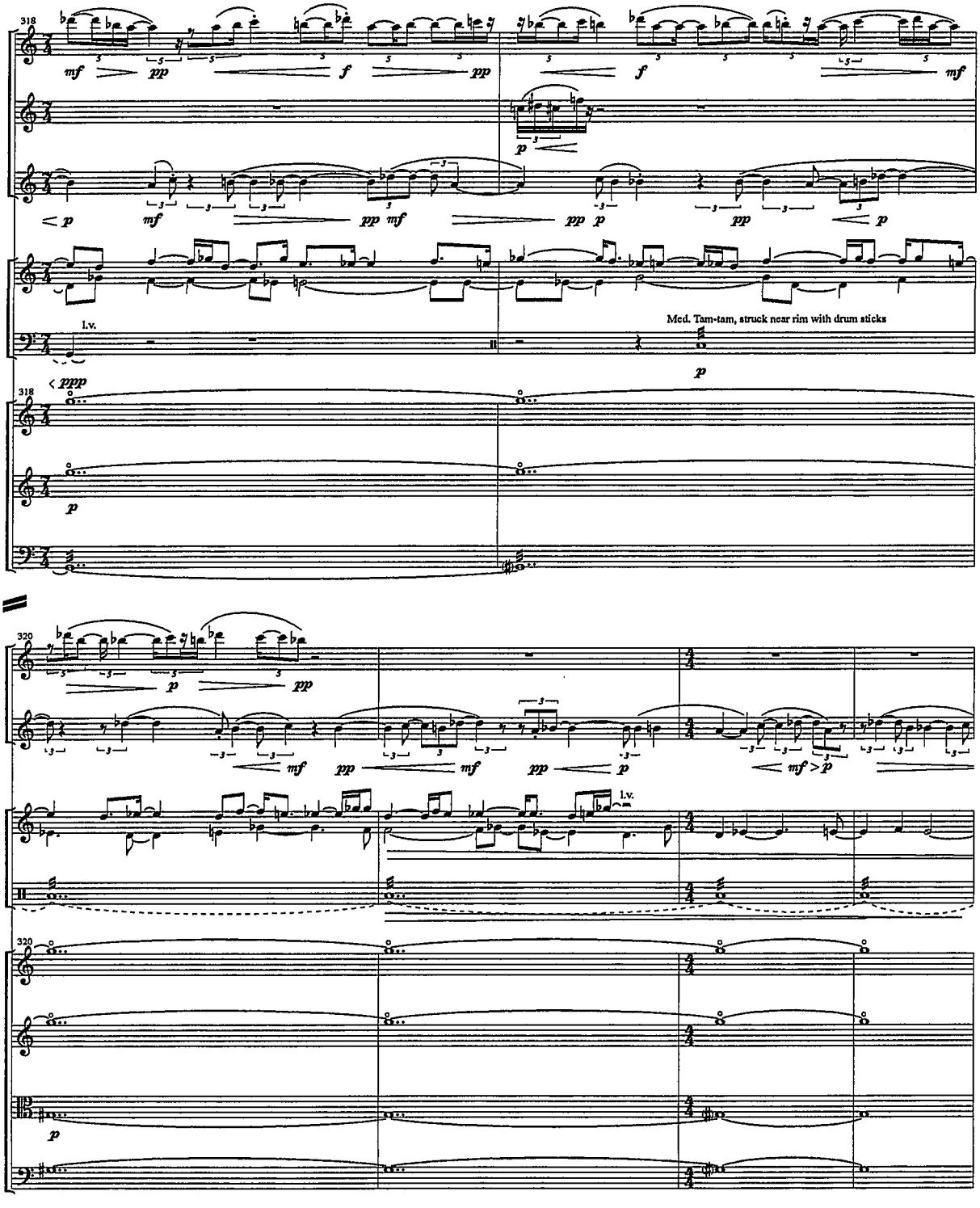

296
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
T.-t.
mf
ppp
296
Vln. I divisi
Vln. II divisi
Vla. divisi
Vc. divisi
D. B.
p (sempre)
pppp

