Tempus ex Mente et in Mente:
Composition in the Perceptual Domain from the Music of *kyi*

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1. Introduction and A Priori Assumptions

The physiognomy of music is so that the perceptions of conceptual makeup as well as temporal experience have the potential to return a vast level of contrast from listener to listener. This notion is especially portrayed in the case of a composer's intention versus an audience members' experience. The music of *kyi* is written with the intention of addressing this persistent contrast through a phenomenological exploration of perceptual functions, time consciousness, and comprehension of acoustical phenomena. To better present the subject material in the music of *kyi* I will utilize a set of 'a priori assumptions', which I apply in a musical context and relate to the listener's experience of sonic structures as well as temporal consciousness. These assumptions are derived from both personal experiences as a listener as well as general concepts of perception, psychology, and philosophy.

I.

In the case of this piece, rhythm and pitch **in tandem** pose the ability to produce more coherent and discrete musical identities than most compositional devices.

Other elements of music such as tempo, meter, timbre, dynamics, and register may be utilized to develop cogent distinguishability, but are nonetheless resigned to be perceptually contingent upon the context within a musical setting. A midpoint or proximal base of these elements may be established anywhere within the range of their existent facets, thereby all relations can be said to be relative. Conversely, both pitch and rhythm can exist outside of this relativity to a founded equilibrium or constant. Additionally, rhythmic and pitch oriented identities may be more freely expressed by a wide range of instruments.

II.

As all perception is differential, there must exist a constant in order for perceptual phenomena or general qualia to arise. For instance, in sight, the constant of darkness or the general absence of light provides the strata or simply the visual contrast for electromagnetic waves to subsist and thus become codifable as qualia. This may also be applied to the emanation of matter, which requires elementary particles e.g. quarks, leptons, bosons etc. in order to arise materially.

In a listening context, the constant itself contains the capacity to fluctuate in the eye of the beholder. For instance, in an anechoic chamber the constant of environmental ambiance is reduced to a level of unnaturally low volume, and the listener begins to perceive previously quiet events as relatively loud. Musically, certain types of music that make use of a drone convey this relative constant. The droning tone

is the axis, which other modes of musical expressions/phenomena may arise e.g. beating (rhythm), consonant/dissonant relationships, and tone centricity.

III.

However, in order for the base level constant or equilibrium to shift a sufficient level of exposure must occur before the environment can be perceived as normative. The amount of time necessary for this notion to become prevalent is by no means extractable without thorough experimentation, but nonetheless can be derived intuitively in so that it functions for a vast majority of observers. Similarly, to undercut expectations and induce a state of surprise, a listener's anticipation of both the temporal and timbral milieu must be sufficiently built.

Husserl's phenomenological model posits a threefold time-conscious structure, which consists of primal impressions, retentions (or 'primary memories') and protentions (Dainton). Husserl defines protentions as follows:

> It belongs to the essence of perception not only that it has in view a punctual now and not only that it releases from its view something that has just been, while 'still intending' it in the original mode of 'just-having-been', but also that it passes over from now to now and, in anticipation, goes to meet the new now. The waking consciousness, the waking life, is a living-towards, a living that goes from the now towards the new now. (qtd. in Dainton).

Therefore, the normative environment of an expected sonic sequence or more simply the relative constant can be said to be a byproduct of protention as it pertains to temporal consciousness. This aural phenomenon may then be developed by way of functional repetition. In contrast to drone music, repetition of discrete motives will yield modes of musical expression/phenomena that deal more directly with the time domain and structural facets, rather than elemental aspects of music such as rhythm and intervallic relationships.

IV.

A plane that involves repetition is not fundamentally immobile. Besides intrinsic alteration due to the perpetuating time domain vis-à-vis continuous flux in the state of the perceiver, natural law posits that all localized repetitive functions eventually desist. Whether it be accounted for by breakdown of the mode of production (performer fatigue), arising solvents (aural masking) or otherwise, a modification to a repetitive function in the material plane is inherently inevitable. Thus, these inevitable cumulative

modifications serve to ultimately extinguish the initial observed identity of the object or content (consisting of pitch and rhythmic identities in this compositional purview).

V.

This malleable and fickle state of identity in stimuli is exhibited through a common phenomenological principle called the unity in opposites, which has been propounded by philosophers such as Heraclitus and Hegel. The latter of whom states:

> Every actual thing involves a coexistence of opposed elements. Consequently to know, or, in other words, to comprehend an object is equivalent to being conscious of it as a concrete unity of opposed determinations, [whereas] the old metaphysic, as we have already seen, when it studied the objects of which it sought a metaphysical knowledge, went to work by applying categories abstractly and to the exclusion of their opposites. (qtd. in Blunden 1997).

Conceptually, this may be compared to an observer's adjustment to a newly normalized existent state or general environment. Once the condition or state external to the perceiver has become entrenched as to be accepted as the new equilibrium, such stimuli gain the ability to transform into its opposite. Again, in the case of listener perception in an anechoic chamber, through environmental transference and sufficient exposure the previously quiet sounds have become perceivable quite loud. This type of transference and exposure applied to the identifiable characteristics of a musical idea may yield the same perceivable export.

VI.

Just as humans experience limits of audible sonic frequencies with boundaries in the lower and upper end of the spectrum so too do we experience such thresholds in rhythm. However, there are no anatomical structures that directly account for these limits as with frequency and the ear's basilar membrane. So, therefore, the upper and lower ends of rhythmic perception are a result of the limits of neural processing or psychology.

An 'interonset interval' or IOI is defined as "the time between the beginnings or attack points of successive events/notes; or the interval between onsets, not including the duration of the events." (London 531). Consulting the formula F=1/T , once an IOI becomes 50ms or less, it essentially enters into the audible frequency domain i.e. 20Hz. If the IOI decreases to a smaller and smaller interval, eventually we will perceive an audible pitch. For instance, a two-voice rhythm made up of a quarter note over two

eighth notes, gradually produces an octave interval if both rhythms are continuously sped up. Thus, the ratio of the rhythms determines the perceivable pitch interval that arises.

In 'Cognitive Constraints on Metric Systems' Justin London calculates that at IOI's just under 100ms humans lose the ability to discriminate one repetition to another and any accurate reproduction becomes impossible. While at this rapid rate of IOI production and discrimination of rhythm and pitch are possible, a crucial aspect of rhythm is lost. Rasmus Baath's term 'subjective rhythmitization' details the phenomenon that occurs when a listener hears a monotone metronome sequence and begins to perceive some sounds as being accented, when in reality, this is not the case (Baath 244). This perceptual illusion is an integral part of meter in music, which allows composers and performers to create rhythmic events that portray a prominent strong-weak beat relationship to drive the music forward. If the IOI's exceed between 200ms and 250ms or 300bpm and 240bmp, respectively, this subjective rhythmitization phenomenon disappears (London 541).

VII

Similarly, rhythm breaks down psychologically on the lower end of the rhythmic spectrum, where beats gradually turn into isolated sonic events. Unlike the upper part of the spectrum, there is no incontrovertibly definite threshold at which rhythm transforms into pitch, or transmutes into anything else musical for that matter. Therefore, the thresholds of rhythmic perception at such slow rates enter into a more nebulous psychology of perception.

The loss of 'perceptually linked' sounds where subjective rhythmitization is no longer accessible, arises at approximately 1800ms or 33bpm (Lehman 13). Despite still being able to perceive beats as having a strong-weak relationship here, it feels almost as if we were teetering on the brink of the music collapsing in on itself as IOIs reach the borders of the 'perceptual present'.

VIII.

The "temporal extent of stimulation that can be perceived at a given time, without the intervention of rehearsal during or after stimulation" is known as the 'perceptual present' (Carterette 205). Outside of this frame, durations of IOI's cause us to exert neurological functions of recall between a passing transient and its proceeding beat in the rhythmic scheme. It therefore accounts for this boundary between the 'direct present' and the realm, which requires properties of memory such as construction or estimation to perceive a rhythmic structure (Fraisse 1963 and 1987). Similarly, psychophysicist Francoise Michon defines the perceptual present as "the time interval in which sensory information, internal processing, and concurrent behavior appear to be integrated within the same span of attention." (qtd. in Lehman 14). The range wherein neurological recall may be necessary has been found to exist anywhere between 2 and 6 (or

8) second IOI's (Fraisse 1963 and 1987). Beyond these durations, we can no longer conceivably call a succession of beats 'rhythm' when presented at such a glacial rate.

IX.

The 'specious present' may be defined as "the maximal window through which we are directly aware of change and persistence…"(Dainton). According to William James, "our maximum distinct intuition of duration hardly covers more than a dozen seconds". This assertion is derived from the experiments of Wundt and Dietze, which measured the recall accuracy of rapid sonic events in listener subjects; James' 12 second model of the specious present is taken from Dietze's findings (James qtd. in Dainton). If we consider it in the context of the access to cognition insofar as short-term memory and vivid anticipation, it may be considered a marriage between Husserl's model of time consciousness with Fraisse's perceptual present. Herein, Fraisse's ca. 6 second model pertains to both Husserl's protentions and retentions, which when combined comprise James' specious present.

X.

In studying rhythmic limits of perception as a consequence of psychology, there is an evident link between these thresholds and biological evolution. Our conceptual systems are grounded and structured by sensory process i.e. perception and motor processes i.e. action. Since these processes evolved in simultaneously they are fundamentally inseparable and mutually informative. Therefore, it is plausible to speculate our ability to feel and recognize rhythms is defined by our motor capacities; and to design a model of rhythm perception based around the idea of a sensory-motor filter (Iyer qtd. in Lehman 18). Vijay Iyer connected these correlations into the table below.

Body Motion	Approximate Duration	Musical Correlate
Breathing, Body Sway	1 to 10 Seconds	Musical Phrase
Heartbeat, Walking, Sexual Intercourse, Head Nod	333 to 1000 Milliseconds	Musical Tempo
Speech, Lingual Motion, Digital Motion	100 to 333 Milliseconds	Fast Notated Rhythm, Smallest Salient Subdivision of Musical Pulse

Building on this concept, Steve Lehman shows how this categorical model relates to the perceptual categories codified by Paul Fraisse (18).

Bodily Motion Category (Iyer)	Approximate Duration	Perceptual Category (Fraisse)	Approximate Duration
Breathing	1 to 10 Seconds	Psychological Present	2 to 8 Seconds
Walking	333 to 1000 Milliseconds	Indifference Interval and Long Duration	400 to 2000 Milliseconds
Speaking	100 to 333 Milliseconds	Short Durations	100 to 400 Milliseconds

(Lehman 19).

These striking instances of similarity highlight the intrinsic interconnectivity between the origins of our organs, modes of perception and evolutionary bodies. Therefore, music as a whole resides within this small window of time, in which our modes of biological operation play out. Exploring the thresholds of temporal consciousness and limits of perceivable identities/facets may then bring into question one's own experience of sound, sound versus music, music versus noise.

2. Musical Approach

Minimalist:

The exploration of the perceptual phenomena in this music is contingent upon the existence and observance of constants. Discrete, identifiable musical material can be succinctly established through the repetition in rhythm and pitch in tandem. This form of reiteration also functions as a method to realize a musical constant from which listener interpretation/phenomena may arise. Additionally, by subjugating rhythm and pitch to recursive models, the listener's perception of developing content may be consigned to the structural relationships of the music. Repeated metrical constructions or a 'sub-structural tala' also instantiate a constant, and the musical content's relationship to this sub-structural tala becomes increasingly evident over time. This metrical consistency elucidates the active musical time felt within which the motivic content will recurse. The minimalistic approach allows for listeners to potentially identify musical motives/ideas whether they are monophonic, polyphonic, or textural. Vicissitudes that undermine the established constants, such as a large-scale change in pitch consistency, tempo drop-off/escalation or interpolation may result in perceptual events or differentiations, which often may be expressed by a listener in the form of surprise.

