UCLA
UCLA Electronic Theses and Dissertations

Title
Music in Virtual Reality: Musical Immersivity and Interactivity

Permalink
https://escholarship.org/uc/item/10c6w9jj

Author
Peire-Serrate, Tomas

Publication Date
2019

Supplemental Material
https://escholarship.org/uc/item/10c6w9jj#supplemental

Peer reviewed|Thesis/dissertation

eScholarship.org Powered by the California Digital Library
University of California

UNIVERSITY OF CALIFORNIA

Los Angeles

Volume I

Music in Virtual Reality: Musical Immersivity and Interactivity

Volume II

Meeting (1.0, 2.0 and 3.0) and Hillary (Concert and VR)

A dissertation submitted in partial satisfaction of
the requirements for the degree of
Doctor of Philosophy in Music

by

Tomàs Peire Serrate

2019

© Copyright by

Tomàs Peire Serrate

2019

ABSTRACT OF THE DISSERTATION

Volume I

Music in Virtual Reality: Musical immersivity and Interactivity

Volume II

Meeting (1.0, 2.0 and 3.0) and Hillary (Concert and VR)

by

Tomàs Peire Serrate

Doctor of Philosophy in Music

University of California, Los Angeles, 2019

Professor Ian Krouse, Co-Chair

Professor David Samuel Lefkowitz, Co-Chair

Volume I

This dissertation will explore virtual reality (VR) as a “spatialized” environment for artistic expression and creation, focusing particularly on the composer’s creative process when working with it. VR environments are already expanding and reformulating the concept of immersivity and interaction, as those terms have been

understood to date. The motivations and goals of the creative impulse responsible for generating works of art will be considered not only from the perspective of composition but also as an underlying force common in artistic expression—a reflection of the need to communicate between individuals at a deep abstract level.

VR provides a new space, analogous to the physical world, but with the potential to become more flexible and adaptable to the purposes of the composer or artist, and to theoretically present the opportunity to recreate what the artist mentally imagined more faithfully. Beyond a space, VR is also a communication and artistic medium still in the process of developing a unique aesthetic identity.

Volume II

The second volume of this dissertation consists of two works, *Meeting* and *Hillary*, each conceived since their inception to have concert hall performance and VR version. *Hillary* has a version which is a combination of acoustic and electronics. *Meeting* has both acoustic and spatialized electronic concert hall versions. Whereas the concert hall format has been premiered in both cases, their VR versions are projected here though a description according to the format presented at the end of chapter 4 of volume I. These descriptions follow the score for each piece.

This dissertation of Tomàs Peire Serrate is approved.

Rebecca Allen

Jocelyn Ho

Neal Stulberg

Ian Krouse, Committee co-Chair

David Samuel Lefkowitz, Committee co-Chair

University of California, Los Angeles

2018

This work is dedicated to

my parents Isabel and Tomás,

my brother Lucas,

and my wife Sara,

for their unconditional love and support

in everything I have wanted to do.

TABLE OF CONTENTS

Abstract of Dissertation ii

Committee Page iv

Dedication v

List of Figures viii

Acknowledgments ix

Vita x

Volume I

Introduction 1

Chapter 1. Spatial Consideration in Music and Art 4

The Physical Space 4

The Abstract Space 14

Chapter 2. Creative Impulse, Interdisciplinarity and Communication 19

Chapter 3. Music, Immersivity, and Virtual Reality 35

The Sound of a Hand 37

Sonomorphis 39

Murmuring Field 41

Dinner Party 43

Recent VR Music Applications 45

Carne y Arena 50

Tónandi 51

Eight 54

Chapter 4. Thoughts and Creative Considerations for VR.
“4”: A VR Composition. 57

Creative Considerations in VR 61

“4” Description of a VR Composition 68

Conclusions 76

References 79

Volume II

Introduction 84

Hillary 84

Score 87

Hillary (VR) 122

Meeting 129

Score 131

Meeting 3.0 (VR) 171

LIST OF FIGURES

Figure 1.1 “The Forty Part Motet”, Janet Cardiff. 7

Figure 1.2. *Villa dei Misterii,* Italy. 10

Figure 1.3. Altamira Cave, Soria, Spain. 11

Figure 1.4. Lascaux Cave, Montignac, France. 11

Figure 1.5. *Girl in Picture Frame*, by Rembrand. 13

Figure 1.6. *Self-portrait*, by Murillo. 13

Figure 2.1. Virtuallity Continuum 32

Figure 2.2. Virtuallity Continuum Circle 33

Figure 4.1. Creative Consideration in VR Chart 67

Figure vol. II.1 *Meeting*, sculpture by Elaine Krown Klein 129

ACKNOWLEDGMENTS

I would like to express my most sincere gratitude to Professors David S. Lefkowitz and Ian Krouse for the opportunity they gave me, and for the trust and guidance I have continuously received from them during my doctorate years. Their mentorship is a reference and will always accompany me.

I would also like to thank Professors Rebecca Allen, Jocelyn Ho, and Neal Stulberg, for their generosity serving in my doctoral committee and for their valuable feedback.

To Professors Mark Carlson, Peter Golub, Bruce Broughton, and Richard Danielpour, and to the rest of the faculty, staff and colleagues of the UCLA Herb Alpert School of Music for enriching my life.

Finally, to my family, and to my wife Sara, who has patiently listened to and read everything I have created, and who has been with me through this adventure every day and every step.

ACADEMIC VITA

2004	Bachelor of Arts History Universidad de Educación a Distancia, Universitat Autònoma de Barcelona, Spain. and Università degli Studi di Trieste, Italy.
2004	Bachelor of Music Piano Escola Municipal de Música Victòria dels Àngels, Conservatori de Terrassa, Conservatori de Badalona, Spain.
2011	Bachelor of Music Composition Escola Superior de Música de Catalunya, Spain. and Sibelius Academy, Finland.
2013	Master of Music Composition New York University – Steinhardt.

VOLUME I

INTRODUCTION

This dissertation will explore virtual reality (VR) as a “spatialized” environment for artistic expression and creation, focusing particularly on the composer’s creative process when working with it. VR environments are already expanding and reformulating the concept of immersivity and interaction, as those terms have been understood to date. The motivations and goals of the creative impulse responsible for generating works of art will be considered not only from the perspective of composition but also as an underlying force common in artistic expression—a reflection of the need to communicate between individuals at a deep abstract level.

VR provides a new space, analogous to the physical world, but with the potential to become more flexible and adaptable to the purposes of the composer or artist, and to theoretically present the opportunity to recreate what the artist mentally imagined more faithfully. Beyond a space, VR is also a communication and artistic medium still in the process of developing a unique aesthetic identity.

Chapter 1 will discuss how, historically, music has interacted with physical space. This has implications for the “abstract” space, which is created in the human mind. Moreover, due to its immersive qualities, artistic expression has used space in different ways to create compelling experiences but also to allow for temporary escapes from the actual physical world to explore and redefine its limitations. The composer Richard Wagner's (1813-1883) idea of total art will be referenced here as a crucial philosophical change in both the conception of art and the limits of the artist.

Chapter 2 will consider the hypothesis that the boundaries of artistic disciplines are arbitrary, conditioned and pre-established by the development of societies. The creative impulse has to push the boundaries of the medium in question to achieve its goals. Technology and interdisciplinary work are very useful when seeking to generate new artwork and, therefore, new ways to communicate. Additionally, this chapter investigates understanding artistic expression from a communicative perspective with the goal of explaining how VR as a new medium of communication will affect it. Marshall McLuhan's (1911-1980) ideas about media as an extension of the human body and mind will provide a theoretical framework from which to approach the implications of using VR.

Chapter 3 will review recent VR and mixed reality (MR) experiences and experiments that feature music prominently, with the goal of exploring the developments in VR musical works to date. Immersivity and interaction are almost inescapable elements of VR experiences, but the degree to which they are implemented or used can vary hugely. Furthermore, while VR is visually immersive, the development of truly musical immersion has not been adequately explored yet. Film and video games have a palpable influence on VR because they are at the core of most VR experiences and their respective industries generate the funding for project development while being driven by the need to make profit.

Chapter 4 will explore what a truly immersive VR musical experience must be able to offer, and the way the creator or the participant would interact with the environment. I will propose a set of guidelines or considerations for approaching musical creation within VR, with particular emphasis on the challenges that composers face and also the enormous opportunities that they are presented with. To complement this, I will include a description of a new VR music work that explores all the aforementioned considerations.

Finally, in the context of this dissertation, I consider it necessary to establish a dialogue between different artistic expressions at different times, as shown in Chapter 1 and 2 (and 3 but less so) so that, ultimately, we can see VR as a logical step in the evolution of art rather than just as an artifact or ephemeral trend.

CHAPTER 1

SPATIAL CONSIDERATIONS IN MUSIC AND ART

This chapter will discuss how space has important implications in music. On the one hand, there is the “physical” space, which refers to the world we physically inhabit—where music is performed, where it resonates, and where it is perceived—and this chapter explores how this can affect the creative process of the composer as well as the notion of immersion. On the other hand, I will refer to “abstract” space, that is, the space that the composer creates internally, and that, via artistic expression (music in this case), is directed and shared with others in the physical space. Since this is not exclusive to music, I will show connections with other artistic disciplines in terms of their underlying creative process and the urge to use and explore space artistically.

THE PHYSICAL SPACE

Music, as organized sounds through time and therefore as a compound of propagating waves, has the inherent property of expansion through space. It is also omnidirectional and therefore it has the potential to fill spaces both directly from its source and indirectly by interacting with physical objects—bouncing off walls and creating reflections until the vibrational energy is completely absorbed and dissipated. Thus, music has the capacity to momentarily fill the space in which it is played, potentially reaching every corner of it. Of course, many factors intervene in this process and can have an infinite number of results. It is not the goal of this dissertation to discuss them from a purely physical or scientific point of view. However, this explanation illustrates an essential characteristic of music, one we could call “fluid” or, more appropriately, “immersive,” that allows it to unify the space it occupies, and therefore to reach and surround everybody and everything in it while it lasts.

Although sometimes overlooked when talking about music, the fact that a good number of composers—beyond the common practice— have explored the implications of using space as a relevant part of their work is nonetheless significant. If music propagates and can potentially reach everywhere, particularly in performing spaces, why is it appealing to composers to deal with the practical problems that spatialization, as the intentional localization of sound, may generate? The answer to this question may be found in nature. We receive sounds from everywhere, a constant stream of acoustic information that we process by default, often unconsciously, allowing us to be aware of and somehow understand the world around us. We mentally recreate it in a unique personal way, coding and decoding all the information received so that we can retrieve it when needed. Hence, it is understandable that composers, being sensible to this phenomenon, would feel the need to replicate it in their own creations, for multiple possible purposes, and with different degrees of depth and consistency. So, we could conceive a musical work as a world in itself, created by a composer to potentially be explored and shared. This idea will be revisited in the second part of this chapter.

The intentional use of space in music has a long documented tradition. For example, Jewish psalm recitation often involved responsive singing between a soloist and a choir, as was the case in early Christian singing practices.[1] We know that in ancient cultures and through the medieval period, music was used to accompany ceremonies and celebrations, both in sacred and secular situations, and of course as entertainment in association with other social activities or artistic expressions. In the Renaissance, the sophistication of the Venetian antiphonal choir music performed at St. Mark's Basilica became a phenomenon. The *cori spezzati*[2] that Andrea (1532/3-1585) and Giovanni Gabrielli (1554/57-1612) helped popularize deployed different groups of singers and performers around the complex architectural space to create a unique, compelling, and immersive sonic effect.[3]

In connection with the Venetian spatial explorations, Thomas Tallis' *Spem in Alium* is an intriguing case. The piece could have been commissioned as a reaction to the sensation that the performance of *Ecce Beatam Lucem,* by the Italian composer and diplomat Alessandro Striggio (1536-1592), had upon its English audience, probably around the year 1567.[4] Along with William Byrd (1539-1623), Tallis (1505-1585) was a leading English composer of his time, and he was challenged to match Striggio's piece. *Spem in Alium*, first performed in 1573, was composed for eight choirs, each one comprised of five singers: a total of 40 different voices for which Tallis wrote 40 different parts. Although it is difficult to certify how this work was premiered, it is believed that it was first performed at Arundel House in London,[5] a palace with an octagonal hall on two levels. This would have made it possible for Tallis to distribute the eight choirs around and above the audience, surely achieving an impressive immersive effect.

---

[1] Lefkowitz, D. Analysis of Post-Tonal Music: A Parametric Approach. Chapter 17, p. 405.

[2] Broken choirs.

[3] Angelini, Andrea. "Divided Choirs: Myth or Reality? Acoustic Experiments in St Mark's Basilica, Venice."

[4] The date is uncertain but Striggio visited the Elizabethan court that year, after a diplomatic tour around different European countries. During the trip, he arranged a few performances of his music, including *Ecce Beatam Lucem*.

In 2001 *Spem in Alium* inspired and was used by Janet Cardiff[6] to create an art installation, which premiered at the Nelson Atkins Museum in Kansas City. Cardiff, a Canadian artist working with sound and immersive installations, replaced the singers with speakers distributed in a circle around the space so that the visitors could walk around while the music was played.

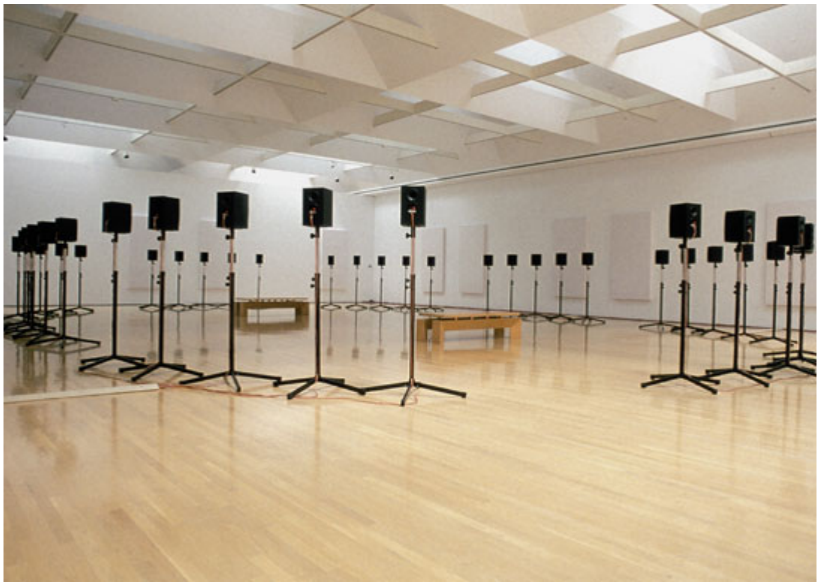


Fig. 1.1 The Forty Part Motet. Janet Cardiff. Musee d'art Contemporain, Montreal.

---

[5] In Fleetwood Sheppard, H. Tallis and his song for forty parts, in The Musical Times and Singing Class Circular (Harley, 2015:149)

[6] Cardiff, J. "The Forty Part Motet." 2001.

The piece played from a 40-track recording, with each singer on an individual track. It offered the possibility of looping the music, so that people could appreciate it while moving freely around the space. Cardiff's piece was very successful and was presented in many venues in subsequent years, thereby contributing to the popularization of Tallis's work. However, it certainly raises questions such as how much the digitalization of the voices affects the resulting experience or, since the voices had to be recorded separately, whether that removes the interactive element between the singers of an ordinary performance. Regardless, this case is interesting because it demonstrates a direct interaction between two artists, separated by more than four centuries, with artistic sensibilities dealing with space.

In conjunction with theatre and particularly with the development of opera in the 17th century, the use of spatialized musical elements in performances for dramatic purposes pushed the limits of the stage space. The placement of performers offstage to emulate distance or movement in relation to the action on stage is a clear example. However, the creative use of space in musical works did not become common until the 20th century, stimulated by technological advances in electronic reproduction and amplification—for example in *musique concrète* and in electroacoustic compositions from the 1950s onwards, with Pierre Shaeffer (1910-1995)[7] as one of the pioneers. Some works tried to emulate not only the sonorities emerging from electronic sounds, but also the spatial location that it was possible to achieve with the use of speakers. As examples, *Gruppen* (1955-57) or *Carré* (1956-60) by Karlheinz Stockhausen (1928-2007) places the audience in the middle of three and four orchestras respectively, each one independent, conducted by a different conductor, but interacting with each other in a deliberate and organized way.

---

[7] Founding the GRMC, *Groupe de Recherche de Musique Concrète*, in 1951. Later it became the *Groupe de Recherches Musicales* (GRM), founded by Shaeffer in 1958.

Stockhausen's spatialized orchestral works, like those from other composers such as Henry Brand, John Corigliano, Marc-André Dalvabie, or Georg Friedrich Haas, are exceptional examples not normally found in live concerts. Historically, music performance has tended to be organized in space for different reasons. The traditional opposition between stage and audience in concert halls was a response to social organization initially and later to commerce strategies, and was, therefore, often a standardizing and constraining element to the composer's intent. In contrast, popular and folk music evolved along different parameters until they were commercially exploited and became a mass phenomenon in the 20th century. Pop and folk music have their roots in gatherings and shared experiences, which allowed for participation and inclusion. As a matter of fact, the aural and oral method of transmission are at the core of these styles of music since they need the frequency of regular shared experience to guarantee their survival.

These musical references exemplify the interest in using spatialization with immersive intentions. This is an important trend in the 21st century, particularly in the entertainment industry, and it is an essential part of the VR experience. However, it is also transcendent in other artistic expressions.

The art historian and media theoretician Oliver Grau, in his book *Virtual art: from Illusion to Immersion* (2003), argues that the quest for immersive experiences (understood as placing the physical body in spaces removed from an actual real place) has always been part of the human creative mind. As an example, he refers to the *Villa dei Misteri*[8], in the south of Italy, close to Pompeii, where frescoes in one of the villa's rooms have been preserved: all its walls are decorated on the theme of the Dionysian mysteries, a set of religious and mythological rituals. It is difficult to say what the intentions were behind these paintings, but whether decorative, reverential or for entertainment, there is no question that they have an immersive impact.

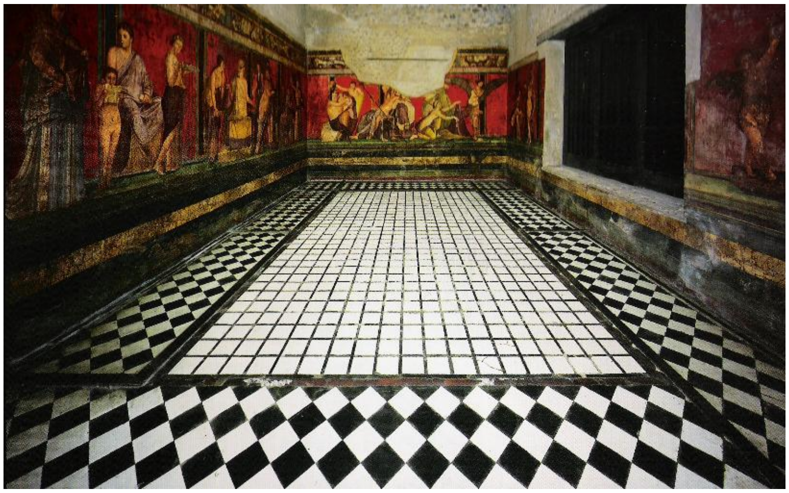


Fig. 1.2. Villa dei Misterii, Pompeii, Italy.

The painted walls at the *Villa dei Misteri* are an example of mural painting, which can be traced back to parietal art. Cave paintings such as those in Altamira (Spain) or Lascaux (France) reveal at least a need to represent or communicate something as well as the existence of a developed technique and sensibility to do it. The scenes represented may not have happened in that particular moment and place and could be recollections of the past or projections and hopes for the future. Furthermore, their size, detail and placing, beyond technical considerations such as materials or surfaces available, create such a deep immersive impression in us nowadays that they raise the question of the aesthetic experience perceived at the time of their creation, more than sixteen thousand years ago.[9]

---

[8] Villa of Mysteries.

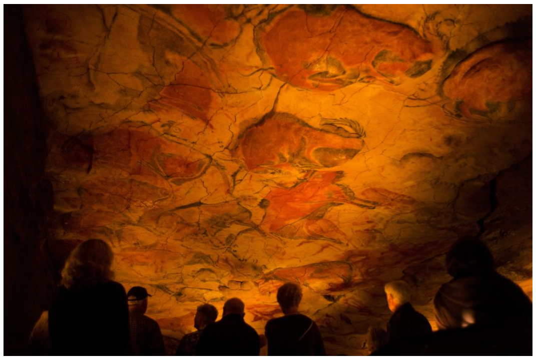


Fig.1.3. Altamira Cave. Soria, Spain.

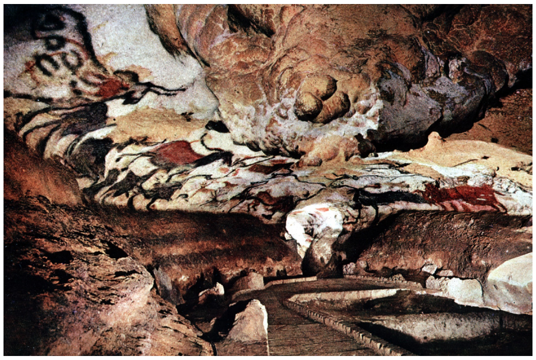


Fig.1.4 Lascaux Cave, Montignac, France.

Another art related to mural painting with immersive potential is tapestries, of which there are samples preserved from as far back as the 3rd century BC. These were used to cover walls and helped mitigate the low temperatures in wealthy houses, and they also functioned as decoration and possibly as entertainment. Additionally, their portability made them a practical choice for use in different properties or for specific occasions.[10] Blurring the distinction between craft and textile art, they were often sumptuous, detailed, and rich in mythological, religious, and historical references. In some cases, their gigantic size generated a similar effect to the frescoes referred to before, just like those that can be found in churches, palaces, temples, *trompe-l'oeil*, etc.

---

[9] There are other examples of Upper Paleolithic paintings from more than forty thousand years ago.

[10] Le Corbusier called them “the mural of the modern age” and “nomadic murals.”

Panoramic paintings, portraying landscapes or historical events, became very popular during the 19th century in Europe and the United States.[11] Interestingly, Robert Barker (1739-1806), the artist who, in 1792, used the term panorama, the wide-angle view of a physical space, to refer to his paintings, enjoyed great success in what he conceived as immersive experiences. He designed and constructed a building with a circular space, a rotunda with two levels, with the sole purpose of exhibiting his work. Situated in Leicester Square, London, the cylindrical space allowed the display of two panoramas, one in the lower and another in the upper circle. The spectator could pay for admission to walk around the space, observe, and *"…fairly imagine he is present at the display of the real scenery…"* as explained in a guidebook of London entertainment of that time.[12] These types of works—forms like the cyclorama or the diorama, which were subsequently influenced by the panorama—enjoyed a warm reception until the development of "moving pictures."

In painting, but in a different format and time, Rembrandt's (1606-1669) *Girl in a Picture Frame* (1645) or Murillo's (1618-1682) *Self Portrait* (1673)—in both of which the subject has seemingly placed a hand on the frame of the painting itself—show this attraction to investing in strategies to deceive the eye of the observer and to convey the idea that art could serve as a small window to another world, as a way of seeing a different world through the eyes of the artist.

---

[11] Hand scrolls like *Qingming Shanghe Tu*, Along the River During the Quingming Festival, by Zhang Zeduan (1085-1145), are earlier examples of forms related to these larger panoramic paintings.

[12] As in the first edition of the guidebook "The Picture of London," 1803.

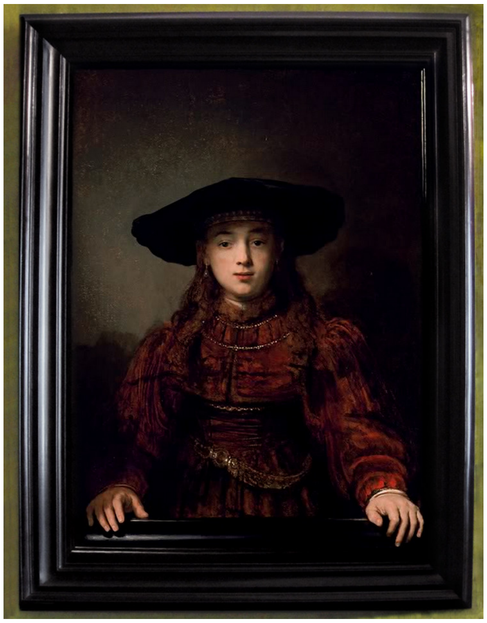


Fig. 1.5. *Girl in Picture Frame*, by Rembrandt.

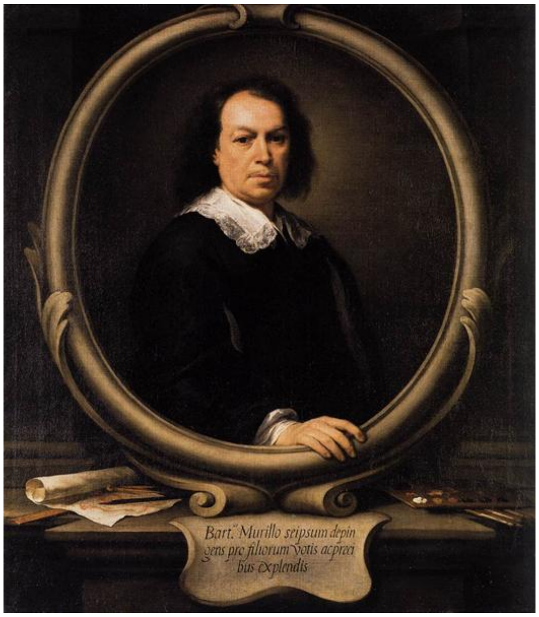


Fig. 1.6. *Self-portrait*, by Murillo.

Those works by Rembrandt and Murillo express an artistic unwillingness to adhere to the limits of their medium. In the 20th century, these limits or boundaries were broken in many ways, including the separation between art and its audience; the so-called fourth wall in film and TV was trespassed, like in the paintings referred to above. It is in fact a provocation to the audience, an invitation to abandon the passive role in the artistic dialogue and to become an active part of it. This immersive and participatory conception of a work of art has been expressed in installations and happenings, and has found its way into other media, such as video games, VR/MR experiences, theme parks, etc.

The idea of projecting an extension of our world may well be an impulse inherent in human nature. The product of what we now categorize in different artistic disciplines has been an intrinsic part of human existence. The interpretation of what has remained until now helps us to understand our own history and origins. Sculpture, for example, shows the need to honor or maintain the physical presence of somebody, or something, beyond its existence, somehow filtered by the sensibility and skill of the sculptor, even if he or she is unaware of it. Poetry, theatre and literature in particular, ever since the distribution of written text became possible with the invention of printing, offer this temporal escape from the present time and reality, not necessarily always with the physical use of space, but certainly on a mental or abstract level.