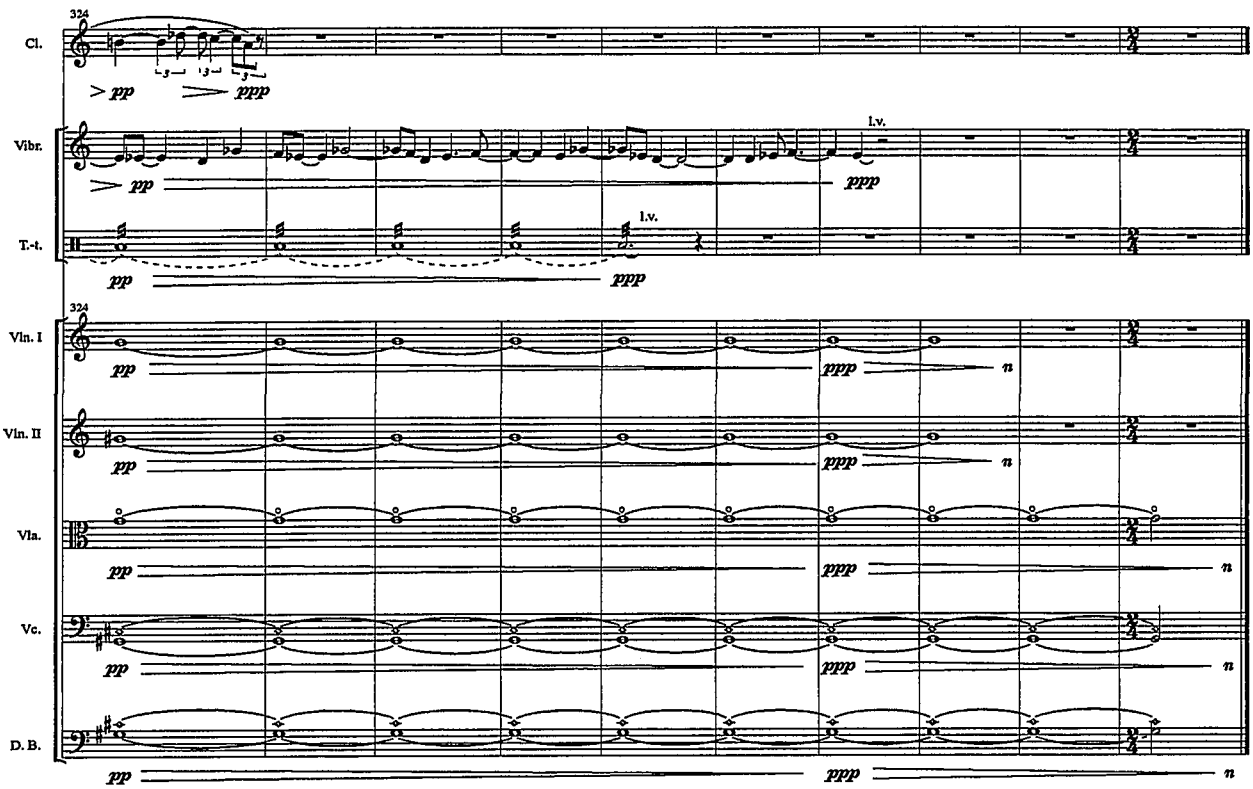

300
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
T.-t.
300
1
2
Vln. I
divisi
3
4
1
2
Vln. II
divisi
3
4
pppp
1
Vc.
divisi
2
D. B.


302
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
T.-t.
< mp
pp
302
1
2
Vln. I divisi
3
4
1
Vln. II divisi 2
3
pppp
pppp
pppp
1
Vc. divisi
2
D. B.


304
Bsn. 1
Bsn. 2
Hn. 1
Hn. 2
Hn. 3
Hn. 4
Trb. 1
Trb. 2
B. Trb.
T.-t.
304
1
2
Vln. I
divisi
3
4
pppp
pppp
pppp
1
Vc.
divisi
2
D. B.


30
31
♩= 120
307
Picc.
T.-t.
l.v.
mf
Perc. 2
Timp.
ppp
Vln. I
pp
Vln. II
Vla.
1
Vc.
divisi
2
D. B.
316
Fl.
1.
p espressivo
mf
p
mf
pp
p
pp
Cl.
p espressivo
mf
p
mf
pp
Vibr., with pedal, motor off
Perc. 1
p
Timp.
p
316
Vln. I
p
Vln. II
Vc.
p


318
Fl.
Picc.
Cl.
Vibr.
Timp.
l.v.
Med. Tam-tam, struck near rim with drum sticks
Vln. I
Vln. II
Vc.
320
Fl.
Cl.
Vibr.
T.-t.
l.v.
Vln. I
Vln. II
Vla.
Vc.


324
Cl.
> pp
ppp
Vibr.
pp
ppp
l.v.
T.-t.
pp
ppp
l.v.
324
Vln. I
pp
ppp
n
Vln. II
pp
ppp
n
Vla.
pp
ppp
n
Vc.
pp
ppp
n
D. B.
pp
ppp
n