Thoughts on Temporal Perception's Relativity in Grisey's *Vortex Temporum* and Voss's *Perspectives*

by

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This thesis centers around a comparative analysis between an instrumental work, *Vortex Temporum* (1995), by Gérard Grisey (1946-98), and a mixed media work by Emerson Voss (b. 1991), *Perspectives* (2017). This essay articulates an interest in musical temporal perception, and serves as a precursor to a larger, ensuing research project concerning musical temporal perception.

The comparative analysis stems from a question. How does temporal perception relate to a musical object's artistic expression? Offered through the lens of the comparative analysis is an experience of these works as complementary, poetic discourses on temporal perception's relativity and its ability to further the realization of a musical object's artistic expression.

Temporal perception is the subjective measurement of objects in motion. Quantitative and qualitative time are a two-part definition of temporal perception that show how our spatial orientation and movement through space (or speed) is linked to our perception of time's passing. Our temporal perception of everything is relative to our spatial orientation and our movement through space—our qualitative and quantitative time respectively. This notion is temporal perception's relativity.

The comparative analysis shows how the frameworks of *Vortex Temporum* and *Perspectives* each uniquely describe temporal perception's relativity. Each work could be perceived as a composer's figurative moving of either his audience or his musical object around one another enhancing the realization of each musical object's artistic expression. *Vortex*'s musical object is a repeated stream of an arpeggio motive from a flute solo in Ravel's *Daphnis and Chloé*. *Perspectives*'s musical object is Johannes Brahms's *Intermezzo Op. 118, No. 2 in A major*.

The analysis of these works compares each composers' methods for articulating their poetic discourse on temporal perception's relativity. Specific techniques used by each composer are analyzed. First, *Vortex*'s use of varying density of "perceptual events" in the first movement's piano solo and *Perspectives*'s use of synchronization of mediums' times in acceleration is analyzed. Second, *Vortex*'s use of condensed, harmonic spectra and *Perspectives*'s use of staging is analyzed. Finally, *Vortex*'s use of recurring opening material from the first movement and *Perspectives*'s use of nine-shot split screen is analyzed.

The concluding section contains three possible paths for research stemming from the comparative analysis. First, research could be conducted by continuing to apply temporal perception's relativity as a framework for analysis to other pieces. Second, research could be conducted by applying classifications of durational arrangements in Grisey's table to vastly differing styles of music in a way similar to the creation of a "perceived events" chart in the comparative analysis's first part. Finally, research could be conducted by examining similarities between vastly differing styles of music and their artistic interpretations by performers of varying skill levels and artistic backgrounds.

Thoughts on Temporal Perception's Relativity in Grisey's *Vortex Temporum* and Voss's *Perspectives*

A Thesis

Presented To the Faculty of the Department of Theory, Composition, and Musicology

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In Partial Fulfillment of the Requirements for the Degree

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by

Emerson Voss

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TABLE OF CONTENTS

TABLE OF CONTENTS (CONTINUED)

LIST OF TABLES

LIST OF FIGURES

Introduction

This thesis centers around a comparative analysis between an instrumental work, *Vortex Temporum* (1995), by Gérard Grisey[1] (1946-98), and a mixed media work of my own, *Perspectives* (2017). This essay articulates my interest in musical temporal perception[2], and serves as a precursor to a larger, ensuing research project concerning musical temporal perception.

This essay is in three main divisions with a concluding section delineating possible paths for research. The first division is an explanation of temporal perception in two components—quantitative temporal perception and qualitative temporal perception[3]. The second division is an explanation of quantitative and qualitative time in *Vortex* and *Perspectives*. The third division is the comparative analysis between quantitative time in *Vortex* and qualitative time in *Perspectives*. The concluding section contains three possible paths for research stemming from the comparative analysis.

My admiration for Grisey's *Vortex* and compulsion to explore this work further is this essay's catalyst. *Vortex* concerns changes in how a musical object is perceived in time. The perceptual framework and compositional techniques which undergird these changes fascinate me. This fascination causes me to ponder time and our perception of its passing. Ultimately, this leads me to a question. How does temporal perception

[1] Grisey is a composer often credited as a founder of the spectral movement.
[2] 'Temporal perception' is defined and discussed further in chapter 1 on p. 5.
[3] 'Quantitative temporal perception' and 'qualitative temporal perception' are defined and discussed further in chapter 1 on p. 5. Also note that 'quantitative temporal perception' and 'qualitative temporal perception' may be referred to as 'quantitative time' and 'qualitative time' respectively.

relate to a musical object's artistic expression? Through this essay's comparative analysis, I begin to explore this question.

This comparative analysis represents my subjective responses to *Vortex* and my desire to see if *Perspectives* bears some resemblance as it pertains to my thoughts about temporal perception's relativity. Offered through the lens of this analysis is an experience of these works as complementary, poetic discourses on temporal perception's relativity and its ability to further the realization of a musical object's artistic expression. The artistic expression of these objects is realized more fully through each piece's unique framework as a poetic discourse[4] on temporal perception's relativity.

Grisey describes *Vortex* as the "birth of a system of swirling, repeated arpeggios and its metamorphosis in different time fields".[5] In this work, Grisey scores flute (from bass to piccolo), Bb clarinet, violin, viola, violoncello, and piano. This forty-minute piece was commissioned by the French Ministry of Culture, Ministerium für Kunst Baden-Würtemberg and the Westdeutsche Rundfunk Köln, on special request from the *Ensemble Recherche*. *Vortex* grows from an arpeggio motive, derived from Maurice Ravel's *Daphnis et Chloé*, heard new through each movement's own unique "time field"—what Grisey calls the time of humans, insects, and whales respectively.[6] The work's three movements are dedicated to Gérard Zinsstag (b. 1941), Salvatore Sciarrino (b. 1947), and Helmut Lachenmann (b. 1935), respectively.[7]

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[4] Note that each audience's temporal perception of a musical object is *not* directly changing due to literal movements between them and a musical object but is figuratively changing within each piece's framework as a poetic discourse on temporal perception's relativity. The poetic discourses concern temporal perception in general *not* necessarily the temporal nature of the artistic mediums themselves.
[5] Gérard Grisey, program notes to *Vortex Temporum*, http://brahms.ircam.fr/works/work/8977/.
[6] Ibid.
[7] Grisey, Gérard. "Program Note Gérard Grisey: Vortex Temporum." 208.106.179.203/notes/grisey-vortex.html (accessed 06/19, 2017).

Perspectives can quite literally be seen (and heard) as perspectives of Brahms's *Intermezzo, Op. 118, No. 2 in A Major*. Premiered on my graduate recital at East Carolina University, this work, in many ways, is an experiment testing the ability of one medium's (music) artistic expression to be translated through differing mediums (film and dance) in three movements. To achieve this: 1) Multiple video takes of a dancer interpreting Brahms's *Intermezzo* were edited together into one music video. 2) The audio was then stripped from the music video. 3) A percussionist (unaware of the *Intermezzo*'s significance) was then asked to interpret the video only. 4) The percussionist's interpretations of the video were then recorded in multiple takes of audio (percussion) and video. 5) These four elements (audio of the *Intermezzo*, audio of the percussionist, video of the percussionist, video of the dance) were inter-referentially integrated to make one video project.

Perspectives is in three movements, each emphasizing one of the three mediums involved—music, film, and dance. Interest can be derived through discoveries of the highlighting of the Brahms *Intermezzo*'s artistic expression's translation through the dance and into the percussion music by means of video editing.

The analysis of these works compares each composers' methods for articulating their poetic discourse on temporal perception's relativity—*Vortex*, concerning temporal perception's quantity and *Perspectives*, concerning temporal perception's quality. In comparing movements from each work, specific techniques used by each composer are analyzed.

This analysis investigates three comparisons between movements of each work. First, both the first movement of *Vortex* and the second movement of *Perspectives*

achieve Grisey's acceleration through increasing density of events—for *Vortex*, with Grisey's discontinuity and for *Perspectives*, with Grisey's continuity. For this comparison, *Vortex*'s use of varying density of "perceptual events" in the movement's piano solo and *Perspectives*'s use of synchronization of mediums' times in acceleration is analyzed. Second, both the second movement of *Vortex* and the first movement of *Perspectives* consist entirely of temporal perception's expansion—for *Vortex*, in terms of speed and for *Perspectives*, in terms of perspective. For this comparison, *Vortex*'s use of condensed, harmonic spectra and *Perspectives*'s use of staging is analyzed. Third, both the third movement of *Vortex* and the third movement of *Perspectives* concern time's contraction—for *Vortex*, in terms of speed and for *Perspectives*, in terms of perspective. For this comparison, *Vortex*'s use of recurring opening material from the first movement and *Perspectives*'s use of nine-shot split screen is analyzed. Before a full presentation of this comparative analysis, it is necessary that temporal perception be defined and that it be understood in terms of its quantity and quality.

Chapter 1: Temporal Perception's Quantity and Quality

Temporal perception is the subjective measurement of objects in motion. There are two parts of temporal perception—quantitative time and qualitative time. Quantitative time is our perception of objects' motions or their speed. Qualitative time is our perception of the objects themselves or our perspective. Together, quantitative and qualitative temporal perception describe our perception of objects in motion or temporal perception.

As we move around objects and/or they move around us, our temporal perception changes. Changes in quantitative temporal perception occur when we perceive an object at different speeds. As a result, the object appears differently to us because we perceive the object more or less frequently (i.e., the doppler effect[8]). For example, as an ambulance's siren passes at a faster speed than our own, we hear the siren's pitch change though the siren's pitch is *not* changing for those in the ambulance. Changes in qualitative time occur when we perceive an object from different perspectives. As a result, the object appears differently to us because we perceive a different part of the object.

Temporal perception expands and contracts.[9] Temporal perception expands quantitatively when we move away from an object. This movement causes our rate of temporal perception to slow due to the doppler effect. In other words, temporal

[8] A layman's explanation of the doppler effect can be found here: "The Doppler Effect: What does Motion do to Waves?" Alt Shift X. https://www.youtube.com/watch?v=h4OnBYrbCjY (accessed 06/22, 2017).
[9] Note that a change in quantitative time is the same either an expansion or a contraction while a change in qualitative time is different than an expansion or contraction.

perception expands quantitatively when we perceive an object less frequently (in other words, more slowly). For example, as an ambulance's siren moves away from us, we perceive its pitch as getting lower.

Temporal perception expands qualitatively when we perceive an object as being closer to us. Put another way, this expansion occurs when we perceive an object as larger. In musical terms, a similar "microscopic" hearing might mean a slowing of a phrase's tempo, bringing local musical details into focus more easily.

Temporal perception contracts quantitatively when we move towards an object. This movement causes our rate of temporal perception to speed up due to the doppler effect. In other words, temporal perception contracts quantitatively when we perceive an object more frequently or more quickly. For example, as an ambulance's siren moves towards us we perceive its pitch as getting higher.

Temporal perception contracts qualitatively when we perceive an object as being farther away from us. Put another way, this contraction occurs when we perceive an object as smaller. In musical terms, a similar "contracted" hearing might mean an acceleration of a phrase's tempo, bringing local musical details out of focus. Both expansions and contractions of temporal perception are present in *Vortex* and *Perspectives*.

These explanations of both quantitative and qualitative time show how our spatial orientation and movement through space (or speed) is linked to our perception of time's passing. A change in our quantitative time is a change in our qualitative time, and vice versa. As we move away from an object, our quantitative time is slowing as an expansion and our qualitative time is shrinking as a contraction. As we move towards an

object our quantitative time is quickening as a contraction and our qualitative time is enlarging as an expansion. These expansions and contractions are due to the doppler effect. In the broadest of summaries, our temporal perception of everything is relative to our spatial orientation and our movement through space.

Chapter 2: Temporal Perception's Quantity and Quality in *Vortex Temporum* and *Perspectives*

This relativity of our temporal perception as a framework for a work of art is not new. In Lawrence Durrell's prefatory note to the second novel, *Balthazar*, of his literary masterpiece, *The Alexandria Quartet* (1962), he outlines its framework:

> I have turned to science and am trying to complete a four-decker novel whose form is based on the relativity proposition. Three sides of space and one of time constitute the soup-mix recipe of a continuum. The four novels follow this pattern. The three first parts […] interlap, interweave in a purely spatial relation. Time is stayed. The fourth part alone will represent time and be a true sequel.[10]

Grisey with *Vortex* and I, following in his footsteps (and long shadow), with *Perspectives* also take "the relativity proposition" to be our frameworks. While Durrell uses a four-part method to show the relativity proposition as his framework, I argue that, in the context of these works' analyses, four parts are unnecessary. One only needs two parts—*Vortex*, as quantitative time and *Perspectives*, as qualitative time to show how these works' frameworks each uniquely describe temporal perception's relativity.

I suggest, in broad terms, that each work could be perceived as a composer's figurative moving of either his audience or his musical object in the space around one another enhancing the realization of each musical object's artistic expression.