THE ABSTRACT SPACE

If a musical work can be understood as a small world created by a composer and if space is a creative aspect in composition, then it is logical to think that spatialized elements could and should be found in it. The original version of the work as imagined internally in the composer’s mind may recreate some of the dynamics that we are used to perceiving aurally in every instant of our lives, and therefore are natural in the creative process. The common practice and other constraints may push music to become simplified as it goes through the different stages of its codification, first in setting the piece into the score and finally into a performance. Consequently, we have to assume that very likely there will be a loss of fidelity in respect to the imagined original.

Regarding the conception of a musical work as a world in itself, the title of Béla Bartók's (1881-1945) piano pieces and learning method, *Mikrokosmos*,[13] somehow exemplifies this idea. All the little pieces contained in the collection are particles that form a unity, a cosmos, while each piece is a unit in itself in which the pianist immerses himself or herself for a few seconds, gaining a unique aesthetic and learning experience. All the pieces relate to the rest of the composer's piano output, to his whole catalogue, to his musical influences, and, ultimately, to the world he lived in. Thus, the chain of small cosmoi contained within larger ones continues possibly ad infinitum. As a matter of fact, since the composer provides a space to be experienced by the performer, it is also likely to be shared by an instructor, and potentially an audience. Clearly this is applicable to any piece of music by any composer, but the title choice by a composer like Bartók makes it less arbitrary and rather allows connections with the subject of this chapter (space) and that of chapter 2 (which deals with the philosophical question of the creative impulse and communication).

Far from finding an optimal use of space, in recent centuries artists have been seeking to achieve immersive effects on audiences and to find new modes of expression. Technological developments have been critical in the reformulation of the limits of artistic disciplines and in enabling further interactions and the generation of new expressive formats. Photography, for example, may be derived from painting, initially surpassing the fidelity of which reality might be recreated and presented. However, most interestingly, what probably was initially perceived by some as a threat, turned out to be more of a liberation; it was an opportunity for painters, for example, that stimulated and transformed the expressive strategies and techniques used up to that point and opened the way to new ideas that generated styles or currents such as impressionism, expressionism, cubism, or all the avant-garde trends of the early 20th century that would reinvigorate not only the painting medium but ultimately all media.

---

[13] 153 Progressive piano pieces published between 1926 and 1939. Gathered in six volumes, the first two are dedicated to his son Peter.

The dialogue between art and technology can be exported to other artistic disciplines, since technological developments provide allies and stimuli to regenerate each discipline's own language and expand its possibilities. In addition, another successful way to find new artistic expression has been the combination of different arts to create interdisciplinary works. The exploration of new combinations has been prolific, even more so in the 20th century, with technological developments in electricity and electronic devices. In these combined or multimedia projects, with the ultimate intention of achieving more powerful and immersive results, music is almost always present. Unsurprisingly, it seems that the immersive quality discussed earlier is a factor of utmost importance to achieve the desired goals. Opera, particularly in the 19th century, is the epitome of this interaction and combination of different disciplines. This is demonstrated by Richard Wagner (1813-1883) and his concept of the

Gesamtkunstwerk.[14] What Wagner's conception and process explains is how what we understand now as "interdisciplinarity" could be seen in fact as a process of liberation from the classifications self-imposed upon our society at practically all levels.

Wagner, by defending the idea of total art, composed the music, wrote the libretto, intervened in the staging and every creative decision, and ultimately even designed a building for his work to be performed in to ensure the most faithful rendition of the product of his creative impulse—that which he imagined in the abstract space. In doing so, he demonstrates that this creative impulse goes beyond the pre-established limitations and attributions of a discipline. In our world, we are driven to specialization for social and economic reasons. However, although it may appear to be a convenient and efficient system to which we can adapt, it is not necessarily a true reflection of human nature. On the contrary, it may have become a burden from which we may be trying to free ourselves.

In the 2003 compilation by Randall Packer and Wen Jordan *Multi Media: From Wagner to Virtual Reality*, the first chapter is *The Artwork of the Future* by Wagner (1849), in which he proposes the aforementioned idea of *Gesamtkunstwerk*. It is significant in the context of this dissertation to find this article in a book dedicated to advancements in the field of virtual reality, perhaps as a precognition of the virtual space. Wagner's thinking will be discussed in the next chapter for further considerations regarding the creative impulse and interdisciplinary ways of expression.

---

[14] Different translations as "universal artwork" or "total work of art," first used in 1827 by German philosopher K.F.E. Trahndorff, and later by Wagner in his two 1849 essays.

CHAPTER 2

CREATIVE IMPULSE, INTERDISCIPLINARITY AND COMMUNICATION

The creative impulse pushes the artist to explore the limits of his/her imagination to produce a work of art. This process eventually reaches the point where the realization of the work of art needs more than what a single framework, medium, or artistic discipline can offer, and consequently the artist feels the need to go beyond any established boundaries. This phenomenon can be seen as the consequence of the inclination that humans have to organize, classify and categorize everything, including creativity. Within the same discipline, for example, a dramatic situation like the appearance of vocal soloists and the choir in the last movement of Beethoven's Ninth Symphony could be explained by the composer's need to break the rules in order to reach his desired climax, making the performance of his artistic intent possible with the appropriate means so it could be conveyed to the world. Here the boundary broken is the traditional instrumentation of the symphony via the introduction of a choir and soloists. As we can conclude now, that adventurous and dramatic leap, premiered in 1824, expanded the concept of what was (until then) the framework of a symphony as a musical form. Nowadays choir, soloists, electronics, projections, and much else besides are not unusual in works using the word "symphony" in their title.

Wagner's concept of total art is an expression of this inexorable creative impulse, a striving for expressive freedom that goes beyond artistic boundaries. As explained in chapter 1, Wagner was not alone in this exploration, and its logical continuation was the rise of interdisciplinary works in the 20th century. Like him, other composers experienced the same instinct in their compositions, resulting in works that incorporated text in different forms, physical movement, and staging, as well as elements that were traditionally less common, such as lighting.

Arnold Schoenberg (1874-1951), for example, after completing his Opus 18, *Die glückliche Hand*,[15] a piece he catalogued as "*Drama mit Musik,"*[16] expressed the possibility of exporting the piece to cinematic format, as cinema was in its early days at the time.[17] The piece (for which he wrote the libretto unlike his previous operatic work *Erwartung)*[18] calls for baritone, a large orchestra including an offstage ensemble, two miming characters, and a chorus of Sprechstimme.[19] But what is striking is the degree of precision and control that he tries to achieve by detailing actors' movements as well as the colors and intensity of the illumination, which are to synchronize closely with the developments in the music and drama on stage. The lighting directions focus particularly on transitions and dynamic changes through time, such as crescendos, decrescendos, tempo changes, and textural changes in the music.[20]

---

[15] *Die glückliche Hand* (The Hand of Fate or The Happy Hand upon different translations) was written between 1910 and 1913. Its premiere was at the Vienna Volksoper in 1924.

[16] Drama with music.

[17] Referred to in various sources including Sanchez-Verdú's dissertation, Reich, W. Arnold Schoenberg oder Der konservative Revolutionär, DTV, Münich, 1974 and Marjana Veselinovic-Hofman's paper *Drama with Music. Die glückliche Hand by Arnold Schoenberg as a Multimedia Project*.

[18] Opus 17, 1909, with a libretto by Marie Pappenheim.

[19] Spoken singing.

[20] This increasing interest in multisensory experiences extending music compositions became a trend for many composers all around Europe from these early years of the 20th Century.

Schoenberg considered himself an amateur painter, but when he was working on *Die glückliche Hand,* he was painting intensively, which may partially explain the obsession with color and light in the piece. Furthermore, the subject has a strong connection with the trauma in his personal life after the affair that his wife Mathilde and the painter Richard Gerstl had a few years before. Perhaps this is an indication that the extreme control over all the details in the work was motivated by a drive to achieve emotional freedom and a need to externalize or communicate a turbulent inner state to the outside world. To succeed in his goal, Schoenberg drew upon all possible artistic resources; thus, it is not surprising that, as mentioned above, he considered using a medium such as cinema to convey his vision better.

Around the same time, Alexander Scriabin (1871-1915) developed a system to connect music and colored lighting in his piece *Prometheus: The Poem of Fire*, a 20-minute symphonic work for piano, orchestra, choir and *clavier à lumières.*[21] The piece was premiered in Moscow in 1911, but it was not performed with the colored lighting until 1915 in New York at Carnegie Hall. Scriabin meant to deliver an experience beyond music alone by intimately relating it to another sense besides hearing. In that regard, and without attempting to delve deeply into the subject, it is worth mentioning the phenomenon of synesthesia, a condition that causes the joining of senses that are not normally connected. Studies show that synesthesia is perceived in multiple and very personal ways, which makes it difficult to explain from the point of view of aesthetic perception, and even harder to share in artistic contexts particularly. The term synesthesia has been used in reference to multisensory experiences without the connotation of the condition that generally is scientifically approved. However, some researchers and studies[22] in progress are considering the hypothesis that connections between different senses in our brain could be common in humans at the moment of birth and during the first years of life, suggesting that this capacity is abandoned as humans get older. Following that hypothesis, though, there is a possibility that the instinct pursued by many artists in combining different artistic disciplines to achieve more compelling and immersive experiences may have a deeper organic foundation than was previously thought.

---

[21] Also *Chromola*, by Preston Millar, upon the invention of the *Color Organ* in 1893 by the painter Alexander Wallace Remington. A mechanical device built to represent sound and accompany music in visual medium.

Similar to these extended explorations in composition, and around the same time as Schoenberg's and Scriabin works, the Russian artist Wassily Kandinsky (1866-1944) created his opera, or experimental theater piece, *Der Gelbe Klang.*[23] This piece, which has neither conventional plot nor dialogue, had a central focus on color, one of Kandinsky's obsessions. As a matter of fact, by that time he had just published *Concerning the Spiritual in Art,*[24] where he elaborates on his theory about abstraction, form, color, and synesthesia. *Der Gelbe Klang* had original music by the Russian composer Thomas de Hartmann (1885-1956), but it was unfortunately lost. Its premiere had to be postponed due to the outbreak of World War I, and it was not until 1972 that it took place at the Guggenheim Museum in New York. This production used music created by Gunther Schuller (1925-2015) based upon notes on the original work by de Hartmann, but later performances in different locations used other music, both pre-existing and original. Kandinsky's interest in synesthesia, a trending topic in artistic circles in this period, is palpable in the four "color-tone dramas" (of which *Der Gelbe Klang* was the first)[25] that he created between 1909 and 1914 as an experiment in blending different art forms.

---

[22] Ravindran, S. "Are We All Born with a Talent for Synaesthesia?"

[23] The Yellow Sound, 1909. First published in 1912 in the *Der Blaue Reiter Almanach* (The Blue Rider Almanac), a publication which emerged from the homonymous expressionist art movement lasting from 1911 to 1914.

[24] Über das Geistige in der Kunst, Munich, 1911.

Significantly, one of the failed attempts to premiere *Der Gelbe Klang* in the years after World War I was in Germany at the Bauhaus,[26] an experimental and interdisciplinary school in which all the arts, including design and architecture, were meant to be interrelated in a sort of *Gesamtkunstwerk* utopia. Kandinsky taught at the Bauhaus from 1922 to 1933. There, artists and designers combined their work, sometimes in shows and presentations incorporating music and dance. Although the school never had a music department, composers like Schoenberg, Igor Stravinsky (1882-1971), and Karol Szymanowski (1882-1937) presented different works in it. In 1923, under the direction of Oskar Schlemmer (1888-1943), the Bauhaus dedicated a week-long festival to the *Celebration of*

---

[25] The others being "The Green Sound," "Black and White," and "Violet."

[26] A German art school, including crafts and fine arts, operating from 1919 to 1933 in Germany, located chronologically in Weimar, Dessau and Berlin. Kandinsky was part of it almost until its demise in 1933, due to pressure received from the Nazi regime.

New Music,[27] where Stravinsky's *A Soldier's Tale*[28] was performed in the presence of the composer, and Paul Hindemith (1895-1963) premiered *Life of the Virgin Mary.*[29] Ferruccio Busoni (1866-1924) attended the festival accompanied by Kurt Weill (1900-1950) and Stefan Volpe (1902-1972), his pupils in Berlin at that time.

The aforementioned concept of striving for freedom in relation to the creative impulse has a philosophical foundation in the thinking of the German philosopher Arthur Schopenhauer (1788-1860). Discussing the duality between the real world and the perceived world, as explained by Immanuel Kant (1724-1804), Schopenhauer finds in the idea of will "the innermost essence"[30] that is intrinsic to human nature and the sole connection between the real world and that perceived by the senses. This essence is, according to Schopenhauer, the endless urging and desire for freedom, truth, or what for some may be God, or a form of godliness. Schopenhauer was influential in Wagner's philosophical and spiritual concerns and was also convinced that music had the sublime power to convey such a concept.

Schopenhauer's "innermost essence" is relevant because it associates the idea of art as the impossible attempt to express an impulse or will and therefore the necessity to expand one's resources to keep trying due to the need to exteriorize it and the yearning to share or communicate it to others. Art, thus, could be understood as the compound of media with which humans try to communicate each other's inner selves.

---

[27] Fest Neuer Musik.
[28] L'Histoire du soldat, 1918.
[29] Das Marienleben, song cycle on 15 poems by Rainer Maria Rilke.
[30] From "The World as Will and Representation," published in 1818.

Many composers, such as Stravinsky or Pierre Boulez (1925-2016), have stated that music means nothing; that it is unable to transfer a concise message—at least nothing that can be coded or transferred into words. Whether provocations or honest statements, this kind of ideas emphasize the abstract nature of music in an artistic, expressive and communicative phenomenon. Since music has the capacity to connect humans at some level, and it operates as a medium of communication in the context of sharing and inner world, we must consider how it can be articulated in the context of media studies. The ideas of the Canadian philosopher and media ecology theorist Marshall McLuhan (1911-1980) can be elucidating, at least from the perspective of western societies.

McLuhan conceived media as extensions of the human body and mind, and of our capability to communicate with and to reach other people.[31] By extending human capability, each medium modifies the relationship or balance between the human senses, affecting not only the individual but also the social environment, hence modifying society. McLuhan describes the history of humankind as a series of Ages, culminating in the Electric Era, which we are now in.

The Tribal Age, the first stage, is predominantly acoustic, and hearing is the primary sense. Humans were organized in communities; communication was oral and therefore immediate and ephemeral. It existed only when heard and only through the spoken word, which led people to be more aware of the present and in the surroundings. The Literate Age, the following stage, is characterized by the development of the phonetic alphabet and a switch toward the eye as the primary organ. This contributed to great progress in sciences and philosophy since, for example, ideas and knowledge were easier to set in a durable format (or medium) to be transmitted. Communication was codified in writing, and therefore emotions and nuances idiosyncratic to the oral communication had to be abstracted and incorporated in the written word. The third stage, The Print Age, is the product of the invention of the printing press in the 15th century,[32] and a critical point for humankind. It signals the transition from an oral/aural culture to a visual culture. The chance to present ideas and knowledge visually and make them available to a mass audience initiated a homogenization of society, a standardization of culture and a transition towards individualism.

---

[31] McLuhan, Marshall. Understanding Media.1964.

With printing, books could be transported and read in privacy, therefore becoming a contributing factor to the isolation of individuals. Regarding this visual culture or world, McLuhan wrote: *"Such [a] world is alien to the resonating diversity of spoken words. So, language was the last art to accept the visual logic of Gutenberg technology, and the first to rebound in the Electric Age."*[33] The quote is meaningful here for two reasons: on the one hand, it hints at the importance of hearing, in this case through language and words, as an efficient and natural way to communicate and connect humans; on the other, it signals the turning point toward the next era: The Electric Age, which in McLuhan's view reverses the exploding dynamic up to that point. If in the Literate Age knowledge and philosophy found the right conditions to develop, the Print Age was the necessary environment for technology to evolve and to take the western world into the modern era, introducing societies to the capitalist system and propitiating political and religious ideologies and emancipation.

---

[32] McLuhan, M. The Gutenberg Galaxy: The Making of Typographic Man. 1962.
[33] McLuhan 1962, p 136.

The Electric Age then turns into an implosion, where electronic media and communication replace the visual culture. For McLuhan, "…*the world has become a computer, an electronic brain, exactly like an infantile piece of science fiction…*"[34] and *"as electrically contracted, the globe is no more than a village."*[35] We have evolved relentlessly to what McLuhan called the "global village": the notion that the world is at the tip of our fingers, whether we want it or not, where everything happens globally and instantaneously—a society of continuous mass media consumption, where what was private or hidden now is public and revealed. In a way this is a return to the community described in the Tribal Age.

Although McLuhan published and explained his theories in the 1960s and 1970s, it is interesting to see how much of all this is current nowadays and how it can help us explain our society, considering the media developments and the influence that these theories have in our everyday life. It certainly seems impossible for most of us to escape or disconnect from communication we send and receive daily, whether written or visual information, advertisements, etc. Similarly, the entertainment industry seems to have adapted to the Electric Age to the last letter. If, with the turn into the 20th century, cinema initiated an unstoppable development toward hegemony among the entertainment media, at the end of the century and the beginning of the 21st, the video game industry seems to be jeopardizing this privileged position.[36] While film has been slowly evolving towards better theatrical systems, but also toward streaming platforms that increasingly substitute the traditional production companies or push them into business models that bypass theatrical releases and distribution, the video game industry has developed a model of entertainment that prioritizes more immersive and interactive experiences that are more global in terms of the actual participation in multiplayer experiences that are potentially enjoyed by thousands of players simultaneously.[37]

---

[34] Ibid. p. 32
[35] McLuhan 1964. p. 5

In this context, the development of VR as a medium with many possible applications and functions has been astonishing in the last few years. It is a medium that can be more immersive, interactive and creative than any other seen before; in a way, it is a virtual version of the "global village" referred to before. McLuhan is once more pertinent here through his famous phrase "The medium is the message"[38] insomuch as, for him, it is not only the content that a medium carries and delivers that is relevant, but also the medium itself. Societies are also transformed by the characteristics of the medium. Furthermore, *"…the content of any medium is always another medium…"*[39] which in turn happens to have been replaced by a new one.

---

[36] According to different sources, in 2018 video games generated US $152.1 billion, whereas film box office earned $40.1 billion and music $19.1 billion.

[37] Like in MMO or MMOG, Massively Multiplayer Online Game. In 2013, World of Tanks set the Guinness Record for the "Most Players Online Simultaneously on one MOG server" hitting the mark of 190,541 players on the RU2 server in Russia.

[38] McLuhan. 1964.

The visual element has a crucial role in what VR is evolving into. This is understandable since its starting point is purely visual and its immediate ancestors are the television, film and video games of the digital era. However, there is a problem within the development of this new medium: the conditions under which the expressive explorations and consequent technological developments are happening. The majority of labs working on VR technology and implementing better devices are funded by large corporations such as Facebook or Microsoft, and their goals are essentially motivated by profit.[40] Developers of VR experiences might depend a great deal on grants and particularly on the potential economic success of their products, and therefore they behave and play around with the complicity of the market and these large companies. This creates an environment that, although certainly changing at great speed, might be focusing attention in the direction that least relates to the artistic impulse discussed above, and may therefore be taking VR towards a territory of superficiality—of distraction through experiences focusing on the entertainment value. In that context, VR needs to be explored, developed, and understood to find expressive, artistic ways to be meaningful, rather than replicating or enhancing models imported from other visual media.

---

[39] Ibid. p. 8.

[40] Additionally, the origins and continuous investments in developments and explorations in VR, as well as with the Internet, are in the army. Training simulations and internal communications respectively, with defense and war purposes, were the goals for implementing these tools initially, and in part continue to be today.

If we can understand art as a medium of communication and connect it with McLuhan's views on media, then art becomes an extension of a human's physical, sensorial, intellectual, and emotional attributes. Considering that virtual reality as a new medium is competing and challenging the success of other media such as film and video games, it may be presenting a unique opportunity for artists to develop a new artistic approach within an environment that provides a whole new set of possibilities. In connection with McLuhan, the ideas of the Scottish philosopher and professor at the University of Edinburgh, Andrew Clark (b. 1957), are relevant here as a further elaboration on conceptualizing art, and music in particular, as an extension of the human mind.[41] According to Clark's "extended mind" hypothesis, cognition is produced in a dynamic cycle running from the mind, or brain, to the outside world through our physical body. Clark states that the human body is not necessarily the limit with the outside world, a sort of unique and final interface with it, and that when we use external tools or devices (pencil and paper or a computer, for example) we are just extending the cycle, so that it is arbitrary to limit cognition to a closed package of mind and biological body. Furthermore, Clark foresees logical steps in this extended cognitive model with the development and use of EBEs[42] or cognitive prosthetics.

---

[41] In an interview, Clark declared that although he had never read McLuhan, he may have been influenced by him through secondary sources.

[42] Electronic Brain Enhancements.

Although Professor Clark's interests and projections in human-electronic integration may seem a little futuristic, the reality is that experimentation with brain implants, for example, has been moving in this direction since the 1950s. In 2006, a man with spinal cord paralysis received the first brain implant through which he interacted with a computer by controlling its cursor,[43] and on July 16, 2019, engineer and technology entrepreneur Elon Musk unveiled publicly some of the developments that his neurotechnology company Neuralink[44] is pursuing to connect human brains to machines. As a consequence, it is conceivable that the opportunity to encode and transfer abstract thinking, perhaps including music composition, with a high degree of accuracy and at an acceptable and useful speed of transmission, into a digitally-generated system like VR is not that far away. Music and electronics have already been fused in many electro-acoustic works including pre-recorded and live interaction, incorporating the latest technological devices, allowing more flexibility and parameters of interaction, and foreshadowing a possible cybernetic era of intimate communication between electronic devices, computers, and organic organisms.

Finally, as a preparation for the next chapter focused on VR experiences and in the philosophical and technological context of the present one, it is necessary to refer to the concept of virtualization, a term used in computer science as the act of creating a virtual version of something physically real.

---

[43] Matthew Nagle played Pong on the computer using only his mind.
[44] Neuralink Corporation, founded in 2016.

According to Frank Popper,[45] contemporary art has become virtualized (virtual art) by the convergence of art and technology in the late 20th century. Popper emphasizes that the virtualization of art in recent years is showing a humanizing approach to technology that underscores immersion, multisensorial experiences, and interactivity as the research of the real and the virtual within the medium.

Thus, virtuality is the term designating one end of a continuum with reality on the opposite side (a scale going from the completely real to the completely virtual), as shown in the following diagram (fig. 2.1.)

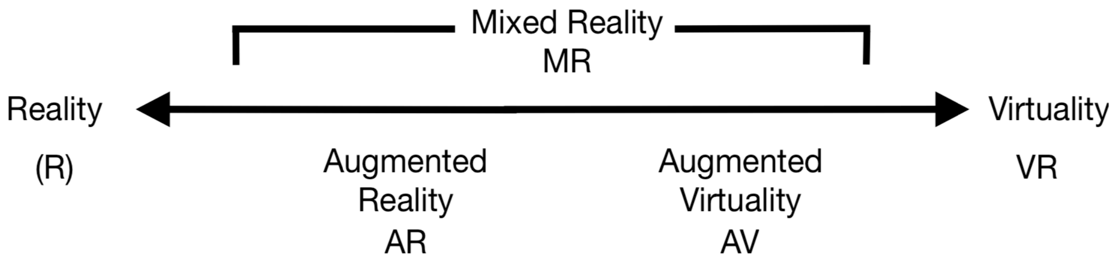


Fig. 2.1. Virtuality continuum

I believe this spectrum may be extended by incorporating the concepts of “abstract” and “physical” space discussed in chapter 1. If so, the “physical” space would be coincidental with the real end of the continuum, whereas the “abstract” space would extend it beyond “reality” in the opposite direction of virtuality, leaving it in the center. Arguably, the “abstract” space should be closer to “virtuality,” since both may contain the notion of an ideal impossible in reality but in fact real, since they exist. Therefore the line from the abstract space to virtuality, through real/physical space, could be almost circular, as shown in the diagram of figure 2.2.

---

[45] In "Origins of Virtualism: An Interview with Frank Popper conducted by Joseph Nechvayal" (2004).

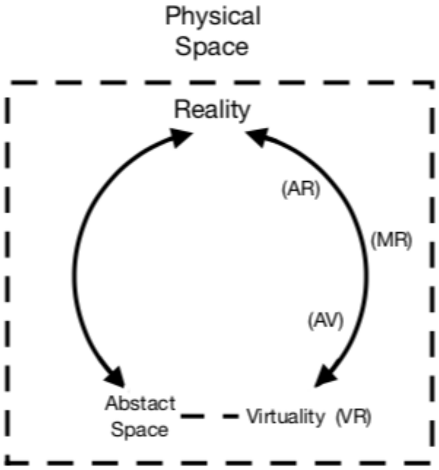


Fig. 2.2. Virtuality continuum circle.

In the spectrum of possibilities, mixed reality (MR), augmented reality (AR), and augmented virtuality (AV) belong to the extended reality family (XR), which includes all the environments and interactions between humans and machines in the virtuality continuum.[46] Additionally, they overlap and share similar technology. Some devices can be used in different types of XR. MR merges both the real and virtual worlds where objects exist in both simultaneously. AR is the real world enhanced by computer-generated objects or data. AV is a virtual environment manipulated by the user from the real world. It also implies that the participants or objects from the real world have a representation in the virtual world. Both AR and AV have real-time interaction but whereas AR happens in the real world where the participant is in, AV does it in the virtually represented, which may be distant. VR completely replaces the real world by a simulated one. The next chapter will present different virtual experiences belonging to different parts of this continuum.

---

[46] The concept of virtuality continuum (VC) was first introduced in 1994 by Paul Milgram in: Milgram, Paul; H. Takemura; A. Utsumi; F. Kishino. “Augmented Reality: A class of displays on the reality-virtuality continuum” *Proceedings of Telemanipulator and Telepresence Technologies*. Pp 2351-34.

CHAPTER 3

MUSIC AND VIRTUAL REALITY

Technological developments in visuals, sound, and interactive interfaces have led the entertainment industry to look for more immersive and interactive experiences. In film, this has been achieved by implementing enlarged screens, IMAX, 3D, or by using a higher frame resolution in shooting and projection.[47] Surround audio systems have extended the possibilities in music-mixing and have increased the importance of sound design, sometimes compromising music appreciation or resulting in an amalgamation of music and sound effects which are difficult to discern. This is certainly affecting the music in film in terms of sonorities and style. There is a discernible influence of electronic music, primarily from popular genres but also from more experimental fields.

Both film and video games (the two more dynamic branches in visual media entertainment in the last few decades) have incorporated these strategies. The latter however, by its very nature, has evolved more in terms of interactivity, at least in its physical aspect.[48] Extensive narratives and game worlds are created with thousands of possible alternatives and variables in terms of sound and music, thanks to the processing power in game engines that allows a degree of detail and flexibility never seen before.