Maximalist:

Through repetitive forms, a palette of musical content arises from the internal processes of the music i.e. the production of sound; the heterogeneity of techniques associated with these modes of production allows for a perpetuating set of raw material. Musical elements with moveable midpoints such as dynamics, register, and timbre subjected to the same heterogeneity may be implemented to obfuscate the musical material identities without altering the physiognomies of such content to the point of perceivable categorical separation. The maximalist elements imbued in the sonic production give rise to this subtle, but apparent perceptual occurrence, that is, listener recalibration. Despite having been presented an object in an altered state at a later point in time, the listener is still able to relate the content's identity back to its previous iteration without much conscious effort. However, consistent and building heterogeneity in the modes of production poses the ability to eventually overtake the perceivable characteristics of a musical idea and therefore strip the musical content of its previously established distinctiveness.

3. Musical Content

Note to the performers:

"Due to the 'saturated' nature of the music, it is not imperative that performers perfect every last detail; instead, the attempt is paramount. As long as the music is performed in time with the fluctuating tempi and with the intention of altering the identity of the material in so far that the musical ideas remain recognizable, but perceptibly altered by one or more of the many notated timbral, dynamic, registral modifications, the effect of the music will be the same.

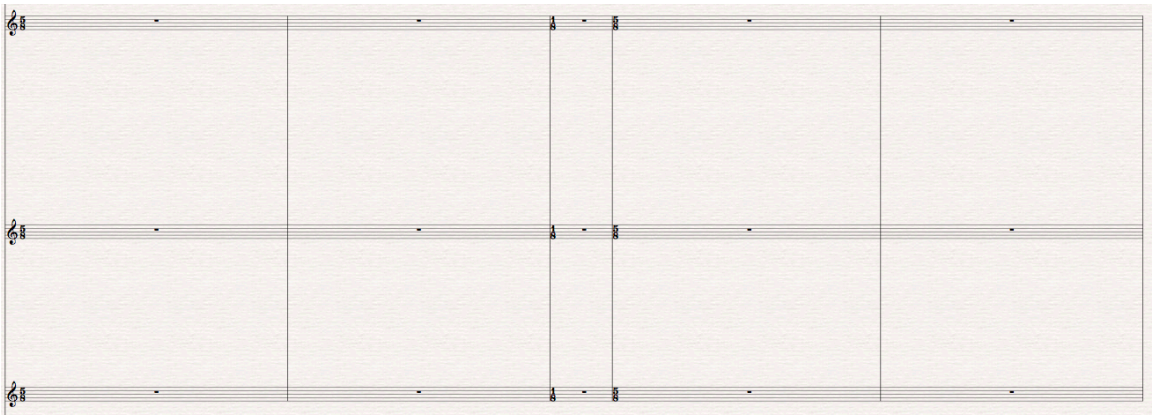
The music is divided into three separate ensembles, which are as follows:

- Vibraphone, Piano, Electric Bass
- Violin I, Violin II, Viola, Violoncello
- Alto Flute, Tenor Saxophone, Electric Guitar

The music of each ensemble is designed to be performed together, but may be performed separately."

Despite the minimalistic approach in the material of the music, the musical ideas themselves contain a degree of complexity and nuance. Each of the ensembles operates within a pre-defined unit of measures that function as a 'cell'. This 'metrical cell' contains 21 eighth note beats in its prime form, but is subject to subtle alterations. The consistent iterations of the 21 eighth beats thus become a 'sub-structural tala', whether felt by the listeners or musicians it is a defining axis for the material.

Figure 1.1 Metrical cell of 21 eighth beats



Each of the ensembles pitch content is derived from the same matrix, which imposes that the ensemble utilizes all 12 chromatic tones wherein the notes in one hexachord are repeatable content and the notes within the other hexachord do not repeat. Generally, this model is the framework in which the pitch schema is based; however, the construct is applied differently within each ensemble. In the first ensemble (vibraphone, piano, and electric bass) the matrix is applied within the frame of the metrical cell with relative consistency. However, the electric bass is anomalous in this respect, as it contains it's own 12-tone row without regard to the hexachordal model.

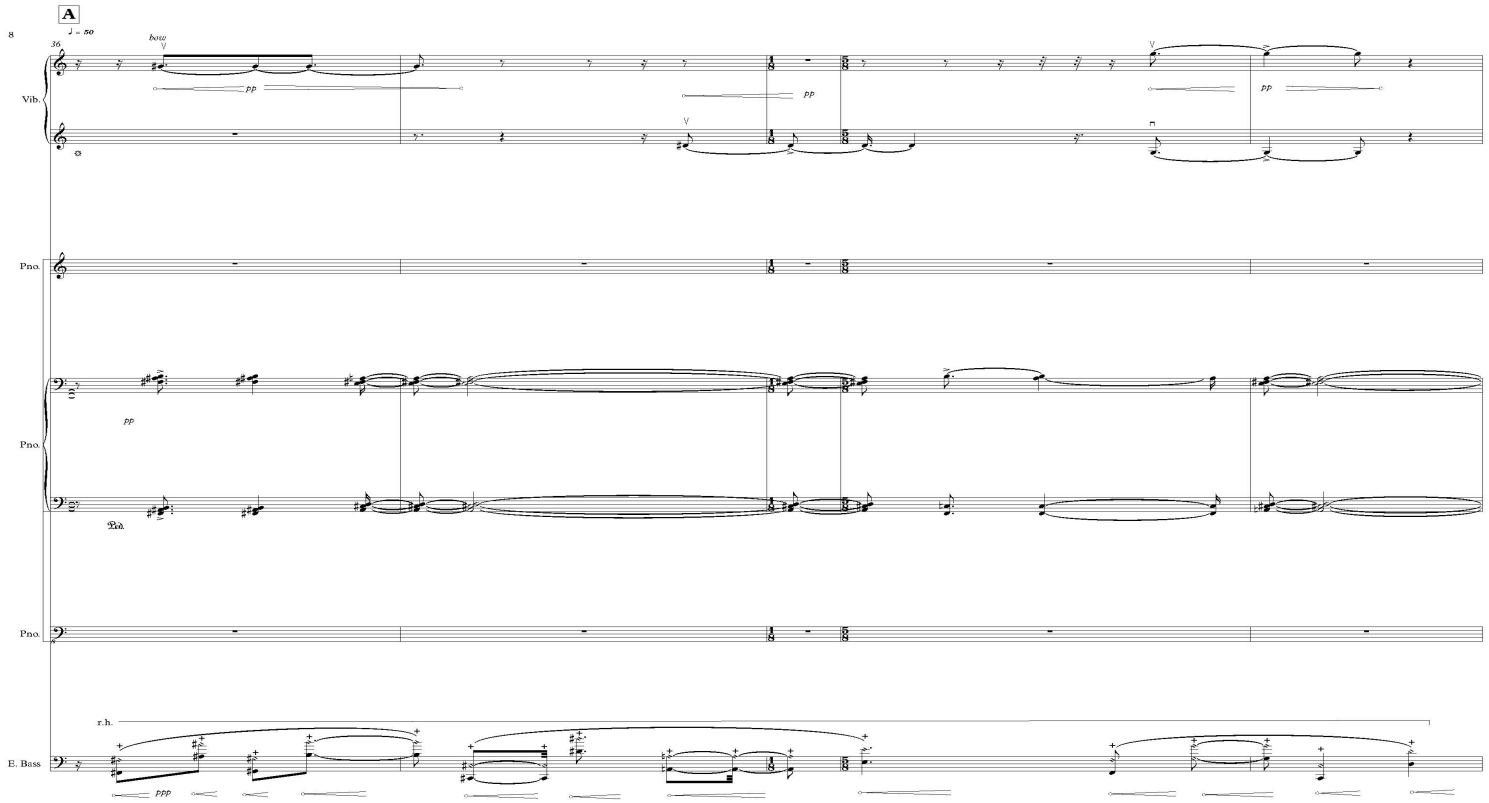
The repeatable hexachord notes in the piano and vibraphone include:

F# B A C# D E

And the non-repeating hexachord notes include:

A# G# D# F C G

Figure 2.1 Hexachordal model implementation in the first ensemble



For the string quartet ensemble, the matrix is applied to the base material, which is then rhythmically augmented and dispersed throughout the piece. However, the base material does occur in its prime form at the midpoint in Section 1 of the piece, sans violin I; otherwise, the quartet operates as a unit with regard to the 12-tone hexachordal model. The A, B, and C divisions within Figure 2.2 indicate where the material is cut for its dispersion.

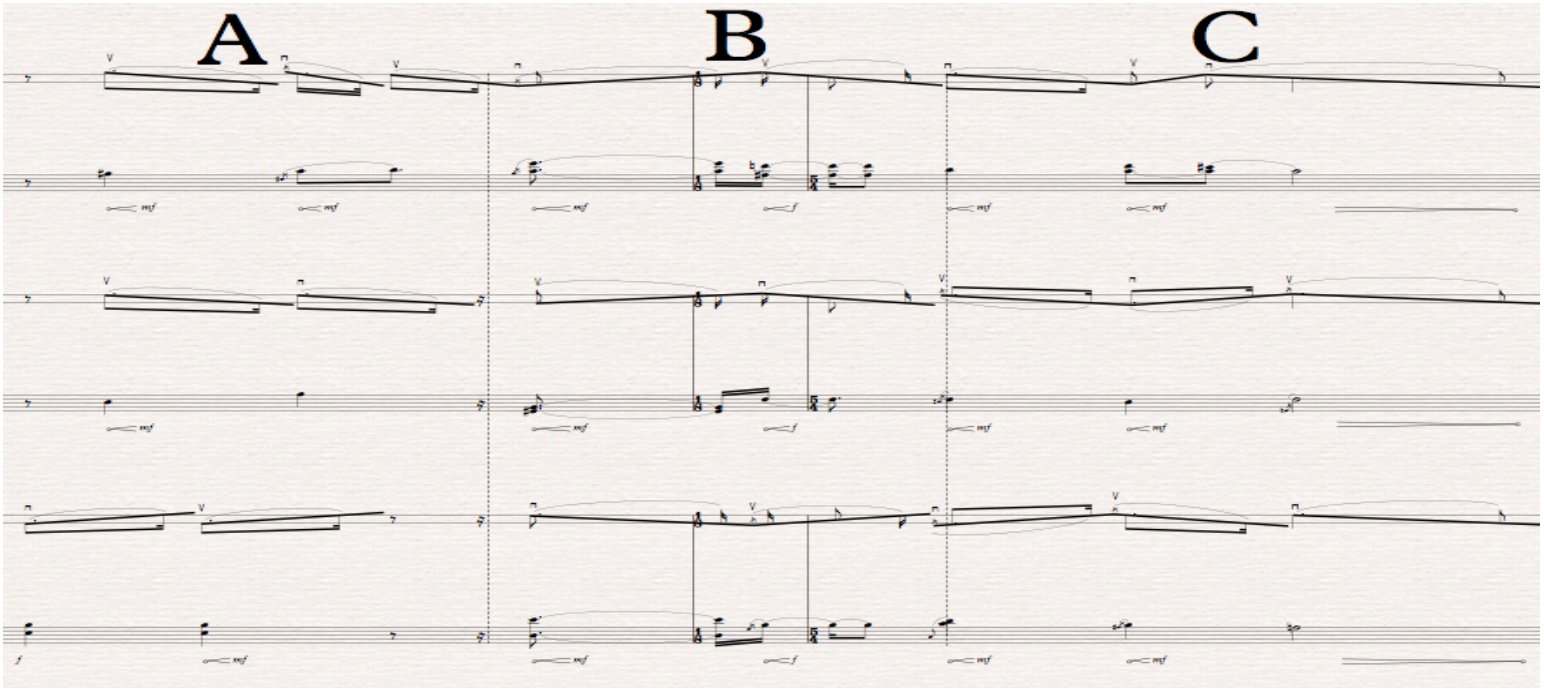
The repeatable hexachord notes include:

B D# D F# A E

The non-repeating hexachord notes include:

G# G C A# C# F

Figure 2.2 Hexachordal model implementation and divisions in the string quartet



The trio ensemble comprised of alto flute, tenor saxophone, and electric guitar utilize the hexachordal model within a large form structure of the piece. Each instrument contains a rhythmic motive and is assigned three pitches. The base pitch series is defined by an interval of a minor third, followed by a major second. The pitch class starts on G# in the electric guitar, B in the alto flute, and C# in the tenor saxophone. It is also transformed in each instrument so that the pitch series becomes defined by an interval of a major second, followed by a minor third. The resulting pitch class for the instruments thus becomes:

Electric Guitar: G# B C# / (transformed) Bb C Eb

Alto Flute: B D E / (transformed) G A C

Tenor Saxophone: C# E F# / (transformed) F G Bb

Therefore, the repeatable hexachord notes derived from the above are:

B C# E C Bb G

The non-repeating hexachord notes include:

G# D F# Eb A F

Figure 2.3 guitar motive

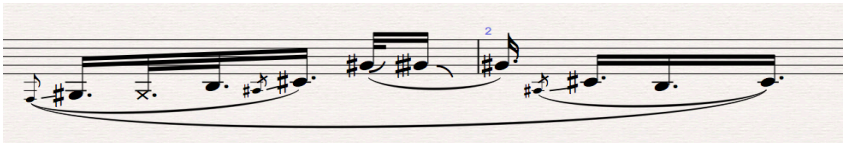


Figure 2.3a guitar motive transformed

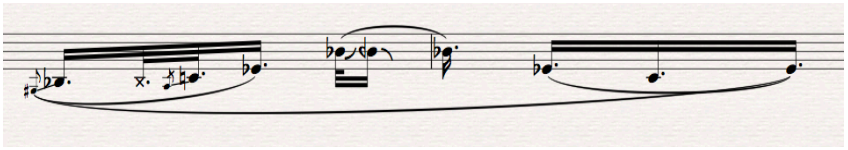


Figure 2.4 alto flute motive

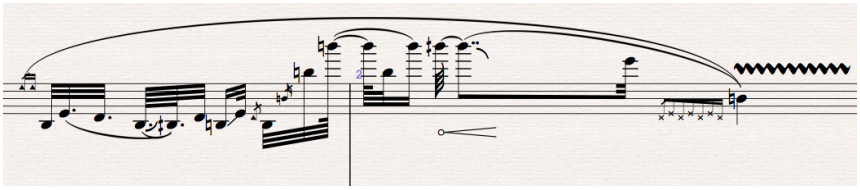


Figure 2.4a alto flute motive transformed

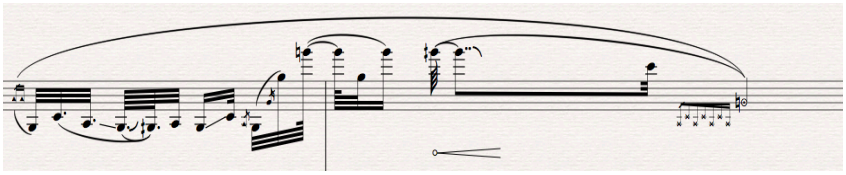


Figure 2.5 tenor saxophone motive

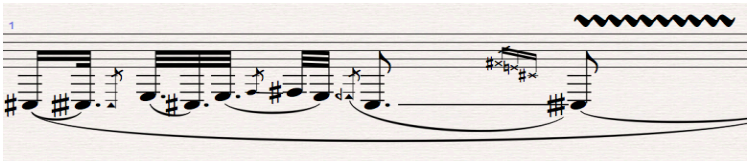
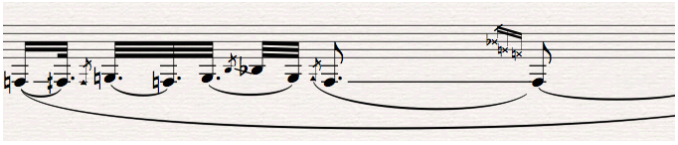


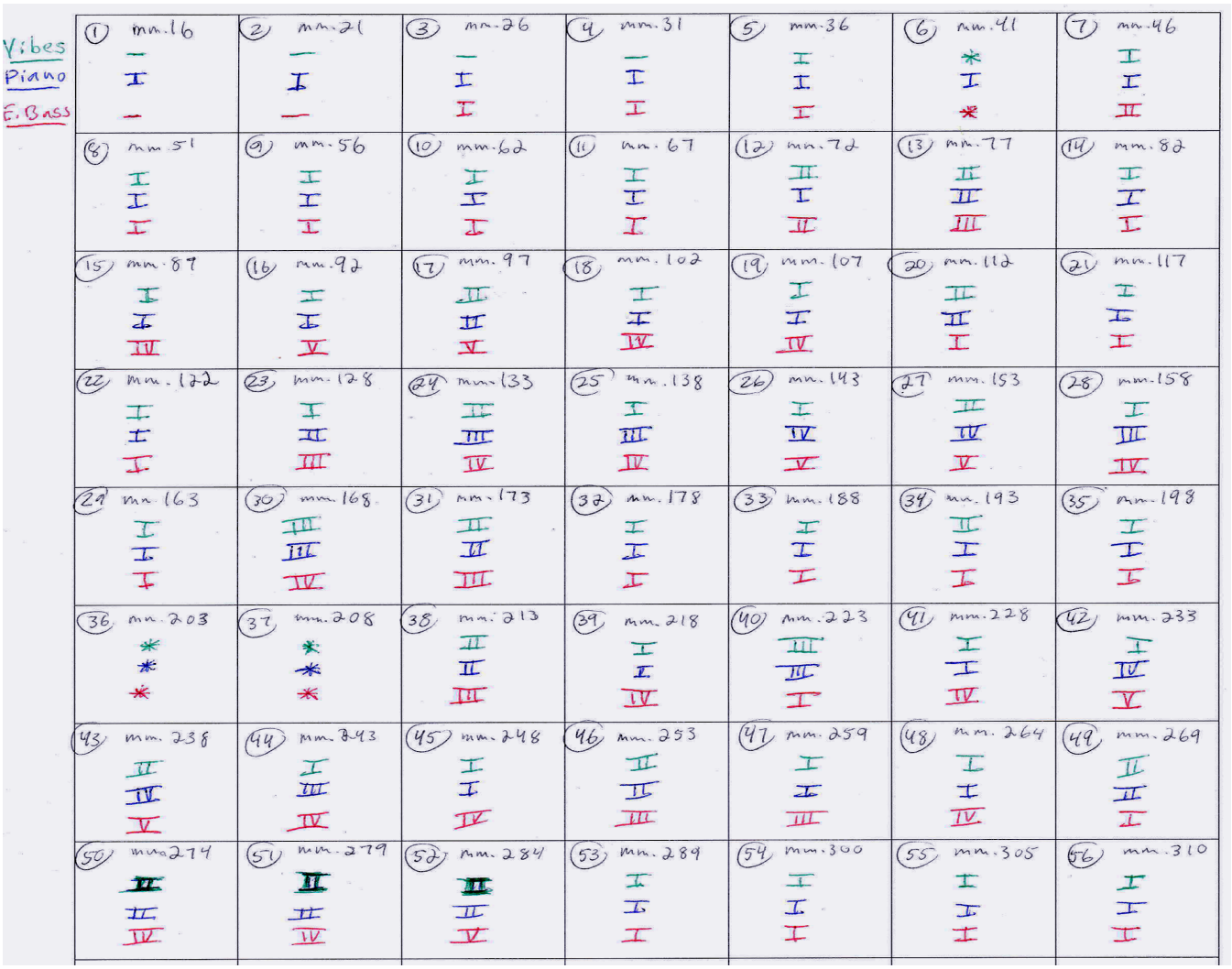
Figure 2.5a tenor saxophone motive transformed



The pitch content of each ensemble resides in between the traditional 12-tone technique and extended tonal harmony (as per the repeated notes of the hexachord); therefore, the material enters a liminal state of perceivable or expected momentum. Essentially, the musical materials take on a static-like disposition, which is further warranted due to the necessity for the listener to perceive the discrete musical ideas. In this way, the complexity of the content disallows further transposition or rhythmic alterations. The modes of production and embellishment to rhythms and pitches in each ensemble do however contain an inherent degree of variability, which is applied in a through-composed manner for each ensemble. The charts presented within the figures below outline these variations for Section 1 of 2 in *kyi*.

For the vibraphone, piano, and electric bass ensemble each instrument has a finite number of ascribed variables, whether it be textural, rhythmic augmentation or otherwise. The variations are employed in a block-like fashion wherein the variation commences at the beginning of the cell and ends with the same cell's conclusion. Again, the latter is also true for the pitch content in this ensemble. Levels of variation are referred to with successive Roman numerals in Figure 3.1. There exists a degree of self-contained variation within a single roman numeral, however, a change in Roman numeral constitutes a perceptible alteration to the material that serves to differentiate the identity, but not undermine its basic characteristics. The higher the Roman numeral the further it is removed from the prime form. The vibraphone contains three levels of variability, the piano contains four levels, and the electric bass makes use of five levels. Figure 3.1 outlines the applied variations; the dashes indicate silence, while the asterisks denote a solely textural employment of the instrument. All instruments occur in their most prime form together at mm. 36 and the overall tendency of the ensemble is to gravitate back towards this base content, which is Roman numeral 'I'. The variations were all composed prior to implementation.