Both works take an objective, musical object[11] to be their primary material from which the rest of the work springs outward. *Vortex*'s objective, musical object is a

[10] Durrell, Lawrence. "Note." In *Balthazar*. New York: Dutton, 1961.
[11] I use the term, "objective, musical object", instead of the more oft 'musical quotation' to draw a distinction between the subjective nature of the changes in temporal perception to which the sound-objects are subjected within the works and the objective nature of the sound-objects themselves. This use

repeated stream of an arpeggio motive from a flute solo in Ravel's *Daphnis and Chloé*. In *Vortex*, the audience is figuratively moved straight back and forth from the Ravel-based arpeggios. This amounts to a changing of the audience's speed or quantitative temporal perception of the Ravel arpeggios. This results in the audience gaining a deeper understanding of the artist expression within the Ravel arpeggios.

Note that movements "straight back and forth" do *not* entail changes of an audience's qualitative time, thus, limiting the audience to an experience of one side of the musical object—the musical object's artistic expression perceived as Ravel arpeggios. This amounts to a figurative isolation of changes to the audience's quantitative temporal perception.

Perspectives's objective, musical object is Johannes Brahms's *Intermezzo Op. 118, No. 2 in A major*. In *Perspectives*, the *Intermezzo* is figuratively moved to three placements around its audience creating differing perspectives of the *Intermezzo* for the audience. This amounts to changes of the audience's perspective or qualitative temporal perception of the *Intermezzo*. This results in the audience gaining a deeper understanding of the artistic expression with the *Intermezzo*.

Note that the audience does *not* move and the *Intermezzo* is in a fixed position during each movement. This entails no movement (or changes of speed) and, thus, no change in the audience's quantitative time. This amounts to a figurative isolation of changes to the audience's qualitative temporal perception.

These works, together, show the relativity of an audience's temporal perception to an artistic object. In the following section, a comparative analysis between these

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of musical objects from outside the confines of a work is, of course, nothing wholly new, and, in a way, continues a tradition while also distinguishing itself enough to be worthy of a unique term.

works supports this claim by outlining specific techniques used by each composer. Before this analysis, both works are presented in broad terms, in part, through a description of diagrams[12] representing their complementary, poetic discourses on temporal perception's relativity.

Evidence for *Vortex*'s isolation of its audience's quantitative temporal perception comes in three forms: Grisey's own words, the words of others in the form of program notes and analyses, and the material contained within *Vortex* and, to a lesser extent, in *Perspectives*. The first two forms will be presented here. The last will be in two parts—the first by a general description of *Vortex*'s structure including an explanation of its diagram[13] in this section and the second through specifics of the comparative analysis in the section to follow.

In 1987 (seven years before work began on *Vortex*), Grisey expressed a desire for musical

> structures which are no longer fixed to a single type of perception. Temporal structures themselves acquire a plasticity relative to the change in scale. These scales of sound proximity—for which one can always substitute a continuum—create a new dimension of sound: depth, or the degree of proximity. Moreover, this play of the zoom lens back and forth can in turn become structural and generate a new dynamic of sound forces relative to the spatial density of sound and their duration.[14]

The key phrase here is: "the play of the zoom lens back and forth". "Back and forth" being the most important words. This can be likened to the changes in quantitative time described in the previous section. By omission, Grisey is *not* referring to a movement of

[12] Refer to figure 1 on p. 13 and figure 2 on p. 17.
[13] Refer to figure 1 on p. 13.
[14] Grisey, Gérard. "Tempus Ex Machina: A Composer's Reflections on Musical Time." Contemporary Music Review 2, no. 1 (1987): 268.

this zoom lens up, down, left, right, or any combination thereof and, therefore, is *not* referring to a change in the audience's perspective or qualitative time.[15]

In Grisey's program notes to *Vortex* he seems to refer to this "play of the zoom lens" of seven years before:

> In *Vortex Temporum*, the three archetypes described above revolve around one fragment and the other in temporary intervals, differing among themselves as among people (the tempo of speech and breathing), whales (spectral time of sleeping rhythms), and birds or insects (extremely contracted time, whose contours become obliterated). Thanks to this imagined microscope, the notes become sound, a chord becomes a spectral complex, and rhythm transforms into a wave of unexpected duration.[16]

I suggest that *Vortex* is Grisey's attempt at creating "a new dimension of sound: depth, or the degree of proximity [,…] a new dynamic of sound forces relative to the spatial density of sound and their duration"[17].

Others support this claim in the form of program notes and analyses. In 2013, Anne Teresa De Keersmaeker choreographed a dance to Grisey's *Vortex Temporum* "measure for measure, second by second"[18]. In program notes for a 2016 performance: "Grisey makes the trembling of molecules—sound's matter—perceivable by examining it on three different scales: with human eyes, through a molecular microscope, and by zooming out on it through a telescope"[19]. In Ching-Yi Wang's analysis of movement I and II of *Vortex Temporum*, he states, referring to the Ravel arpeggio of the first movement in the second movement, "it is impossible and inaudible for the listener to perceive and recognize the first movement material in such a slow tempo, but one can

[15] An important aside: in a way, this movement of the zoom lens up, down, left, right, or any combination thereof *does* pertain to *Perspectives*.
[16] Grisey, Gérard. "Program Note…".
[17] Grisey, Gérard. "Tempus Ex…", 268.
[18] "Notes on Vortex Temporum." https://www.bam.org/media/7544746/Vortex-Temporum.pdf (accessed 06/20, 2017).
[19] Ibid.

still feel that the undulating contour from the first movement transforms into the moving waves, stretched out extremely over time"[20]. The key words here are "a slow tempo" which refer to a linking of the Ravel arpeggio in the first movement to the second by a change in its speed relative to its audience. This can be likened to quantitative time's expansion discussed in the previous section.

Evidence for *Perspectives*'s isolation of its audience's qualitative temporal perception comes in the form of a summary of the work following *Vortex*'s summary below.

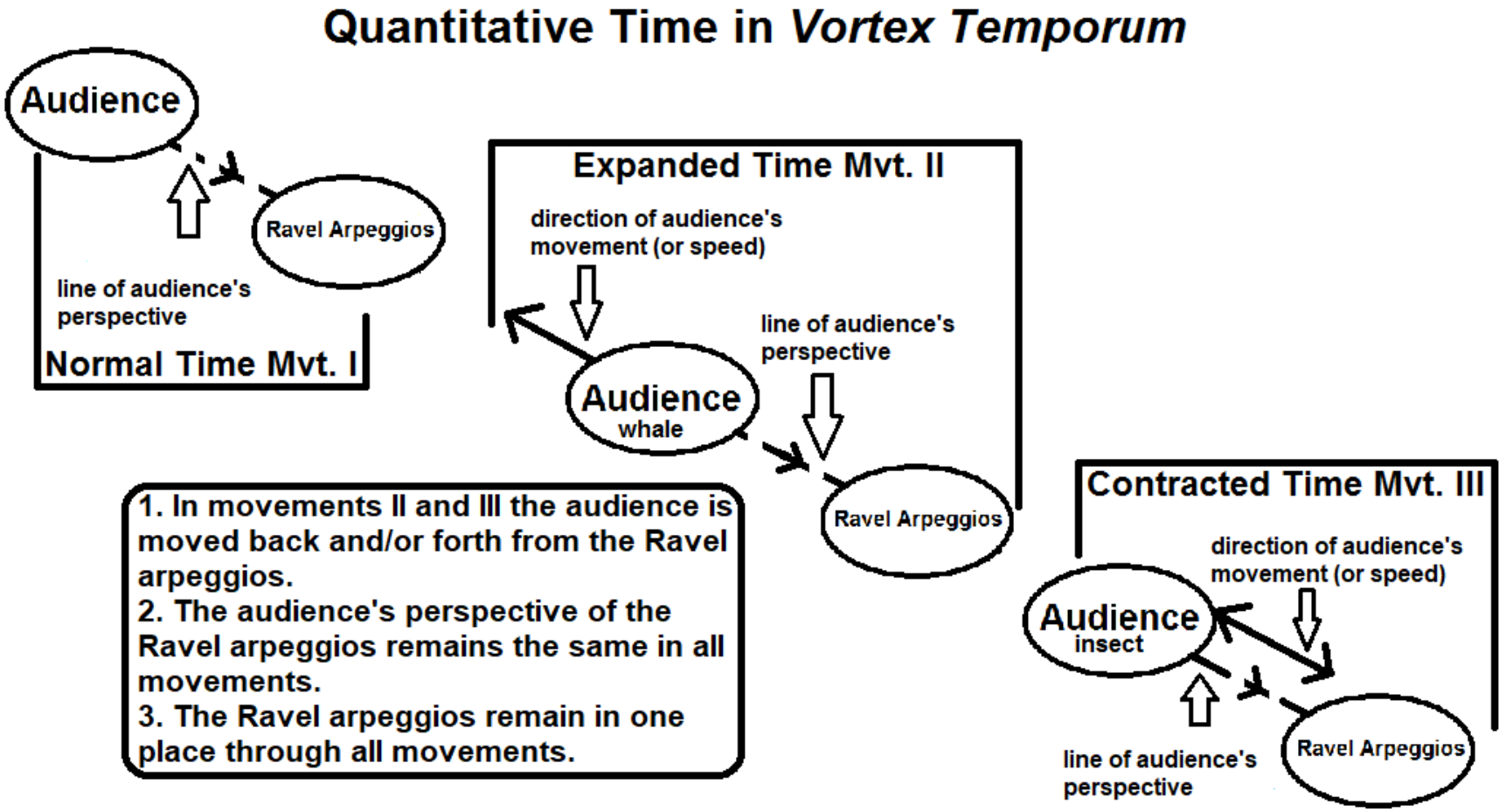
An Explanation of *Vortex Temporum*'s Diagram

The diagram of quantitative time in *Vortex*[21] shows how *Vortex* could be perceived as Grisey figuratively moving his audience back and forth in the space around a repeated stream of Ravel-based arpeggios isolating changes in his audience's quantitative time.

As shown in *Vortex*'s diagram, each movement is Grisey's moving of his audience back and forth from the Ravel arpeggios resulting in three different quantitative temporal zones—one for each movement.

[20] Wang, Ching-Yi. "Spectral Music and Gérard Grisey's "Vortex Temporum I and II"."ProQuest Dissertations Publishing, 2012: 87. In Summon; Summon (accessed 2/23/2017).
[21] Refer to figure 1 on p. 13.

Figure 1


Quantitative Time in *Vortex Temporum*
Audience
Ravel Arpeggios
line of audience's perspective
Normal Time Mvt. I
Expanded Time Mvt. II
direction of audience's movement (or speed)
line of audience's perspective
Audience
whale
Ravel Arpeggios
1. In movements II and III the audience is moved back and/or forth from the Ravel arpeggios.
2. The audience's perspective of the Ravel arpeggios remains the same in all movements.
3. The Ravel arpeggios remain in one place through all movements.
Contracted Time Mvt. III
direction of audience's movement (or speed)
Audience
insect
line of audience's perspective
Ravel Arpeggios

In movement I, Grisey holds his audience still relative to the Ravel arpeggios which also remain still relative to the audience. This is shown in the upper left part of the diagram. In this movement, the Ravel arpeggio is heard in “normal time” and can be likened to how we perceive the movements of most objects in everyday life at relatively similar speeds.

This movement is in three parts that

> develop three aspects of the original wave, well known to acoustic engineers: the sinusoidal wave (vibration formula); the square wave (dotted rhythm) and the jagged wave (piano solo). They develop the tempo, which can be defined as 'joyful', the tempo of articulation, rhythm of human breathing. The isolated piano section reaches the boundaries of virtuosity.[22]

It could be imagined that each one of these differing aspects of the original wave is Grisey’s slight movement of his audience either up, down, left, right, or any combination thereof. This would create slight shifts of the audience’s perspective of the Ravel arpeggios’ artistic expression—as a sine wave, a square wave, or a saw-tooth wave.

In movement II, Grisey moves his audience straight back from the Ravel arpeggios resulting in the Ravel arpeggios being perceived as slowed. In the middle part of *Vortex*’s diagram, this movement is shown as a solid arrow pointing out from the audience. This is the direction of the audience’s movement (or speed) away from the Ravel arpeggios. The broken line represents the audience’s line of perspective towards the Ravel arpeggios

As the audience’s relative speed increases due to this movement back from the Ravel arpeggios, their quantitative time in relation to the Ravel arpeggios expands. Grisey refers to this movement as “whale time”.[23] Perhaps Grisey chose this name to

[22] Grisey, Gérard. "Program Note…”.
[23] Ibid.

draw parallels between the expansion of his audience's time and the expansive size of a whale.

This movement could also be imagined as a magnification of the Ravel arpeggios. The Ravel arpeggios are perceived at a slower rate by the audience thus allowing the audience to focus on the musical details of the Ravel arpeggios more easily. Grisey shows this through the extensive use of manipulated, harmonic spectra[24] in this second movement.

In movement III, Grisey moves his audience back and forth from the Ravel arpeggios creating both expansions and contractions of the audience's quantitative time in relation to the Ravel arpeggios. This third movement is shown on the bottom right of the diagram. The solid, double arrow line shows the movement of the audience back and forth from the Ravel arpeggios. Grisey achieves this movement of his audience musically by repeatedly reintroducing altered versions of the first movement's opening material.[25]

This third movement can be referred to as "insect time". Perhaps Grisey chose this name to draw parallels between rapid back and forth movement of the audience from the Ravel arpeggios and the frenetic movement of a flying insect.