---

[47] The standard being 24fps. Peter Jackson's *The Hobbit: An Unexpected Journey* (2012) was the first feature film commercially released at 48 fps. Other resolutions have been used since then, although it depends on the equipment available in each theatre. Although less standardized, the video game industry considers anything between 30-60 fps acceptable.

[48] Intertextuality, quoting, referencing, honoring, parody, etc., can be seen as a type of interactivity, intellectual in this case, between the artist and the audience.

In terms of sound, audio in VR systems uses binaural stereo in combination with the Head-tracking technology of the VR Head Mounted Display (HMD) to emulate a three-dimensional sound field around the head of the participant. The tracking data from the VR HMD is used to place sound sources according to the movement of the head and body of the participant around the space. These sound sources could also be in motion themselves and therefore this data has to be rendered to generate the desired spatialized and immersive effect.[49] This solves the problem that stereo or surround have to simulate the positioning of sound sources above and below the audience. VR audio requires not only this panoramic three-dimensional sound, but also the possibility of reacting to the interaction that the movement of the participant in the VR world requires. Ambisonics, a technology for both recording and reproducing 3D audio and existing since the 1970s, has been used to achieve this: it creates a surrounding sphere of sound around the participant. It reproduces sound captured with specific Ambisonics microphones[50] and allows for the positioning of additional sounds within its spherical field. It can be reproduced via speakers or binaural headphones.

---

[49] In VR systems different audio plugins, such as dearVR Pro, Amber HRTF, or Google VR, to mention a few, have been designed to process Head-Related Transfer Function (HRTF) data from the HMD.

[50] Ambisonics microphones are non-directional, treating equally any source from any direction. There are different degrees of accuracy in this process, depending on the number of loudspeakers to reproduce it, the computer power, storage capacity, etc. The technique to achieve this degree of accuracy is known as Higher Order of Ambisonics (HOA).

Immersive audio is a field of growing interest not only in relation to VR but also for live concerts, for example, as demonstrated by the L-Isa project created by L-Acoustics, a leading company in terms of live sound in large venues and stadiums. L-Isa is a technology enabling multidimensional sound experiences, or as the company promotes it: “Immersive Hyperreal Sound.” As immersive experiences like VR continue to evolve, we should expect to see projects combining these technologies. More interestingly, this technology should inspire and increase the creative possibilities for composers.

In that context, the implementation of VR systems has evolved from purely experimental projects in universities or private companies’ labs to devices and experiences available to the general public. In order to properly describe the opportunities that VR offers for composers today, in this chapter I will review significant VR experiences showing the use of music in the 1990s, more recent uses of VR in the field of music, and finally describe in more detail three recent works I believe have approached the medium in an innovative way and which use music as an important, if not central, element alongside some commercial ones.

The Sound of One Hand

Jaron Lanier (b. 1960) is considered one of the founding fathers of VR. A visionary, computer scientist, and visual artist, Lanier is also a composer and an improviser, owner and performer of many instruments, some of them rare, unique, or invented. It is significant for this dissertation that such a relevant authority in the field of VR attaches great importance to music as an agent for innovation. In 1992, Lanier gave a public performance of *The Sound of One Hand*, a VR music improvisation experience that he created and which consisted of a virtual world created with three instruments in it: the Rhythm Gimbal, the CyberXylo, and the CyberSax. The instruments could be played with a single hand using a DataGlove as an interface and the Head Mounted Display (HMD) XVR EyePhone by VPL[51] for the visuals. The audience watched the performance live on a big screen, a 2D version of what Lanier was seeing, and listened to the music resulting from the improvisation with the virtual instruments through a stereo system. As he explains in his paper "Virtual Instrumentation,"[52] the sound of the instruments was generated by two samplers/synthesizers, and he decided not to use 3D sound because it would not have been possible for the audience to appreciate it without the use of headphones.

Although there is not much footage available, the experience presents the instruments generated in 3D and suspended in space while a hand makes them move and sound as it touches them. The instruments have some autonomy and continue sounding even if the hand has moved towards another instrument. The result is an amalgamation of the three instruments, with the Rhythm Gimbal as background and the choice of the CyberXylo or the CyberSax as soloists. The CyberSax has a hybrid sonority between a wind instrument and an electric guitar, whereas the CyberXylo sounds very similar to a regular xylophone.

---

[51] VPL Research, founded by J. Lanier in 1984. One of the first companies for research, development and sale of VR devices.
[52] http://www.jaronlanier.com/instruments.html.

The piece had a few performances around the world, always with Lanier as performer-improviser. Interestingly, for Lanier at that time the CyberSax was *"the most sophisticated virtual hand tool yet designed,"*[53] with a surprising number of options such as controlling the mix, timbre, volume, and even the placement of the tone in space. In Lanier's words, *"the purpose [of this experience] is to play music in an intensely gestural style."*[54] This emphasizes that interaction and embodiment are essential elements of VR.

SonoMorphis

This computer-based interactive installation was presented in 1998 by the ZKM[55] researchers Bernd Lintermann, an artist who focuses on interactive and generative systems, and Torsten Belschner, a sound designer and media artist. *SonoMorphis* combined 3D visuals and generative composition[56] processes in a multidimensional experience. The participant could interact with the visuals by choosing a model—an abstract graphic object, such as an organism with a familiar shape—and choosing from different mutation patterns with which the visualization of a "creature" could be manipulated in real time. The angle of perception could be rotated so the visuals could be viewed from different perspectives. The processes applied to the graphic visualization were inspired and extracted from similar processes in nature and studied in genetics. On an acoustic level, the parameters used to define and create the visuals were also the source for the musical output. Thus, sound and visuals relate to the same underlying data structure. Generative composition and sound synthesis techniques implemented in Max[57] were used to create musical structures, reinterpreting the data used for the physical objects to define the appropriate parameters for the music, such as pitch, register, amplitude, etc., as well as all the information needed to generate different types of sounds to define the color and density of the compositions. Lintermann explains how the installation was conceived as being as flexible as "[...] *a musical instrument, consisting of an image and a sonic component. Observation of the system's behavior during exhibitions has shown its ability to respond to users' varying approaches, playing styles, and temperaments in a differentiated and recognizable way*."

---

[53] Ibid.

[54] Ibid.

[55] *Zentrum für Kunst und Medien*. Center for Art and Media in Karlsruhe, Germany.

[56] Music created from a set of rules or conditions causing the composer's will to be removed from the creative process and aiming to make the music ever-different. Brian Eno popularized the term in the 1970s, but there are numerous composers working with the idea and a range of approaches to the concept.

Although a direct relation between visuals and sound was not intended, the authors explain how they tried to find a middle way to provide the participant with connective elements in the experience, something between total separation and complete coordination. They established certain rules, such as changing sound's quality when the visual structure was clearly changing. Interestingly, one these rules was spatialization, mapping musical elements with visual structures so that the participant´s mind naturally associated them.

---

[57] Max/MSP/Jitter, a visual programming language for music and multimedia developed by Cycling '74 upon Miller Puckette's work on *The Patcher* at IRCAM, later Max/FST and the Opcode Systems's commercial version.

The installation could be accessed from its real exhibition point as well as remotely via the World Wide Web, both affecting the visual and acoustic results simultaneously. In that sense, and in the creators' conception, *SonoMorphis* was an implemented approximation to the idea of an "open artwork,"[58] potentially infinite both in time and space.

Murmuring Fields

Between 1998 and 2000, Monika Fleischmann, an artist and researcher of visual arts, and Wolfgang Strauss, an architect and media artist, experimented with the idea of physical immersion, defining an area where visitors could interact with virtual space and objects as they moved freely around thanks to a camera recognizing their movements.

Murmuring Fields was shown as a CAVE[59] installation, a cube with all six inner surfaces available as screens for projection (though not the "ceiling" in this case) with the aim of surrounding the participants with images and sound. Participants were asked to wear shutter glasses so they could appreciate 3D images of the environments as well as images generated by their movements within the space. Two or three participants were allowed in at a time due to the limited area (10 by 10 meters) and the need to have space to move around. The interesting aspect of this installation was the idea of embodiment and awareness of the participant being the avatar in the virtual space. Since the participant did not have to wear uncomfortable gear other than the shutter glasses, the movement around the space could be quite spontaneous, facilitating the process of understanding the environment and the consequences of movement in it. Thus, the participant's movement had a two-fold response in the system: a visual abstract representation projected on the wall-screens, and an aural response generated by the movement of the avatar, activating sounding areas in the CAVE, which were represented by 3D symbols in the projection. The sounds emitted, though they seemed like random bits of audio recordings, were actually acoustic references to the response to the environment, hence a clue for the participant to develop an understanding of the mechanism of the system—an interactive communication between the participant/avatar and the virtual world. The sounds in *Murmuring Fields*, recordings of statements by different thinkers,[60] are virtually positioned around space with a decreasing density from the center: in the center the statements overlap, the sound field is collapsed, but as the participant moved towards the edge of the space, these are broken, sounding incomplete until just parts of words or just phonemes could be heard. According to the authors, this represented a travel "from noise to silence."[61] The freedom of movement of the participant allowed him/her to create meaning, in that case not only attached to sound but to actual bits or complete sentences somehow freely associated.

---

[58] From Umberto Eco's *Opera Aperta*, 1962.

[59] Cave Automatic Virtual Environment, an immersive VR environment where projectors are directed to between three and six of the walls of a room-sized cube.

---

[60] Paul Virilio, Villem Flusser, Marvin Minsky and Joseph Weizenbaum. In Fleischmann, M. Strauss, W. Ramsgaard Thomsen, M. And Novak, J. "The making of *Murmuring fields* – developing e-Muse."

[61] Ibid.

As previously seen in *SonoMorphis*, *Murmuring Fields* featured the possibility of additional participants intervening in real time in the environment via the Internet, utilizing once again the idea of being simultaneously in different places. This remote intervention could manipulate the type of sounds that the acoustic responses made. The whole experience was interesting because it reserved an important role for music and sound in the process of learning the "laws" or rules of the new environment. However, the randomness with which the sound was implemented made it more difficult to trace whether the results were effective or disorientating.

Dinner Party

At a convention about the intersection of new technologies and art called *The Engadget Experience: Alternative Realities* in November 2017 in Los Angeles, a presentation of the promotional trailer for the VR movie *Dinner Party* directed by Angel Manuel Soto took place. It is based on the story of a couple that discovers that in 1961 they have been abducted by aliens. The couple hosts a dinner party with friends and, at some point, the wife decides to play a tape containing the recording of the hypnosis session in which they explain, in a hypnotized mental state, their experience with aliens. Before initiating the experience, the participant sits at a real table, set for a fictional dinner, with a group of 15 other participants. On the plates, the VR headsets (Occulus Rift[62]) were "served."

The experience lasted around six minutes, beginning with a bird's-eye view of the dining room. In fact, the angle of the shot is decided by the participant, thanks to the use of VR headsets and the 360° camera used to shoot the film. However, the movement of the camera around the space was predefined and, after a short time, the events in the scene make you stop looking around and compel you to witness the action, as in a regular movie. The music here was meant to induce a sense of weirdness. There was also diegetic music coming from a record player, and sound design to create an immersive feeling. The scene then switches to the inside of a car with the couple driving at night. It is a flashback to the moment when the abduction happened. An intense increase of white light indicates that something unnatural is about to happen. Then "The End." The experience was intense but prompted a certain sense of dizziness due to the movements of the camera as well as the impression of not having achieved much more than what could have been done with a regular movie in 3D or IMAX. In the presentation of the project, the director explained that their idea was to suggest that the audience would enjoy the perspective of the aliens, who follow the events as an invisible presence.

---

[62] A virtual reality headset developed and manufactured by Oculus VR, since 2014 a division of Facebook, Inc.

Recent VR Music Application

Many of the more recent VR experiences, in which music has a role beyond accompanying the visuals, do not have a truly innovative and artistic approach. Rather, they adapt or import formats from other media. For example, the use of 360° video in music video clips seems to be a new trend, particularly since YouTube incorporated this option in its video-sharing platform. Some of these videos incorporate binaural spatialization of the music, meaning the motion of the screen affects the way that the audio is received. Composers, performers, and bands have started to release singles using the traditional video clip format but considering the capabilities of a VR device to experience it. The 360° video format allows the participant to constantly look around, regardless of what is going on in terms of the narrative of the video clip. Some are static, like U2's *Song for Someone*[63] in which the participant sits in the middle of the band performing the song whilst the band moves to different places in the world to meet other people joining them singing. Others are dynamic or in motion, like *Squarepusher's Stor Eiglass,*[64] where a cartoon-like version of a huge body that the participant is placed on top of travels as if on a rollercoaster through a dystopian world in which human bodies are wired to VR devices and are sucked in and collected by gigantic machines. This is a surprising reflection upon the idea of a medium within a medium. Similarly, the English rock-band Muse used VR as a promotional medium for their 2015 album *Drones*. The single *Revolt* was turned into a 360° video to be enjoyed with a VR headset. The video is set in a futuristic world with rebellious activists confronting the authoritarian regimes' cyber police, and meanwhile the band is performing onsite at the confrontational events. The participant can decide what to follow in this highly agitated scene. Significantly, Matt Bellamy, the leader of the band, declared in a later interview that *"…VR is genuinely the next step in terms of getting that immersive feeling that people maybe felt in the early 20th century when they first saw motion pictures."*[65]

---

[63] U2 *Song for Someone*, 2015, VR video promotion: https://www.engadget.com/2015/10/29/apple-vr-u2-video/

[64] *Squarepusher's Stor Eiglass*, 2015, Marshmallow Laser feast collaboration with the illustrator Rob Pybus, and the animator Blue Zoo: https://pitchfork.com/news/59563-squarepushers-stor-eiglass-crazy-virtual-reality-video-will-make-you-dizzy/

These types of projects do not necessarily require a different compositional approach than the equivalent for traditional media. The themes and lyrics might refer to the VR medium, like in *Squarepusher*, or in some cases sound design might be attached to objects that react to placement positioning when using the VR headset, so attention is directed to a different point in the space.

Film projects in VR seem to approach the possibilities of the new environment by taking a step back towards immersive theatre and placing the participant in the action of the scene as an invisible spectator in a privileged position, as seen in *Dinner Party*. In that regard, some experiences propose a non-linear narrative beyond the classical approach and leave some decision-making to the participant.

---

[65] "Muse's New Album Comes to Life in Virtual Reality." *Microsoft In Culture*, https://www.microsoft.com/inculture/musicxtech/muse-vr-games-simulation-theory-tour/.

Another growing format consists of attending live shows through a VR platform, like LiveNation[66] or NOYS VR.[67] The main attraction here is to be able to enjoy the concert from perspectives not hitherto experienced, including even being on stage with the performers. Similarly, electronic music concerts in VR spaces can be attended, and, by the use of avatars, it is possible to interact with other participants, dance, talk, etc. The telepresence element, inherent in VR technology, will play an important role in music and is likely to have many applications as well as ramifications for performing, conducting, and teaching music in the near future.

The educational aspect of music and VR is attracting a lot of attention from institutions interested in developing new ways to make music more approachable to everybody, but in particular, to young people. It is possible to explore music from the classical repertoire in a virtual environment while learning about the instrumentation, the composer, the structure and other theoretical elements of the piece, such as its history, and essentially anything related to it, if desired. It is also possible to play some of the instrumental parts of the piece, replacing the performer, or to follow a tutorial, lesson, or demonstration of how to do it. With the 2015 project VAN Beethoven, the LA Phil provided a visual experience based on an excerpt of Beethoven's Fifth Symphony, with the intention of introducing symphonic music to new audiences. More recently, the VR Sound Stage by the Philharmonic Orchestra has experiences promoting music appreciation in an innovative way: a VR experience in which the participant hears music through an 18-speaker Ambisonics sound system, which faithfully reproduces the placing of the instruments within an orchestra and enables the participant to perceive the orchestral sound from inside the group of performers.

---

[66] By NextVR.
[67] A social platform for VR live streaming concerts.

In his recent book *Experience on Demand*,[68] Professor Jeremy Bailenson, from the University of California, Berkeley, explains how VR has the potential to be helpful to society in many ways and different areas: from experience to promote empathy regarding environmental issues, to VR trainings of all kinds that help individuals to achieve goals faster and reduce risks. In health, programs including VR experiences to treat psychological issues, traumas, and pain-related conditions have been demonstrating outstanding results. In this context, a recent project in Ireland called "Conductology,"[69] seems to combine different areas from those referenced above: in a music experience, composition and interaction are the main elements of connection to help groups of people with special needs to explore creativity and expression in a new way. The experience, initiated by the Royal Irish Academy of Music (RIAM), uses adaptive instruments and VR tools via easily accessible technology (such as midi instruments and laptops) to rehearse and perform music created by their participants. Besides contributing to the socialization of the participants, which is frequently a challenge or impossible due to their severe difficulties, the creative side of the project seems to generate temporary relief from their afflictions.

---

[68] Bailenson, Jeremy. *Experience on Demand: What Virtual Reality Is, How It Works, and What It Can Do For You*. 2018.

[69] An initiative from Creative Ireland Programme and the Royal Irish Academy of Music that started on October 2018.

What is interesting is that in the publication where the first concert of this group was announced,[70] Brendan Breslin, Head of RIAM Connect,[71] stated regarding the plans for the project that *"The virtual reality is the next step and it means that everybody can access the same amount of performance as others, specifically for people with physical challenges. We have a member with quadriplegic cerebral palsy and it means that he can engage on a musical platform…"*[72] Besides the encouraging opportunity that experiences like this can provide for a group of people outside of the radar of other commercial developments, they also demonstrate the significant influence music can have as a communication and therapeutic medium while also yielding an artistic output.

In comparison with all the visual research and output produced by visual and multimedia artists, the musical explorations in VR to produce new formats seem a little less creative. Some experiences, however, do present innovative visions on what the future of music in VR might be. To close this chapter, I will refer to three works that use music and VR environments in very different ways and that present ideas to keep pursuing in the next steps in VR creation in general and in composition in particular.

---

[70] September 2019.

[71] The outreach program of the RIAM.

[72] According to the citation at the article *"I have a tremor… but the music makes it stop" – Disabled-led Irish orchestra ready for its first performance*. By Mícheál Ó Scannail .Publish at the News Irish News online, September 24 2019.

Carne y Arena

This VR experience, created by Alejandro González Iñarritu in collaboration with Industrial Light & Magic xLab,[73] was premiered at the 2017 Cannes Film Festival. The experience recreates the ordeal that individuals and families have to go through in trying to cross the Mexican-US border in order to seek a viable future. Participants become part of one of these families, walking through the desert at night and eventually being spotted by a helicopter and detained by a border patrol. It all happens in a large space, like a hangar, with sand to walk on to imitate the desert. The participant walks in barefoot with a headset, and two assistants take care of the cables constantly from behind, following the participant's movements so that the feeling of free motion is guaranteed. Along with the sand, the low temperature and the fans displayed and programmed to react and produce airflow according to the conditions and events of the virtualized world turn it into a very physically powerful experience, notwithstanding its psychological intensity.

Carne y Arena tries to be a highly realistic recreation and as such, sound plays an important role in making it convincing. The sound design is carefully thought out, but understandably it might be verging on a hyper-real experience, where the real and fictional or virtual are seamlessly blended. Most likely, the majority of participants have never been themselves in such a situation, and possibly they have no experiences in their lives that could be analogous and relatable. For that reason, there is an intentional use of sound and music to enhance and replicate the emotions that people suffered in real situations. In preparation, the creators drew upon hundreds of interviews and testimonials to better understand the drama and psychological effects on the people who have undergone this traumatic experience.

---

[73] An immersive entertainment studio, division of Lucasfilm. Founded in 2015.

The music is the work of the composer Alva Nolto (b. 1965), who collaborated before with Iñarritu in *The Revenant* (2016) when co-composing the score with Ryuichi Sakamoto (b. 1952). In *Carne y Arena*, the aesthetic of the music is very close to sound design. The impression is that it is an extension to it, creating subtle ambiences resulting from electronic elaborations that blend the diegetic sounds that are linked to the visuals. Thus, the music is almost indiscernible when the participant is immersed in the experience. However, it certainly works on an almost unconscious level and helps to enhance the tense emotions arising as a result of the events that have to be confronted.

Carne y Arena shows how the virtual environment can be a powerful device to create empathy in audiences with a sensitive and dramatic subject. In that case, music plays a very psychological role, avoiding the diminishing effect on realism of a potential non-diegetic type of score.

Tónandi

Tónandi is a remarkable MR experience that intends to put at the same level music, visuals and interactivity together. It is the result of a collaboration between the Icelandic avant-rock band Sigur Rós and Magic Leap, an American startup company founded in 2011 which focuses on developing MR experiences for their own head-mounted virtual retinal display, the Magic Leap One.[74] Essentially, *Tónandi* presents visuals inspired by the acoustic qualities of sounds and musical elements created by Sigur Rós, which the participant can interact with and, by doing so, alter. These visuals, a combination of abstract shapes, particles, creatures and objects that recall vegetal nature (such as leaves of grass, algae, or trees) are superimposed on the surfaces of the real space. They have a "natural" movement, recreating that of an imaginary living ecosystem, but also following elements of the music (rhythm or texture, for example). The visual elements can also mutate or evolve, changing colors as well as the light they reflect, and they do it particularly when the participant interacts with them. Besides the obvious directional sight-tracking, the interaction with the visuals and the music is possible through Hand-Tracking, a system developed to recognize discrete hand poses through the head-mount without the need of any additional device or control. Different hand poses (up to eight)[75] cause different effects that trigger subsequent visual and aural reactions. These can be done continuously and simultaneously, with both hands, multiplying the possible output to a potentially infinite number of responses, since the sound and the visuals keep evolving regardless of the interference of the participant.

---

[74] First announced in December 2017, the Magic Leap One Creator's Edition started shipping in July 2018.

[75] In version 0.21.0, from October, 24, 2019.

It is worth noting, and it is part of the language used in the musicians' and developers' presentation of the experience, that the role of synesthesia in *Tónandi* is at its core. As discussed in chapter 2, this condition plays an important role in musical works in the 20th and 21st centuries, and the concept is sometimes used to denote not a singular condition present in some individuals, but to indicate experiences that, by combining different artistic expressions often involving sound and color, generate an enhanced experience in some way amplified or taken beyond what could be seen as the sum of its parts. Mike Tucker and Stephen Mangiat, the creative and technical leads of *Tónandi*, explain how the interaction with music and sound by virtually touching the creatures in motion and therefore triggering a reaction at all levels, creates almost a tactile sensorial illusion—the feeling of touching music.

Music in *Tónandi* has an electroacoustic experimental air, a combination of synthesized rhythmic patterns, textural backgrounds, and sound effects. Whether the experience is successful or not in terms of its public acceptance and commercial impact,[76] it is a fine attempt to implement an experience that focuses on real-time interaction with musical elements, something that will have to be further explored in both MR and VR musical experiences as an intrinsic feature of the medium.

---

[76] Magic Leap One's current retail price is above $2000 and therefore not yet a product available to a wide audience.

Eight

Premiered at the Holland Festival, *Eight* is probably the most adventurous VR, or MR to be more precise, musical experience I have found until now. It is a piece that perfectly exemplifies the possibilities that the virtual environment can offer to composers. Its composer, Michel Van der Aa, revisits the story of a woman's life backwards. After a brief musical introduction, an old woman appears, singing and inviting the participant to go through her memories with her. The virtualized singer encourages you to move around different spaces that recall and recreate passages of her life. In the different sections of the piece, she keeps disappearing and reappearing, each time younger, until she reaches her childhood. The virtual space integrates objects that can be touched in the real world, hence the MR extension of the work. The design of the experience combines sections where the participant is invited to walk with more static scenes where they are to stop, listen, and contemplate the visuals. This is achieved using a semi-circular corridor and a room-like area (all constructed within a larger space) to allow different types of simulated freedom for the participant. The path followed takes advantage of the static scenes to promote free contemplation of the virtual world and to reverse the direction of the walking path, thus breaking the potential monotony of a repeating pattern as well as creating a sense of moving around a much wider space with a lot of physical freedom.

The musical conception of the piece is aesthetically eclectic, ranging from a classical contemporary and operatic style to almost electronic pop music. This is reflected in the way the featured singer, Kate Miller-Heideke (a singer-songwriter with a very versatile voice and operatic background) sings, but also in the type of arrangement and instrumentation used, which combines acoustic and electronic instruments and effects, both mixed and produced, featuring a good degree of spatialization. Van der Aa also incorporates choral music, recorded by the Nederlands Kamerkoor, clearly featured in one of the scenes and blended with the accompaniment of the singer in others. The overall structure of the piece combines sections from solo music, recitative, or solo accompanied singing, to fully orchestrated including the choir. This cleverly makes the piece varied and balanced, managing to hold the attention of the participant very well.

What *Eight* exemplifies is that the visual and acoustic possibilities of a VR and MR environment inspire topics that have to do with the psyche and emotions from an individual's perspective. This does not mean that it cannot be successfully tackled or achieved using other approaches; however, the explorations of an immersive and progressively more interactive virtual environment signal the possibilities of embodying other people's minds and experiencing other people's feelings and emotions from a singular and unique perspective. The interactive part, which the MR implementation of the piece proposes, is incidental. In the virtual corridor, the walls are made of a synthetic fabric that, when touched, create a sort of visual effect. There are a few places where a fence can be touched and grabbed while watching different scenes and that have a visual correlation in the digital design of the environment. Towards the end, the participant is invited to hide underneath a table with a big tablecloth on it that the participant can touch. It is in fact a table under which the participant has to hide towards the end of the piece in order to listen to the child singing.

CHAPTER 4

THOUGHTS AND CREATIVE CONSIDERATIONS FOR VR.

“4”: A VR COMPOSITION.

This final chapter will raise some thoughts and ontological questions regarding what it means to create art in VR spaces. From a composer’s perspective and as a reflection of what has been explained in the previous chapters, I will present what creating music in VR entails artistically in an itemized list. It is important to highlight that this list of considerations is the result of the reflection and research done in chapters one through three, which have been necessary as historical, philosophical and conceptual foundations on which to formulate it. Furthermore, although there were some intuitive ideas or hypotheses about composition in VR, this research not only expanded the scope of the implications of the new medium for composers, but revealed important aspects regarding the creative process and the goals for artistic expression in VR. Finally, I will include a description of a VR composition that will incorporate each of these items. This will serve as a model that could be the starting point for actual implementation in VR.

The discussion about art finding its way to be expressed through different disciplines or media can unleash the idea that the world we have created around us is an expression in itself: a collective product of our creative brain, cooperating willingly or not with other humans. Is, then, virtual reality an analogue version of it? As a digital medium that can be expanded and modified very quickly, is it a more flexible version of the world we inhabit right now? VR spaces can behave like hallucinations to us,[77] replacing, or leaking into, our world for a certain amount of time. As technology is rapidly evolving, virtual environments are becoming more convincing, intense, and appealing, reducing the gap between what we perceive as real and what we perceive as virtual. Consequently, the "embodiment" of VR experiences are more intense and seemingly "real," enhanced by immersive and interactive strategies and provoking sensations that have lasting effects upon us.