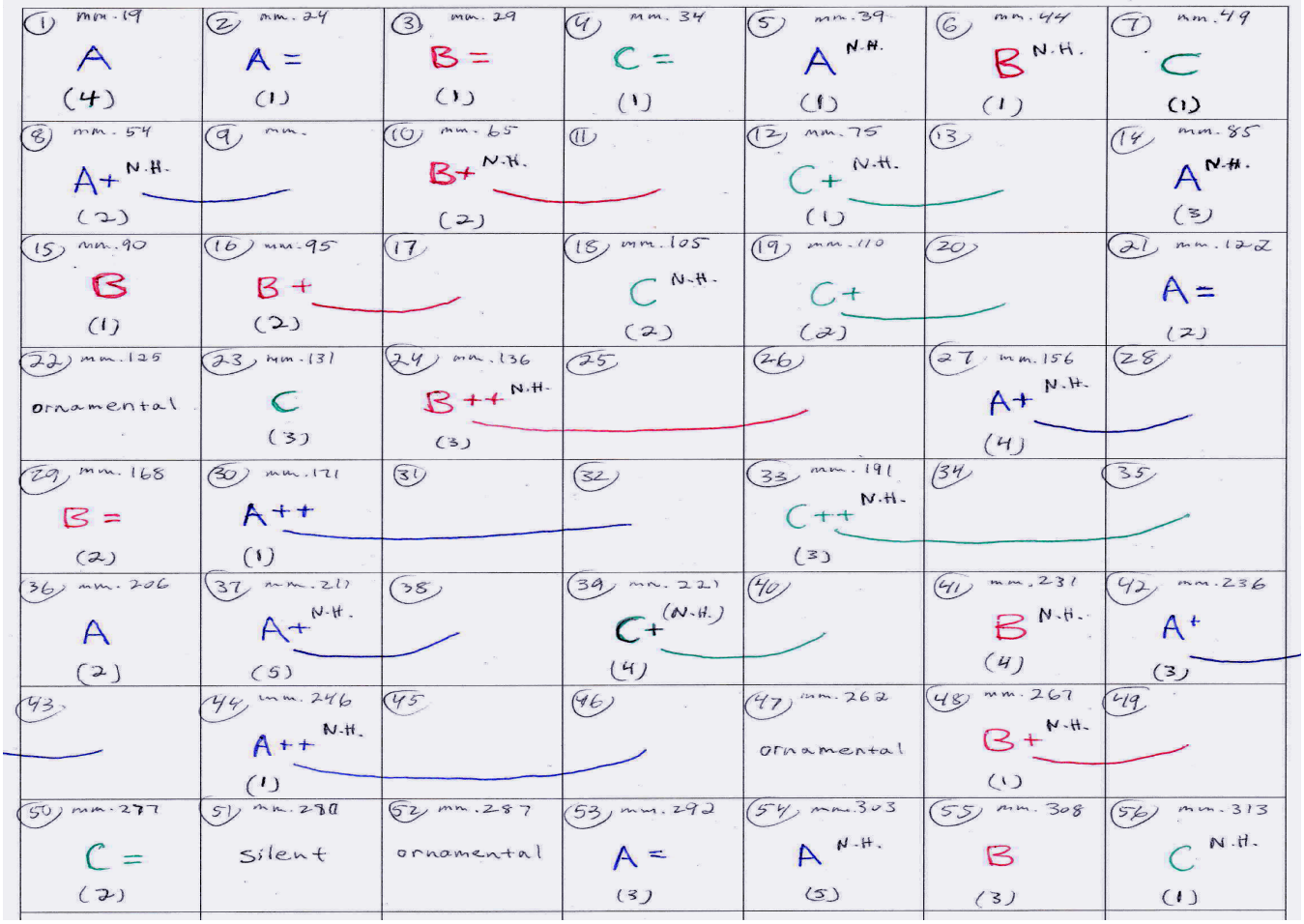
Figure 3.1 Vibraphone, Piano, and Electric Bass



The string quartet is composed of variations of the divisions within the base material previously presented in Figure 2.2. The content is subjected to rhythmic augmentation, registral alteration or the imposed natural harmonic spectrum (as denoted by 'N.H.' in Figure 3.2 below). The natural harmonic series is derived from the pitches A2, C#3, D3, E3, and F#3, which make up a sonority the piano continually returns to. The content is also treated with various timbral and 'sub-rhythmical' adjustments generated by specified movements/placements of the bow'. These alterations are loosely tied to each line of the base material and move in tandem as the musical lines of the polyphonic structure change instruments. This trade-off also results in the registral variation and is signified by the parenthesized number within each cell of Figure 3.2 (1, being the form presented in the base material, and each successive number indicates the movement of the lines upwards in the registral mapping of the string

quartet [note: the violin I line moves down into the cello]). The measure numbers for the cells of the string quartet differ from that of the other two ensembles due to the fact that this ensemble is continually offset from the initial cell structure. In the figure below, an '=' denotes an iteration of the material sans the normative rhythmic/timbral fluctuations in bowing; while a '+' signifies a rhythmic augmentation doubling the initial material and a '++' signifies a rhythmic augmentation of 2.5 times the material's original value. Note that the letters 'A', 'B', and 'C' relate back to Figure 2. 2

Figure 3.2 String Quartet



As mentioned previously, the alto flute, tenor saxophone, and electric guitar ensemble is comprised of 3 discrete rhythmic and pitch oriented motives assigned to each instrument. The instruments adopt the motivic material of other parts, but continuously move towards (or back towards) their assigned content. At the same time, the ensemble gradually cycles through unison statements of each instrument's base content. In Figure 3.3 'A' denotes the rhythmic motive of the electric guitar, 'B', the alto flute, and 'C', the tenor saxophone. Ascribed pitch content is noted in parenthesis beside each instruments rhythmic

assignment. Additionally, it should be noted that due to the diminuted rhythms of the ensemble, the motives occur more than once within the frame of the cell. However, the tempo of the 'master cell' or metrical cell changes quite often, and in defiance of these temporal changes the rhythmic motives of the ensemble adjust according to the tempo change in order to be perceived as not having changed. Therefore, this results in a modification to the number of repetitions of the motivic content within the metrical cell.

Figure 3.3 Alto Flute, Tenor Saxophone, Electric Guitar

Figure 3.3a example adjusted guitar motive rhythm example

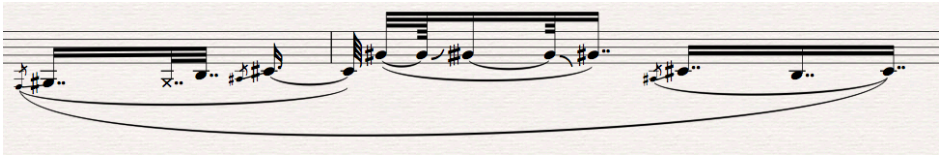


Figure 3.3b example adjusted alto flute motive rhythm example

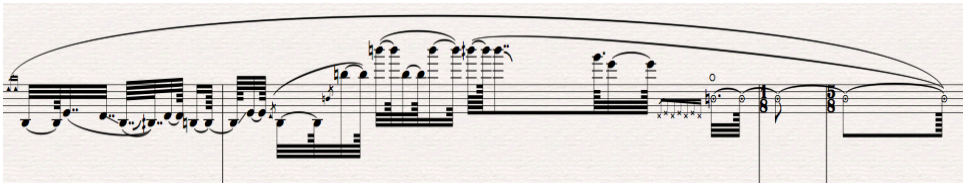
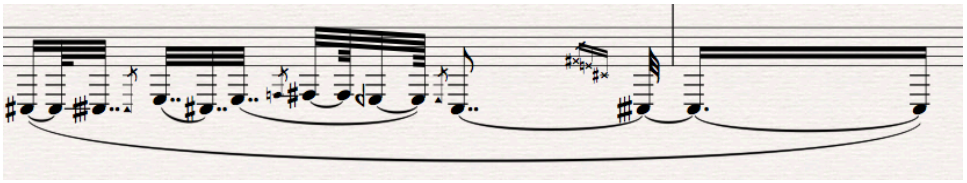


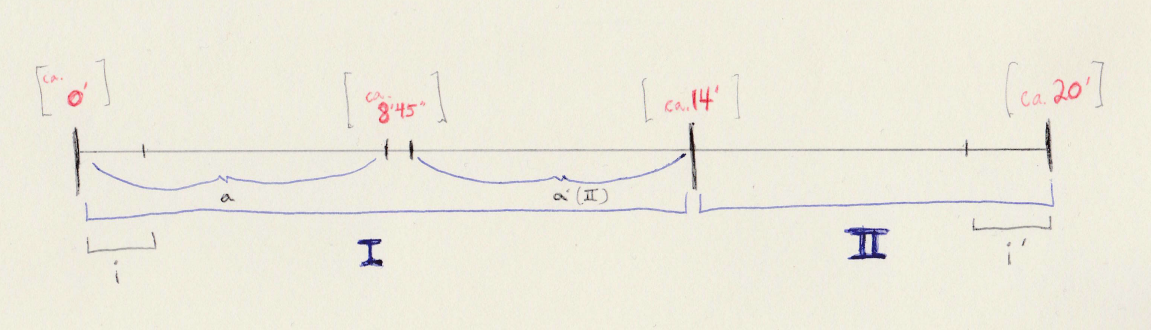
Figure 3.3c example adjusted tenor saxophone rhythm example



The initial composition of the base rhythmic and pitch content of the piece is derived from a series of improvisations. Prevalent material from long-form improvisations was transcribed and treated with the devised hexachordal model. The improvisations took place on either the piano or guitar; in total six different improvisational ideas were incorporated into this music. The resulting content is embodied by the vibraphone and piano (1), electric bass (2), string quartet (3), alto flute (4), tenor saxophone (5), and electric guitar (6); the latter three improvisations were merged into one hexachordal model. This method allows for the musical identities to maintain an innate inimitable quality whilst sharing a common environment.

4. Structural Elements

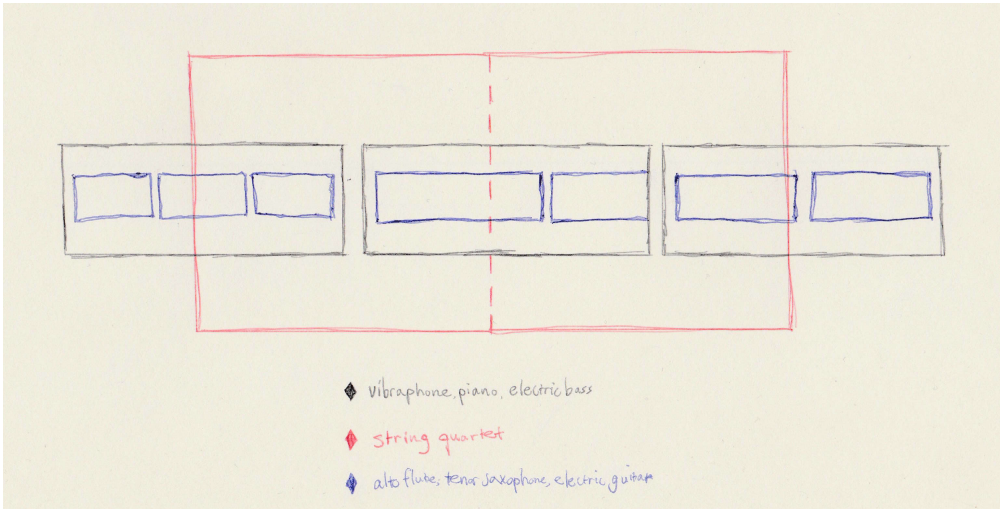
Figure 4.1 Overarching structure of *kyi*



kyi's large form structure consists of two main sections, the first of which commences in bar 16 following the 'invocation' by the piano, wherein a series of harmonics on the D-Major7(9) notes are introduced. Section 1 is further divided up into two portions and contains an identifiable midpoint where the string quartet presents its base material, solo. In its entirety, Section 1 encompasses the first 7/10ths of the piece.