The diagram also reflects Grisey's isolation of his audience's quantitative time. The dashed lines representing the direction of the audience's perspective are always directed towards the same part of *Vortex*'s musical object. Thus, the audience is always

[24] Spectra are analyses of timbre by a spectrograph.
[25] It could be perceived that the first movement's opening material is increasingly altered with each return because the audience's greater speed in relation to the Ravel arpeggios causes time to flow more slowly for the audience. This causes the audience to perceive the Ravel arpeggios as having "aged" quickly. It could be posited that Grisey reflects this quick "aging" through increasingly altering the reintroductions of the first movement's opening material.

viewing the side of the musical object and, consequently, only perceives the musical object as Ravel-based arpeggios.

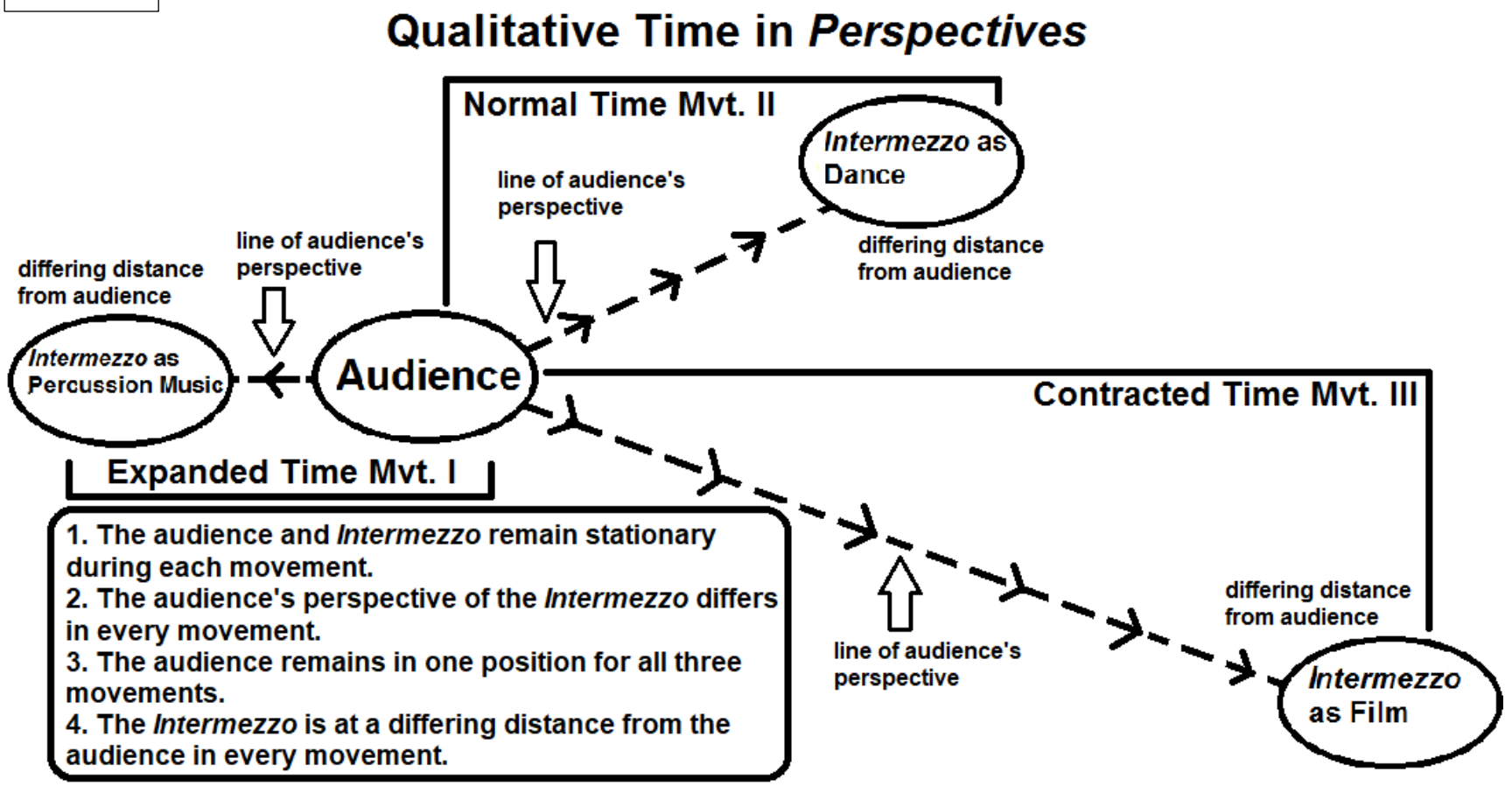
An Explanation of *Perspectives*'s Diagram

In *Perspectives*, changes of its audience's perspective cause the artistic expression of its musical object (the Brahms *Intermezzo*) to be perceived through different artistic mediums. Therefore, it could be perceived that Grisey achieves an isolation of his audience's quantitative time throughout this work because the musical object's artistic expression is always kept in the form of music.

The diagram of qualitative time in *Perspectives*[26] shows how it could be perceived as the movement of Brahms's *Intermezzo Op. 118, No. 2 in A major* around its audience in space isolating changes in its audience's qualitative time in relation to the *Intermezzo*.

[26] Refer to figure 2 on p. 17.

Figure 2


Qualitative Time in *Perspectives*
Normal Time Mvt. II
Intermezzo as Dance
line of audience's perspective
differing distance from audience
line of audience's perspective
differing distance from audience
Intermezzo as Percussion Music
Audience
Contracted Time Mvt. III
Expanded Time Mvt. I
1. The audience and *Intermezzo* remain stationary during each movement.
2. The audience's perspective of the *Intermezzo* differs in every movement.
3. The audience remains in one position for all three movements.
4. The *Intermezzo* is at a differing distance from the audience in every movement.
line of audience's perspective
differing distance from audience
Intermezzo as Film

It should be noted that that the audience's temporal perception changes in two ways in *Perspectives* and changes in only one way in *Vortex*. In *Vortex*, the only way changes in the audience's temporal perception occur is from movements of the audience back and forth from the Ravel arpeggios.

For *Perspectives*, one way in which the audience's temporal perception changes is by shifts in the audience's perspective of the *Intermezzo* through differing placements of the *Intermezzo* around the audience. In *Perspectives*, the other way the audience's temporal perception shifts is through placements of the *Intermezzo* at differing distances from the audience for each movement. As an object moves closer its qualitative time expands. As an object moves farther away its qualitative time contracts. These differing distances from the audience are responsible for the contraction and expansion of the audience's qualitative time. On *Perspectives*'s diagram, the forms of the *Intermezzo* are shown at differing distances from the audience.

It seems that this work's structure, as represented in the diagram, is referenced by Grisey's plea for composers to truly put the listener at the center of their work:

> What [of a] spatial view of musical time - but also what anthropocentrism there is in [an] image of a man at the center of time, a listener fixed at the very center of the work to which he is listening! One might say that a truly Copernican revolution remains to be fought in music…[27]

Perhaps *Perspectives* is my answer to this "Copernican" plea.

The audience's qualitative time in relation to the *Intermezzo* is isolated because no changes of the audience's quantitative time occur—the audience and Intermezzo remain stationary during each movement. Only changes in the audience's perspective of the *Intermezzo* occur. The audience's perspective is labeled as "line of audience's

[27] Grisey, Gérard. "Tempus Ex…", 242-3.

perspective”. The lines have arrows to indicate in what direction their perspectives are directed during a given movement.

This isolation of qualitative time is achieved by how each form of the *Intermezzo* was created. It was ensured that each artistic interpreter (dancer, percussionist, filmmaker) interpreted the *Intermezzo* in a one-to-one event succession relative to what they were interpreting. A description of this process is, in large part, the broad summary of this work.

This one-to-one process was achieved as follows: The process began with a dancer interpreting the original Brahms *Intermezzo* as she was listening to the Brahms *Intermezzo*. She began her interpretation when she first heard it and ended her interpretation when she first did not hear it. This process was duplicated and recorded in multiple takes of video with multiple camera angles. While the events of the interpretations (each video take) differed from each other and the Brahms *Intermezzo*, the rates of event succession for all forms of the *Intermezzo* (the differing dance take interpretations of the Brahms) did not. These takes of the dancer were then edited into one video the same length of the recording of all original takes of the dance (which were, consequently, the same length of the original Brahms recording from which the dance was derived). Furthermore, all parts of the takes that were used for this edited dance-video were never moved from their original sequence. For instance, if a pirouette occurred at the 2’ 47’’ mark in a dance take used for the edited dance-video, then it also occurred at the 2’ 47” mark in the edited dance-video.

This process was duplicated for the making of an edited video of a percussionist's interpretations of the edited dance-video[28] (i.e., a percussion-music-form of the *Intermezzo*). The two differences between the making of this percussion video and the dance-form video were that 1) now the interpretations used to make the video were of video and not of an audio recording only and 2) the recordings of the percussionist's interpretations had both their audio and video retained.

This percussion-video-form of the *Intermezzo* served as the first movement to *Perspectives*. Objects at a closer distance consume more of each other's total qualitative time or 'perspective' and is, thus, an expansion of these objects' relative qualitative time. Relative to the *Intermezzo*'s distance at movement II, the *Intermezzo* is closer at movement I, and, therefore the audience's relative qualitative time for the *Intermezzo* has expanded. The differing distances of the Intermezzo from the audience caused expansions and contractions of their qualitative times. On *Perspectives*'s diagram, this first movement is shown at the far left. At this perspective, the *Intermezzo* is observed by the audience as percussion music. The distance of the *Intermezzo* from the audience is shortest for this movement and, therefore, constitutes an expansion of time relative to the "normal time" experienced in the second movement. This was achieved by the choice to use only video-takes of percussion for editing this movement.

In movement I, the percussion-music-form of the *Intermezzo* is so close to the audience that it completely engulfs its view so that all the audience can experience is this form of the *Intermezzo*. Generally, our view is not engulfed by one object. "Normally" our qualitative time is spread more evenly between objects. This is the

[28] Note that the audio was stripped from the edited together dance-video before the percussionist interpreted it to ensure the percussionist was unaware of the *Intermezzo*'s significance.

reason for the percussion-form of the *Intermezzo* being considered an expansion of qualitative time.[29] This expansion of qualitative time is discussed more thoroughly in the comparative analysis.

In movement II, the *Intermezzo* is primarily observed as a dance, and is, therefore, primarily composed of dance takes. Movement II concerns “normal” qualitative time and is at a middling distance from its audience. This is shown in the upper middle part of the diagram. This “normal” qualitative time contains a more balanced view of the *Intermezzo*. Both the percussion-form and the dance-form are present within this movement though the dance takes predominance. One-to-one event succession is maintained throughout this movement.

In movement III, the *Intermezzo* is primarily observed as a film. Though the other movements are shown through film, this movement sets itself apart because the editing particularly draws attention to the movement as a film. This is achieved primarily through nine-shot split-screen containing nearly every take of both the dance and percussion music.

This nine-shot also shows the movement’s contracted qualitative time. The *Intermezzo*’s placement in this movement is farthest from the audience, thus, it takes less of the audience’s total qualitative time allowing for more objects to be observed—a contraction of qualitative time. This contraction of qualitative time is discussed more thoroughly in the comparative analysis. This is shown at the right of the diagram. For the most part, this form of the *Intermezzo* keeps with the one-to-one event succession like the other two movements.

[29] The dancer is present in this movement. Not so much as a dancer, but as a tiny, glimpse of the side of the *Intermezzo* that is a dance in movement II.

Chapter 3: *Vortex Temporum* and *Perspectives* – A Comparative Analysis

The analysis of these works compares each composer's methods for highlighting their differing approaches to a poetic discourse on temporal perception's relativity—*Vortex*, concerning quantitative time and *Perspectives*, concerning qualitative time. This analysis consists of three comparisons, each between methods and techniques within differing movements between the works.

The First Comparison

First, both the first movement of *Vortex* and the second movement of *Perspectives* achieve Grisey's acceleration through increasing density of events[30]—for *Vortex*, with Grisey's discontinuity and for *Perspectives*, with Grisey's continuity. For this comparison, *Vortex*'s use of varying density of "perceptual events" in the movement's piano solo and *Perspectives*'s use of synchronization of mediums' times in acceleration[31] are analyzed.

It should be noted that this comparison of the analysis does *not* concern the poetic discourse of each piece and is, therefore, *not* figurative. Grisey's accelerations concern the temporal nature of the pieces themselves and affect the literal temporal perception of the audience.

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[30] What is meant by 'density of events' is explained in the comparison concerning *Vortex* to follow.
[31] What is meant by "synchronization of mediums' times in acceleration" is explained in the comparison concerning *Perspectives* to follow.