The role of the body in experiencing VR is essential to the medium, but it also raises the question of whether, and how far, our bodies are the physical encapsulating interface of our minds, so that we can operate in the surrounding physical world—in other words, that we perceive the world outside our mind through our full bodies. Thus, if our mind is able to experience and recreate other realities, is our brain the repository of a powerful entity, mind, soul, will, etc., that is trying to find a way to escape?

The output, resulting from what we appreciate as art and technology, could be a by-product of intense research that finds in VR a suitable way out toward another plane of existence. This feeling of perpetually searching or striving, an unstable state in which we can project our individual and collective lives, may propel us forward: a consistent nonconformist attitude perhaps toward a utopia of peace, pleasure, truth, or freedom. However, would this be possible only in our minds, or are our bodies essential parts of it? Since our physical bodies are sensitive, painful, far from perfect, and definitely not immutable or eternal, are our minds promoting the creation of alternate realities from which to escape? Are our minds enslaved or locked into a brain within our bodies? Perhaps VR is just another attempt in an endless succession, one trying to approach the challenge by merging art and technology intimately.

---

[77] From program notes of Rebecca Allen's INSIDE, 2016 art installation http://www.rebeccaallen.com/projects/inside

Besides the considerations above, which perhaps project the subject of this dissertation a little bit further away from its core topic, what VR is currently promoting is the creation of new spaces, worlds or cosmoi, by individuals or collectives, with extraordinary immersive possibilities and with such an increasing degree of interactivity that not only observation and participation are possible in them, but artistic creation is becoming a real option.

Currently, it is still necessary to design and create the VR environments from outside the medium (although to validate the design and predict how it will function already requires multiple tests from the inside). What is fascinating is the resulting appearance of these designed environments or worlds, ranging from the mere recreation of the world “outside” in which we physically live, to the most fantastic, surreal or imaginative areas. Rebecca Allen, an artist and VR pioneer, used MRI scan data from a real human brain to create the environment of her piece INSIDE,[78] a metaphor of what our brain is trying to achieve through VR. What this revealed is that the task that the designer-artist of VR worlds is facing is that of developing an aesthetic unique to the medium. So far, what is undeniable is that there is a solid connection with the visualization of these environments. Without objects, colors, or shapes, it seems impossible to create the VR space; everything else—immersion, interactivity, sound—is waiting for a secondary level for implementation.

---

[78] ibid. Allen

Thus, what would a musical VR piece mean to the participant? And would this environment provide the opportunity for the composer to communicate a closer version of his/her original artistic vision? Will this artistic vision be modified by the possibilities offered by virtual reality? In the next section I will outline important considerations regarding the creation of a VR composition. As will be explained, this does not necessarily mean that the work is exclusively for the hearing sense, but that music is the generator that calls for other elements to participate. Composing in VR requires considering immersivity and interactivity (essential elements of the medium) as part of the work. These have to be regarded differently as we do in the real world, since we have the possibility of defining the laws that apply to the virtual world or space created. The composer is able to design the appropriate rules for his/her artistic intent and define if the participant can interact with it and how. This raises questions like how consequential this interaction will be for the final output and perception of the piece. Although there might not be a clear answer to that problem yet, it is possible that as more musical works in VR explore this possibilities, composers will find new solutions to incorporate these elements in ways not imagined yet.

The following outline is intended as a reference for composers when initiating the realization of a VR piece of music to evaluate the pertinence of the medium about to be used and its potential.[79]

CREATIVE CONSIDERATIONS IN VR

The following is an itemized list of what creating music in VR entails artistically. Although all of them have to be considered in the composition process, the items in the list are divided with reference to the participant's experience and to the composer's conception of the piece.

Participant:

- **Interaction** A VR musical work should consider the use of interactive elements; the participant may eventually be able to touch, modify, move, or manipulate as many elements of the music as possible, or as defined by the composer based on his/her creative intent.
- **Participant's experience** The perception of a VR musical work may be unique for each participant. Many participants experience the work at the same time and in the same place. Their positioning may be identical, even overlapping

---

[79] Before composing an orchestral piece, a composer should be aware of the possibilities of the ensemble. The composer could decide (for example) not to use strings at all, or any other instrument or group of instruments. However, this should be a decision based upon an artistic intention, and not borne out of ignorance or laziness.

with each other, but it is unlikely that they will interact with the piece in exactly the same way.

- **Participant's movement** The participant or participants could perform alongside the VR musical work, improvising or following instructions set by the composer. There could be a virtual score for them to follow.
- **Participant's location** Participants may be in different parts of the world and the potential number of attendees is infinite, or rather limited only by technology/creative decision.
- **Scope** Participation in a VR musical work may imply active artistic creation by the participant. This could be recorded and assimilated in imaginative ways into the original work, and consequently the piece would be constantly changing and would be left unfinished, or open.
- **"Opera aperta"** A VR musical work may have no end; it is constantly evolving and possibly dependent on feedback by the actions of the participant or participants.
- **Appraisal** It might not be possible to listen fully to a VR musical work.
- **Multidimensionality** A composition may occur in different places simultaneously and the participant should be able to move around or travel through them while the piece lasts. In that case, the conception of a multidimensional piece of music will raise questions regarding structure, non-linear narratives, and intertextuality within and beyond the actual work.
- **Multiple participants** If a piece is shared between two or more participants, and interactivity is available, a decision has to be made regarding the

perception of others' interactions, and whether they affect the perceptual experience of the work by the rest of the participants or not. As a matter of fact, this could be an element of choice, a decision available to be made by the participant.

- **Participant-performer** A composition should consider if one or more parts should be performed in real time, for example by a participant-performer (or composer-participant-performer); the equivalent of a pre-record + live performance composition. That creates a specific level of participation between the composer and the participant (participant-audience in this case). If so, the piece would have limitations in terms of its accessibility (upon participant-performer availability). If the participant-performer's performance is recorded, it could generate a fixed version of this particular performance.
- **Customized VR instrument** If the piece allows the participant to perform on it, the instrument can be predefined or let open to customization. If so, there could be already some preset instruments available or allow the participant (particularly if a participant-performer), could bring in one of his/her own.
- **VR concert/jam** Upon the previous considerations, a performance space/section would be allowed within the piece, where multiple participant-performers interact playing and/or improvising.
- **Avatar** Participant/s may or may not have an avatar representation in the VR composition based upon composers criteria. If so, it should be considered how this avatar is chosen.

Composer:

- **Abstract Space** A VR composition should aim to faithfully reproduce the original that inhabits the composer's mind, the abstract space, so that the participant can expect to experience something very close to what the composer perceived internally.
- **Interaction** The composer may anticipate different interactive options on the piece by participants. In that case, the experience becomes intentionally unpredictable and open-ended, according to the composer's plan.
- **Time** A piece of music can be limited or unlimited in time. We have seen before how both compositions and proto-VR experiences have used generative strategies to create a potentially infinite stream of music or sound. In an environment with endless possible ramifications and extensions, this needs to be taken into consideration and open to the participant's decision.
- **Instrumentation** A VR piece of music may have as many sounds as desired (including recorded or virtual instruments). The exponential increment of processing power, speed, or storage, is close to allowing this. Thus, composers will have the opportunity to explore acoustic combinations that are currently not feasible in the physical world. Additionally, as in the participants *Customized VR Instrument*, a composer may create his/her own VR instrument for unique sounds/characteristics, etc.
- **Projecting sound** Sources may project in a spherical way, not necessarily directionally as with a traditional speaker. All combinations of sources are possible, and each may potentially have different acoustic responses, not

linked to a specific acoustic space but to the discretion and artistic intent of the composer.

- **Motion of sound** Any source of music—which could include a single instrument, a full orchestra, or pretty much anything—can be in motion through the VR space of the piece. The participant will perceive that they are moving toward or away from the source if he/she decides to remain still or if motion is not permitted at that moment.
- **Source Fragmentation** A source of music can be fragmented, deconstructed, appear or disappear, mutate or evolve, following any rule or set of rules chosen by the composer.
- **Combinations of Works** Upon the previous idea, a musical VR work could share its limits with other pieces, whether they belong to the same work or not. These other pieces may or may not be directly connected. For example, a musical VR work may contemplate the notion of several pieces of music occurring at the same time,[80] but because the distances in space are potentially infinite, this might not be automatically evident to the participant and will depend upon the placement/location of the participant in the VR experience and the decisions made by the composer in terms of the rules that govern the composition.
- **Rules** Any rule or set of rules may include changes to the rules at any time and as many times as desired.

---

[80] As in Charles Ives Fourth Symphony.

- **Use of art forms** The composition may not be limited solely to use of sound. We have seen before how the creative impulse often demands the complicity and participation of different artistic elements and media. The idea of a composer working exclusively with sound is as limiting as it was limiting to use only a tonal system for expressive purposes in the common practice era. Thus, color, shapes, lights, textures, motion, interaction, etc. can be resourceful at any given moment in order to achieve the artistic goal. Of course, technological limitations will establish certain boundaries, but in time these will be progressively removed, and therefore other senses, like smell or touch, will be incorporated in the palette or resources available to the composer.
- **Immersion** A VR musical work has to consider immersion as a primal element, understood as the surrounded position of the participant. This does not imply that every work necessarily has to be acoustically spatialized. Discrete decisions such as the absence of sound or spatial response in specific moments may be artistically necessary and should be evaluated in each case.
- **Composer's catalog** Since elements in a VR musical work may be interconnected, as in the *Mikrokosmos* idea discussed in chapter 1, a composer may be writing another part of his piece, a chapter or a new space for appreciation. In a way, this links with a conception of the complete works of a composer being his/her "opus," and therefore all his/her works can be interconnected to a certain extent. Some of them may be more distant and others more closely related, but, in the end, they all contribute to the artistic

personality of the composer. This idea could be taken further by including influences, contemporary and associated colleagues, etc.

- **Exceptions** A VR musical work does not always have to do any or all of the above.

Creative Considerations in VR	
Participant	**Composer**
• Interaction • Participant’s experience • Participant’s movement • Participant’s location • Scope • “*Opera aperta*” • Appraisal • Multidimensionality • Multiple-participants • Participant-performer • Customized VR instrument • VR concert/jam • Avatar	• Abstract space • Interaction • Time • Instrumentation • Projecting sound • Motion of sound • Source fragmentation • Combination of Works • Rules • Use of art forms • Immersion • Composer’s catalog • Exceptions

Fig. 4.1 Creative Considerations in VR chart.

“4” — DESCRIPTION OF A VR COMPOSITION

In the following lines, I will describe a composition for a VR environment. Its title is “4.” It departs from music and sound as its primary element, considering space and the participant’s interaction as fundamental parts of the work.

In the piece, immersivity will be achieved by the spatialization of each musical element, which will consider all possible positions in a sphere around the space (or around the participant) for the placement of the source. These musical elements (or any sound) are not attached to any acoustic response in particular; the space does not have necessarily a specific reverberation. Thus, different responses can be used creatively and simultaneously, as will be described in particular moments within the piece.

In addition to music, light, color, visuals, and haptic responses are also included. They complement the composition and serve as guide to the participant’s interactive experience. It is important to note that these are part of the creative process of the piece, and not just mere additions *a posteriori*.

“4” is conceptualized as a single participant experience. However, the possibility of a multi-participant version could be considered. In that case, each participant could access the experience from different places in the world simultaneously and have a singular perception as described, without interaction with the other participants except for one of the “additional spaces” (space C) described in page 72.

The piece can run between 6 and 12 minutes, depending on the decisions of the participant.

To guide the reading, I have color-coded the description as follows:

- Music and sound. Its description, spatialization, and modulating effects.
- Participant's interaction.
- Lighting, color.
- Visual
- Haptics
- EXIT (closing section of the piece, a sort of Escape/Coda)

“4” BEGINS

Black.

Progressively, from silence, a sensation of emptiness develops. It is suggested by the reverberation of a large empty space, unclear whether indoor or outdoor, and by a very soft and subtle breeze, almost nothing.

A sustained sound, one note, mid-register, begins to emerge. First without vibrato (light bowing pressure too) so it is difficult to identify an instrument yet. While getting louder very slowly, the sound source begins to move around the participant, as if drawing a circle of sound. A violoncello is now identifiable. There is a bit of reverb in the sound, so it leaves a trail. As the sound source continues to move, the rest of a virtual string quartet’s instruments join the same note, allowing tiny microtonal deviations so the sound gets thicker.

The participant can wait or move.

If he/she decides to move, the sound source will react by moving in the same direction slightly afterwards, as if trying to keep a safe distance.

(Still black.)

Increasing vibrato, bow pressure, and volume as the circular movement slows down until each instrument stops at every quarter of an imaginary circle (radius = ca. 10 meters) around the participant. The sound stops and immediately each player is visible.

Only warm light on the players. Soft yellow-orange. Slightly different for each.

Each instrument is at a slightly different height (above and below) in relation to the participant, but there is no obvious plan for the arrangement of the musicians. The rest of the space is dark. The musicians are staring at the participant, with a neutral expression and in resting position (not about to play).

Nothing happens until the participant begins to move:

1. If the participant does not move at all for more than 30-40 seconds, each player will begin to move slowly, as if in an invisible platform, distancing themselves from the participant, each musician is going in a different direction. As they get farther away, the image will also lose definition or disintegrate.

   They'll disappear completely in 3-4 minutes. Go to EXIT.

2. If the participant moves, the musicians stop. Then:

Wherever they are in the space, the four musicians begin to play an arpeggiated pattern. This is a repeated chord progression, constant, rhythmic, and at a medium-fast tempo. Notes and rhythms are constantly added or removed from the pattern, to make it less predictable and always in a smooth harmonic transformation.

The piece played by the string quartet has a total duration of 5 minutes. However, it contemplates the extension of up to four sections that will be played/revealed depending on the participant's action.

If the participant does not do anything, when the piece is done, go to EXIT.

The sound is dry now only for the instruments of the quartet, not at all affected by the acoustic characteristics of the space. The breeze may continue, independently, so both sounds, instruments-dry and space-wet, coexist.

The participant may interact with one player at a time, independently of the other players, and choose from the following options:

a. Increase/decrease tempo up until a ratio of 1:2 of the original
b. Extend or reduce the number of notes in the chord
c. Drag up/down the register of the chord both by transposition and/or inversion (only chordal in that piece)
d. Increase/decrease dynamic
e. Change articulation: shorten/lengthen the notes preserving their duration (staccato-legato)
f. Move the spatial position of the player far away/towards and 360°.
g. Vary the lighting on the performer, by increasing/decreasing intensity as well choosing the color.

At any moment, the participant may decide to get closer to a player. If so, the other players will start playing less notes in their patterns, like filtering out subdivisions of it, and therefore creating the perception of playing slower. The ratio at which the notes will be dropped will be relative to the distance participant-player.

If the participant gets close enough to a player, an access to another space will be revealed (different light coming from each of these spaces).

The spaces can appear in any order. Each of these spaces can be entered at any moment (once revealed), or be ignored.

Every time the participant explores a new space, the string quartet piece is prolonged by 1-2 minutes.

The participant can always return to the main space and interact, or not, with the players until the piece they are playing has finished. Then go to EXIT.

Additional Spaces

The four spaces are:

A) Filled by a mass of granulated sound, soft, like constant white noise, completely dry. The space between the grains, grain size, should be high, noticeable. If the participant moves around he/she will discover that his/her presence acts as a dynamic equalizer, or frequency filter. The sound will change with any movement of the participant (for example raising an arm, stepping forward, jumping, etc.) cutting out frequencies so that a dense, cluster-like, chord will be heard.

A vibrating haptic response is produced with the movements in this space. If the participant does not move, the vibration is not perceived or progressively disappears. Similar to the one in EXIT.

The lighting of the room will respond to the movement by changing color and intensity.

The string quartet is hearable coming from the other space but above the participant's position. It keeps playing through the piece, more legato, or with more reverb than before, as a contrast with the granulated sound of this space.

B) There is a virtual score of the music the string quartet is playing in the initial space. It is possible to follow what the performers are playing. The music continues to be heard but from this space, so it sounds as if it is coming from the "other space." Now it has a long cathedral-like reverberation.

If the participant wants to look forward or backwards in the piece, the performers will follow, slightly increasing their temp to catch up, but without altering abruptly the flow of the piece. In that regard, the response feels slow.

C) A large empty space. Black. Similar to the one at the beginning. Another piece (optional: a previous work written by the composer) sounds as if it is far away, blending with the quartet—coming from the other space.

The participant can move towards the sound, so it will get louder until he/she is "on" it (the initial string quartet will then be inaudible), and it will get softer if she/he moves far away from it.

When this piece ends, go to EXIT, unless the participant has returned to the initial space.

(Optional: if the piece is intended as multi-participant, this could be a shared space in which participants could roam or wander around, deciding whether to "attend" the performance of the other piece or not. There is a visual representation, avatar, of each of them, and a certain degree of interaction/communication between them should be possible.)

D) An old grand piano, not black, and without lid is placed in the middle of the space. The string quartet will keep playing; ignoring anything the participant does in this room. There is a bench by the piano.

   a. If the participant sits on it, a score will be revealed. It is a tune with an accompaniment. The participant can play it: right hand, left hand, or both, as long as the playing is close to what's written in the score.

   b. If the participant plays anything else, the lid of the keyboard will fold down. The participant can open it and try again.

   c. The participant can play inside the piano as much as and whatever he/she wants. (No score here.) As the quartet approaches the end of the piece, if the participant is still playing inside the piano, the volume of the sound will be decreasing until silence.

When the quartet reaches the end of the piece, then go to EXIT.

EXIT

Black.

The same sensation of space as at the beginning, which should now be familiar, but with slightly more breeze.

A drone-like sound, with the same pitch as the initial cello sound, begins to emerge. It is unclear whether the sound is electronically generated or by an acoustic instrument.

As it circles and gets louder, the rest of the instruments join it in the same way as the beginning. However, the sound keeps gaining mass, as if turning the quartet into a small string orchestra first, and gradually into an impossible number of string instruments. It should feel like a continuous stream of sound surrounding the participant. It will last around 1 minute.

If he/she decides to reach out or move in any direction, a continuous haptic response, like a soft vibration, should occur. Moving in any direction should feel like walking in between/through the supposed players (not visible) playing the same sustained note.

The “noise” of the bowing should be very present.

Suddenly only the noise remains, and vanishes slowly, blending with the breeze.

END of “4”

CONCLUSIONS

My interest in exploring composition in virtual reality in this dissertation has been informed by my activity as a composer, which in the last few years has been focused around concert and media projects. In mid-2018, when I had the opportunity to collaborate with Professor Rebecca Allen in her VR work *Life Without Matter*, I already had an intuition regarding the transformational power of this new medium. My participation in the project confirmed that feeling, but also raised many questions regarding how immersivity and interaction could be explored artistically from the composer's point of view.

Chapters 1 and 2 were instrumental in establishing a logical connection between traditional acoustic composition and the possibilities of VR through the underlying concept of the artistic impulse. "Physical" and "abstract" space relate to the creative possibilities in VR as a new environment. Furthermore, VR seems to merge both of them into one, since, potentially, the performative space can be the creative one as well. Similarly, the need to express this impulse through the work of art has been pushing artists, with the aid of technological developments, to find new media and combinations of media in interdisciplinary works to better represent the original work that they imagined. The notion of media as extensions of the human body and mind, as seen in McLuhan and Clarke, also place VR in the context of communication and media ecology in that, within the next few years, it will change not only the way we communicate but also the way we create and the artistic output we produce.

Nowadays composers use all sorts of electronic devices and sound sources to create their compositions. It is not unusual to find works created by more than one composer, or a composer in collaboration with one or more specialists in technological areas that might be obscure to the composer in terms of the process, such as programming or digital design, but necessary to achieve the artistic vision. I believe that VR will require this kind of collaborative effort from composers until a quasi-zero-loss interface between the human mind and computers (or whatever is in use then) is finally implemented. In the meantime, synergies in collaborative projects might result in new art forms, which, in VR, may find a conducive environment ready to be shared by different people participating from different parts of the world—something that otherwise would have been less likely to happen.

After reviewing some of the work done in VR with an important music component, it was clear that the visual element has been predominant, due to the influence of the entertainment industry. Immersion and interaction are fundamental elements of VR so that the experiences can be embodied and are therefore more engaging and compelling. Although understanding that the visuals in VR are also inherent, I believe that composers can find more flexible and artistic ways to compose a VR work and to open new possibilities for them to share and for participants to explore. Furthermore, and alongside the aforementioned remote participation, the notion of a composition, or a work of art, can be extended to the collective creation in VR. The engagement of the participant in a composition can be explored in a similar way that improvisation or aleatoric music has been explored before, dramatically increasing the possible outputs.

Finally, I proposed a series of guidelines to be considered when approaching composition in VR. Far from being intended as rules of any sort, the hope is that they work as a reminder of the potential of the medium, and stimulation for creation, to challenge and expand musical expression. One of these considerations, the “use of art forms,” indicates the possibility of using visuals, haptics, and essentially any other sensory response or artistic form available: a VR *Gesamtkunstwerk*. Implied in this consideration is the idea that VR could be the medium for a purely musical work or experience, including or not including interaction, and exploring immersivity from just an acoustic perspective. Thus, in composing for a truly immersive space, such as the one VR can provide, a composer should consider not only the spatialized positioning musical or sound elements, but the possibility of moving them in space, their individual acoustic responses, or possible modulations of their timbral qualities throughout the piece.

REFERENCES

Bailenson, Jeremy. *Experience on Demand: What Virtual Reality Is, How It Works, and What It Can Do*. W. W. Norton & Company, Inc., 2019.

Bürger, Peter and Shaw, Michael. *Theory of the Avant-Garde*. University of Minnesota Press, 1984.

Calleja, Gordon. *In-Game: Immersion to Incorporation*. MIT Press, 2011.

Calleja, Gordon. *Revising Immersion: A Conceptual Model for the Analysis of Digital Game Involvement*. Situated Play, Proceedings of DiGRA 2007 Conference.

Chion, Michel, Claudia Gorbman, and Walter Murch. *Audio-vision: Sound on Screen*. New York: Columbia University Press, 1994.

Chan, Melanie. *Virtual Reality. Representations in Contemporary Media*. Bloomsbury Publishing. USA, 2014.

Cheng, William Joaquin. *Sound Play: Video Games and the Musical Imagination*. Oxford University Press. USA, 2014.

Collins, Karen. *Game sound: An Introduction to the History, Theory, and Practice of Video Game Music and Sound Design*. MIT Press. MA2008.

Collins, Karen. *Playing with Sound: a Theory of Interacting with Sound and Music in Video Games.* MIT Press, 2013.

Collins, Karen, et al. *The Oxford Handbook of Interactive Audio*. Oxford Univ. Press, 2017.

Cook, Perry R. *Music, Cognition, and Computerized Sound: An Introduction to Psychoacoustics*. Cambridge, MA: MIT Press, 1999.

Donnelly, K. J., et al. *Music in Video Games: Studying Play*. Routledge/Taylor & Francis Group, 2014.

Ermi, Laura and Mäyrä, Frans. *Fundamental Components of the Gameplay Experience: Analyzing Immersion*. Changing Views-Worlds in Play, Proceedings of DiGRA 2005 Conference.

Foster, Hal. *The Return of the Real*. Cambridge, MA.: MIT Press, 2009.

Grau, Oliver, and Custance, Gloria. *Virtual Art: From Illusion to Immersion*. MIT Press, 2003.

Grau, Oliver, and Veigl, Thomas. *Imagery in the 21st century*. MIT Press, 2013.

Harley, John. *Thomas Tallis*. Ashgate, 2015.

Howard, Deborah, and Moretti, Laura. *Sound and Space in Renaissance Venice: Architecture, Music, Acoustics*. New Haven: Yale University Press, 2009.

Jones, Stuart. "Space-Dis-Place: How Sound and Interactivity Can Reconfigure Our Apprehension of Space." *Leonardo Music Journal* 16 (2006): 20-27.

Lefkowitz, David S. *Analysis of Post-Tonal Music: A Parametric Approach*. Berkeley: University of California Press. (Forthcoming).

Logan, Robert K. *McLuhan Extended and the Extended Mind Thesis (EMT).* AVANT. The Journal of The Philosophical- Interdisciplinary Vanguard, 4 (2), 2013. pp. 45- 58.

McLuhan, Marshall. *The Gutenberg Galaxy*. University of Toronto Press, 1965.

McLuhan, Marshall. *Understanding Media*. Sphere Books, 1964.

Mura, G. et al. *Metaplasticity in Virtual Words: Aesthetic and Semantic Concepts*. ISR, 2011.

Mumma, Gordon, and Fillon, Michelle. *Cybersonic Arts: Adventures in American New Music*. University of Illinois Press, 2015.

"Origins of Virtualism: An Interview with Frank Popper conducted by Joseph Nechvayal," CAA Art Journal, Spring 2004, pp. 62–77

Packer, Randall, et al. *Multimedia: from Wagner to Virtual Reality*. W.W. Norton & Company, 2006.

Popper, Frank. *From Technological to Virtual Art*. MIT Press, 2007.

Rheingold, H. *Virtual Reality*. Touchstone, 1991.

Rogers, Holly. *Sounding the Gallery: Video and the Rise of Art-music*. Oxford University Press, 2013.

Rose, Frank. *The Art of Immersion: How the Digital Generation is Remaking Hollywood, Madison Avenue, and The Way We Tell Stories*. W.W. Norton & Company, 2012.

Schopenhauer, Arthur, et al. *The World as Will and Representation*. Cambridge University Press, 2018.

Strauss, J. N. *The "Anxiety of Influence" in Twentieth-Century Music*. The Journal of Musicology, Vol. 9, No. 4, pp. 430-477.

Veselinovic-Hofman, *Drama with Music. Die Glückliche Hand by Arnold Schoenberg as a Multimedia Project.* New Sound 36, II/2010.

Willgoss, Richard. *Creativity in Contemporary Art Music Composition.* International Review of the Aesthetics and Sociology of Music 43, No. 2 (2012): 423-37.

PhD DISSERTATIONS

Casanelles, Sergi. "The Hyperorchestra: A Study of a Virtual Musical Ensemble in Film Music that Transcends Reality." Order No. 3729807, New York University, 2015.

Jaroszewicz, Martin. "Compositional Strategies in Spectral Spatialization." Order No. 3702302, University of California, Riverside, 2015.

Kim, Sohee, "The Study of the Relationship Between Arnold Schoenberg and Wassily Kandinsky during Schoenberg´s Experssionist Period." The Ohio State University, 2010.

Overholt, Sara Ann. "Karlheinz Stockhausen's Spatial Theories: Analyses of Gruppen Fuer Drei Orchester and Oktophonie, Electronische Musik Vom Dienstag Aus LICHT." Order No. 3233734, University of California, Santa Barbara, 2006.

Sánchez-Verdú, José Maria. "Cartografias del espacio, el timepo y la memoria como morfologia de una creación musical interdisciplinary," Universidad Autónoma de Madrid, 2017.