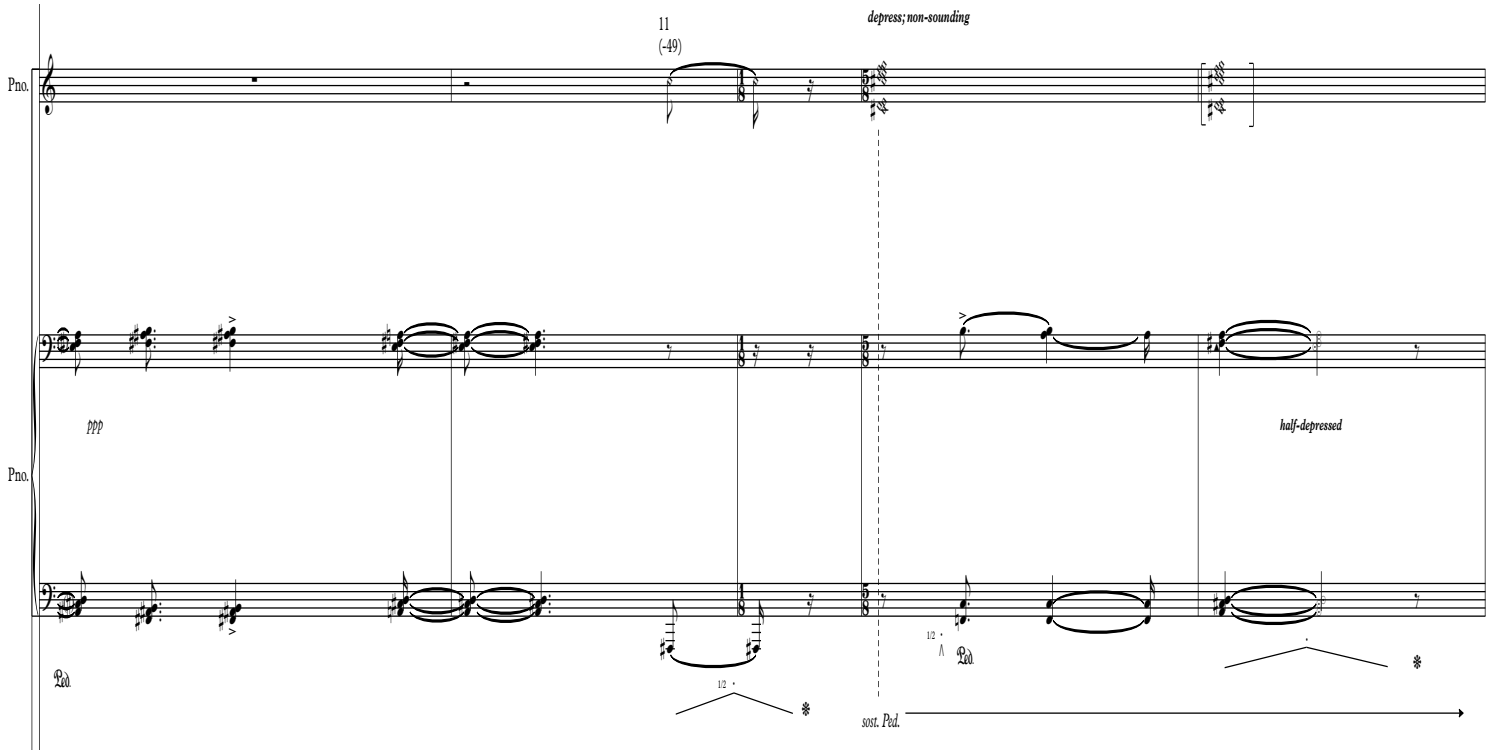
Figure 4.2 outlines each musical ensemble's relationship to the metrical cell in Section 1 of the music. The vibraphone, piano and electric bass ensemble have a consistent 1:1 relationship with the metrical cell, thus no graphic for the cell is provided. Moreover, the figure includes general transformations of the space, which an ensemble's content occupies. While there exists an extended degree of nuance to these alterations, the figure strives to communicate the overall trends of the material for the string quartet ensemble as well as for the alto flute, tenor saxophone, electric guitar ensemble.

Figure 4.2



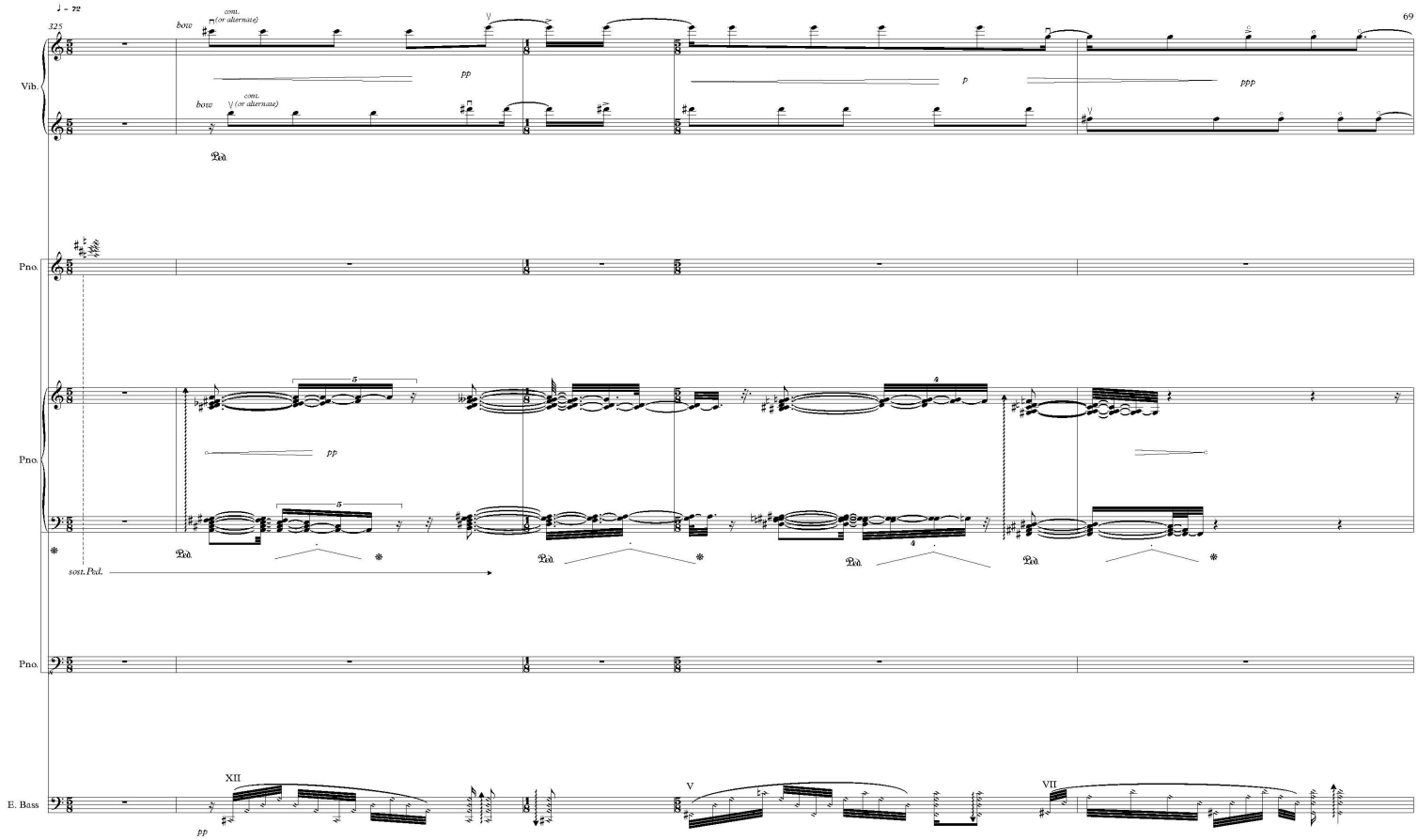
Despite the fact that Section 2 occupies a smaller portion of linear time in the music, it exhibits a continual presence. Halfway through Section 1, the material of Section 2 gradually begins to arise out of Section 1, and only clearly perceptually becomes a new section for the last 3/10ths of the music. Throughout the first half of Section 1 various ornamental and unfamiliar material are subtly injected into the apparent textures and motivic units. For example, Figure 5.1 highlights the piano content in the sostenuto pedal, which appears outside of the expected register and serves to alter the decay spectrum of the repeated sonorities.

Figure 5.1



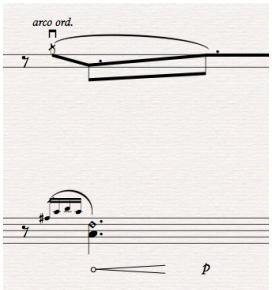
Only in the second half of Section 1 does the interpolating material become the substrate of that which comprises Section 2. The ensemble's presentation of material in Section 2 is stripped of all previous relationships to the metrical cell, which itself continues mostly unaltered. The musical material in Section 2 is also a significant departure from the musical content within Section 1; this can be seen in the vibraphone, piano, and electric bass ensemble's first statement of Section 2 in Figure 5.1a.

Figure 5.1a first measures of Section 2 for the vibraphone, piano, and electric bass



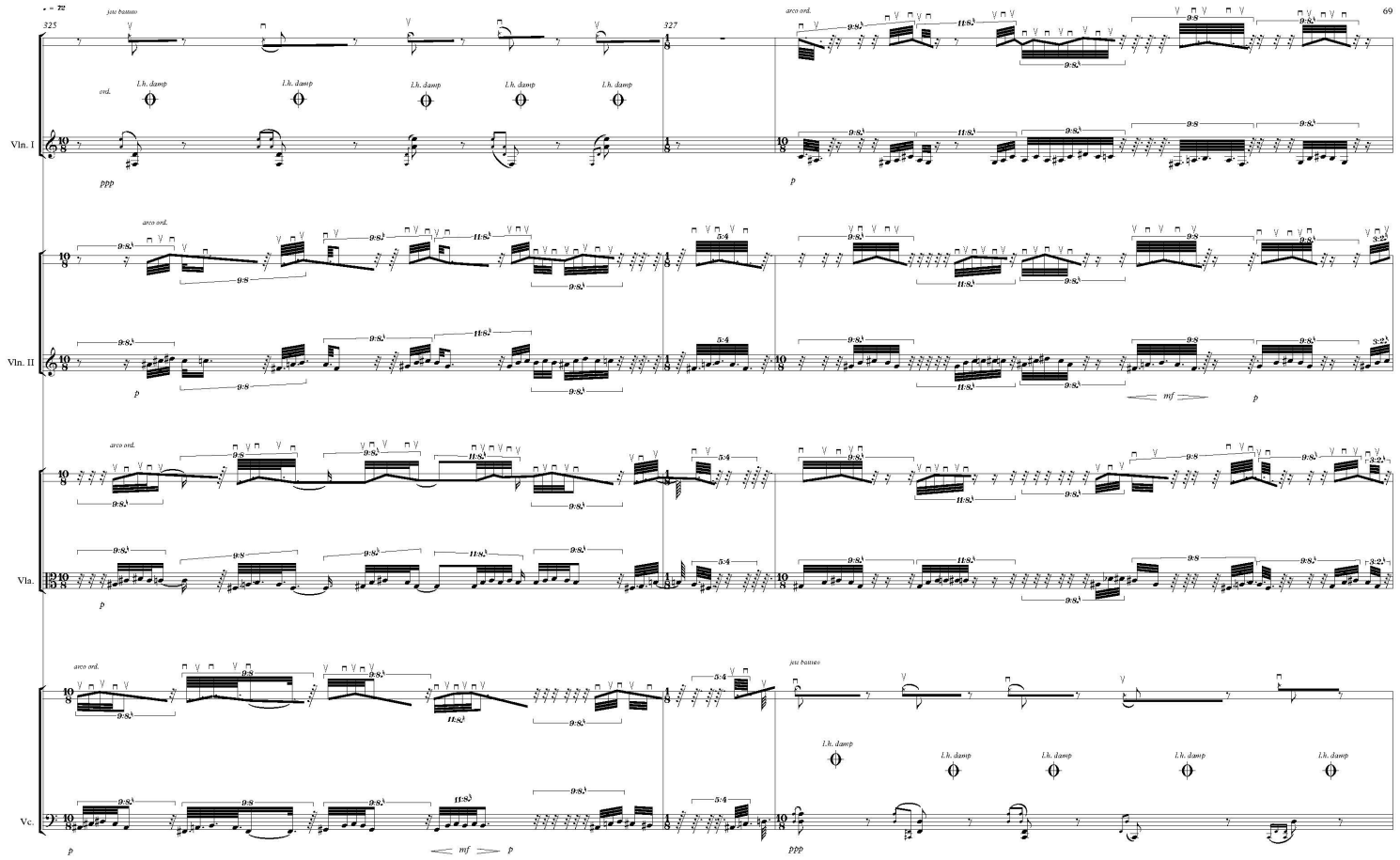
Likewise, in the strings, the content of Section 2 begins to appear mainly in the form of ornament-like interpolations. Often this new material is registrally displaced to a higher octave and performed rapidly as grace notes with a sharp return to the initial texture of string harmonics as outlined in the figure below.