Grisey's Continuity and Discontinuity

Before this comparison, Grisey's view of continuity and discontinuity must be explained. It is necessary to understand the difference between rhythms and durations as Grisey defines it. Grisey defines rhythms as a relation of note values to "a given pulse, the meter, in the form of a periodic reference point. […] Each rhythm is perceived in its qualitative relationship to meter (on the beat, off the beat) but also in its quantitative[32] relationship to meter (longer or shorter than the beat)"[33]. This form of rhythm is, of course, quite common comprising virtually all of today's popular music and western music between chant and the late-nineteenth century. Durations, rather, are

> without a reference pulse […] Each duration is perceived quantitatively by its relationship to preceding and successive durations […] In fact, a micro-pulse allows the performer or conductor to count and execute these durations, but it only exists as a way of working and has no perceptual reality. The more complex the durations (combinations of fractions of the unit), the more our appreciation of them is only relative (longer or shorter than…).[34]

Grisey lists composers who manipulate durations: "the golden section (Bela Bartók), the Fibonacci series (Karlheinz Stockhausen), Newtonian binomials (Jean-Claude Risset), and also stochastic procedures: kinetic theory of gases (Iannis Xenakis)" and ultimately finds their approaches unsatisfying because of their lack of focus regarding their listener's perception of them.[35] He takes special aim at Olivier Messiaen's non-retrogradable rhythms and Pierre Boulez's rhythmic symmetry and asymmetry, remarking on their implicit assumptions of a listener as a "superman […] gifted with a memory that enabled him to reconstruct the entirety of the durations so that

[32] 'Qualitative' and 'quantitative' in this quotation do *not* refer exactly to my use of 'quantitative' and 'qualitative'. In this context, their meanings are delineated in parentheticals after each term.
[33] Grisey, Gérard. "Tempus Ex…", 239.
[34] Ibid, 240.
[35] Ibid.

he could, a posteriori, classify them as symmetrical or not!... Or unless this were, once again, the business' only of the specialist who reads a score!..."[36]. Grisey argues that the symmetry in these rhythms is not heard by the listener and that these rhythms are, therefore, of no use classified as such.[37] Grisey suggests another way to arrange durational arrangements—a table[38] of arrangements of durations from most predictable to least predictable.[39] The table below shows arrangements of durations (or musical events).

Table 1

Grisey's Arrangements of Durations

a) ***Periodic***	maximum predictability	Order
b) ***Continuous-dynamic***	average predictability	
1) continuous acceleration		
2) continuous deceleration		
c) ***Discontinuous-dynamic***	slight predictability	
1) acceleration or deceleration by stages or by elision		
2) statistical acceleration or deceleration		
d) ***Statistical***	zero predictability	Disorder
complete redivision		
punpredictability of durations		
maximum discontinuity		

Periodic-based combinations of musical events are the most predictable. They are derived arithmetically.[40]

[36] Ibid, 242.
[37] Ibid, 243.
[38] Refer to table 1 on p. 25.
[39] Grisey, Gérard. "Tempus Ex…", 244.
[40] Refer to figures 3 and 4 on p. 24.

Figure 3

Periodic-Based Arithmetical Combinations

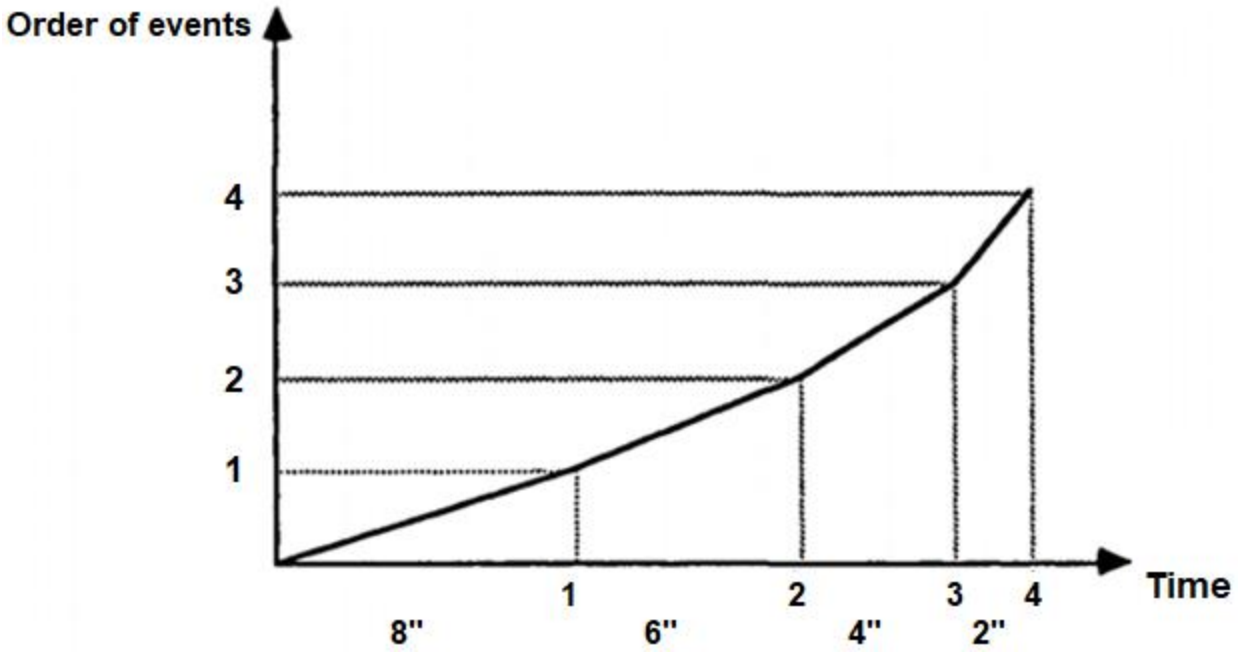
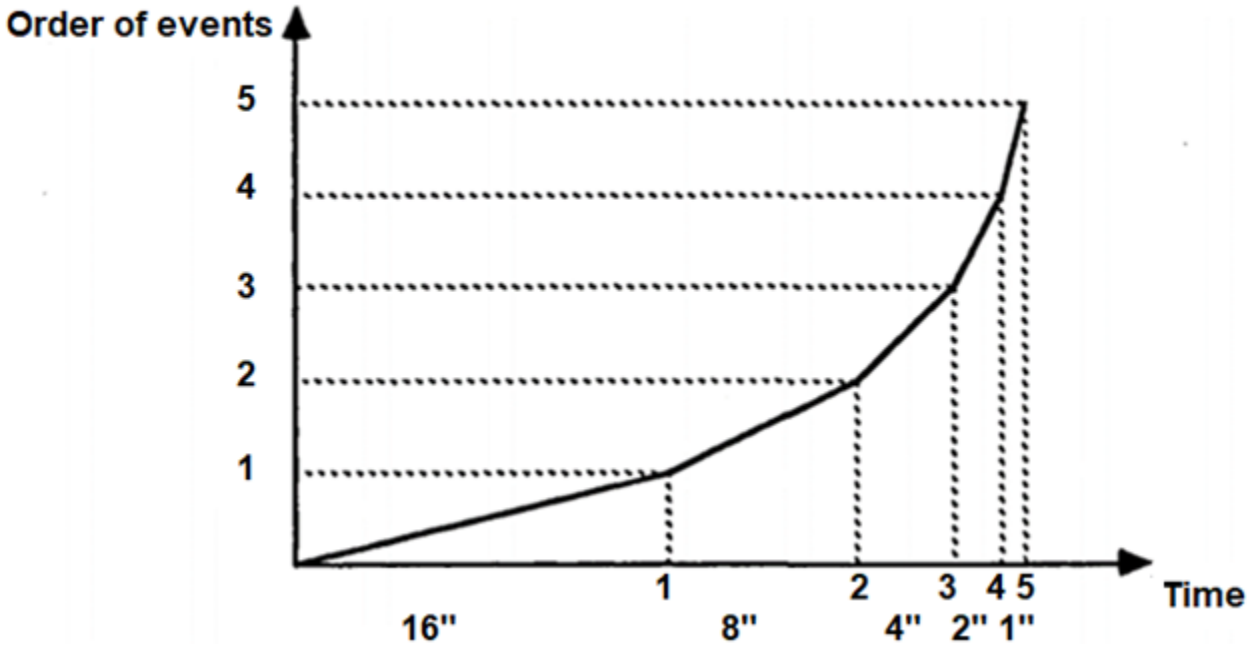


Figure 4

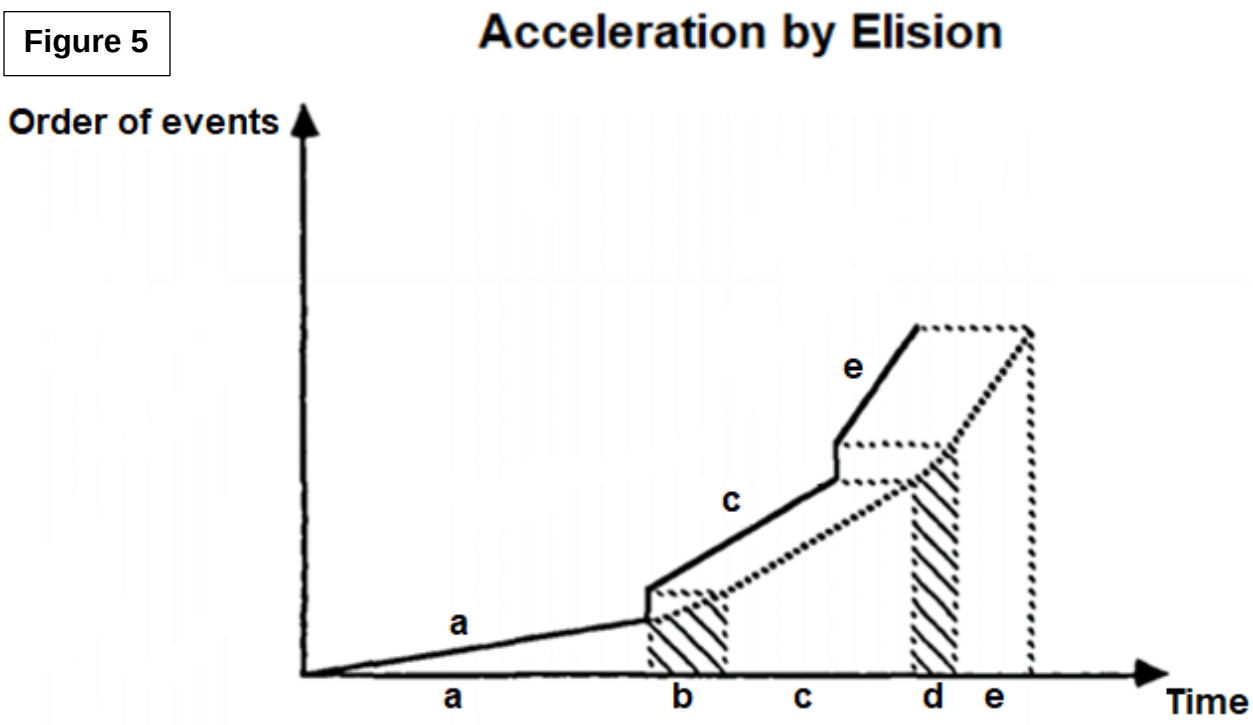
Periodic-Based Geometric Combinations



Continuous-dynamic combinations of musical events are logarithmic and less predictable though certainly not overly surprising. *Perspectives*'s acceleration is continuous-dynamic.

Discontinuous-dynamic combinations of musical events are logarithmic like continuous combinations except that parts of the curve may be skipped. An event that should come later in time may arrive early according to the curve, and vice versa. Discontinuous-dynamic curves provide for much less predictability while still sounding united, not random. *Vortex*'s acceleration is continuous-dynamic. These curves also work the same for deceleration. Acceleration by elision keeps with acceleration curve but "jumps" forward in the curve.[41] This could also be imagined as working in deceleration similarly. As shown in Grisey's table, the musical events increase in density over time.

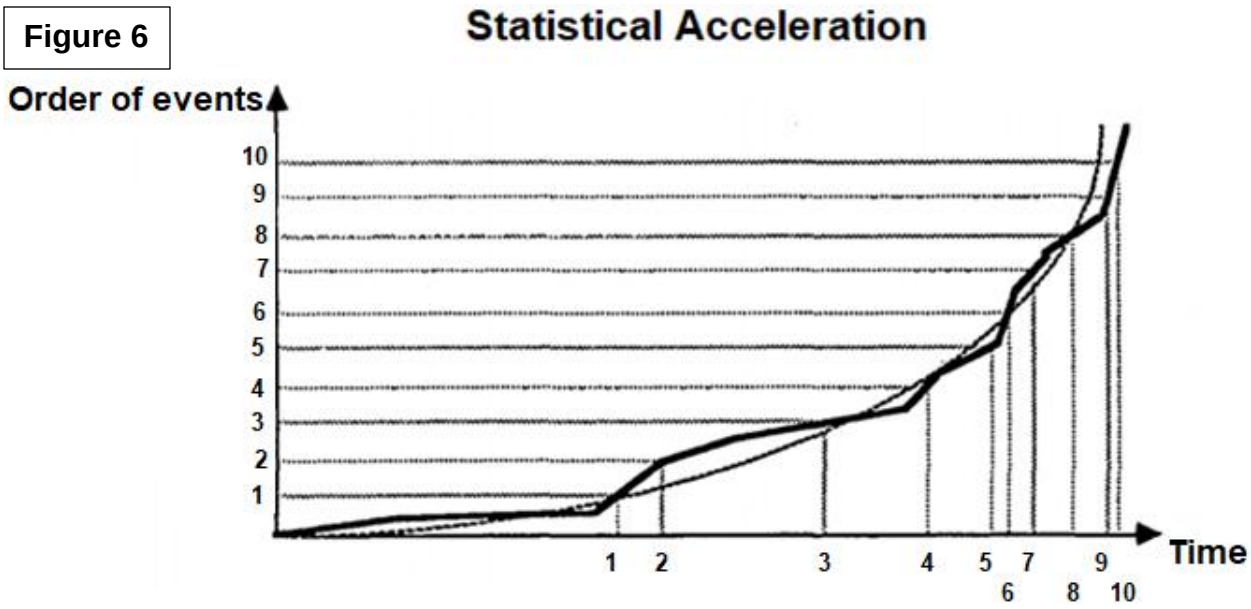
Figure 5



[41] Refer to figure 5 on p. 26.