Schnurr, Andrew Alan. "Mimetic Transpositions: An Aesthetic Theory of Composition Linking Music and Speech" University of California, Los Angeles, 2013.

WEBSITE AND ONLINE ARTICLES AND RESOURCES

G. Iñárritu, Alejandro: CARNE y ARENA (Virtually present, Physically invisible) | LACMA, www.lacma.org/carne-y-arena#landing.

Allen, Rebecca. Rebecca Allen's INSIDE, 2016 art installation

INSIDE - Rebecca Allen, http://www.rebeccaallen.com/projects/inside.

Angelini, Andrea. “Divided Choirs: Myth or Reality? Acoustic Experiments in St Mark's Basilica, Venice.” *The IFCM Magazine*, 8 Dec. 2018, http://icb.ifcm.net/en_US/divided-choirs-myth-or-reality/.

Media Art Net. “Media Art Net: Fleischmann, Monika: Murmuring Fields.” *Medien Kunst Netz*, Media Art Net, 30 Nov. 2019, http://www.medienkunstnetz.de/works/murmuring-fields/images/2/.

Barone, Joshua. “'Eight' Is a Breakthrough for Virtual Reality in Classical Music.” *The New York Times*, The New York Times, 5 July 2019, https://www.nytimes.com/2019/07/05/arts/music/michel-van-der-aa-eight.html.

Collins, Karen. *Beep: A Documentary History of Game Sound*. 2016 Film.

Corbusier, Le, and Jeanneret, Charles-Édouard. “Le Corbusier (Charles-Édouard Jeanneret). Muralnomad Tapestry 'Les Musiciennes'. 1953: MoMA.” *The Museum of Modern Art*, https://www.moma.org/collection/works/221194.

Dataphonic audio solutions, www.dataphonic.de/proj_detail.php?bereich=c&projectnr=1&language=d.

“DINNER PARTY VR.” *Dinner Party*, www.dinnerpartyvr.com/.

Gawboy, Anna. Documentary by doctoral candidate at Yale, about the performance of “Scriabin’s Prometheus: The Poem of Fire,” with colored lighting recreation. https://www.youtube.com/watch?v=V3B7uQ5K0IU

Giacomini, Luca, et al. “Artistic Connections: the BAUHAUS School, Rubinstein, Szymanowski and Hindemith.” *Hi*, https://hi-storylessons.eu/culture/artistic-connections-the-bauhaus-school-rubinstein-szymanowski-and-hindemith/.

“Magic Leap: Encounter New Worlds.” *Home | Magic Leap*, https://www.magicleap.com/.

“Muse's New Album Comes to Life in Virtual Reality.” *Microsoft In Culture*, https://www.microsoft.com/inculture/musicxtech/muse-vr-games-simulation-theory-tour/.

Murmuring Fields by (collective) fleischmann / strauss - ada | Archive of Digital Art, www.digitalartarchive.at/database/general/work/murmuring-fields.html.

Noë, Alva. “The Power Of 40 Speakers In A Room.” *NPR*, NPR, 10 Mar. 2017, www.npr.org/sections/13.7/2017/03/10/519587414/the-power-of-40-speakers-in-a-room.

Ravindran, Shruti. “Are We All Born with a Talent for Synaesthesia? – Shruti Ravindran: Aeon Essays.” *Aeon*, Aeon, 25 Nov. 2019, https://aeon.co/essays/are-we-all-born-with-a-talent-for-synaesthesia.

“Robert Barker's Leicester Square Panorama: The Rotunda.” *The Regency Redingote*, 9 Sept. 2012, https://regencyredingote.wordpress.com/2012/08/03/robert-barkers-leicester-square-panorama-the-rotunda/.

Scannáil, Mícheál Ó “'I Have a Tremor... but the Music Makes It Stop' - Disabled-Led Irish Orchestra Ready for Its First Performance.” *Independent.ie*, Independent.ie, 25 Sept. 2019, https://www.independent.ie/irish-news/news/i-have-a-tremor-but-the-music-makes-it-stop-disabledled-irish-orchestra-ready-for-its-first-performance-38531390.html.

The Making of 'Murmuring Fields' - Developing e-MUSE, https://www.i3net.org/ser_pub/services/magazine/august98/page20-21.html.

“The Engadget Experience 2017.” *Engadget*, http://www.engadget.com/events/the-engadget-experience-2017/.

“The Sound Future of Virtual Reality.” *Musicworks Magazine*, https://www.musicworks.ca/featured-article/sound-future-virtual-reality.

“Tónandi.” *Sigur Rós*, https://sigurros.com/tonandi/.

“Torsten Belschner, Bernd Lintermann: Sonomorphis: 1998.” *ZKM*, 1 Jan. 1998, https://zkm.de/en/artwork/sonomorphis.

“Virtual Instrumentation.” *Jaron Lanier's Homepage*, http://www.jaronlanier.com/instruments.html.

Jaron Lanier's Homepage, http://www.jaronlanier.com/knittalk.html.

“Virtual Reality and Music.” *Jaron Lanier's Homepage*, http://www.jaronlanier.com/vr.html.

“Virtual Reality - Latest Virtual Reality News Headset Reviews.” *Virtual Reality Society*, https://www.vrs.org.uk/.

Volume II

The second volume of this dissertation consists of two works, Meeting and Hillary, each conceived since their inception to have concert hall performance and VR version. In its first version, Hillary combination of acoustic instruments and and electronics. *Meeting* has both acoustic and spatialized electronic concert hall versions. Whereas the concert hall format has been premiered in both cases, their VR versions are projected here in a description according to the format presented at the end of chapter 4 of volume I. These descriptions follow the score for each piece.

HILLARY

The idea of creating a monodrama based on the United States presidential election of November 8, 2016 was born the same night. After the victory of Donald J. Trump was confirmed, the expected concession speech was postponed. It was John Podesta, the chair of Hillary Clinton's campaign, who took the microphone and announced that Ms. Clinton would not speak until later that night. This reaction made me think about the precise instant in which Ms. Clinton, probably following the vote count in the news with her team, realized that she had lost. For many, that was an unexpected defeat, but it was also a missed historical opportunity (of having a female president) and practically a 180° direction change from the policies and character of President Obama. I had the feeling that this event was more than just disappointing, particularly because very few people believed this would happen. The situation made me consider a piece that would scrutinize the various reactions she might have had and would provide an anatomy of the instant in which, in my imagination, many thoughts and feelings unfolded at the speed of light.

The opportunity to compose and premiere a concert hall version of the piece came with the commission of a short voice work including an opera singer to be premiered at the OffLiceu Series on June 1, 2018. It was a perfect opportunity, since the performance would take place in the Foyer of the Gran Teatre del Liceu in Barcelona—a large space that includes a stage, round tables and chairs for the audience, three large screens with projectors, a surround sound audio system, and programmable color lighting. These resources made it possible to place the audience in different parts of the space, give them different perspectives such as among the supporters waiting for her victory or defeat speech or journalists in a conference room, or alternatively to put the audience in her mind and to provide them with the opportunity to experience some of her feelings.

The piece is written for soprano, piano, cello with live electronics, surround pre-recorded electronics and sound design, video projection and lighting. The score details all these elements and provides guidelines for my collaborators who created the visuals (Ferran Masip), the libretto, the lighting and the stage direction (Jordi Pérez Solé).

Since its inception, the multimedia aspect of the piece, along with the emotional and psychological characteristics of the libretto, made me think that this could be turned into a VR musical work—a piece where the participant experiences the range of emotions of the main character very closely. The music would be the same as the concert hall version, while the guidelines in the score would be adapted for the VR experience. Following the score of the piece presented here, a description of the proposed VR version is included.

For both VR version descriptions, I have used the color coding as in chapter 4 (except for EXIT, which is not needed here). As a reminder:

- Music and sound. Its description, spatialization, and modulating effects.
- Participant's interaction.
- Lighting, color.
- Visual
- Haptics

Tomàs Peire Serrate

Hillary

*Electoral monodrama for soprano,
violoncello, piano, electronics, and video.*

2018

Hillary was premiered at the OFFLiceu Series
on June 1st 2018, at the Foyer of the Gran Teatre del Liceu, in Barcelona.

Elena Copons was Hillary.

Àlex Rodríguez Flaqué, violoncello.
Lucas Peire Serrate, piano.
Ferran Masip, video.
Tomàs Peire Serrate, electronics and musical director.
Jordi Pérez Solé, libretto and stage director.

Monodrama in one act

Music by Tomàs Peire Serate
Libretto by Jordi Pérez Solé

Sections:

1. Intro
2. cngrt
3. Water
4. What Is This?
5. The Cellphone
6. The Message
7. You Haven't Been Able to Connect
8. Enough
9. Mother
10. What Happened?
11. Outro

All sections are performed attacca

Original in Catalan.

English translation by: Tomàs Peire Serrate

Duration: ca. 18 minutes.

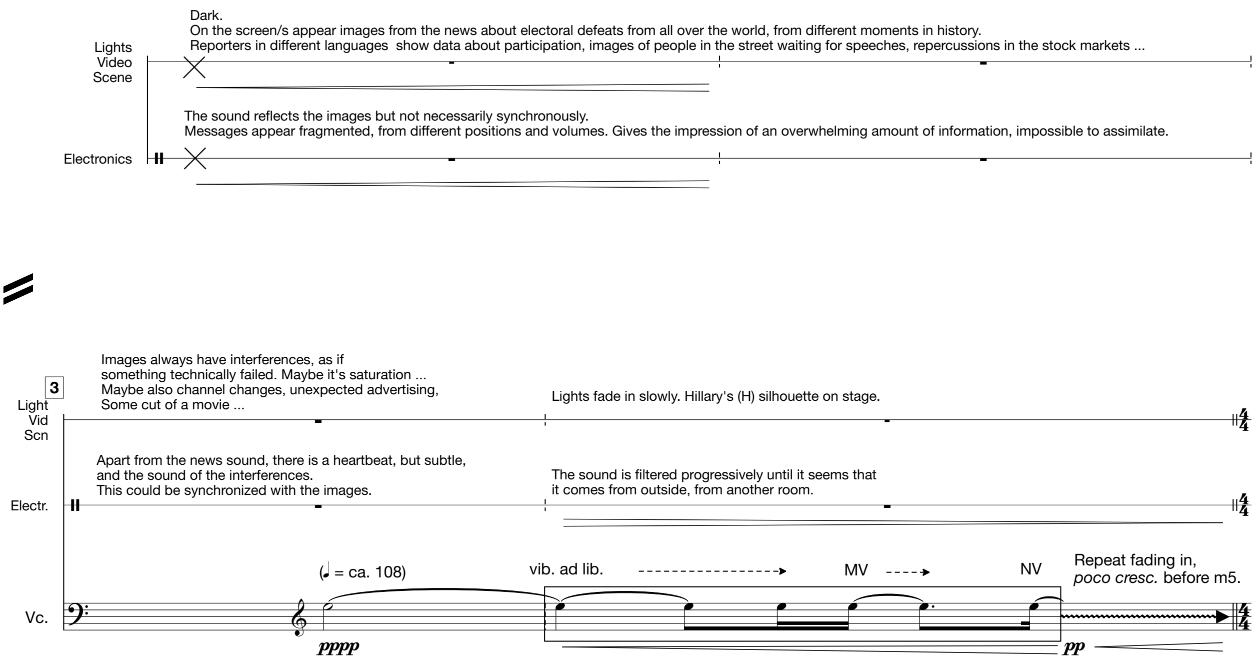
Version: 1.20 12/3/2019

Hillary

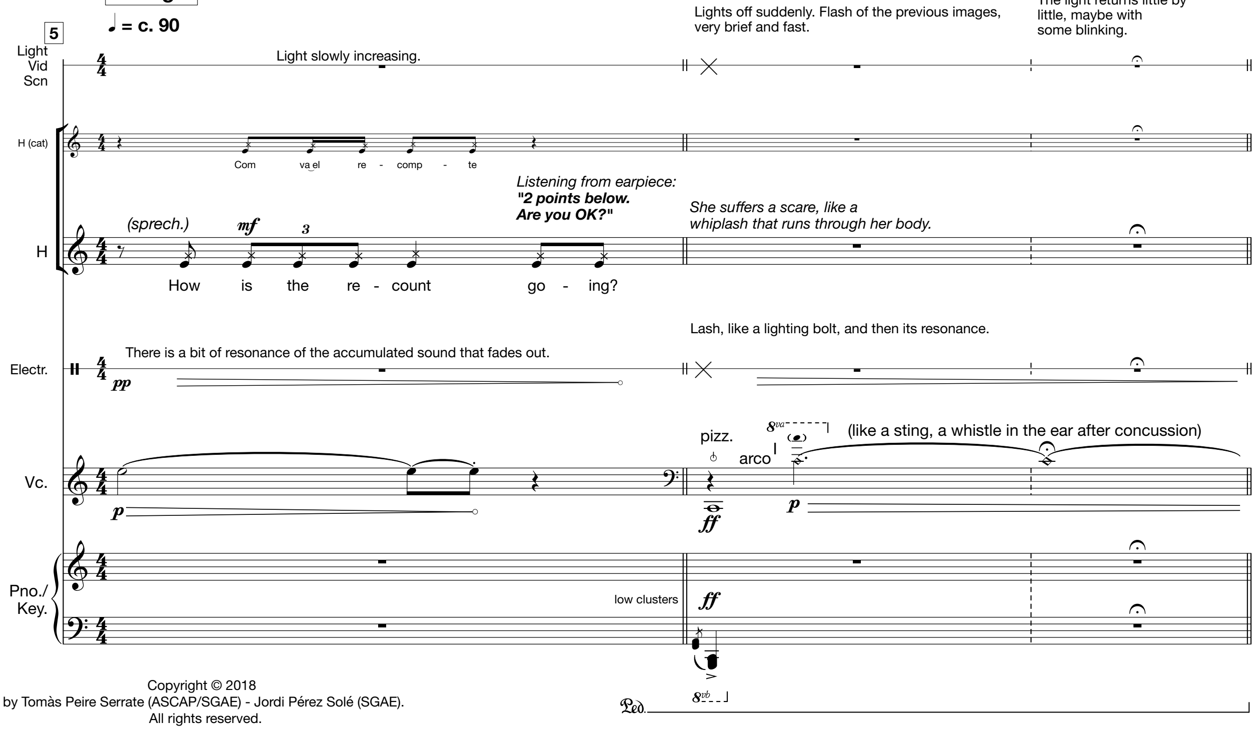
Electoral monodrama for soprano, violoncello, piano, electronics, and video.

Music: Tomàs Peire Serrate
Libretto: Jordi Pérez Solé
(2018)

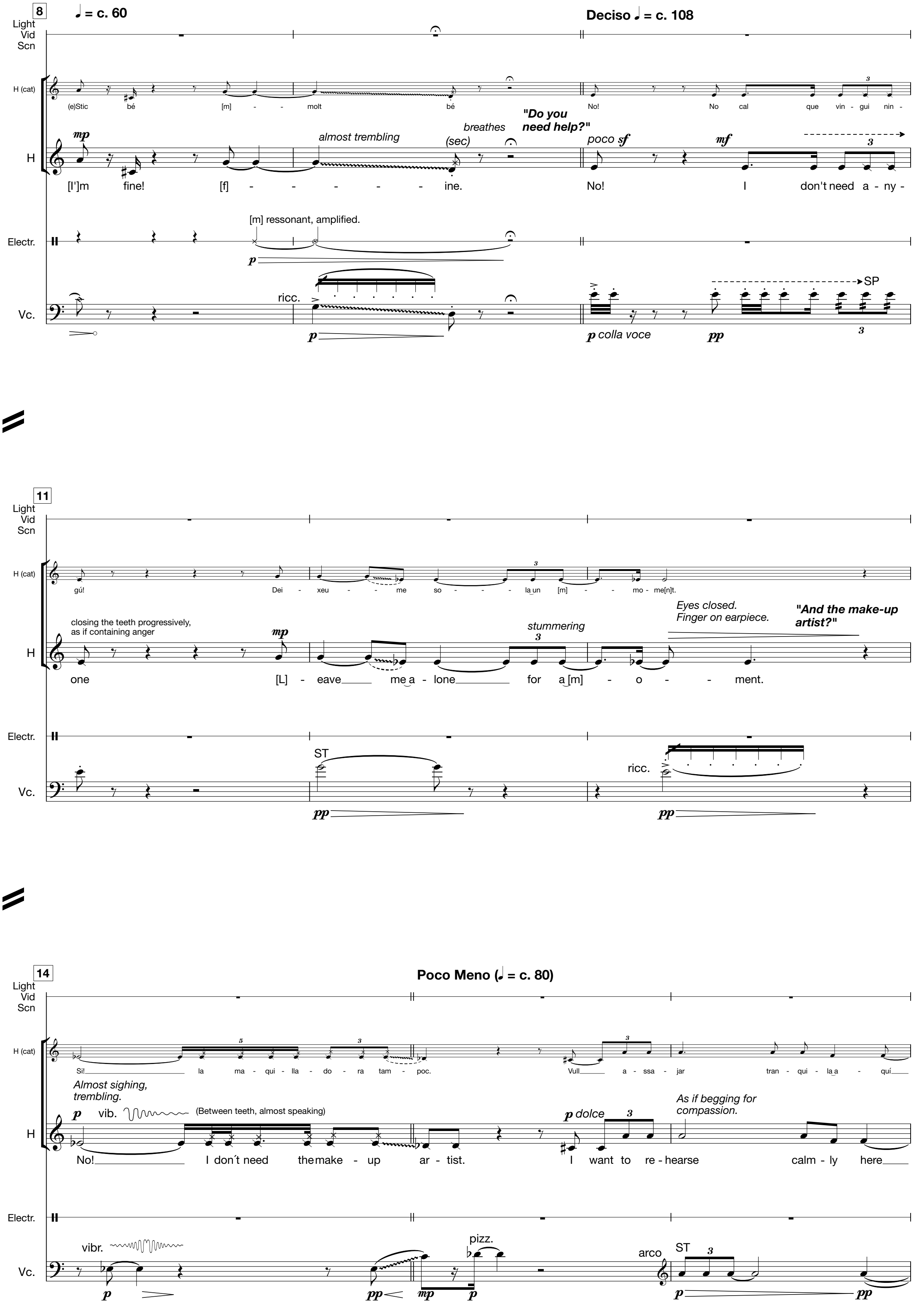
1. Intro

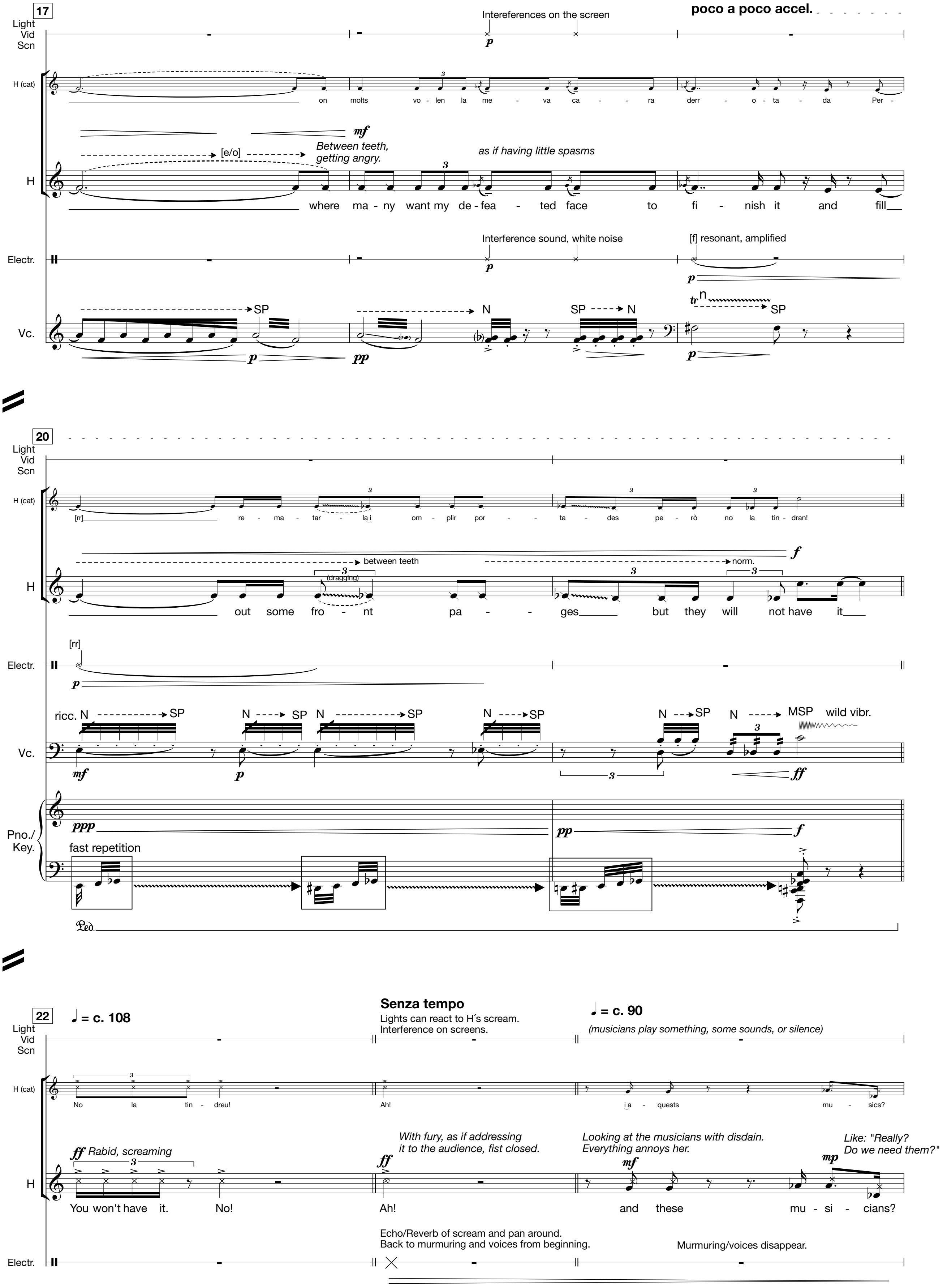

Dark.
On the screen/s appear images from the news about electoral defeats from all over the world, from different moments in history.
Reporters in different languages show data about participation, images of people in the street waiting for speeches, repercussions in the stock markets ...
Lights
Video
Scene
The sound reflects the images but not necessarily synchronously.
Messages appear fragmented, from different positions and volumes. Gives the impression of an overwhelming amount of information, impossible to assimilate.
Electronics
3
Light
Vid
Scn
Images always have interferences, as if something technically failed. Maybe it's saturation ... Maybe also channel changes, unexpected advertising, Some cut of a movie ...
Lights fade in slowly. Hillary's (H) silhouette on stage.
Electr.
Apart from the news sound, there is a heartbeat, but subtle, and the sound of the interferences. This could be synchronized with the images.
The sound is filtered progressively until it seems that it comes from outside, from another room.
Vc.
(♩ = ca. 108)
pppp
vib. ad lib.
MV
NV
pp
Repeat fading in, poco cresc. before m5.

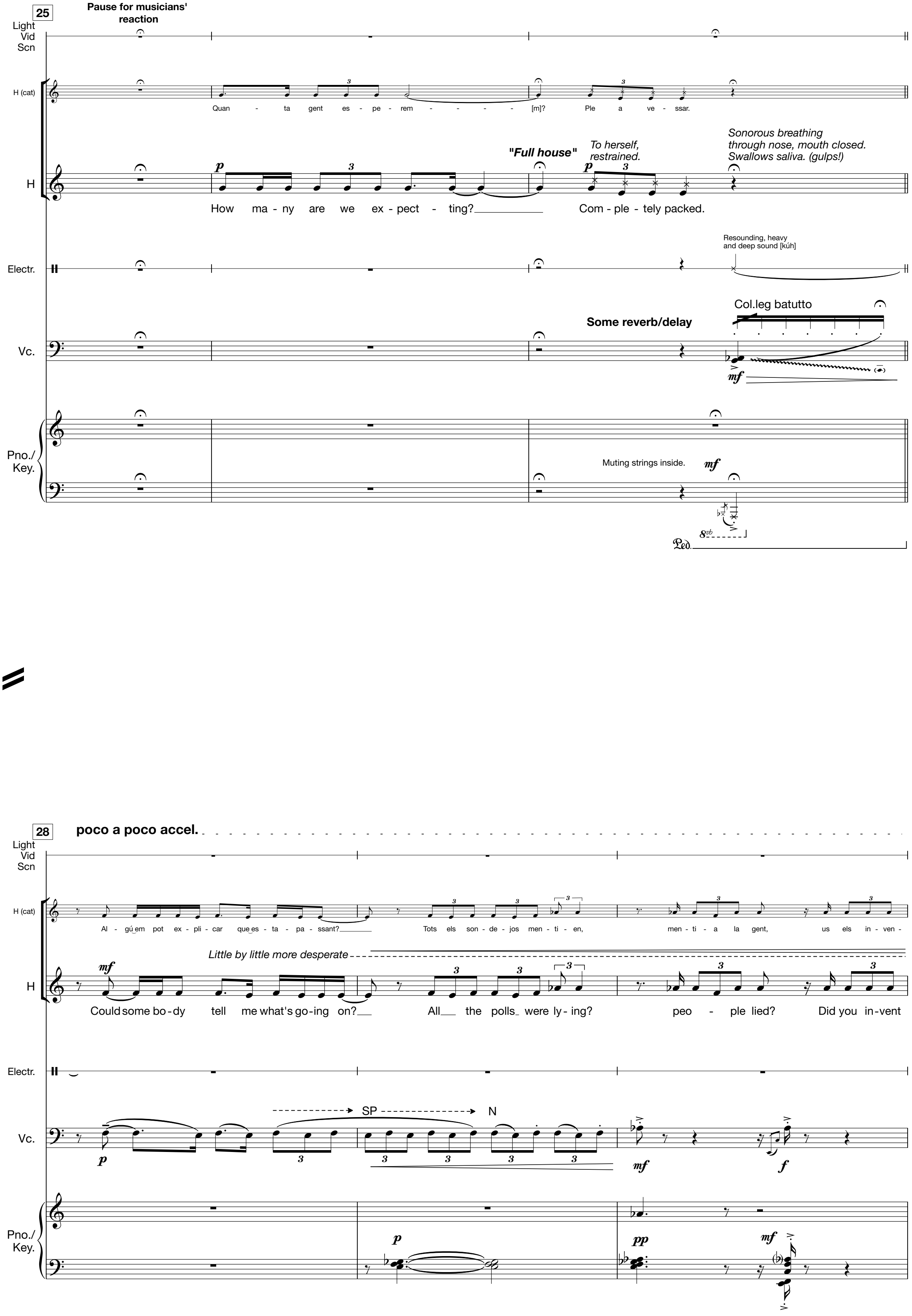
2. cngrt

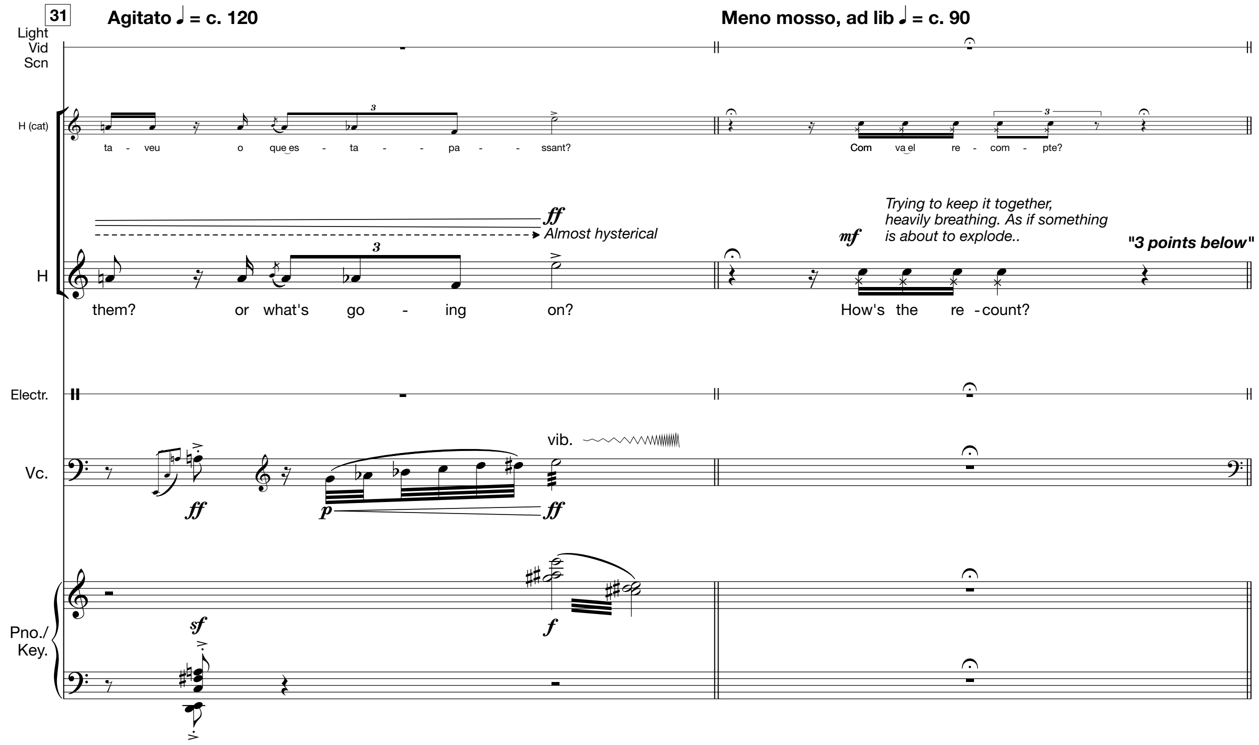

♩ = c. 90
5
Light
Vid
Scn
Light slowly increasing.
Senza tempo
Lights off suddenly. Flash of the previous images, very brief and fast.
The light returns little by little, maybe with some blinking.
H (cat)
Com va el re - comp - te
H
(sprech.)
mf
3
How is the re - count go - ing?
Listening from earpiece: "2 points below. Are you OK?"
She suffers a scare, like a whiplash that runs through her body.
Electr.
There is a bit of resonance of the accumulated sound that fades out.
pp
Lash, like a lighting bolt, and then its resonance.
Vc.
p
pizz.
arco
8va
(like a sting, a whistle in the ear after concussion)
ff
p
Pno./
Key.
low clusters
ff
8vb
Ped.