Figure 5.2



In Section 2 the strings adopt these interpolations as base content.

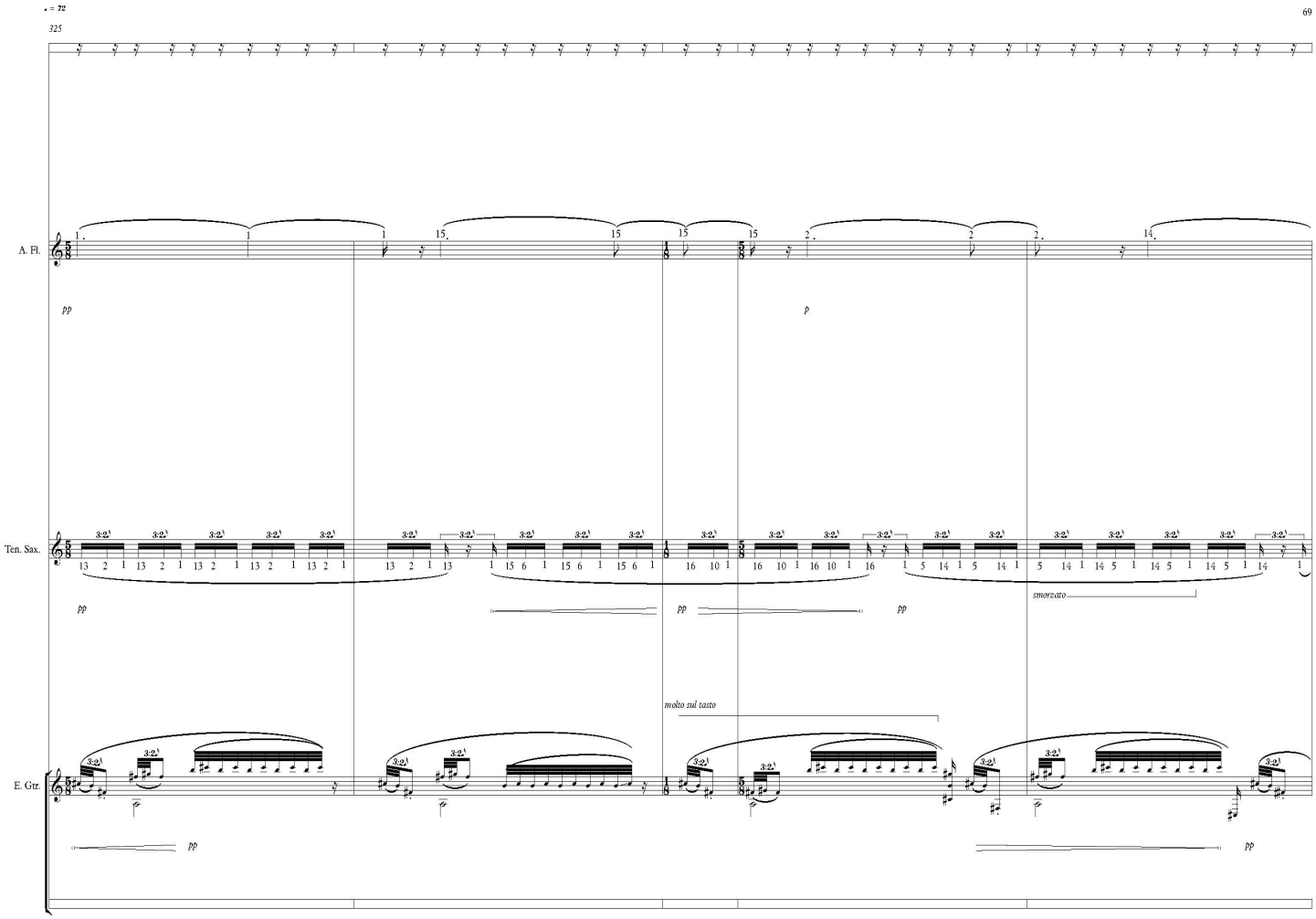
Figure 5.2a first measures of Section 2 for the string quartet



Due to the complex nature of the base material in the alto flute, tenor saxophone, and electric guitar ensemble, there is no instance wherein the motivic repetitions divide evenly within a metrical cell. Therefore, the initial content of these parts includes negative space, which should be noted is written out as silence in the base construction. The negative space is included in order to incorporate only complete iterations of motivic content for each instrument's base material, and is also subjected to the rhythmic adjustments imposed by the alternating tempi. Within this negative space, an instrument will frequently state fragments of its coupled content in an effort to return to such material; this is however only in the case when the instrument is not already engaged with its paired content. When performing with the coupled motive, fragments of the arising content comprising Section 2 may be presented in the negative

space. Gradually, the musical ideas within these spaces evolve more clearly into the material comprising Section 2.

Figure 5.3 Section 2 of the alto flute, tenor saxophone, and electric guitar ensemble
(numbers refer to specified fingerings outlined in the score's introduction/notes)



The saturation of musical ideas in terms of increased pace of articulation and lack of negative space within Section 2 form a musical environment wherein the perceivable export crosses the threshold of motivically comprehended music, and becomes a textural landscape. On the other hand, within Section 1 of the piece, the perceivable result resides in a liminal space of realizing motivic relationships and experiencing an unstable texture.

5. Perceptual Events

In conjunction with this idea of perceptual liminality between distinguishable musical identities and textural composition, Section 1 of the music explores an array of perceptual phenomena in the listening experience. Through repetition, the degree of 'pre-audibility' for the listener becomes a relatively constant satiated expectation. This results in a composition that is engaged with Gerard Grisey's 'perceptible time', as opposed to chronometric time, and the composition's material becomes the variance in the degree of predictability (258). This pre-audibility is essentially what Husserl calls a protention. Grisey, however, adds that when pre-audibility is obfuscated by any substantial change in the music, listener protentions are disrupted by the interpolation of a newly established present 'now'.

The metrical cell is subjected to frequent alteration in tempo. There are 4 main tempi that regulate the elapsed time for one iteration of the metrical cell. The chronometric time of each cell explores the upper boundaries and space between Fraisse's perceptual present and James' specious present.

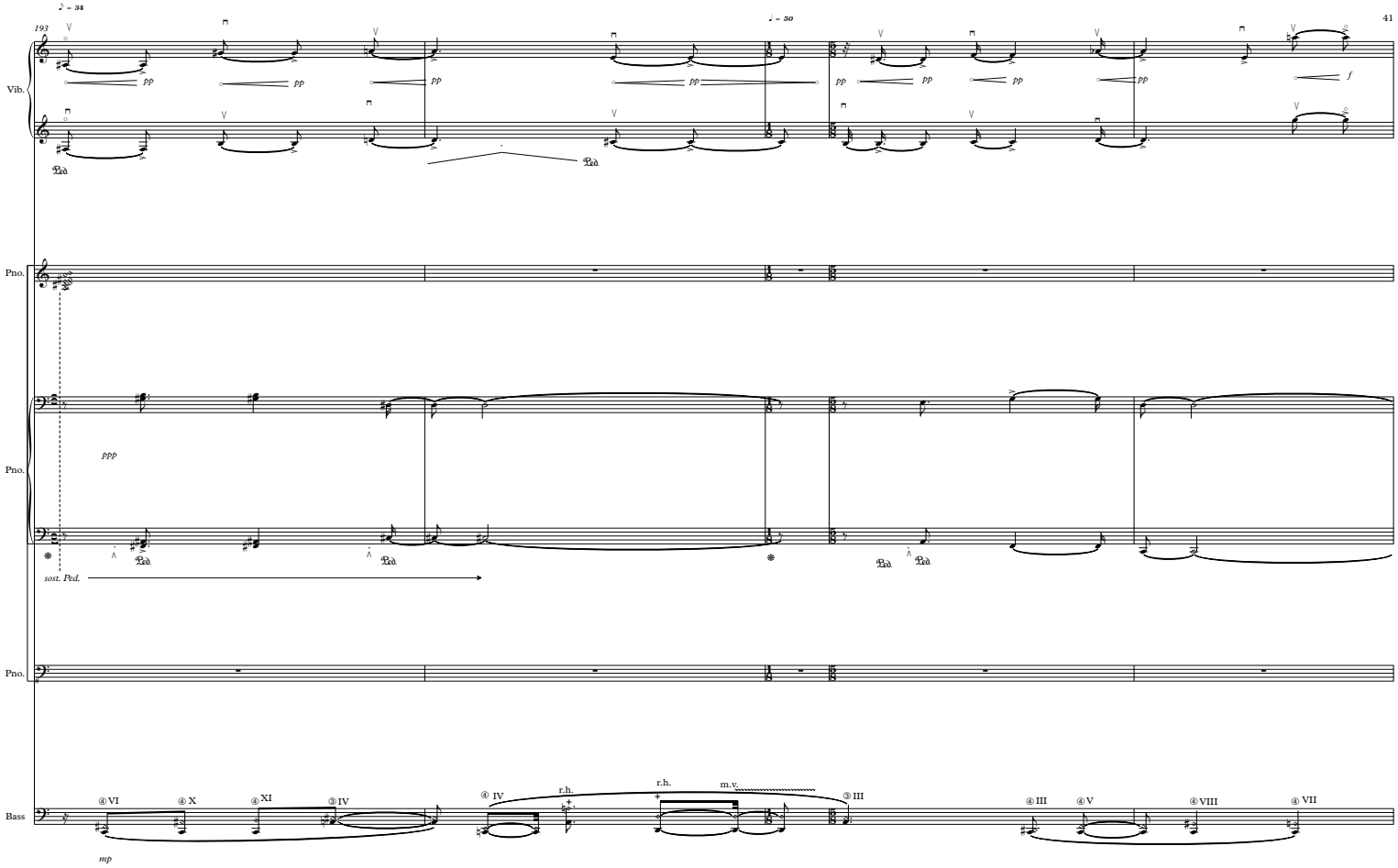
Quarter note = 50: ca. 13"
Quarter note = 65: ca. 9"
Quarter note = 72: ca. 8.6"
Quarter note = 80: ca. 7.5"

Tempo 65 is utilized most consistently; second to it is tempo 72, followed by tempo 80. The alternation between these three tempi, which range a mere 1.5 second difference function as deviations just above the just noticeable difference. Tempo 50 functions as a definitively perceived change that serves to affirm listener suspicions that the elapsed time of the metrical cell may be in flux. This tempo occurs to the most infrequently out of the 4, acting as a reminder for the listener.

The total number of tempo changes versus the total number of metrical cells is in a ratio of approximately 5:7, respectively. In this way, a perceivable norm of an unchanging tempo is established, and the listener may construe divergence from that norm. Additionally, due to the numerical proximity of the ratio, tempi flux becomes yet another normative plane from which perceptual events can arise.
The music begins in a radically slower tempo than that of the aforementioned alternating 4, specifically eighth note = 33. Here, the time distance intervals of notes at this tempo in the music regularly reside at or below the threshold of accessible subjective rhythmitization as well as outside the realm of the perceptual present.