Statistical acceleration is a combination of accelerations and decelerations that when plotted on a graph show overall acceleration.[42] This also works for deceleration.

Figure 6



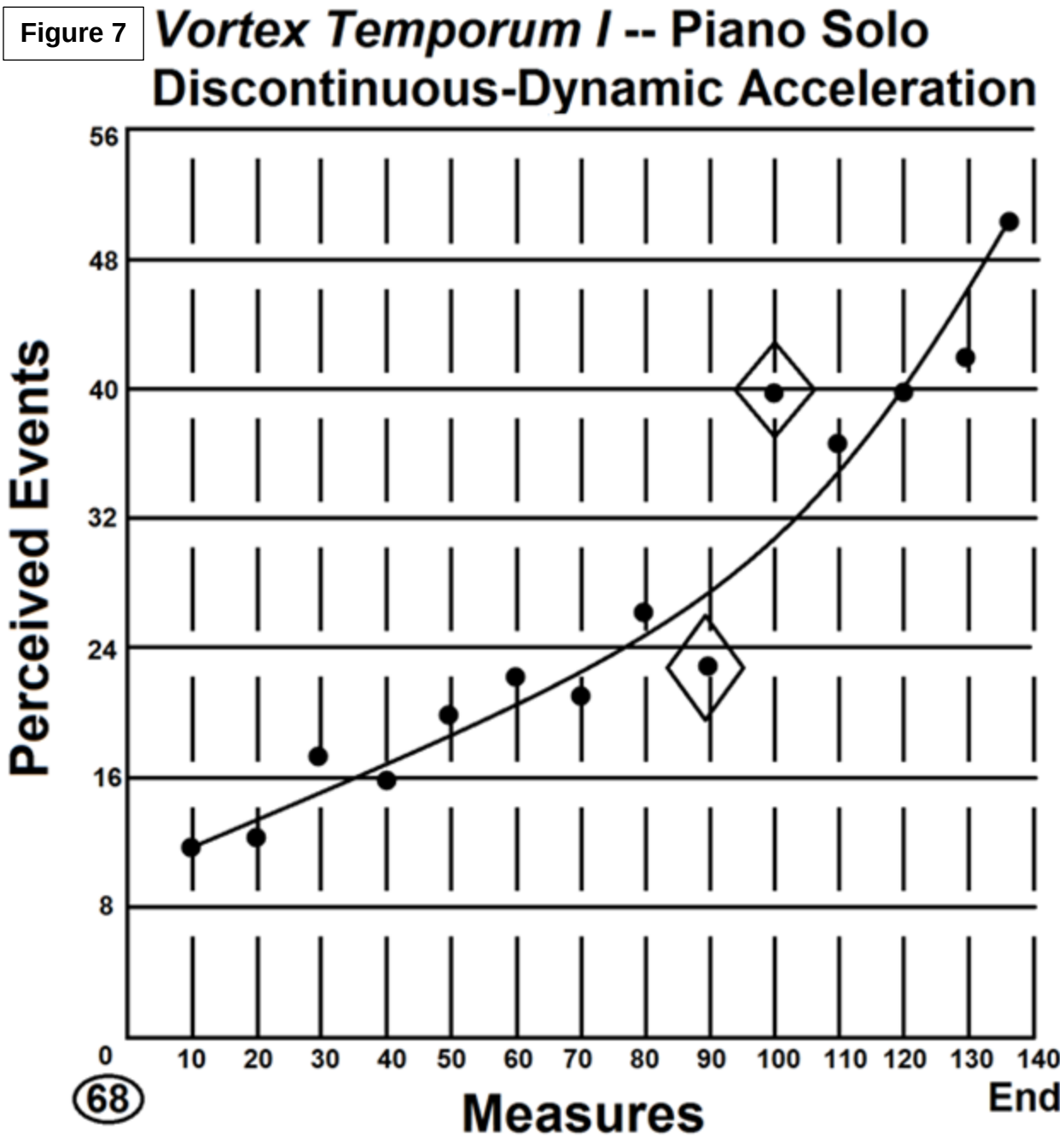
There is the rhythmic equivalent of white-noise in which all predictability is gone and no overall perceptual discernment of acceleration and deceleration can be determined. Lastly, there is rhythmic silence during a held musical event.

First Comparison: *Vortex Temporum*

In movement I of *Vortex Temporum*, Grisey uses a long-term, discontinuous-dynamic acceleration for the entirety of the movement's climactic piano solo. [43]

[42] Refer to figure 6 on p. 27.
[43] Refer to figure 7 on p. 28.

Figure 7



This graph was created by counting the total number of measures in the piano solo and counting the total number of perceived events that occurred within the span of each set of ten measures. The number of perceived events is on the y-axis while the number of measures in the piano solo is on the x-axis. This solo starts at rehearsal marking 68 of movement I and ends 137 measures later as indicated on the graph. The

scatter plot contains an approximate line-of-best-fit showing the logarithmic nature of the change in the number of perceived events. An elision is shown between the two points that have diamonds surrounding them.

The “perceived events” are obviously subjective though Grisey’s table (by which this graph was created) is a representation of arrangements of musical events as *perceived* by the listener. My perceiving of these musical events was determined largely by two things: 1) changes of contour and 2) points of arrival. I marked an event as any segment of music between which the change of contour seemed to mark a musical event’s end and the beginning of a new one. I strived always to hear the smallest possible musical events. Silences of more than an eighth note were generally considered one event. Points of arrival were numbered as an event if the contour led to an impressionable end. Therefore, points of arrival were counted twice—once as part of an event between contour shifts and once as a point of arrival.

The measures of the piano solo are of differing meters (though do not average a great difference in size), and this does cause the graph to be skewed. I argue that the logarithmic acceleration and “jump” as an elision are shown prominent enough to render the skewed nature of the graph negligible.

First Comparison: *Perspectives*

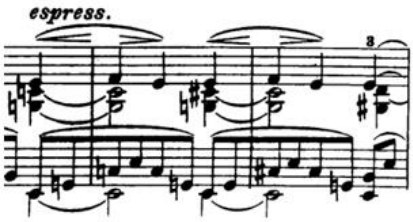
Perspectives movement II (7’ 09” – 12’ 40”) contains a continuous-dynamic acceleration by synchronization of each mediums’ times. This occurs approximately between the 10’45” and 11’35” marks in the video. Four elements (the Brahms

Intermezzo, its dance-form, its percussion-music-form, and its film-form) are working in tandem during this acceleration.

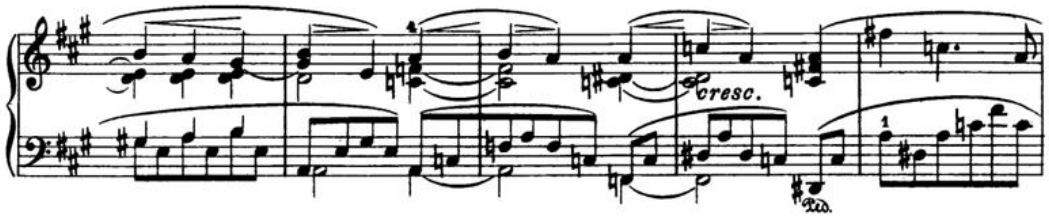
An understanding of how and why they work together is contingent upon an understanding of the original Brahms *Intermezzo*'s expression at the time of the acceleration. From measure (mm.) 85 beat (b.) 3 – mm. 99 b. 1 there is an upward motion of building tension.[44]

Figure 8

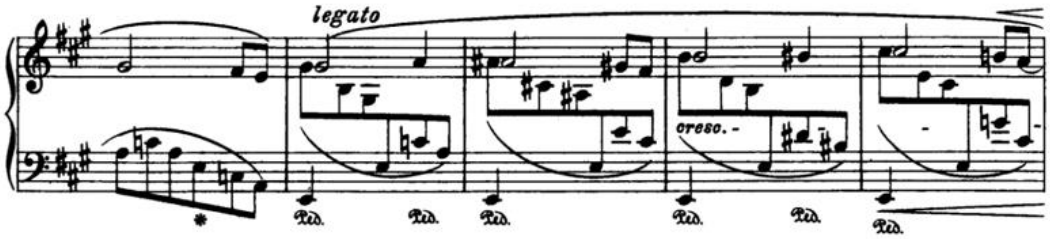
Brahms *Intermezzo Op. 118, No. 2* (mm. 85 b. 3 - mm. 99 b. 3)



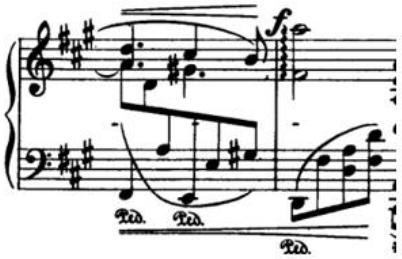
mm. 85 b. 3 – 87



mm. 88 - 92



mm. 93 - 97



mm. 98 – 99 b. 3

[44] Refer to figure 8 on p. 30. Measures were counted straight through including the pickup.

The Brahms *Intermezzo* ends in a plagal cadence, D – A. This building upward motion moves towards the D major chord at mm. 99 which initiates a concluding descent to the piece's final cadence. Essentially, the chromatic C major chord at b. 3 of mm. 85 moves to the cadential D major chord at mm. 99 b. 1.

The Brahms *Intermezzo*'s emotional expression as a building tension was reflected into the dancer's interpretation of it. In the piano recording of the Brahms *Intermezzo*, mm. 85 begins approximately four minutes into the recording. The second movement of *Perspectives* begins at approximately 7' 10". Consequently, the dancer's reaction to this build can be clearly observed approximately four minutes into the second movement starting at 11'. The building tension's effect on the dance can be observed through her uneasy, twisting motion on the floor.

This section is interspersed with video and audio of the dance's interpretations by the percussionist. Consequently, the percussionist's interpretation was influenced by the twisting motion in the form of mallet and hand percussion rolls on both the congas and bongos. The audio of these rolls was manipulated and reversed. The individual reversed notes of each roll were then re-sequenced into forward motion which begins at the 11' 10" mark and builds as an acceleration to the 11' 31" mark. These individual reversed notes of the roll are distributed logarithmically with no "jumps" as an elision between the marks given. This is the percussionist music's link to the Brahms *Intermezzo* and its dance-form.

The linking of film to the other mediums is obvious, in that, the entire work is a film, but in this section the quick cuts which are synchronized to the reversed conga bongo rolls emphasize this continuous-dynamic acceleration specifically.

The Second Comparison

Second, both the second movement of *Vortex* and the first movement of *Perspectives* consist entirely of time's expansion—for *Vortex*, in terms of speed and for *Perspectives*, in terms of perspective. For this comparison, *Vortex*'s use of condensed, harmonic spectra and *Perspectives*'s use of staging are analyzed.

Note that the final two comparisons of the analysis do concern the poetic discourse of each piece. Therefore, these comparisons support the figurative changes in the audience's temporal perception *not* their literal changes.

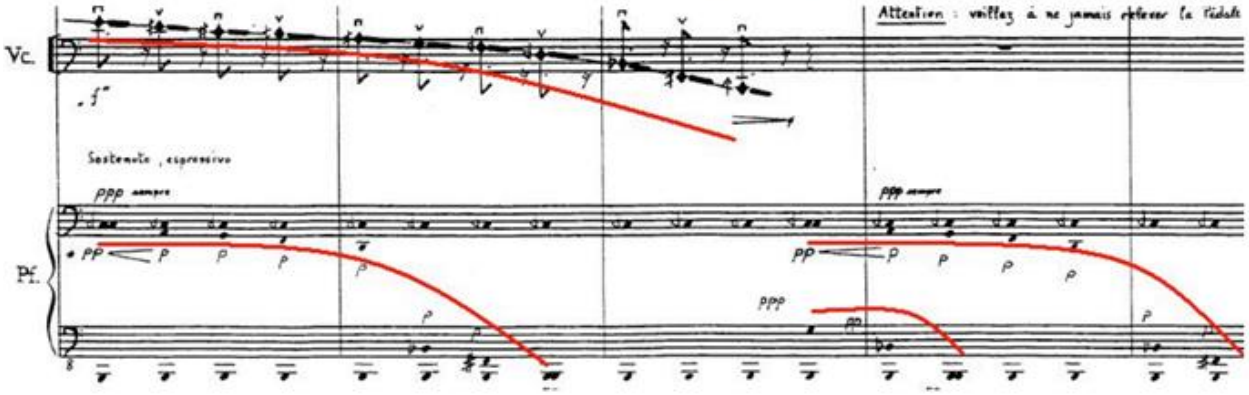
Second Comparison: *Vortex Temporum*

In movement II of *Vortex*, Grisey moves his audience back from the Ravel arpeggios resulting in an expansion of their quantitative time. This is reflected, in part, by a slow, continual downward trajectory[45] in the piano accompanied by long, held notes from the rest of the ensemble in the movement's opening.[46]

[45] Refer to figure 9 on p. 32. The downward trajectory of the piano and cello parts is marked.
[46] Wang, 88.