Copyright © 2018
by Tomàs Peire Serrate (ASCAP/SGAE) - Jordi Pérez Solé (SGAE).
All rights reserved.

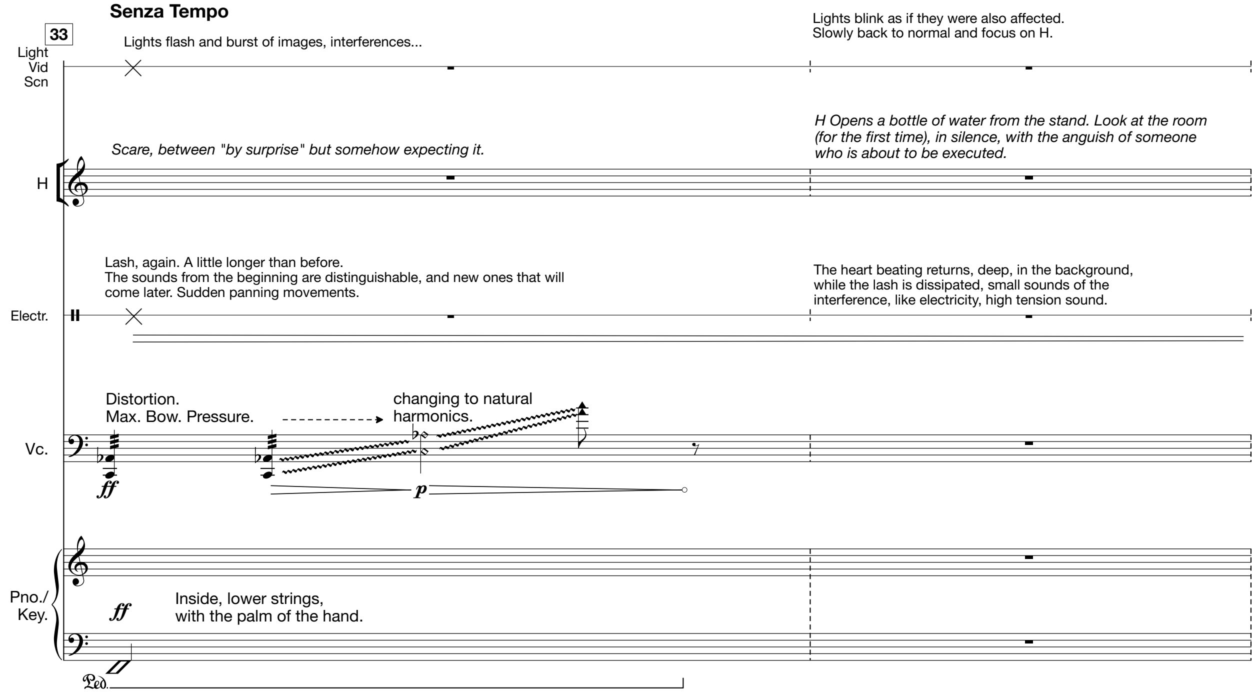

8
♩ = c. 60
Deciso ♩ = c. 108
Light
Vid
Scn
H (cat)
(e)Stic bé [m] - - molt bé
No! No cal que vin - gui nin -
H
mp
almost trembling
breathes
(sec)
"Do you need help?"
poco sf
mf
[I']m fine! [f] - - - - - - ine.
No! I don't need a - ny -
Electr.
[m] ressonant, amplified.
p
Vc.
ricc.
p
p colla voce
pp
SP
3
11
gú! Dei - xeu - - me so - - - la un [m] - - mo - me[n]t.
closing the teeth progressively, as if containing anger
mp
stummering
Eyes closed. Finger on earpiece.
"And the make-up artist?"
one [L] - eave me a - lone for a [m] - o - - ment.
ST
ricc.
pp
pp
14
Poco Meno (♩ = c. 80)
Si! la ma - qui - lla - do - ra tam - poc.
Vull a - ssa - jar tran - qui - la a - quí
Almost sighing, trembling.
p vib.
(Between teeth, almost speaking)
p dolce
As if begging for compassion.
No! I don´t need the make - up ar - tist.
I want to re - hearse calm - ly here
vibr.
p
pp
pizz.
mp
p
arco
ST
p
pp
5
3

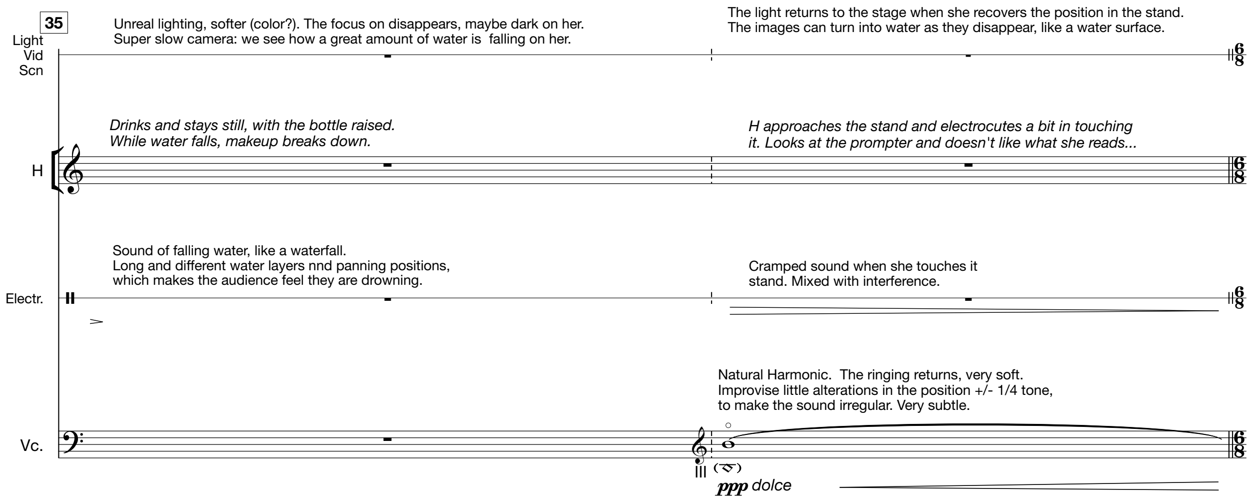

17
poco a poco accel.
Intereferences on the screen
Light Vid Scn
H (cat)
on molts vo - len la me - va ca - ra derr - o - ta - da Per -
mf
[e/o]
Between teeth, getting angry.
as if having little spasms
H
where ma - ny want my de - fea - ted face to fi - nish it and fill
Interference sound, white noise
[f] resonant, amplified
Electr.
p
SP
N
SP N
tr n
SP
Vc.
pp
20
re - ma - tar - la i om - plir por - ta - des pe - rò no la tin - dran!
[rr]
f
between teeth
norm.
(dragging)
out some fro - nt pa - ges but they will not have it
ricc. N SP
N SP
N SP
N SP
N SP
N MSP wild vibr.
ff
ppp
fast repetition
Pno./ Key.
Ped.
22
♩ = c. 108
No la tin - dreu!
ff Rabid, screaming
You won't have it. No!
Senza tempo
Lights can react to H´s scream.
Interference on screens.
Ah!
With fury, as if addressing it to the audience, fist closed.
♩ = c. 90
(musicians play something, some sounds, or silence)
i a - quests mu - sics?
Looking at the musicians with disdain. Everything annoys her.
Like: "Really? Do we need them?"
mp
and these mu - si - cians?
Echo/Reverb of scream and pan around.
Back to murmuring and voices from beginning.
Murmuring/voices disappear.


25
Pause for musicians' reaction
Light
Vid
Scn
H (cat)
Quan - ta gent es - pe - rem - - - - - [m]? Ple a ve - ssar.
H
"Full house"
To herself, restrained.
Sonorous breathing through nose, mouth closed. Swallows saliva. (gulps!)
How ma - ny are we ex - pect - ting? Com - ple - tely packed.
Electr.
Resounding, heavy and deep sound [kúh]
Some reverb/delay
Col.leg batutto
Vc.
Pno./ Key.
Muting strings inside.
8vb
Ped.
28
poco a poco accel.
Al - gú em pot ex - pli - car que es - ta - pa - ssant? Tots els son - de - jos men - ti - en, men - ti - a la gent, us els in - ven -
Little by little more desperate
Could some bo - dy tell me what's go - ing on? All the polls were ly - ing? peo - ple lied? Did you in - vent
SP
N


31
Agitato ♩ = c. 120
Meno mosso, ad lib ♩ = c. 90
Light
Vid
Scn
H (cat)
ta - veu o que es - ta - - pa - - ssant?
Com va el re - com - pte?
ff
Almost hysterical
mf
Trying to keep it together, heavily breathing. As if something is about to explode..
"3 points below"
H
them? or what's go - ing on?
How's the re - count?
Electr.
vib.
Vc.
ff
p
ff
Pno./
Key.
sf
f

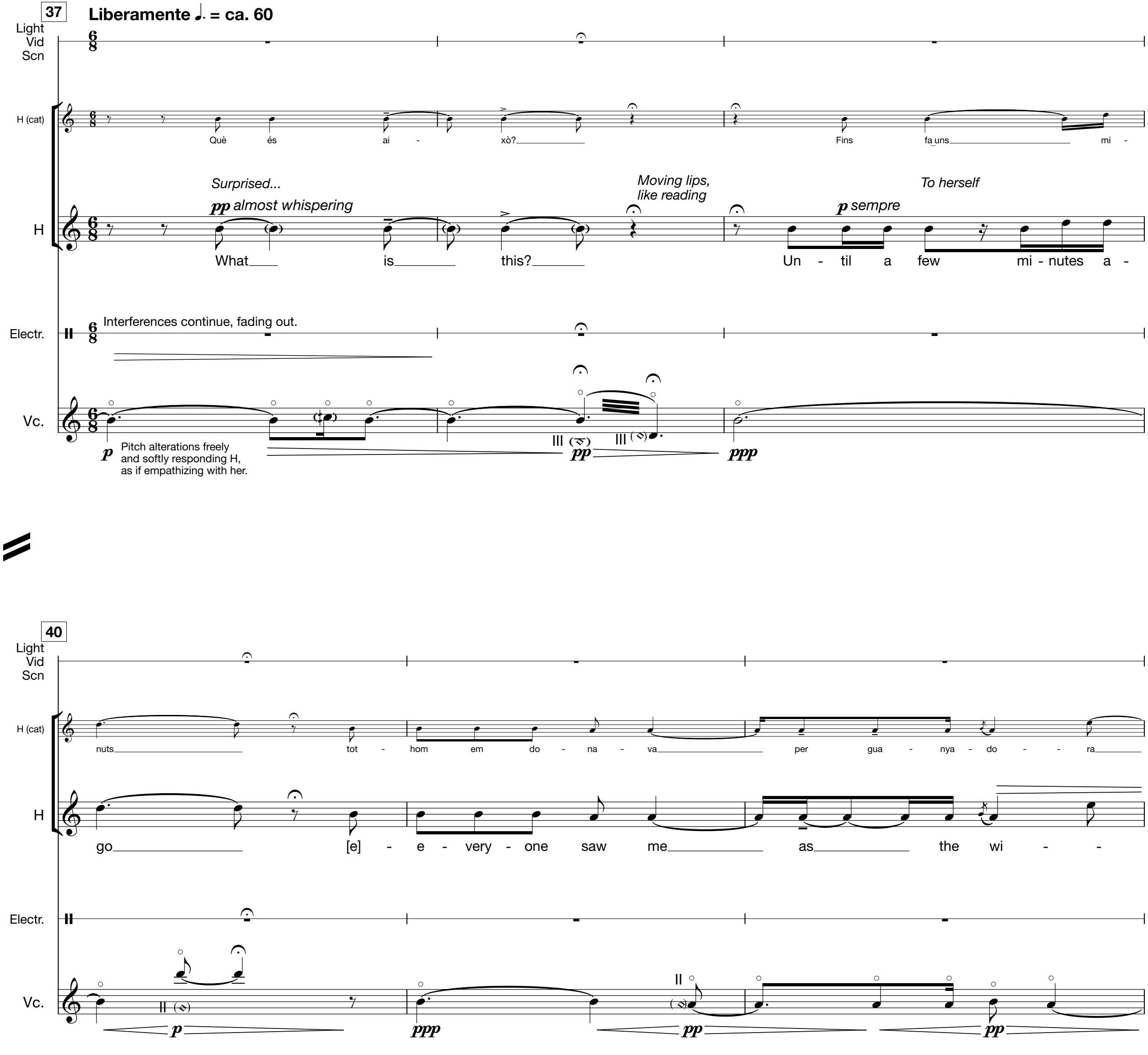
3. Water

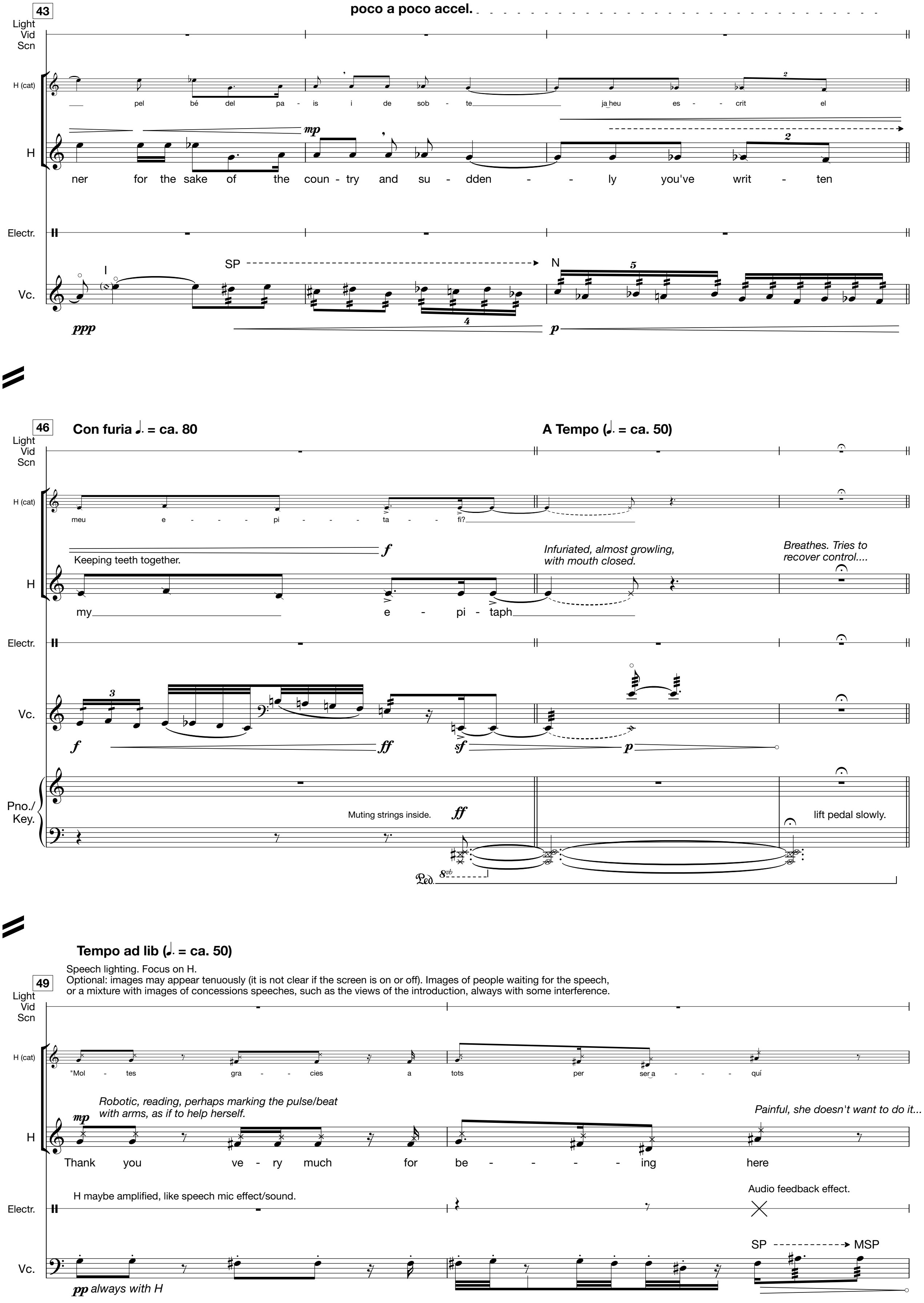

Senza Tempo
33
Light
Vid
Scn
Lights flash and burst of images, interferences...
Lights blink as if they were also affected.
Slowly back to normal and focus on H.
Scare, between "by surprise" but somehow expecting it.
H Opens a bottle of water from the stand. Look at the room (for the first time), in silence, with the anguish of someone who is about to be executed.
H
Lash, again. A little longer than before.
The sounds from the beginning are distinguishable, and new ones that will come later. Sudden panning movements.
The heart beating returns, deep, in the background, while the lash is dissipated, small sounds of the interference, like electricity, high tension sound.
Electr.
Distortion.
Max. Bow. Pressure.
changing to natural harmonics.
Vc.
ff
p
Pno./
Key.
ff
Inside, lower strings, with the palm of the hand.
Ped.

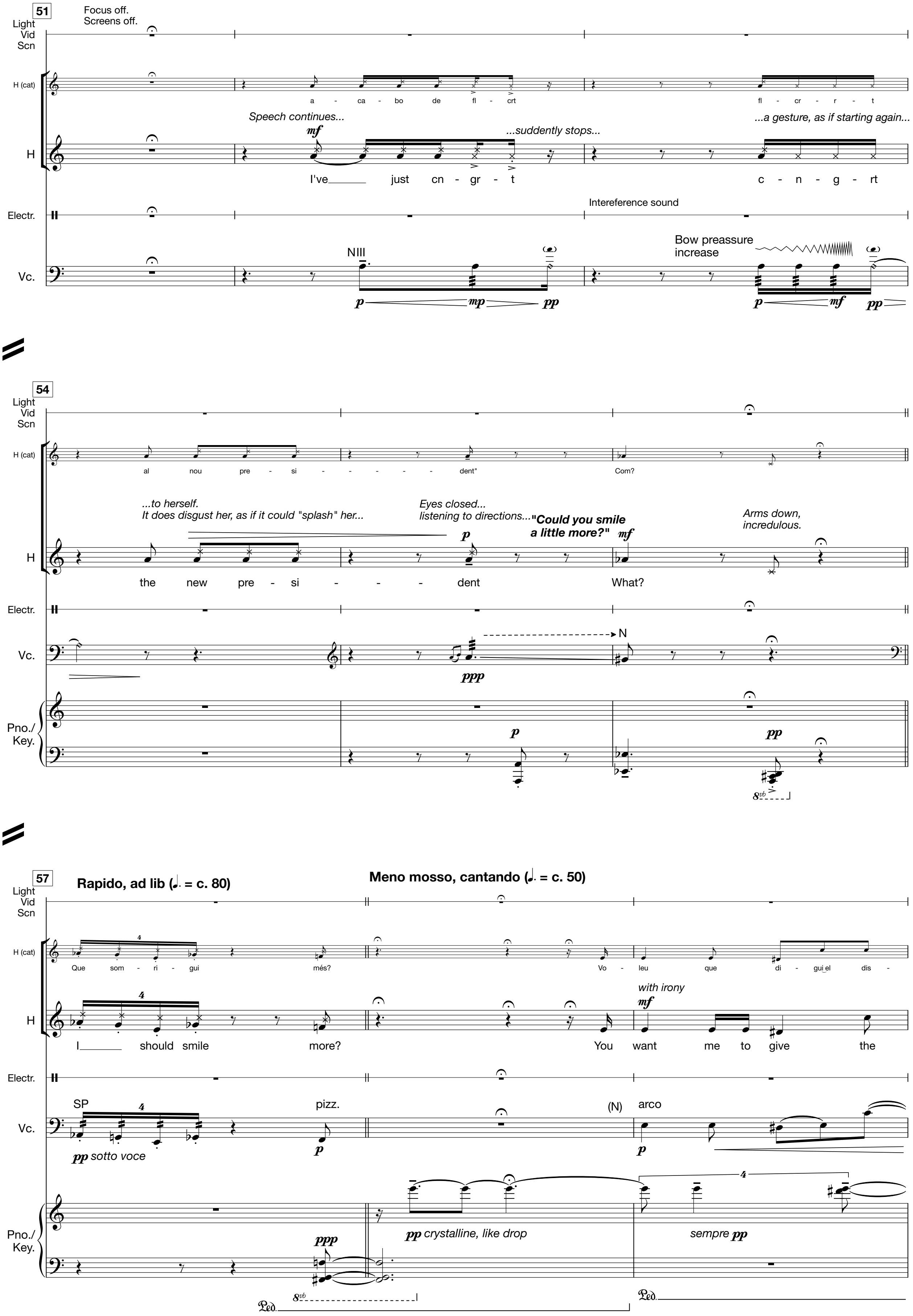

35
Light
Vid
Scn
Unreal lighting, softer (color?). The focus on disappears, maybe dark on her.
Super slow camera: we see how a great amount of water is falling on her.
The light returns to the stage when she recovers the position in the stand.
The images can turn into water as they disappear, like a water surface.
6/8
H
Drinks and stays still, with the bottle raised.
While water falls, makeup breaks down.
H approaches the stand and electrocutes a bit in touching
it. Looks at the prompter and doesn't like what she reads...
Electr.
Sound of falling water, like a waterfall.
Long and different water layers nnd panning positions,
which makes the audience feel they are drowning.
Cramped sound when she touches it
stand. Mixed with interference.
Vc.
Natural Harmonic. The ringing returns, very soft.
Improvise little alterations in the position +/- 1/4 tone,
to make the sound irregular. Very subtle.
III
ppp dolce

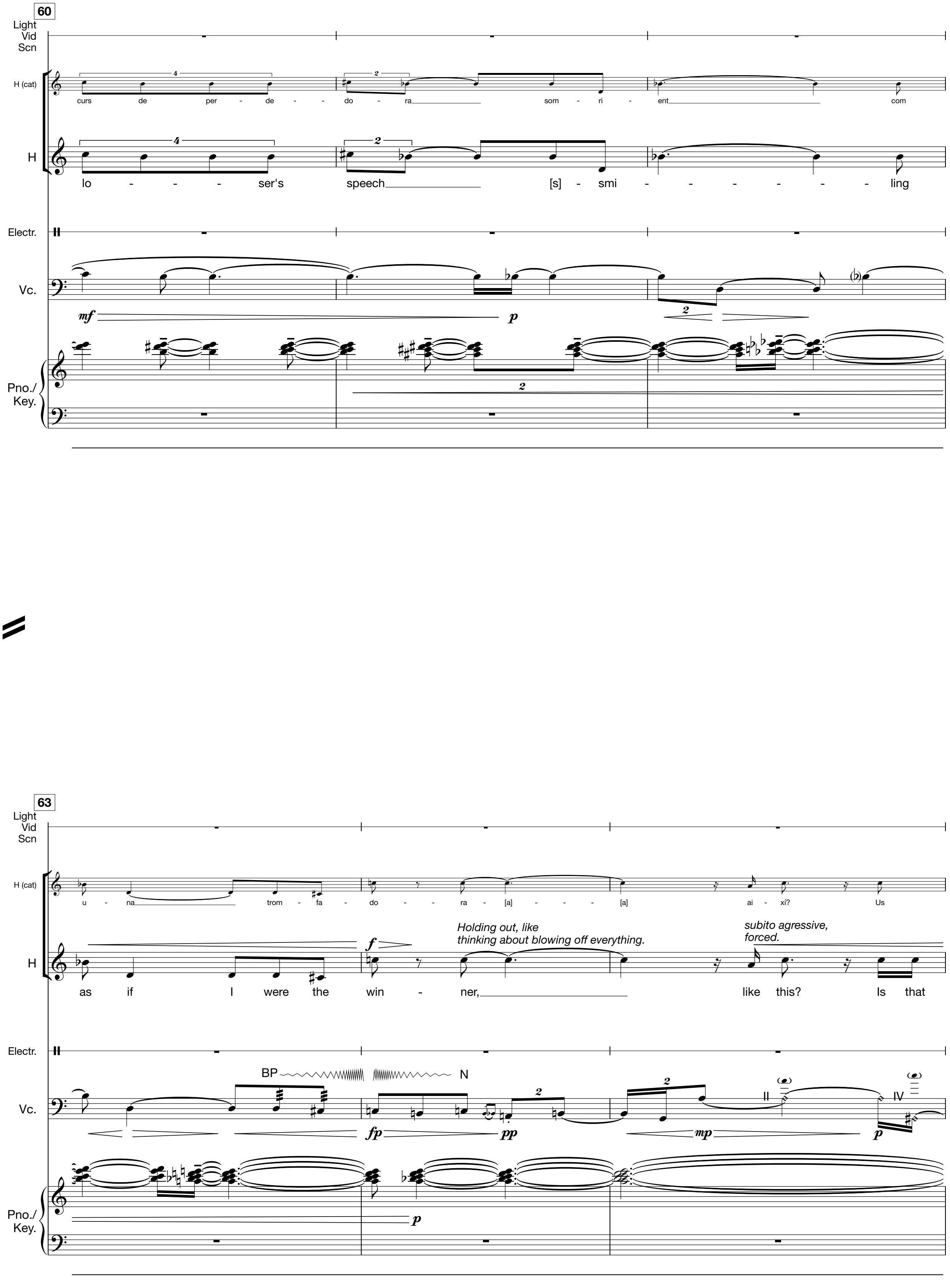
4. What Is This?