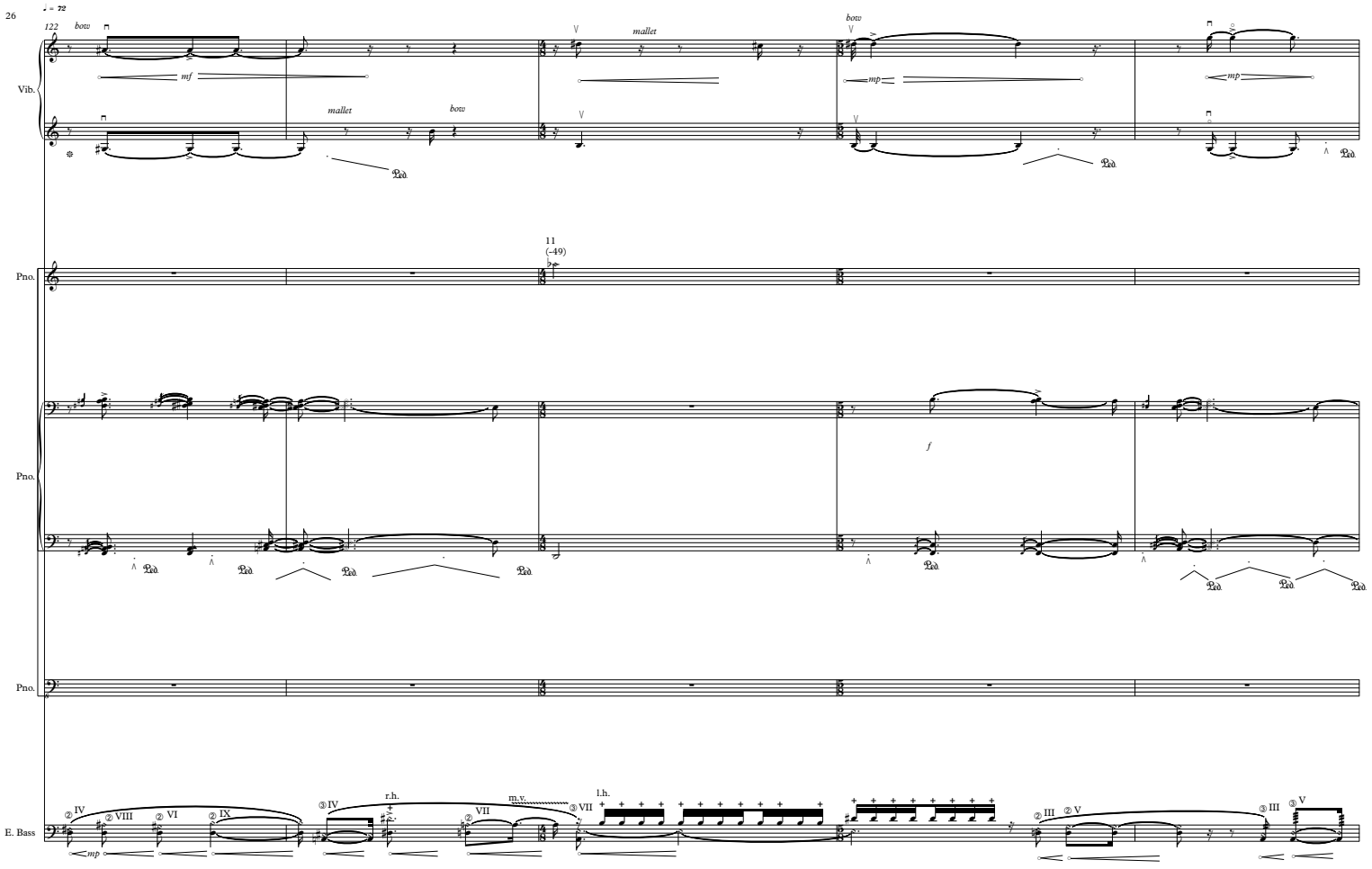
Within Section 1 of *kyi*, the tempo does revert back to this nebulous state of rhythmic perception present in the grave invocation, but only twice and only for half of a metrical cell each time. In the first occurrence, the tempo drops to quarter note = 33, which is at or below the threshold of subjective rhythmitization for most ensemble parts. In the second half of Section 1, the tempo drops to eighth note = 34 wherein most instrument's rhythmic content now falls outside of the perceptual present. These two perceptual events are further deviations from the normative plane of just noticeable tempi fluctuations.

Figure 6.1 Tempo modulation to the limits of the perceptual present in the vibraphone, piano, and electric bass



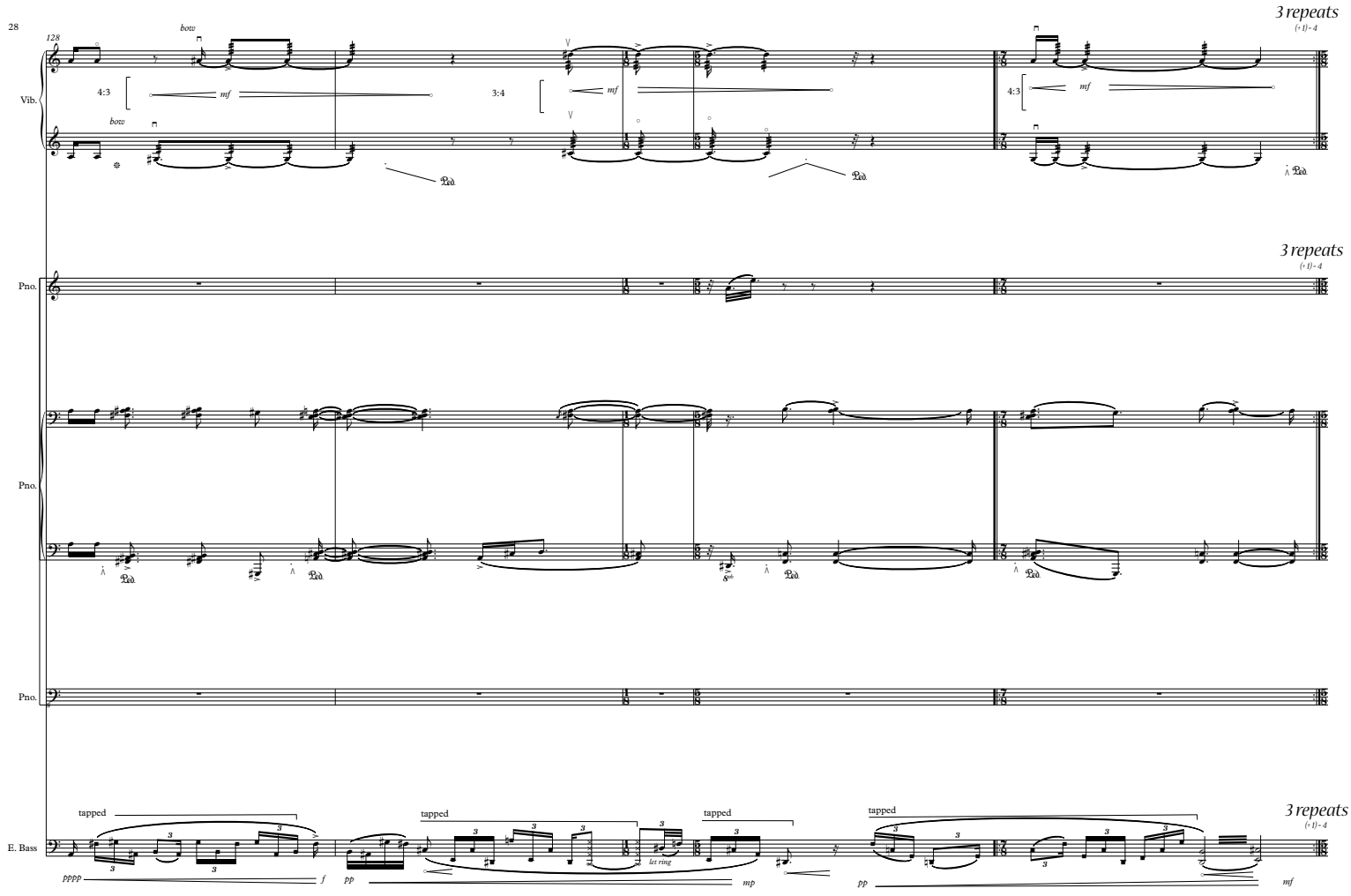
In tandem with the tempi alterations that distort the identity of the metrical cell below the threshold of extinguishing its basic identity, meter modulations to the midpoint of the metrical cell also function as a similar perceptual event. These modulations are implemented via expansions to the 1/8 bar, which functions as the midpoint of the metrical cell. In total there are eight meter modulations to the metrical cell in Section 1, which include five transformations of a 1/8 bar into a 4/8 bar and three transformations into 6/8 bar.

Figure 6.2 meter modulation; 1/8 bar expanded into a 4/8 bar



Meter modulations also occur at the ends of metrical cells, but are always accompanied by a repetition of a single bar. The 5/8 bar is expanded into a 7/8 bar; therefore, the elapsed time alteration is greater than any previous modulations. However, due to the fact that this bar of 7/8 repeats verbatim, the perceptual result is not a perceived expansion of the metrical cell, but instead a glitch within it. There are four total instances of these types of perceivable glitches, two of which make use of a single repeat. In one instance, the bar is looped an additional time resulting in three total iterations, and in another occurrence the repeat yields four total iterations.

Figure 6.3 meter modulation and single bar repetition resulting in 4 total iterations



This type of perceptual phenomena, creates what Grisey terms “an unexpected acoustic jolt”. The linear unfolding of time is disrupted and the perceiver’s mode of listening departs from ‘temporal perception’ and enters into ‘auditory perception’. Much like the effect of the radical tempi alterations this shift in the mode of listening can be accounted for by the disappearance of pre-audibility. Grisey’s model

for this concept of perception states, that "the acuity of auditory perception is inversely proportional to that of temporal perception." (259). In the music of *kyi*, repetition functions as the vehicle, which gives rise to the temporal perception. The departures from the temporal perception into the auditory perceptive domain result in 'perceptual events' for the listener. By composing these moments in a ratio that greatly favors pre-audibility, as well as employing a diversity of methods to achieve the same result, a listener can then potentially ascertain the structural functions of these moments. As a general rule, methods of achieving this shift in perception for the listener must not exceed a chronometric length beyond the limit of the perceptual present, that is, approximately 6 seconds. This would disallow the listener to experience the difference as a departure so that once the normative content returns no action of memory as it relates to the perceptual present is required to recall the music before the interpolation.

Fermatas are utilized at the beginnings or ends of metrical cells to be differentiated from any meter expansions. However, similar to single bar repetitions, fermatas become a glitch, but here the sound 'freezes' instead of 'skipping' as in the former. By employing a fermata on either the first note or last note of a metrical cell, the content, which follows will be perceivable as a largely unchanged re-statement or continued repetition. In *kyi*, a fermata though does not lend itself to development for several reasons, but especially insofar as it must be contained within the perceptual present domain.

On the other hand, additional musical material inserted in between metrical cells allows for large form structural development. In the preceding examples of acoustical jolts, all instruments of each ensemble are subjected to the same compositional technique in order to maintain their linear relationships. Conversely, interpolations of new material occupying a length of time or bar of music outside of the metrical cell create a palette for variation. However, the material occupying this new space must be characteristically differentiable from any and all other musical material. Successive unisons on a single note provide a veritable departure, yet also maintain a discernible identity in its own right. These interpolations can be developed through a gradually emerging rhythmic and pitch unison amongst all ensemble members. The first unison appears in the vibraphone, piano, and electric bass (Figure 6.4). Since the characteristics of this interpolation are clearly beyond the scope of expectation, any other ensemble content can continue to propagate simultaneously. Musical examples of the preliminary and ultimate unison development are provided in the figures below.

(on the proceeding two pages)

Figure 6.4 the first unison in the vibraphone, piano and electric bass

Figure 6.5 the last unison where all instruments have adopted the general pattern

B

♩ = 65

61

Vib.

bow ⊓ cont.

pp

pppp

bow ⊓ cont.

Pno.

[alternate left/right hand]

mp

pp

Pno.

Pno.

E. Bass

p

ppp

13

B

♩ = 65

61

flaut.

ricochet

ricochet col legno

Vln. I

l.h. 1/2 pressed

ord.