Figure 9

The Piano and Cello Parts in the Opening of *Vortex Temporum II*



This, in turn, results in the perception of the arpeggios as slowed. The downward motion reflects the occurrence of a drop in pitch as a sound moves away from its listener.[47]

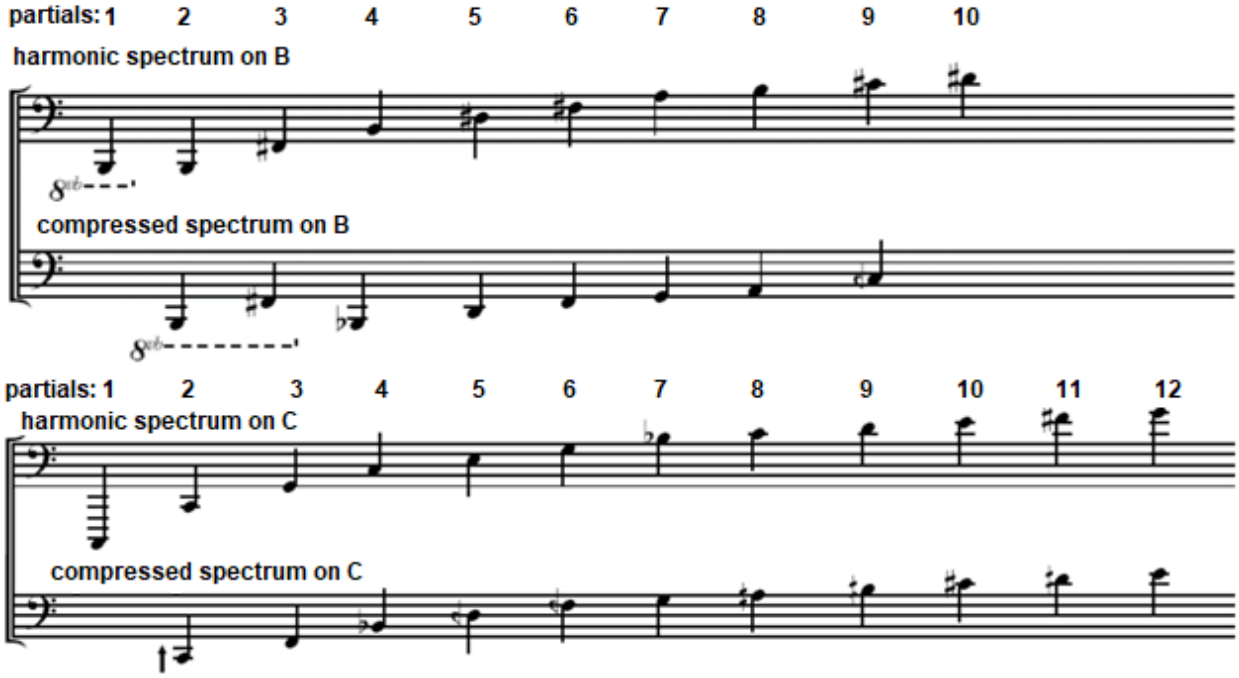
This extreme slowing of the Ravel arpeggios in movement II allows the audience to clearly perceive minute details of the Ravel arpeggios. It could be perceived that the audience's increase in perceptual acuity of the Ravel arpeggios allows them to hear the individual overtones of the pitches that comprise the arpeggios. This notion is supported by Grisey's use of compressed spectra[48] in this movement.

[47]This phenomenon is the doppler effect. A full layman's explanation can be found here: "The Doppler Effect: What does Motion do to Waves?" Alt Shift X. https://www.youtube.com/watch?v=h4OnBYrbCjY (accessed 06/22, 2017).

[48] These are the timbral representations of pitches through their overtones.

Figure 10

Derivation of Piano and Cello Parts in the Opening of *Vortex Temporum II*



At the opening of the movement[49] Grisey shows this through two condensed spectras—one on C (in the cello) and one on B (in the piano).[50] These condensed spectra both appear in their retrograded forms.[51] They begin the movement's harmonic/timbral progression and are continually distorted and developed throughout the movement.

Second Comparison: *Perspectives*

In *Perspectives* movement I (1' 32" – 7' 07"), the audience's expansion of their qualitative time is achieved through staging. By choosing to stage only the percussion-form of the *Intermezzo* for the entirety of the movement, the audience's temporal view

[49] Refer to the figure 9 on p. 33.
[50] Wang, 91. Refer to figure 10 on p. 32.
[51] Ibid.

was confined to one side of *Perspectives*'s musical object—the percussion-form. This compared with the more balanced temporal view in the second movement (parts of the dance-form and percussion-form shown together) is an expansion of their view with respect to the *Intermezzo* as percussion music. Through this expansion, only one side of the *Intermezzo* can be experienced.

The Third Comparison

Third, both the third movement of *Vortex* and the third movement of *Perspectives* concern time's contraction—for *Vortex*, in terms of speed and for *Perspectives*, in terms of perspectives. For this comparison, *Vortex*'s use of recurring opening material from the first movement and *Perspectives*'s use of nine-shot split screen are analyzed.

Third Comparison: *Vortex Temporum*

In *Vortex*, Grisey continually moves his audience back and forth from the Ravel arpeggios resulting in quantitative expansions and contractions[52] of the audience's quantitative time. As Grisey moves his audience closer to the Ravel arpeggios their quantitative expands and "normalizes" reflecting the opening Ravel arpeggios in the "normal time" of movement I. As Grisey moves his audience back from the Ravel arpeggios their quantitative time contracts reflected by the opening Ravel arpeggios appearing distorted as they appear sped up. A closer examination of three contractions and expansions illustrates both Grisey's imagination and skill.

[52] Refer to table 2 on p. 34. This is by no means all of the contractions and expansions though these seem most prominent and structural. The location column's numbers refer to rehearsal markings.

Table 2

Vortex Temporum III - Temporal Expansions and Contractions	
Location	Salient Features
Opening	Nearly identical to first movement opening; Pizzicati
1	Longer; Arpeggio division change in piano
2	Pitches of arpeggio change
3	Strings take arpeggio
5	Brief; Long note values suspend arpeggio
6	Mixed rhythmic divisions
10	Brief; Long note values suspend arpeggio
12	Rhythmic complexity: 16th quintuplets over 16ths over 8:5
16	Sparse
20	String harmonics outline contour
22	Soft; Piano leads; Short notes outlining arpeggios
26	Undulating dynamics
30	Contour outlined with timbre between sultasto and sul pont
35	Complex rhythmic overlays with suspended notes of arpeggio
40	Faint return; high string harmonics, little piano
44	In piano - intervallic expansion becomes arpeggio
60	Two sound masses

Movement III's first three bars[53] are nearly identical to movement I's opening[54]. Grisey uses the same three overlapping arpeggios in the flute, clarinet, and piano, though by bar four the arpeggios are interrupted by sparse pizzicato in the cello outlining the piano's arpeggio, the viola outlining the clarinet's arpeggio, and the violin briefly accenting the flute's arpeggio. By the fifth bar the arpeggios begin to dissipate.[55] These first few bars of movement III's opening orient the audience to the first

[53] Refer to figure 12 on p. 38.
[54] Refer to figure 11 on p. 37.
[55] Refer to figure 13 on p. 39.

movement's "normal time". Grisey then pulls his audience back from this "time field" rendering the stream of arpeggios as mere points in time and plucks of string.