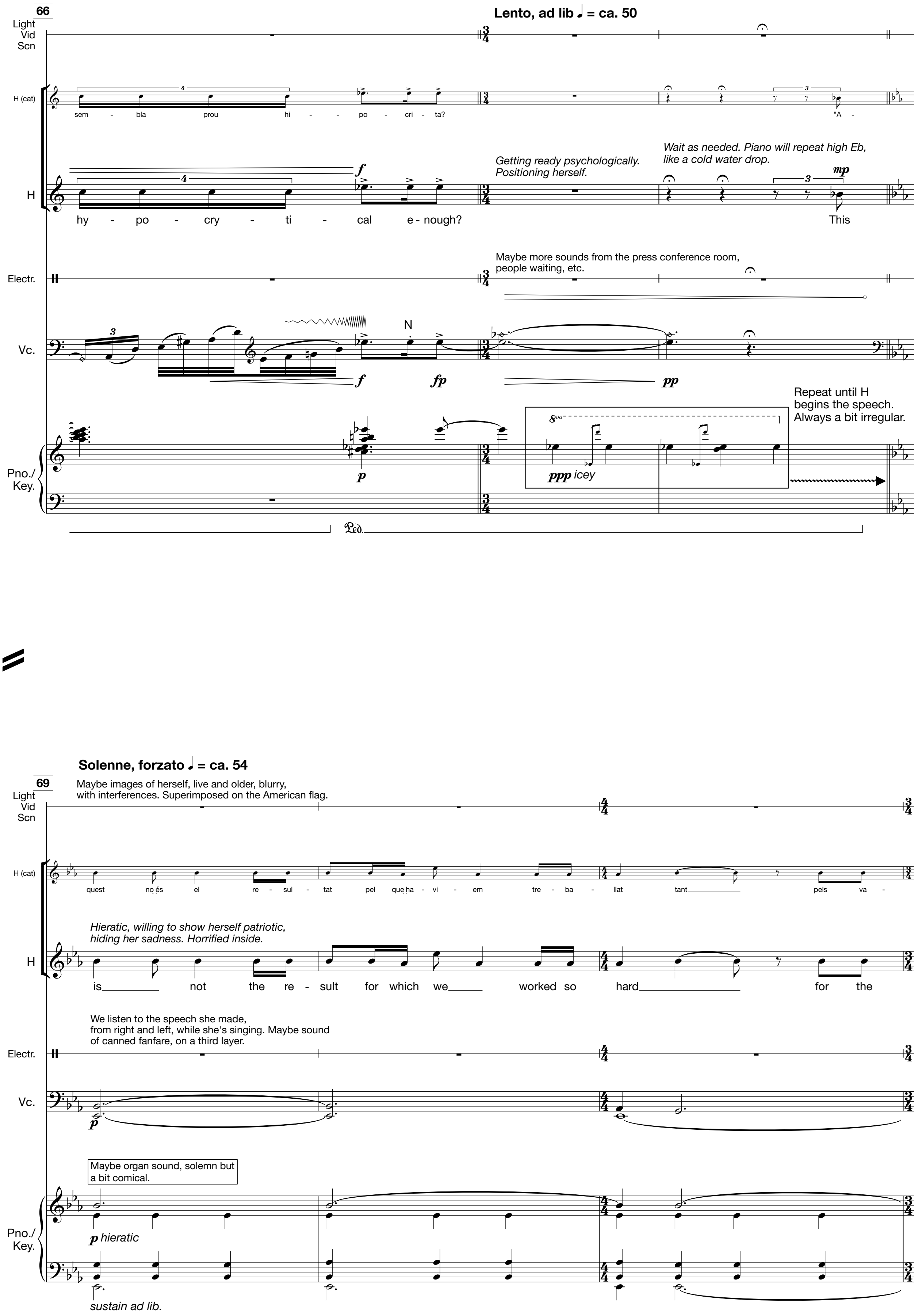
Liberamente ♩. = ca. 60

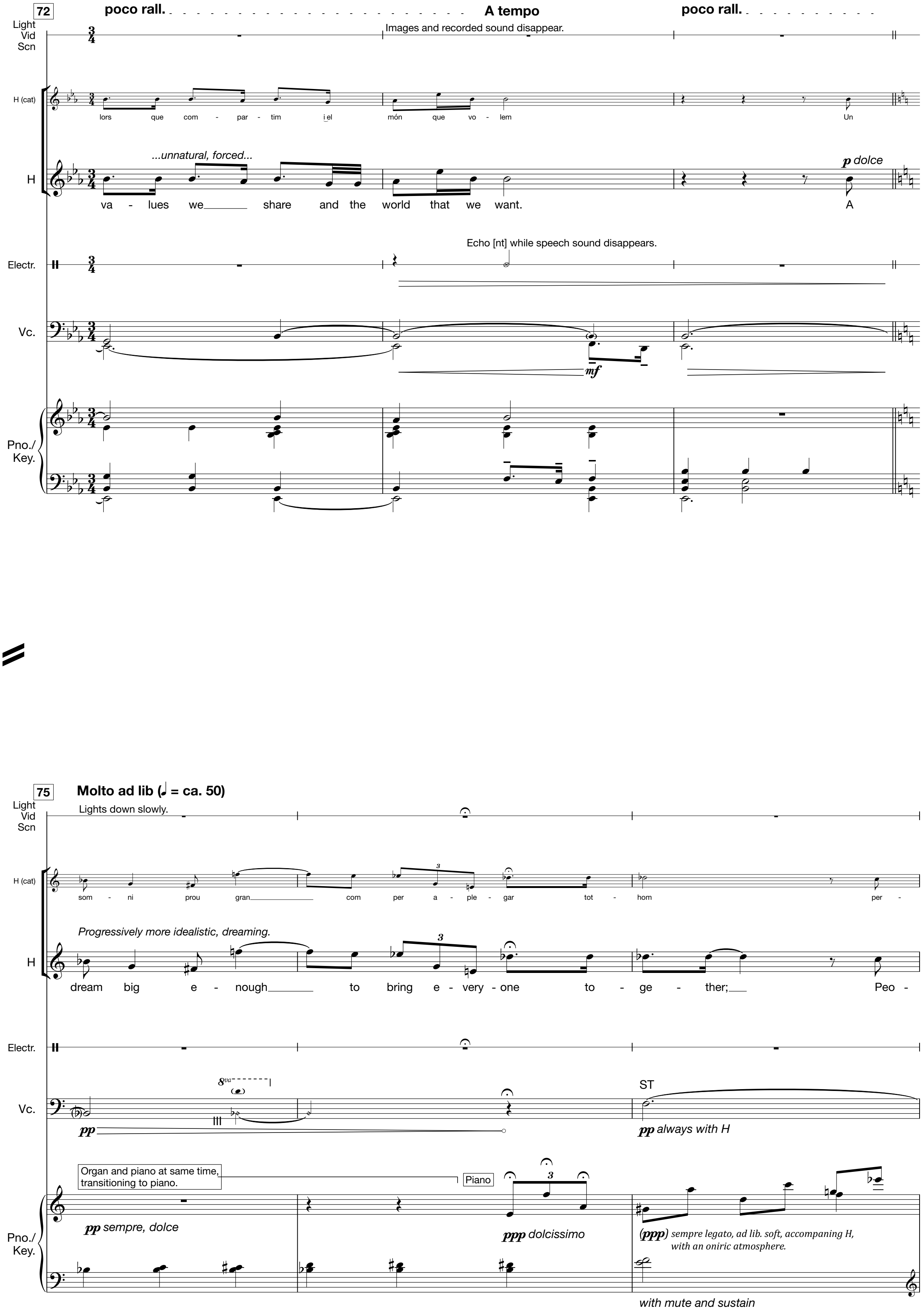

37
Light
Vid
Scn
6/8
H (cat)
Què és ai - xò?
Fins fa uns mi -
H
Surprised...
pp almost whispering
Moving lips,
like reading
To herself
p sempre
What is this?
Un - til a few mi - nutes a -
Electr.
Interferences continue, fading out.
Vc.
p
Pitch alterations freely
and softly responding H,
as if empathizing with her.
III
pp
ppp
40
Light
Vid
Scn
H (cat)
nuts tot - hom em do - na - va per gua - nya - do - ra
H
go [e] - e - very - one saw me as the wi - -
Electr.
Vc.
II
p
ppp
pp
pp

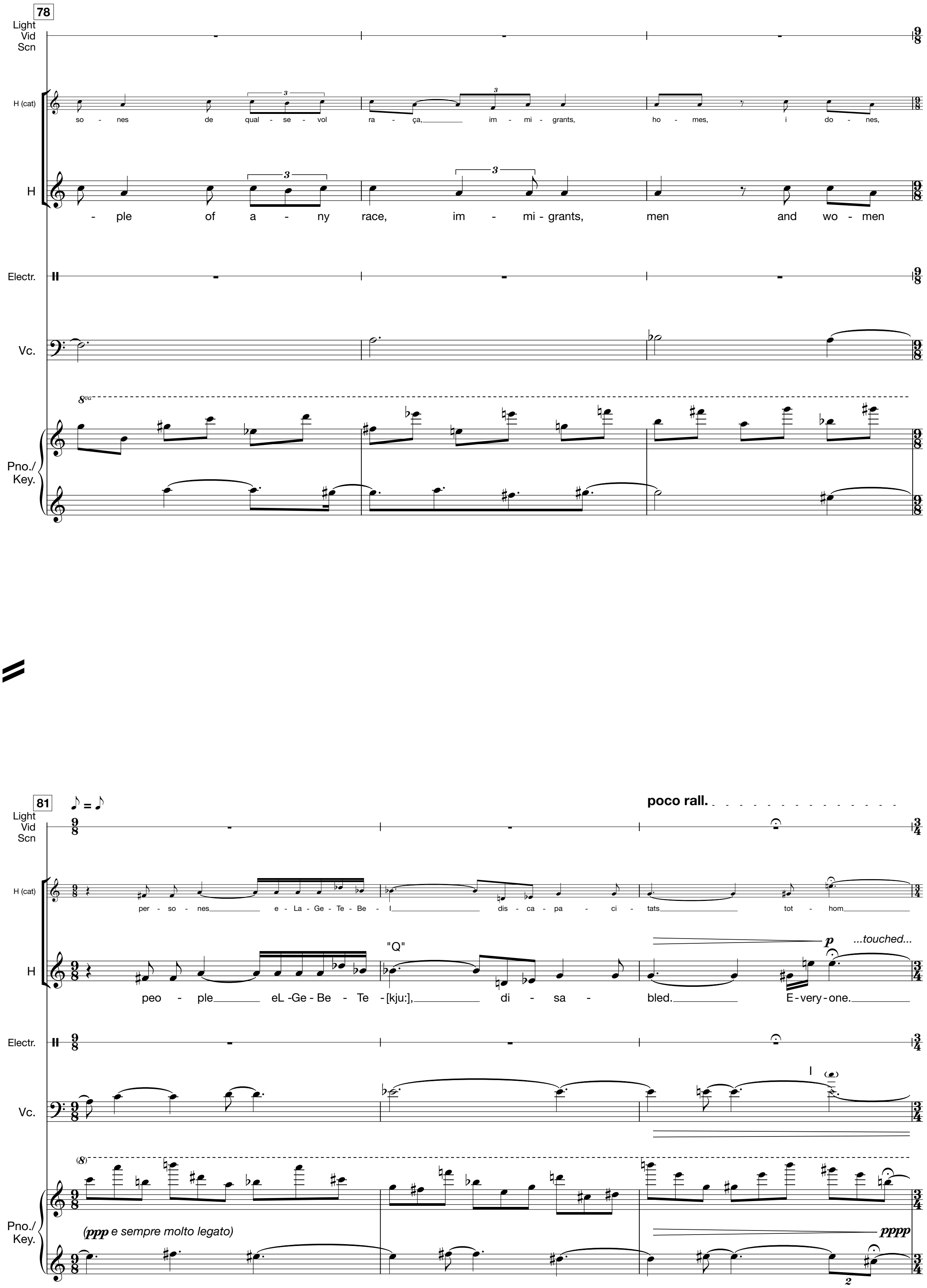

43
poco a poco accel.
Light
Vid
Scn
H (cat)
pel bé del pa - is i de sob - te ja heu es - - crit el
2
mp
H
ner for the sake of the coun - try and su - dden - - ly you've writ - ten
2
Electr.
Vc.
I
SP
N
5
4
ppp
p
46
Con furia ♩. = ca. 80
A Tempo (♩. = ca. 50)
meu e - - - pi - - - ta - - fi?
Keeping teeth together.
f
Infuriated, almost growling, with mouth closed.
Breathes. Tries to recover control....
my e - pi - taph
3
f
ff
sf
p
Pno./
Key.
Muting strings inside.
ff
lift pedal slowly.
8vb
Ped.
Tempo ad lib (♩. = ca. 50)
Speech lighting. Focus on H.
Optional: images may appear tenuously (it is not clear if the screen is on or off). Images of people waiting for the speech, or a mixture with images of concessions speeches, such as the views of the introduction, always with some interference.
49
"Mol - tes gra - cies a tots per ser a - - - - quí
Robotic, reading, perhaps marking the pulse/beat with arms, as if to help herself.
mp
Painful, she doesn't want to do it...
Thank you ve - ry much for be - - - - - ing here
H maybe amplified, like speech mic effect/sound.
Audio feedback effect.
SP
MSP
pp always with H

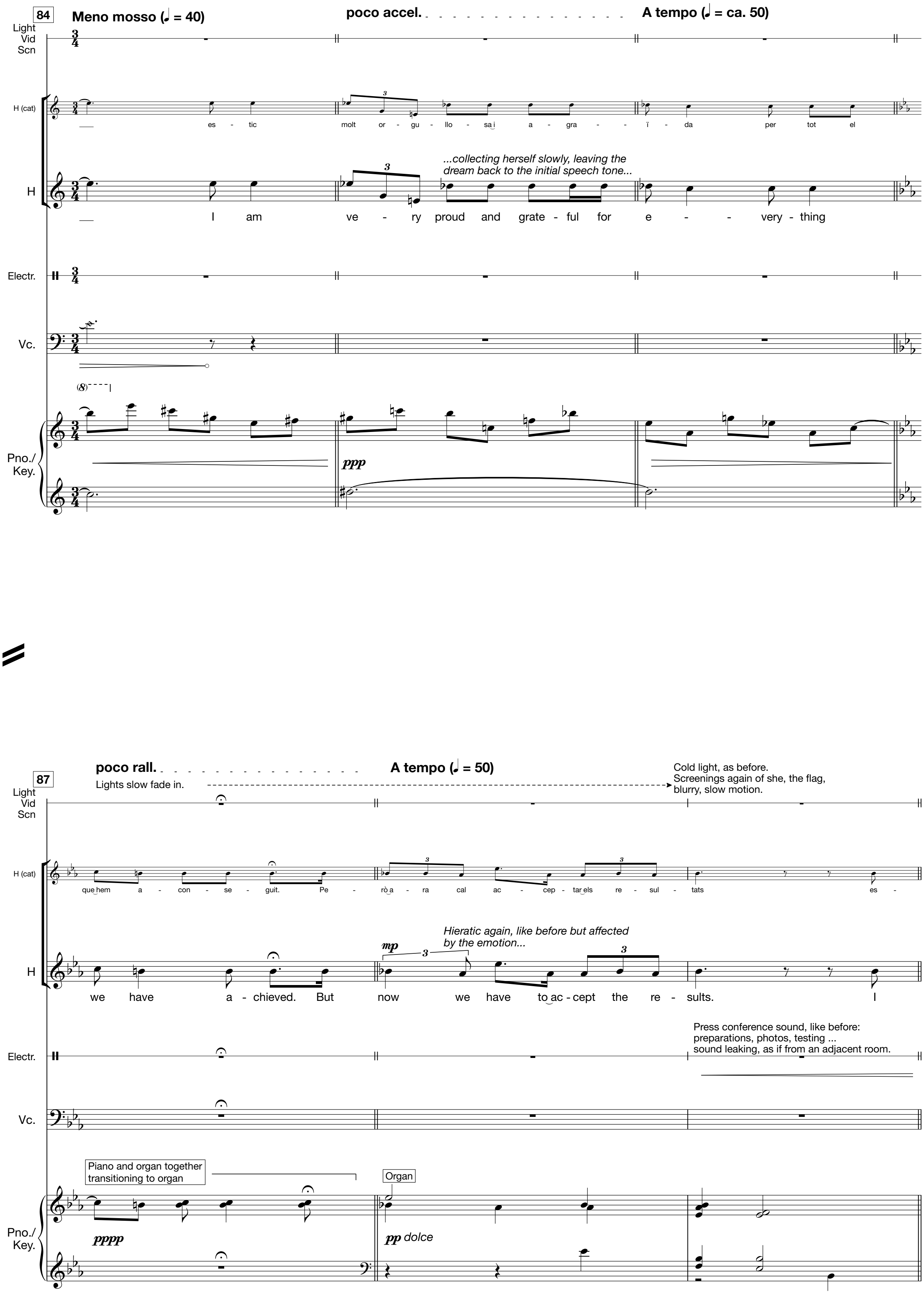

51
Focus off.
Screens off.
Light
Vid
Scn
H (cat)
a - ca - bo de fl - crt
fl - cr - r - t
Speech continues...
...suddenly stops...
...a gesture, as if starting again...
mf
H
I've just cn - gr - t
c - n - g - rt
Electr.
Intereference sound
Bow preassure increase
NIII
Vc.
p mp pp
p mf pp
54
al nou pre - si - - - - - dent"
Com?
...to herself.
It does disgust her, as if it could "splash" her...
Eyes closed...
listening to directions...
"Could you smile a little more?"
Arms down,
incredulous.
p
mf
the new pre - si - - - dent
What?
N
ppp
Pno./
Key.
p
pp
8vb
57
Rapido, ad lib (♩. = c. 80)
Meno mosso, cantando (♩. = c. 50)
4
Que som - ri - gui més?
Vo - leu que di - gui el dis -
with irony
I should smile more?
You want me to give the
SP
pizz.
(N)
arco
pp sotto voce
p
p
ppp
pp crystalline, like drop
sempre pp
8vb
Ped.
Ped.

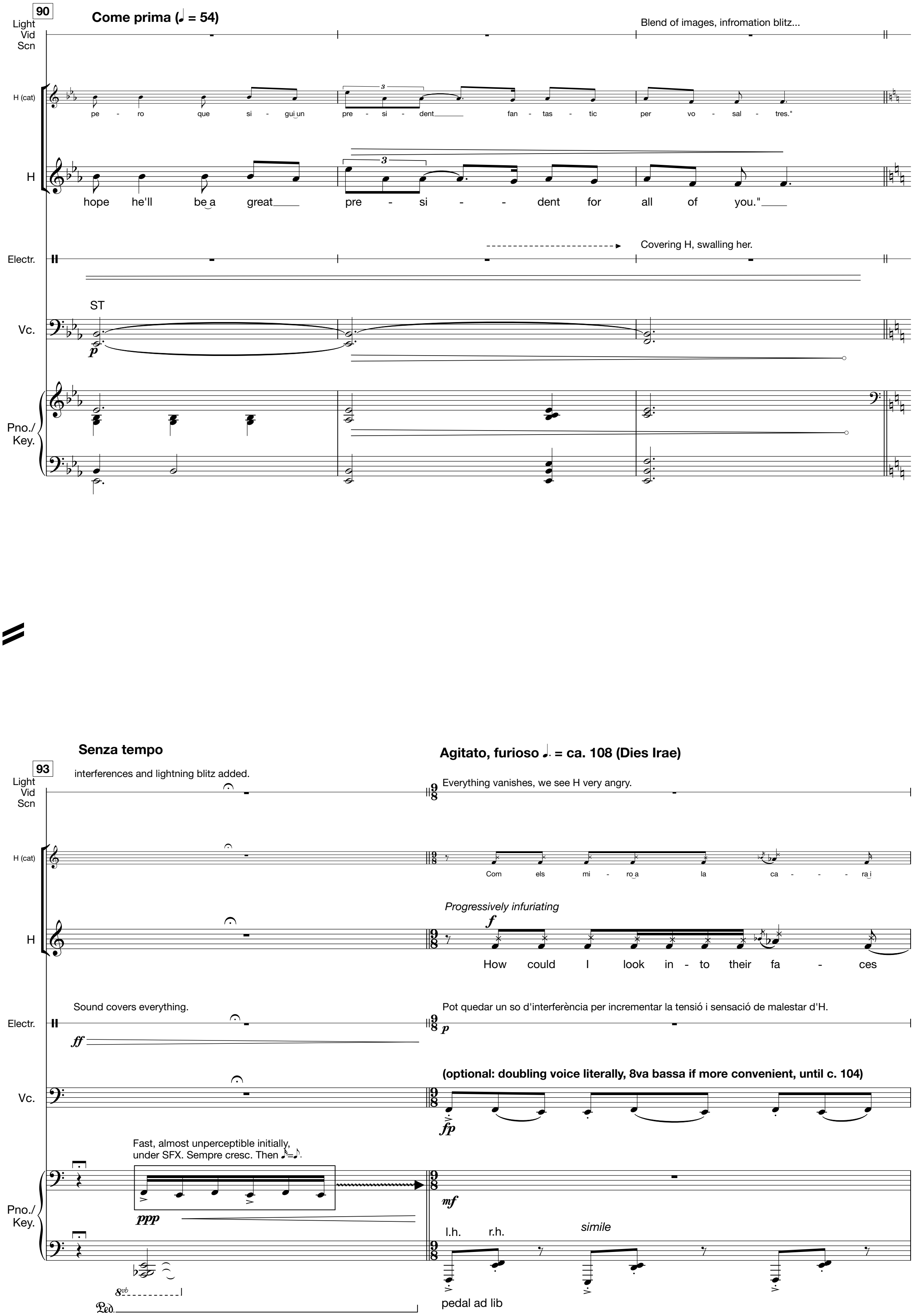

60
Light
Vid
Scn
H (cat)
curs de per - de - - do - ra som - ri - ent com
H
lo - - - ser's speech [s] - smi - - - - - - - ling
Electr.
Vc.
mf
p
Pno./
Key.
63
u - na trom - fa - do - - ra - [a] - - - [a] ai - xi? Us
f
Holding out, like
thinking about blowing off everything.
subito agressive,
forced.
as if I were the win - ner, like this? Is that
BP
N
II
IV
fp
pp
mp
p

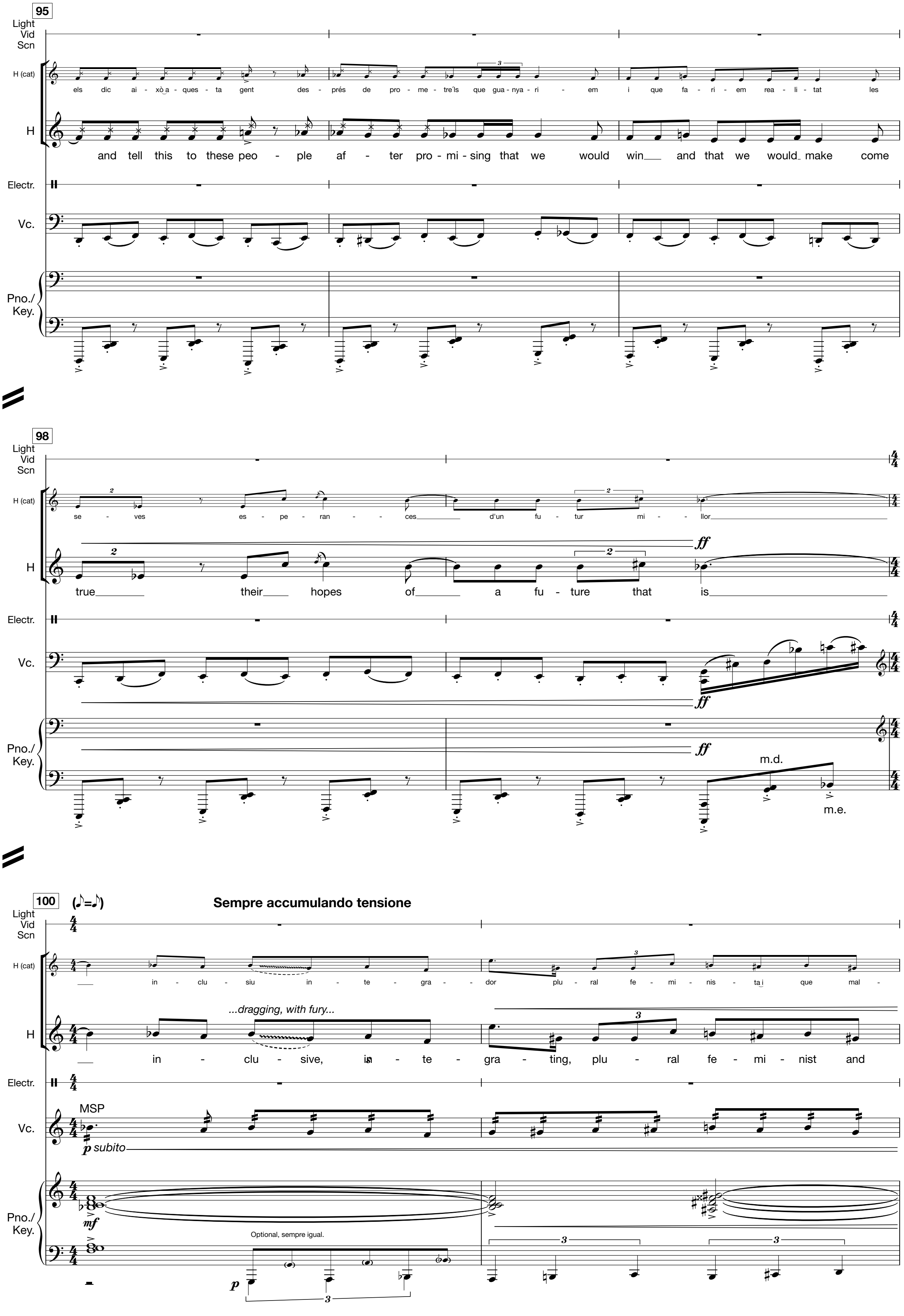

66
Light Vid Scn
Lento, ad lib ♩ = ca. 50
H (cat)
sem - bla prou hi - po - cri - ta?
"A -
Getting ready psychologically. Positioning herself.
Wait as needed. Piano will repeat high Eb, like a cold water drop.
H
f
mp
hy - po - cry - ti - cal e - nough?
This
Maybe more sounds from the press conference room, people waiting, etc.
Electr.
N
Vc.
f
fp
pp
Repeat until H begins the speech. Always a bit irregular.
8va
ppp icey
p
Pno./ Key.
Ped.
Solenne, forzato ♩ = ca. 54
69
Maybe images of herself, live and older, blurry, with interferences. Superimposed on the American flag.
quest no és el re - sul - tat pel que ha - vi - em tre - ba - llat tant pels va -
Hieratic, willing to show herself patriotic, hiding her sadness. Horrified inside.
is not the re - sult for which we worked so hard for the
We listen to the speech she made, from right and left, while she's singing. Maybe sound of canned fanfare, on a third layer.
p
Maybe organ sound, solemn but a bit comical.
p hieratic
sustain ad lib.