(+2)

II

l.h.

ppp

'mf'

pp

ppp

ricochet col legno

jete battuto

l.h. damp

Vln. II

l.h. 1/2 pressed

II, III

l.h.

ppp

'mf'

ppp

ricochet

jete battuto

col legno ricochet

Vla.

(+2)

III

l.h.

pp

ppp

flaut.

ricochet

col legno ricochet

Vc.

l.h. 1/2 pressed

ord.

(+2)

II

l.h.

pp

ppp

13

B

♩ = 65

61

A. Fl.

mp

ppp

Ten. Sax.

mp

ppp

E. Gtr.

mp

pp

62

L

294

bow ⊓ cont.

Vib.

pp

bow ⊓ cont.

pppp

Pno.

Pno.

p

ppp

Pno.

E. Bass

mf

p

62

L

294

jete

ord.

Vln. I

col legno tratto

ord.

Vln. II

1/2 col legno tratto

Vla.

jete

ord.

Vc.

62

L

294

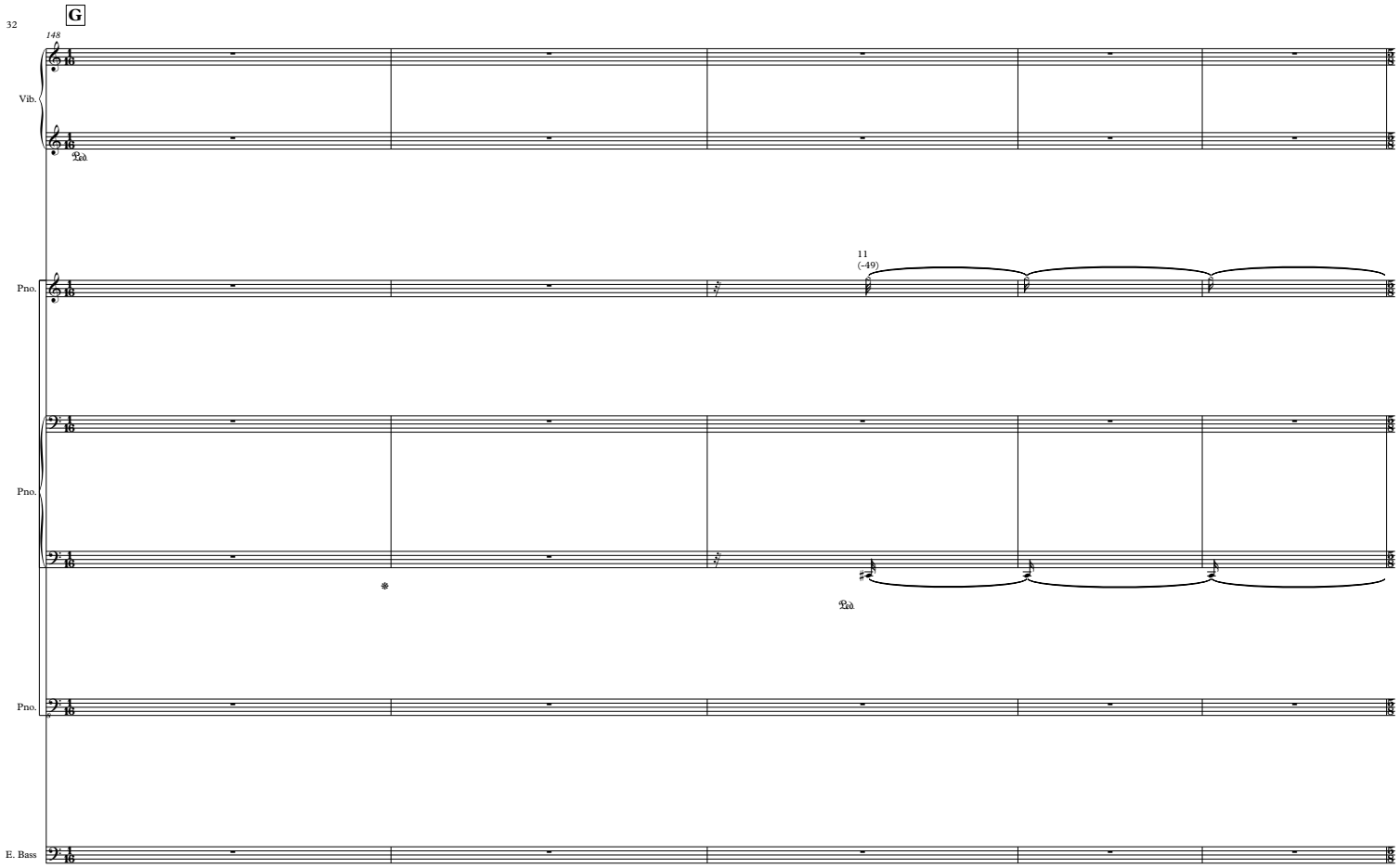
A. Fl.

Ten. Sax.

E. Gtr.

The most distinguishable acoustical jolt in the context of this music is an interpolation of full ensemble silence. The five bars of one-sixteen are meant to have the effect of a rushed silence. In this way, silence functions simultaneously as a glitch and a more prominent structural event. It is inserted only twice in the music and may be significant in the structural comprehension for the listener.

Figure 6.6 first silent interpolation



Instrument exchanges exploit an instance where an acoustical jolt may exceed the temporal limit of the perceptual present while maintaining a similar effect to all other compositional techniques mentioned previously. All exchanges imply that all content from each ensemble is traded off to another ensemble, and all instruments take part in exchanges without exception.

Exchanges occur on both a micro and a macro level; at the micro level, the motivic content of the ensembles is traded off for no more than three (3) eighth note beats within the metrical cell. This trading off implies that a compositional translation must be made. For instance, the timbral milieu of the string quartet differs vastly from that of the alto flute, tenor saxophone, and electric guitar, so certain acoustical

treatments must be approximated in order to maintain a degree of semblance in the exchanged material. On a macro level, the instruments trade off for the entirety of a metrical cell, which by rule lasts longer than the approximated upper limit of the perceptual present. Despite propagating beyond the upper limit of the perceptual present, macro exchanges may achieve a similar result to all other acoustical jolt methods; this is due to the fact that the musical content itself has not been altered, but instead displaced within a degree of recognizability in the timbral domain. Thus, the departure for the listener can be perceived as still existing within the bounds of temporal perception.

Figure 6.7 first macro exchange
(on the proceeding page)

D

♩ = 80

117

Vib.

Pno.

Pno.

Pno.

E. Bass

Vln. I

Vln. II

Vla.

Vc.

A. Fl.

Ten. Sax.

E. Gtr.

bow

arco ord.

XII

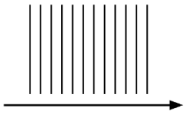
6. Conclusions

A listener's repeated exposure to the complex field of superimposed material eventually relativizes the static conditions, and as a result, what was previously felt to be on the brink of noise has transmuted into a cognitive equilibrium. In this lens, silent interpolations that have been transformed into perceivably loud acoustical jolts have in fact always contained the quality of loudness. The composition has merely reformed the conditions to allow sense perception to corroborate the notion of the unity in opposites. Just as well, the existent cellular frame has becomes the de facto chronometric reference to which subjective temporal comprehensions may be referenced.

The theoretical perceptual events embedded within this newly calibrated cognitive equilibrium explore the thresholds of many arising psychological phenomena. Essentially, the sheer density and nuance of the music exists at the point where I theorize many of the perceptual events and deductions may still arise. This complication of the base material is adapted to express the musicality imbued at the genesis of this piece. Purely psychological concepts of perceptual understanding could more aptly be explored in the likes of drone music or lab experimentation, but here the aim is to utilize such concepts as the structural driving force for both composer and listener. Listeners may well extrapolate the subtle physiognomic elements of the musical material with great variability, but the overall existent frame strives to arouse in the listener the notion of the fickle reality of time consciousness as well as the nature of linear structures, which proceeds from our perception of temporality.

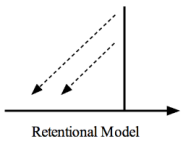
Temporal consciousness has often been explored through three different models of perception. These models serve to portray a simplification of a theoretical structure of time consciousness.

Figure 7.1



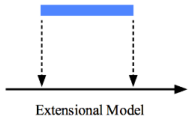
The 'Cinematic Model' depicts a continuous series of perceptual awareness moment to moment, which cascade into a stream of consciousness. This model resembles films utilization of a series of individual 'stills' to give the illusion of motion (Dainton).

Figure 7.1a



The 'Retentional Model' posits a conscious awareness, which is comprised of continuously emerging immediate experiences accompanied by memory-based representations of the recent past. This model lacks temporal extension or protensions altogether (Dainton).

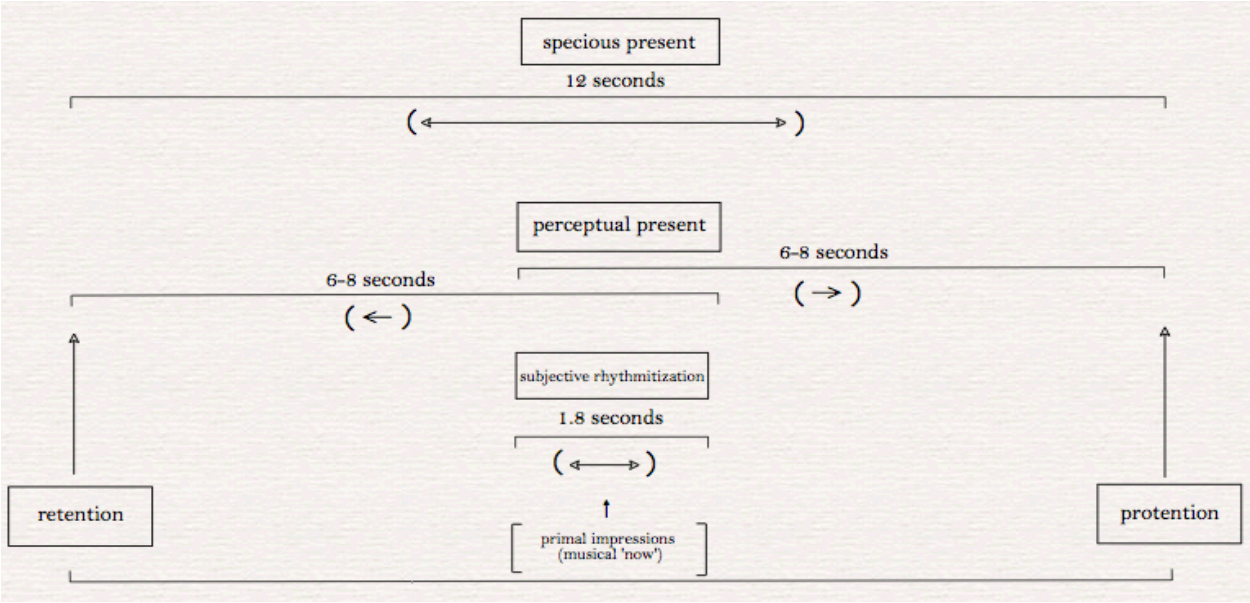
Figure 7.1b



The 'Extensional Model' on the other hand asserts that immediate experience itself is temporally extended. Here, streams of consciousness are neither made of up momentary instances nor memory referenced experiences, but larger temporal frames of protensions or expectation in which a more encompassing immediate experience resides (Dainton).

In developing an understanding of temporal consciousness in music it may be helpful to view these models as not mutually exclusive. Then, using previously discussed psychological framings we can create a model of one kind of perception, which may be occurring unconsciously in a listener.

Figure 7.2



This model is of course specific to the design of the music in *kyi.* However, it may be applied as a new analytical lens to other music to develop a more intimate understanding of how time perception may be unconsciously or consciously influencing composers, performers, and listeners.

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