Figure 11

The Opening of *Vortex Temporum I*

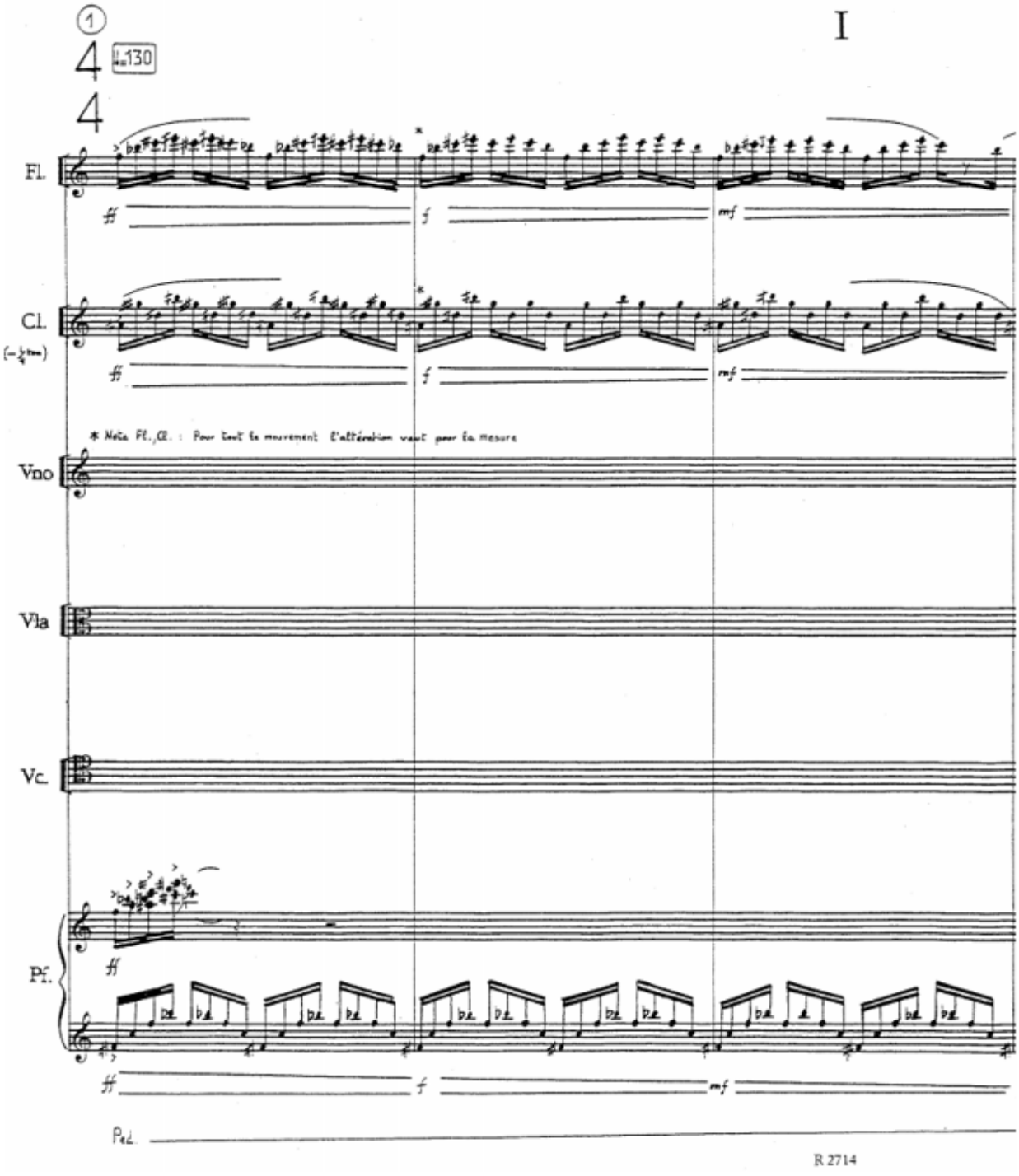


Figure 12

The Opening of *Vortex Temporum III*

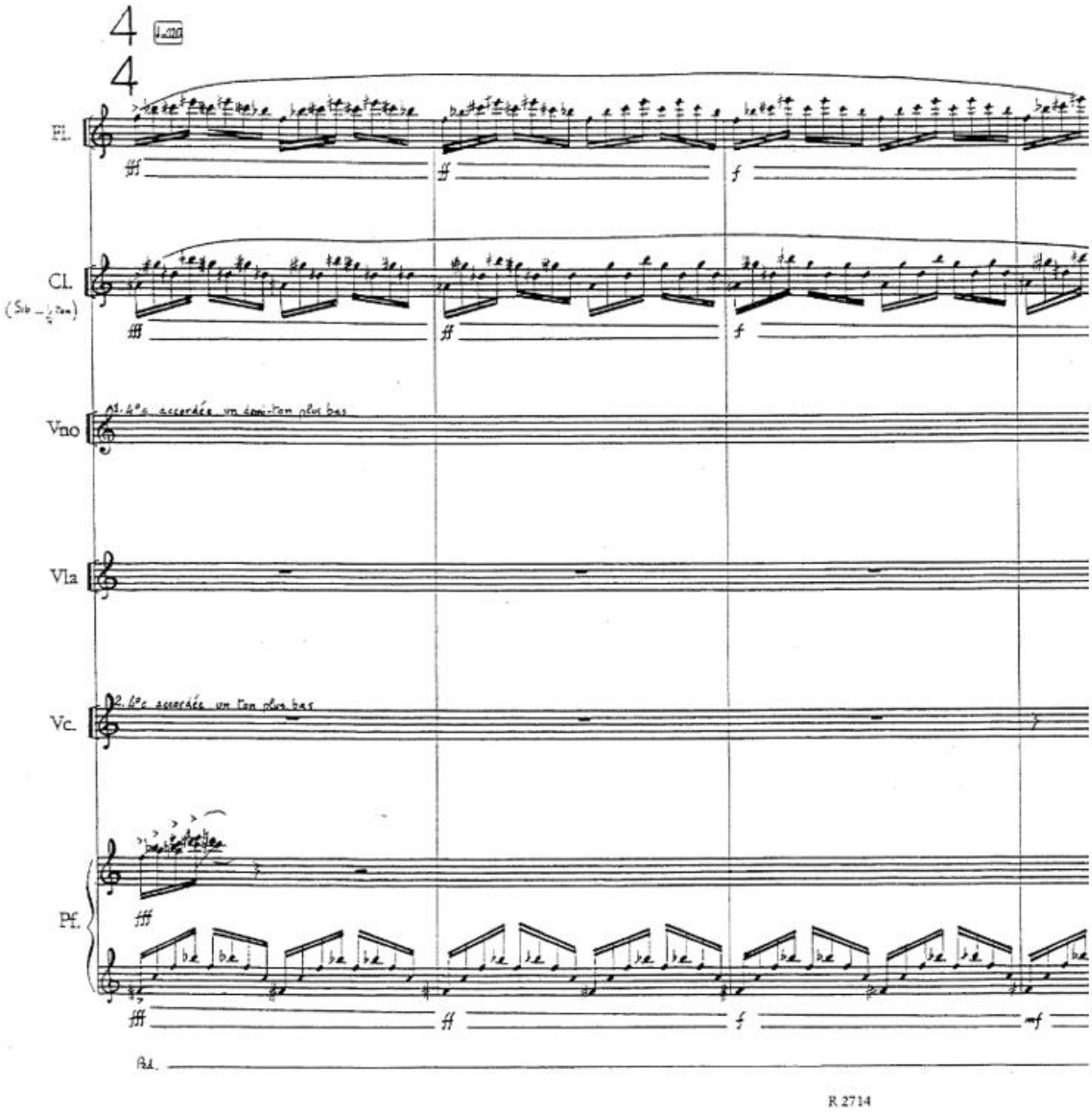
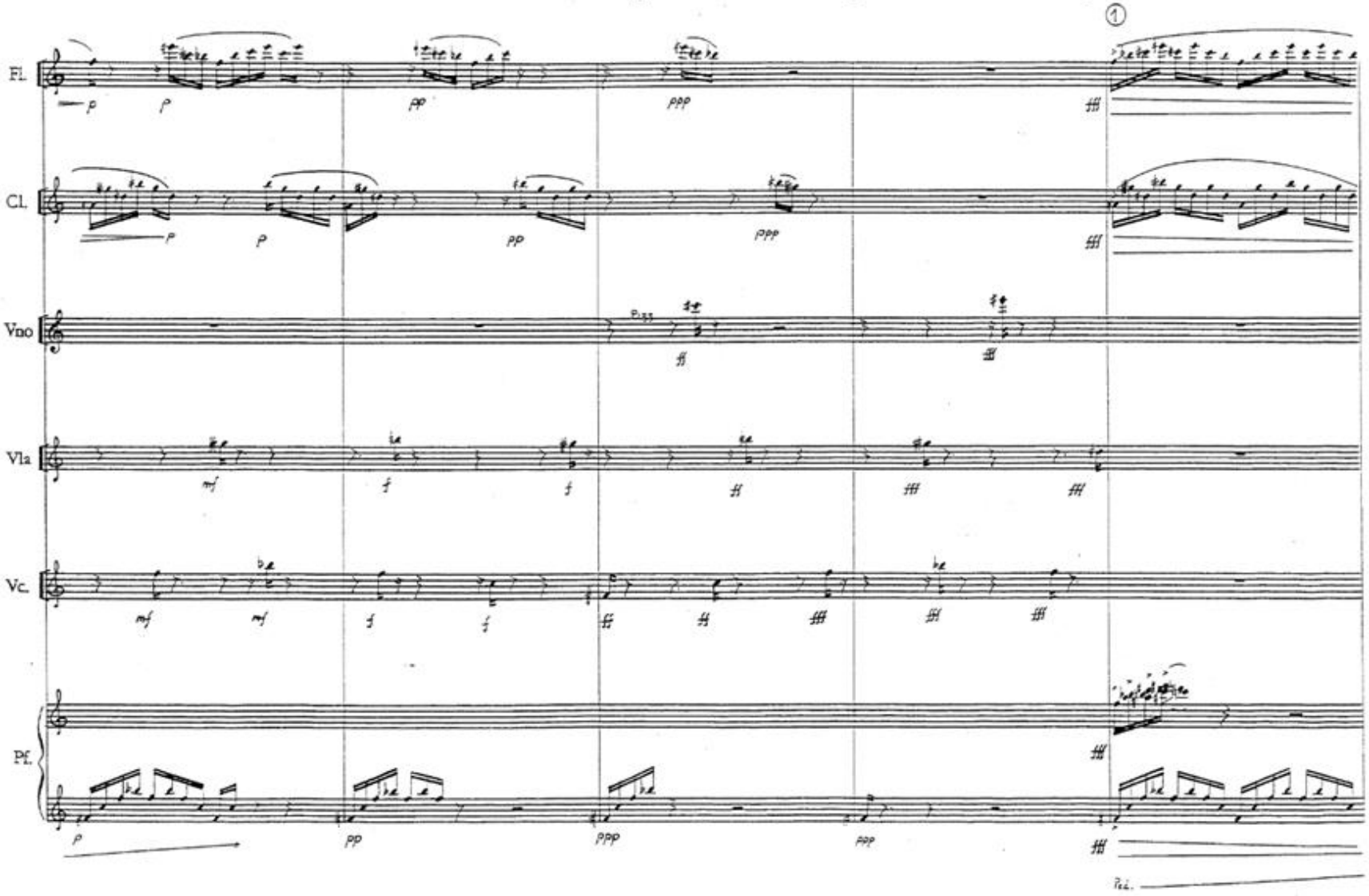


Figure 13

Vortex Temporum III (mm. 6 - 10)



At rehearsal marking 26, Grisey introduces another contraction of the opening material though now the Ravel arpeggios have distorted to a reference of the piano solo's initial gesture from the first movement (rehearsal marking 68).[56] As the piano continues its jagged, microtonal arpeggios the cello, viola, bass clarinet, and flute enter one by one each holding long notes. The upper three voices create a microtonal cluster around D# with a low F ¾ sharp in the cello. Grisey then has them expand and contract their dynamic ranges in unison.[57] This push and pull of the dynamics creates the illusion that the audience is being continually pulled close to the ensemble only to be pushed away again. The can be perceived to be the back and forth motion creating the audience's quantitative contractions of time. As these temporal contractions continue the range of the gestures extends upward reflecting the perceived change in the audience's quantitative time in relation to the arpeggios.

[56] Refer to figure 14 on p. 41.
[57] Refer to figure 15 on p. 42.

Figure 14 ***Vortex Temporum III*** **(rehearsal marking 26)**

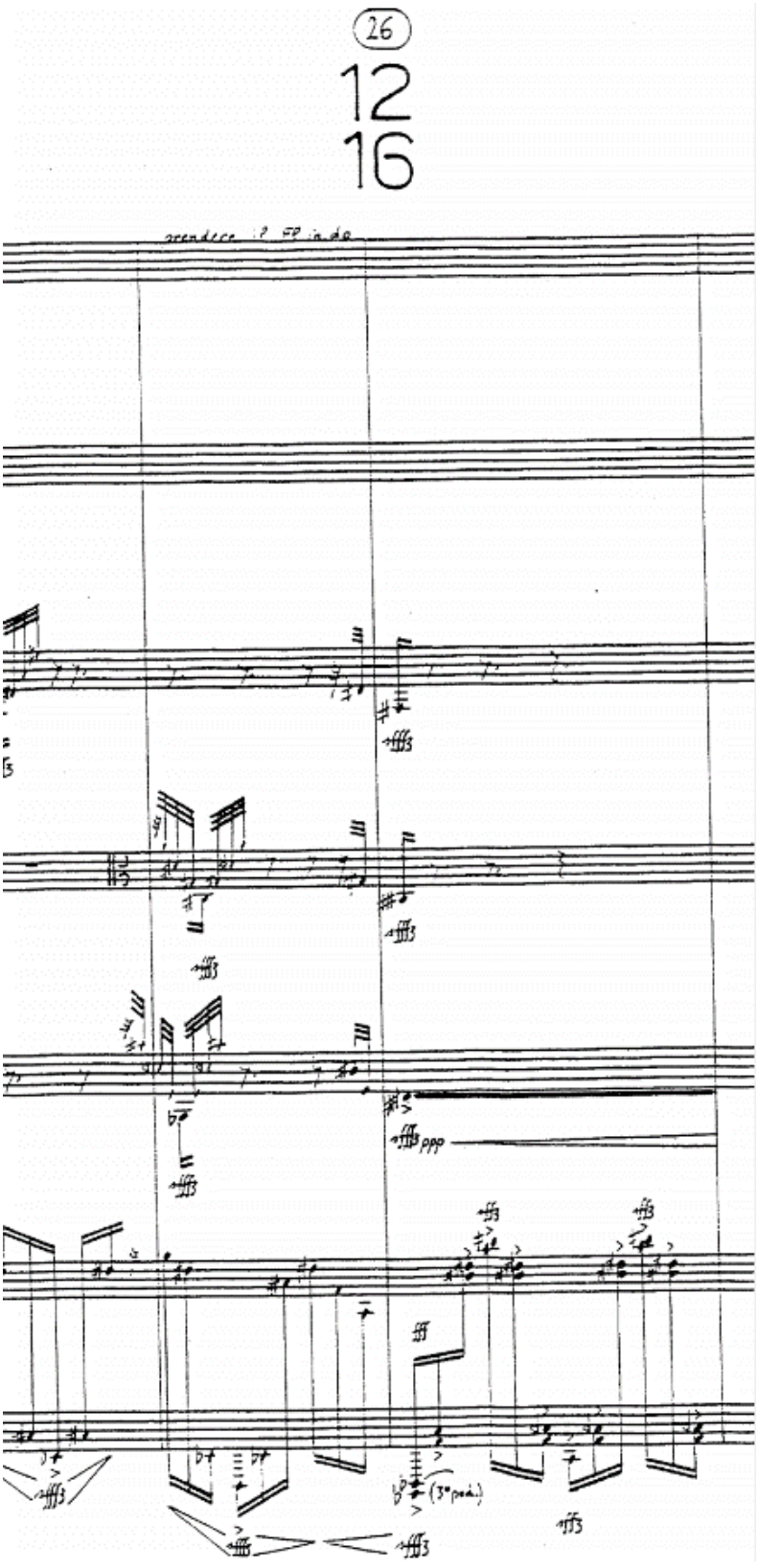
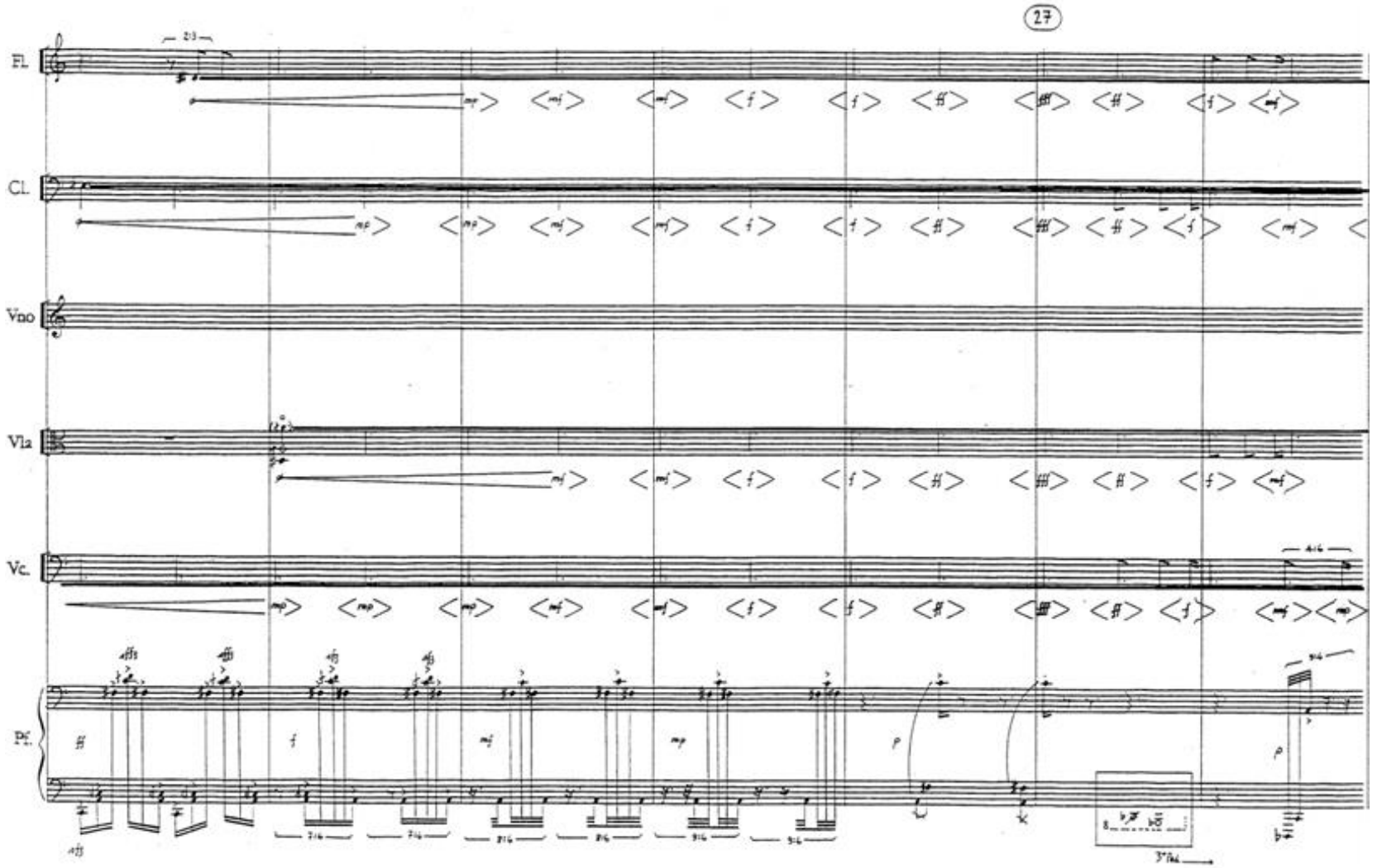


Figure 15

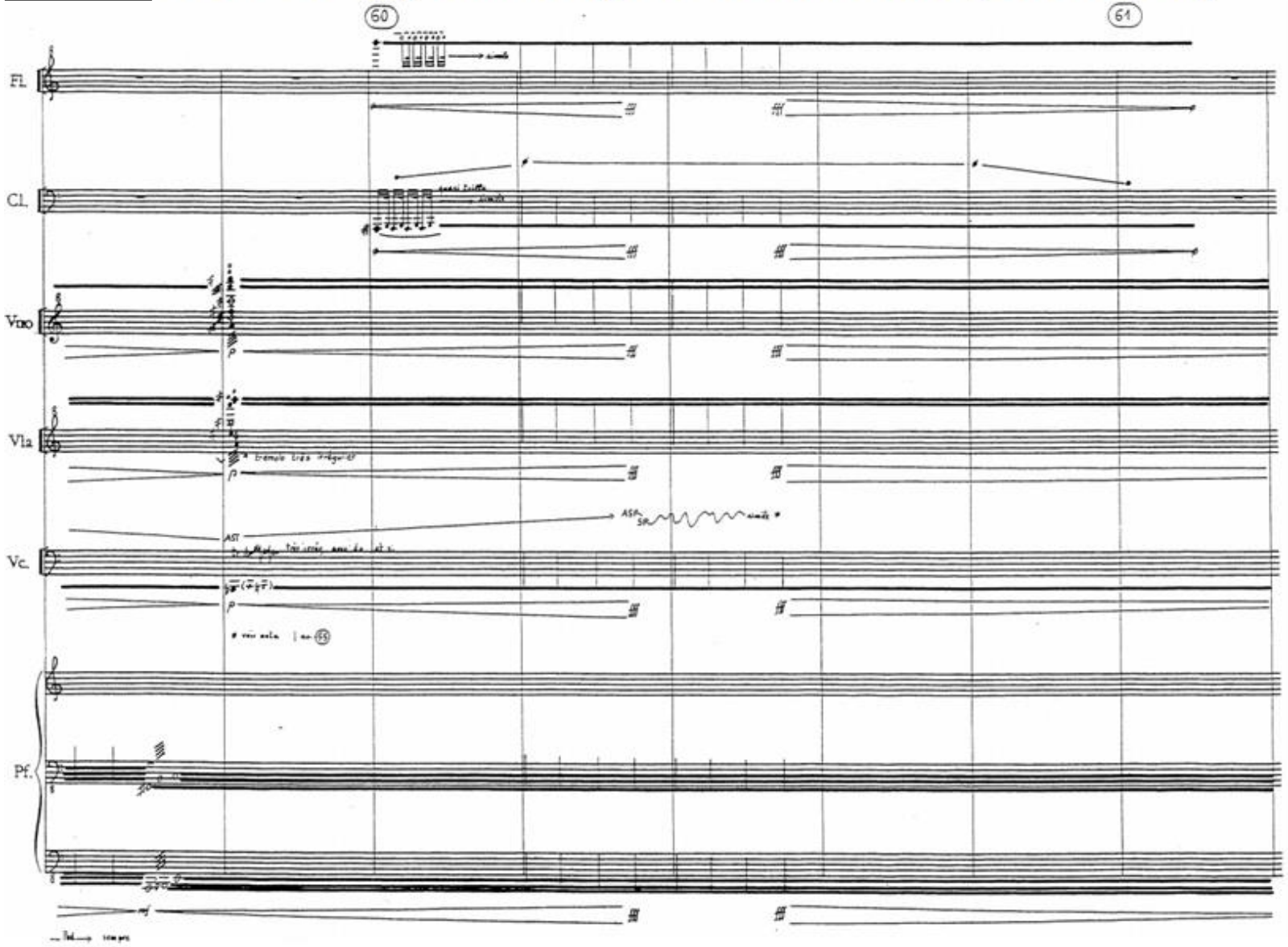
Vortex Temporum III (rehearsal marking 27)



Grisey's final contraction is the most abstract and comes in the form of two sound masses that increase in dynamic range and then taper off.[58] They can each be perceived as masses of Ravel arpeggios contracted together so densely that they become a wash of sound. Perhaps, even perceived as the entire piece condensed into a gesture. The flute, violin, and viola have harmonics (violin and viola double stop tremolos) providing the upper range of the mass. The bass clarinet, cello, and piano tremolo and trill in their lowest ranges. Grisey takes advantage of the bass clarinet's ability for harsh, raspy timbres in its lowest range by including it in the mass's crescendos to a triple forte that decrescendos into the air noise and piano harmonics of the concluding interlude.

[58] Refer to figure 17 on p. 40. This shows the second sound mass only.

Figure 16 ***Vortex Temporum III*** **(rehearsal marking 60 and 61)**



Third Comparison: *Perspectives*

In movement III (12’ 42” – 18’ 08”) of *Perspectives*, the *Intermezzo*’s placement shifts causing a change in the audience’s perspective of the *Intermezzo* in its film-form. In movement III, the *Intermezzo* is placed the greatest distance from the audience. Therefore, the audience’s qualitative time of the *Intermezzo* is contracted. At this greater distance, the proportion the *Intermezzo* consumes of the audience’s total qualitative time is less than in movements I and II. This contraction allows for the qualitative time in relation to other object to enlarge for the audience. The audience’s enlarged qualitative time (or perspective) for other objects is shown through nine-shot split screen (a property unique to film). In each of these screens, other perspectives of the *Intermezzo* (or other forms of the *Intermezzo*) are shown. Through the audience’s perspective of the *Intermezzo*’s side that is film, multiple sides (or forms) of the *Intermezzo* are experienced at once. It is as if the qualitative time of the audience contracts so much as to allow them an omnipresence around the *Intermezzo* as a musical object. Two uses of this nine-shot split screen within the movement are analyzed.

The third movement opens and closes with nine-shot split screen. The movement’s opening (12’ 42” – 14’ 43”) begins with black-and-white screens fading in and out of differing positions within the nine-shot view. This begins with one screen and builds to a climax (14’ 18”) with eight of the nine screens containing images. There is one screen left black at this climax.

At this climax, each screen was color-graded to create a mosaic of differing shades of gray. This first screen shown in the movement contains the dance video that the percussionist interpreted to make the film-form of the *Intermezzo*. This video remains on screen for the entire sequence though is shifted to differing positions. Its color level is slightly lifted in comparison to all the other screens so its movement can be tracked.

The other screens contain takes of the dancer and percussionist many of which have already been seen in the first two movements. Some of the screens contain takes that are in reverse, and at 13’ 45” in the upper right the same two takes are shown—one forward, one reversed. At 13’ 55” their times match and cross one another.

Throughout this opening section the Brahms *Intermezzo* as piano music is slowed to half speed. At points in the sequence, the *Intermezzo* piano music matches movements on varying screens. This occurs at the 13’ 20” mark with the bottom right screen. At points in this sequence, the percussionist’s audio can be heard synced with a few of the screens. This occurs at the 13’ 35” mark with the bottom middle screen. At the climax of this section (14’ 30”), the middle screen becomes full screen with audio of a cymbal hit from the percussionist.

The closing (17’ 02” – 18’ 08”) of the movement reintroduces the nine-shot split screen synced to audio of a tom-tom hit followed by a tam-tam hit. The tom-tom hit signals the boundary lines and the tam-tam hit signals the first screen. Like the opening, the screens contain takes of the dancer and percussionist though now with color and faster movement from screen to screen. These screens pop in and fade in matching the tension built by the edited audio of the percussionist’s drum rolls. The same techniques

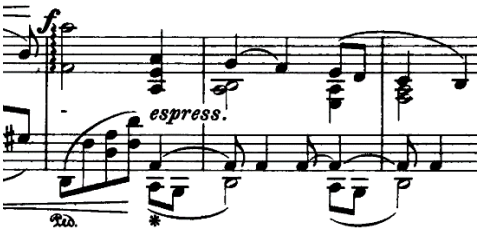
used for Grisey's continuous acceleration described in movement two were applied here.

As the final climax (17' 31") of the work approaches a low, distorted sound rises in pitch to a tam-tam hit that initiates the simultaneous playing of two themes in the original Brahms *Intermezzo*.[59]

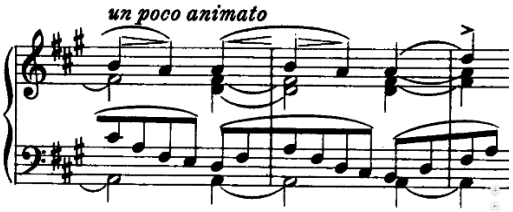
Figure 17

Brahms *Intermezzo Op. 118, No. 2* (mm. 86 – 88 and mm. 95 – 97 b. 1)

mm. 86 - 88



mm. 95 – 97 b. 1



Visually the tam-tam hit initiates a mosaic of the dancer touching her face. The screens are jumbled—scaled to various sizes, flipped, inverted, and placed in differing positions. The movement ends with split screen fading to reveal the dancer gracefully moving to the floor.

[59] Refer to figure 17 on p. 47.

Conclusion

Through this comparative analysis three possible paths for research are clear. Each path stems from the comparative analysis between *Vortex* and *Perspectives* concerning temporal perception's relativity.

First, research might stem from the comparative analysis as a whole. The analysis concerns musical aesthetics as it is an explanation of my subjective appreciation for Grisey's *Vortex Temporum*. From this musical aesthetic viewpoint, research could be conducted by continuing to apply the framework of my analysis to other pieces. These pieces could be found to concern, like *Vortex* and *Perspectives*, a poetic discourse on temporal perception of a musical object. This viewpoint could then be compared to more traditional views of motivic development. This research might suggest that temporal perception is a legitimate viewpoint for an explanation of motivic development in a variety of musical contexts.

Second, research might stem from the part of the comparative analysis concerning quantitative time. Specifically, this research might stem from Grisey's table[60] of arrangements of durations from most predictable to least predictable.[61] From this viewpoint, research could be conducted by applying classifications of durational arrangements in Grisey's table to vastly differing styles of music in a way similar to the creation of my "perceived events" chart in the comparative analysis's first part concerning *Vortex*. Grisey's classifications of these durational arrangements could then

[60] Refer to table 1 on p. 24.
[61] Grisey, Gérard. "Tempus Ex…", 244.

be compared to others' ideas concerning the speed of musical events. An example of one such idea is explained in part four on flexible tempos of David Epstein's *Shaping Time*.[62] This research might suggest that quantitative time in pieces of vastly differing styles as measured according to Grisey's table is the more universally applicable and effective way to describe quantitative time in music.

Third, research might stem from the part of the comparative analysis concerning qualitative time. Specifically, this research might stem from *Perspectives*'s reflections of the Brahms *Intermezzo*'s artistic expression in the dance, percussion music, and film. From this viewpoint, research could be conducted by examining similarities between vastly differing styles of music and their artistic interpretations by performers of varying skill levels and artistic backgrounds. This research could be conducted similarly by the highlighting of the reflections of the Brahms *Intermezzo*'s artistic expression in the first part of the comparative analysis concerning *Perspectives*. This research could then be compared to other artforms which rely on interpretation (e.g., jazz). This research might suggest that artistic interpretations of other artworks can retain the original artwork's artistic expression by reflecting its shades of intensity.

Each of these paths of research could be taken together or separately in any combination as a larger research project concerning musical temporal perception's relativity.

[62] Epstein, David, 1930-2002. Shaping Time: Music, the Brain, and Performance. New York;Toronto;: Schirmer Books, 1994: 365-567.

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