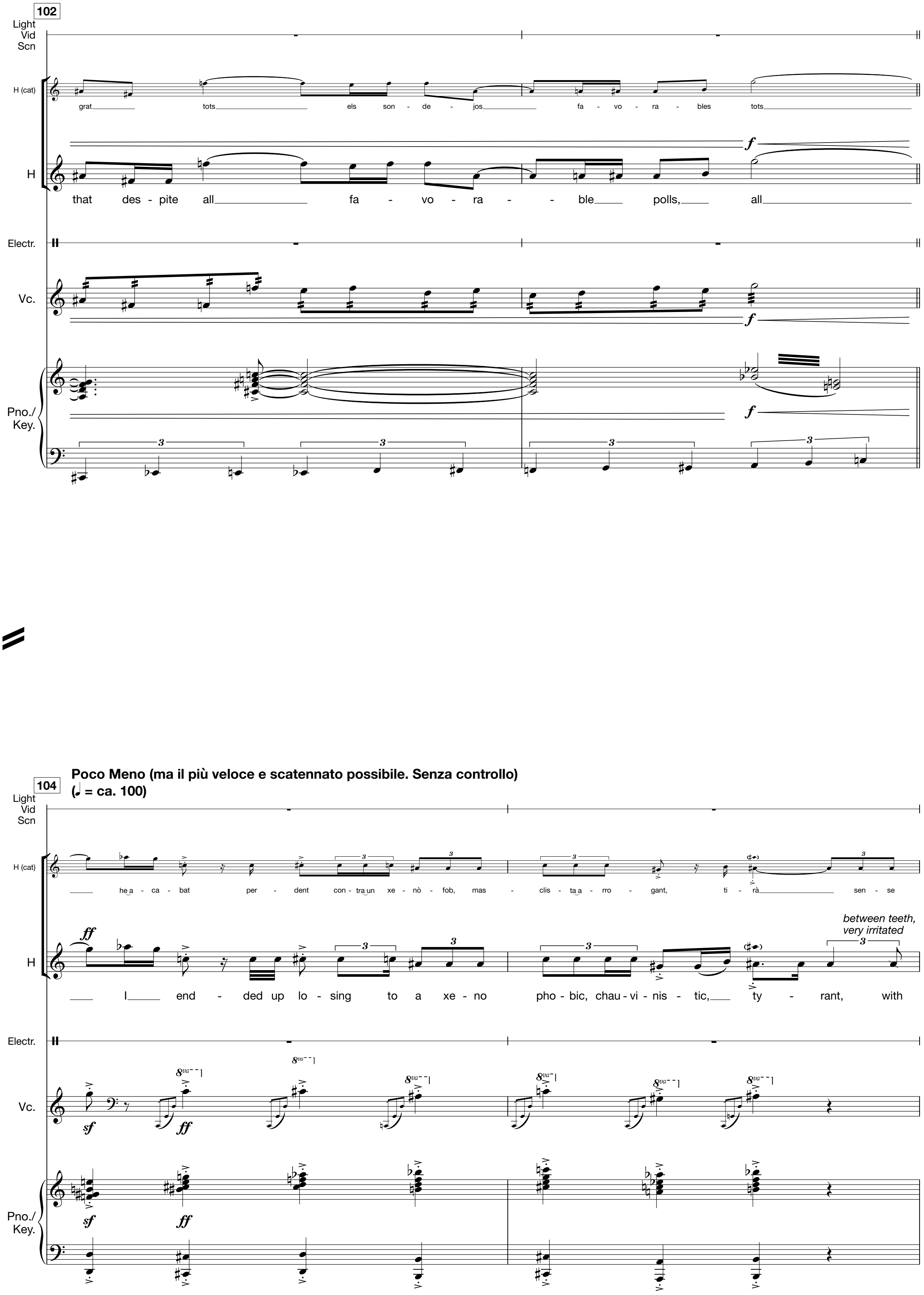

72
poco rall.
A tempo
poco rall.
Light Vid Scn
Images and recorded sound disappear.
H (cat)
lors que com - par - tim i el món que vo - lem Un
H
...unnatural, forced...
va - lues we share and the world that we want. A
p dolce
Electr.
Echo [nt] while speech sound disappears.
Vc.
mf
Pno./ Key.
75
Molto ad lib (♩ = ca. 50)
Lights down slowly.
som - ni prou gran com per a - ple - gar tot - hom per -
Progressively more idealistic, dreaming.
dream big e - nough to bring e - very - one to - ge - ther; Peo -
8va
III
pp
ST
pp always with H
Organ and piano at same time, transitioning to piano.
Piano
pp sempre, dolce
ppp dolcissimo
(ppp) sempre legato, ad lib. soft, accompaning H, with an oniric atmosphere.
with mute and sustain

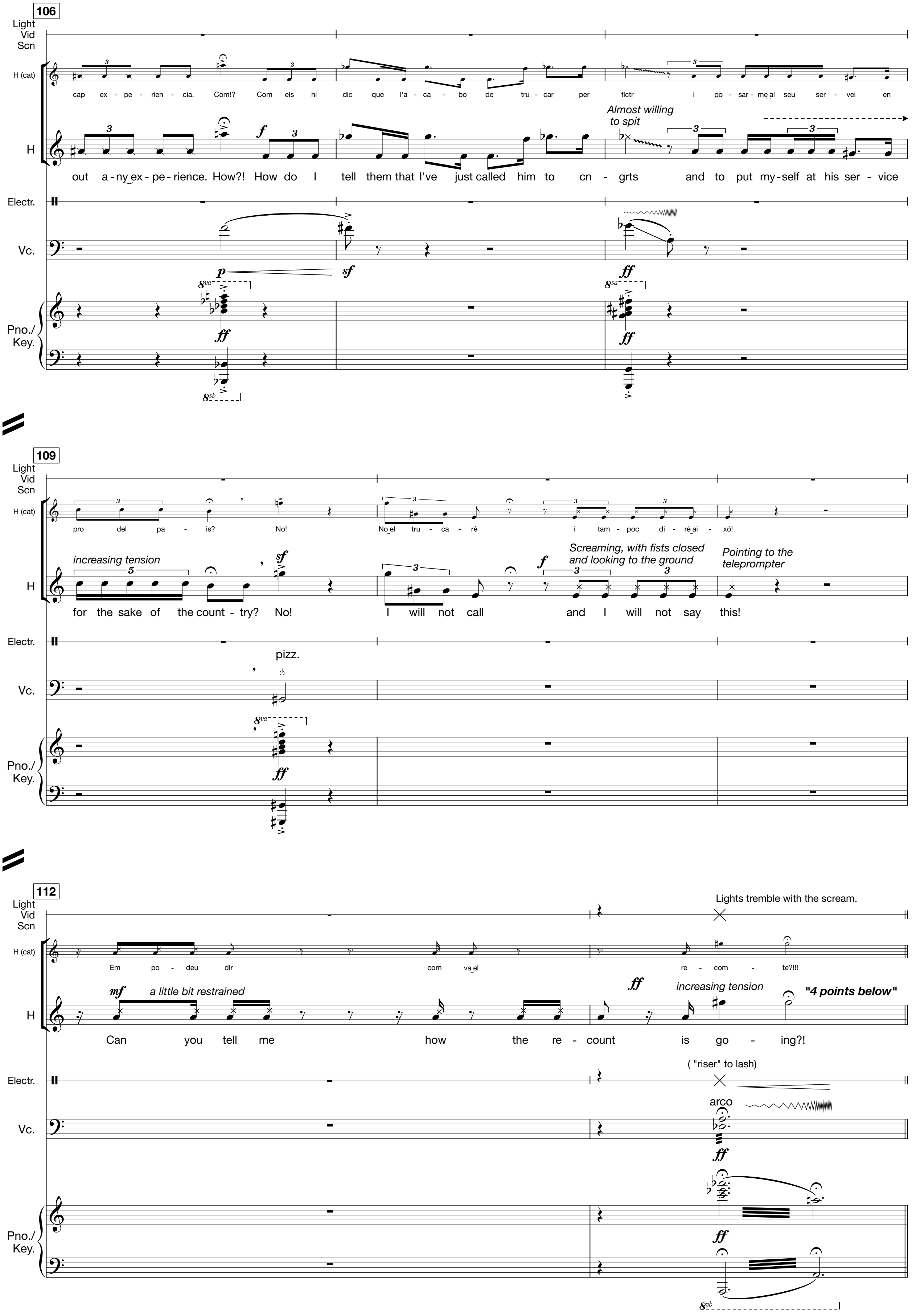

78
Light Vid Scn
H (cat)
so - nes de qual - se - vol ra - ça, im - mi - grants, ho - mes, i do - nes,
H
- ple of a - ny race, im - mi - grants, men and wo - men
Electr.
Vc.
8va
Pno./ Key.
81
♪ = ♪
poco rall.
per - so - nes e - La - Ge - Te - Be - I dis - ca - pa - ci - tats tot - hom
"Q"
p
...touched...
peo - ple eL - Ge - Be - Te - [kju:], di - sa - bled. E - very - one.
(8)
(ppp e sempre molto legato)
pppp


84
Meno mosso (♩ = 40)
poco accel.
A tempo (♩ = ca. 50)
Light Vid Scn
H (cat)
es - tic molt or - gu - llo - sa i a - gra - ï - da per tot el
...collecting herself slowly, leaving the dream back to the initial speech tone...
H
I am ve - ry proud and grate - ful for e - - very - thing
Electr.
Vc.
Pno./ Key.
(8)
ppp
87
poco rall.
A tempo (♩ = 50)
Lights slow fade in.
Cold light, as before. Screenings again of she, the flag, blurry, slow motion.
que hem a - con - se - guit. Pe - rò a - ra cal ac - cep - tar els re - sul - tats es -
Hieratic again, like before but affected by the emotion...
mp
we have a - chieved. But now we have to ac - cept the re - sults. I
Press conference sound, like before: preparations, photos, testing ... sound leaking, as if from an adjacent room.
Piano and organ together transitioning to organ
Organ
pppp
pp dolce

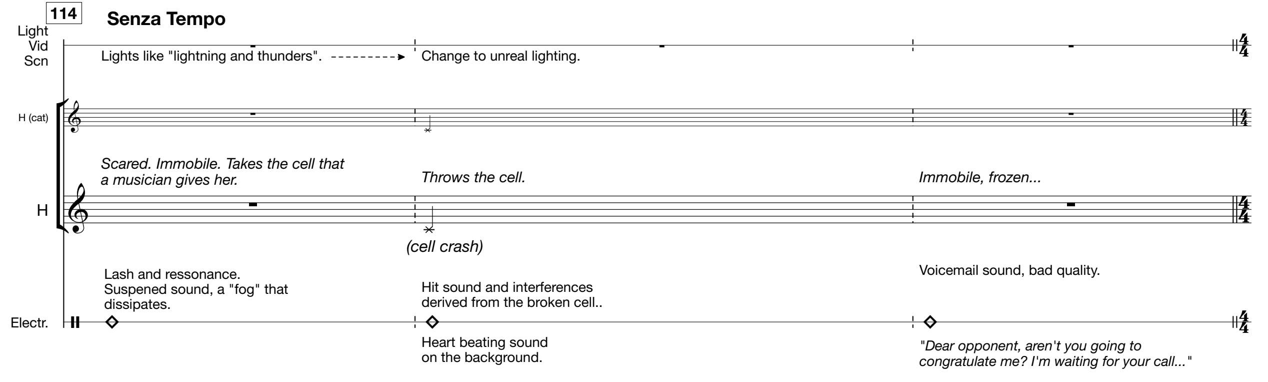

90
Come prima (♩ = 54)
Light Vid Scn
Blend of images, infromation blitz...
H (cat)
pe - ro que si - gui un pre - si - dent fan - tas - tic per vo - sal - tres."
H
hope he'll be a great pre - si - - dent for all of you."
Electr.
Covering H, swalling her.
ST
Vc.
p
Pno./ Key.
93
Senza tempo
interferences and lightning blitz added.
Agitato, furioso ♩. = ca. 108 (Dies Irae)
Everything vanishes, we see H very angry.
H (cat)
Com els mi - ro a la ca - - - ra i
Progressively infuriating
f
How could I look in - to their fa - ces
Sound covers everything.
ff
Pot quedar un so d'interferència per incrementar la tensió i sensació de malestar d'H.
p
(optional: doubling voice literally, 8va bassa if more convenient, until c. 104)
fp
Fast, almost unperceptible initially, under SFX. Sempre cresc. Then 𝅘𝅥𝅯=𝅘𝅥𝅮.
ppp
mf
l.h. r.h.
simile
8vb
Ped.
pedal ad lib


95
Light
Vid
Scn
H (cat)
els dic ai - xò a - ques - ta gent des - prés de pro - me - tre'ls que gua - nya - ri - em i que fa - ri - em rea - li - tat les
H
and tell this to these peo - ple af - ter pro - mi - sing that we would win and that we would make come
Electr.
Vc.
Pno./
Key.
98
se - ves es - pe - ran - ces d'un fu - tur mi - llor
true their hopes of a fu - ture that is
ff
m.d.
m.e.
100
(♪=♪)
Sempre accumulando tensione
in - clu - siu in - te - gra - dor plu - ral fe - mi - nis - ta i que mal -
...dragging, with fury...
in - clu - sive, in - te - gra - ting, plu - ral fe - mi - nist and
MSP
p subito
mf
Optional, sempre igual.
p
3

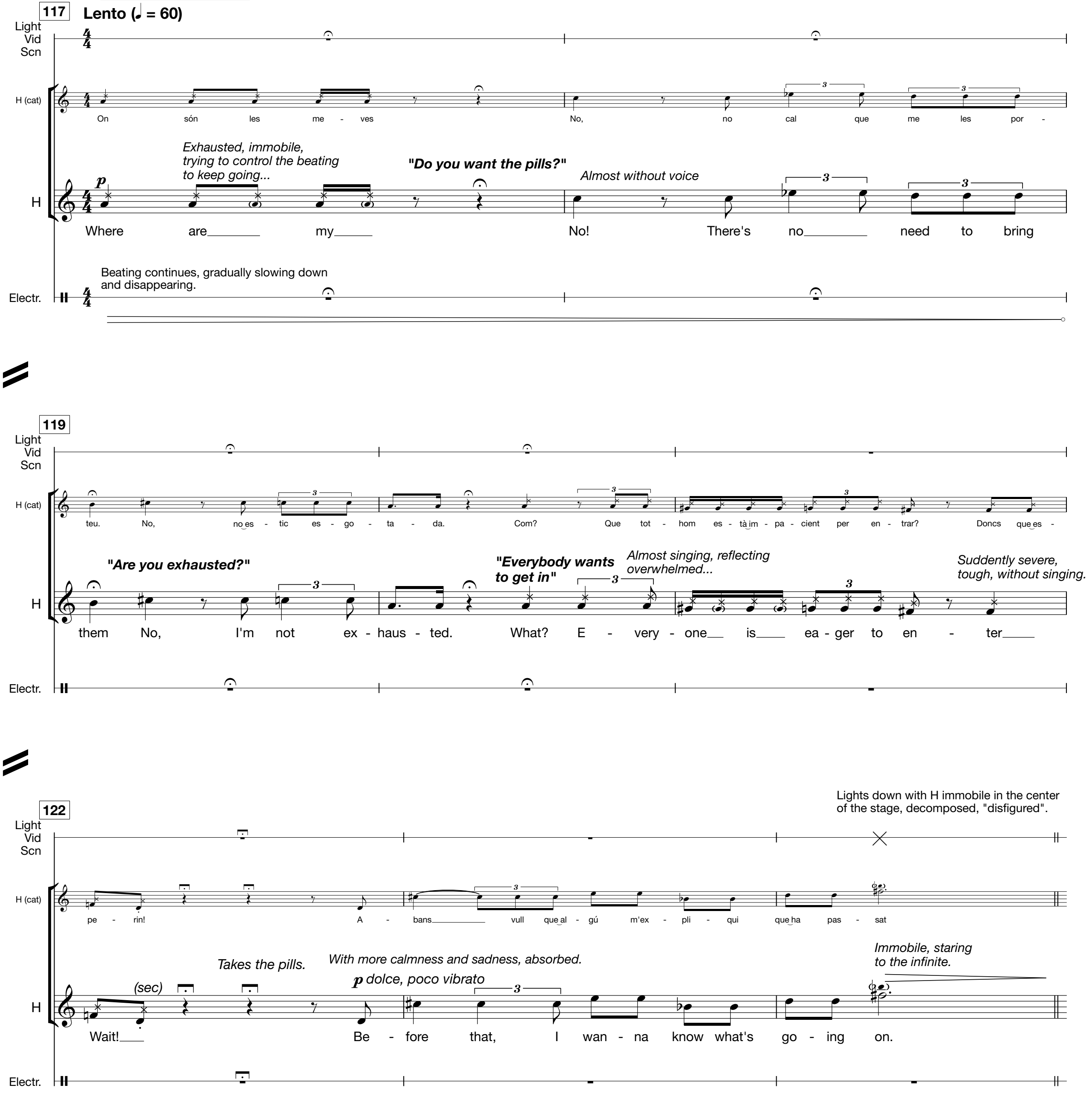

102
Light
Vid
Scn
H (cat)
grat tots els son - de - jos fa - vo - ra - bles tots
H
that des - pite all fa - vo - ra - - ble polls, all
Electr.
Vc.
Pno./
Key.
3
f
Poco Meno (ma il più veloce e scatennato possibile. Senza controllo)
(♩ = ca. 100)
104
he a - ca - bat per - dent con - tra un xe - nò - fob, mas - clis - ta a - rro - gant, ti - rà sen - se
ff
between teeth, very irritated
I end - ded up lo - sing to a xe - no pho - bic, chau - vi - nis - tic, ty - rant, with
8va
sf
ff


106
Light Vid Scn
H (cat)
cap ex - pe - rien - cia. Com!? Com els hi dic que l'a - ca - bo de tru - car per fictr i po - sar-me al seu ser - vei en
Almost willing to spit
H
out a - ny ex - pe - rience. How?! How do I tell them that I've just called him to cn - grts and to put my - self at his ser - vice
Electr.
Vc.
Pno./ Key.
109
pro del pa - is? No! No el tru - ca - ré i tam - poc di - ré ai - xó!
increasing tension
Screaming, with fists closed and looking to the ground
Pointing to the teleprompter
for the sake of the count - try? No! I will not call and I will not say this!
pizz.
112
Lights tremble with the scream.
Em po - deu dir com va el re - com - te?!!!
a little bit restrained
increasing tension
"4 points below"
Can you tell me how the re - count is go - ing?!
("riser" to lash)
arco

5. The Cellphone

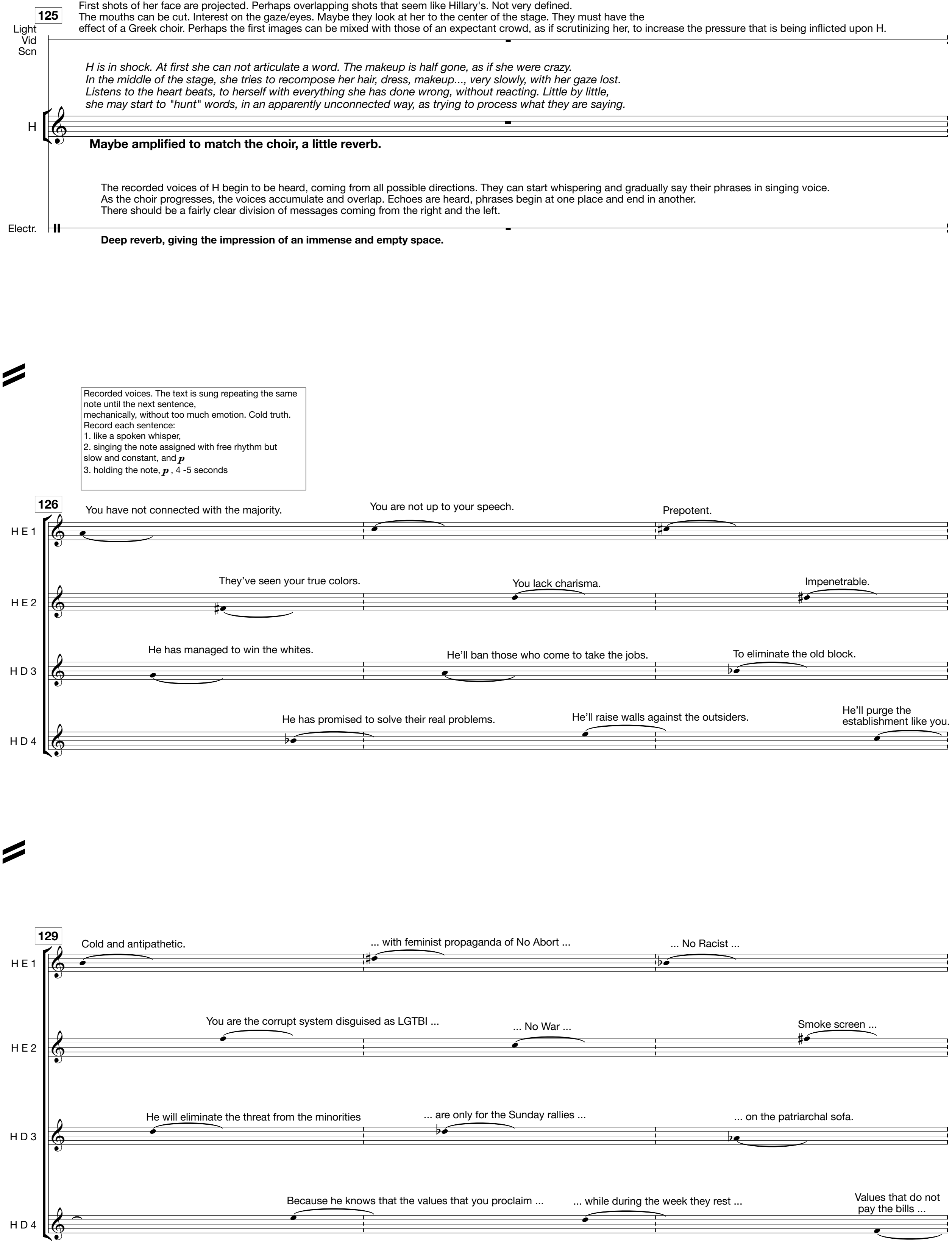

114
Senza Tempo
Light
Vid
Scn
Lights like "lightning and thunders".
Change to unreal lighting.
H (cat)
Scared. Immobile. Takes the cell that a musician gives her.
Throws the cell.
Immobile, frozen...
H
(cell crash)
Lash and ressonance.
Suspened sound, a "fog" that dissipates.
Hit sound and interferences derived from the broken cell..
Voicemail sound, bad quality.
Electr.
Heart beating sound on the background.
"Dear opponent, aren't you going to congratulate me? I'm waiting for your call..."

6. The Message


117
Lento (♩ = 60)
Light
Vid
Scn
H (cat)
On són les me - ves
No, no cal que me les por -
Exhausted, immobile, trying to control the beating to keep going...
"Do you want the pills?"
Almost without voice
H
p
Where are my
No! There's no need to bring
Beating continues, gradually slowing down and disappearing.
Electr.
119
teu. No, no es - tic es - go - ta - da. Com? Que tot - hom es - tà im - pa - cient per en - trar? Doncs que es -
"Are you exhausted?"
"Everybody wants to get in"
Almost singing, reflecting overwhelmed...
Suddently severe, tough, without singing.
them No, I'm not ex - haus - ted. What? E - very - one is ea - ger to en - ter
122
Lights down with H immobile in the center of the stage, decomposed, "disfigured".
pe - rin! A - bans vull que al - gú m'ex - pli - qui que ha pas - sat
Takes the pills.
With more calmness and sadness, absorbed.
(sec)
p dolce, poco vibrato
Immobile, staring to the infinite.
Wait! Be - fore that, I wan - na know what's go - ing on.

7. You Haven't Been Able to Connect

Senza tempo



Ambience / lights "unreal".
First shots of her face are projected. Perhaps overlapping shots that seem like Hillary's. Not very defined.
The mouths can be cut. Interest on the gaze/eyes. Maybe they look at her to the center of the stage. They must have the
effect of a Greek choir. Perhaps the first images can be mixed with those of an expectant crowd, as if scrutinizing her, to increase the pressure that is being inflicted upon H.

H is in shock. At first she can not articulate a word. The makeup is half gone, as if she were crazy.
In the middle of the stage, she tries to recompose her hair, dress, makeup..., very slowly, with her gaze lost.
Listens to the heart beats, to herself with everything she has done wrong, without reacting. Little by little,
she may start to "hunt" words, in an apparently unconnected way, as trying to process what they are saying.

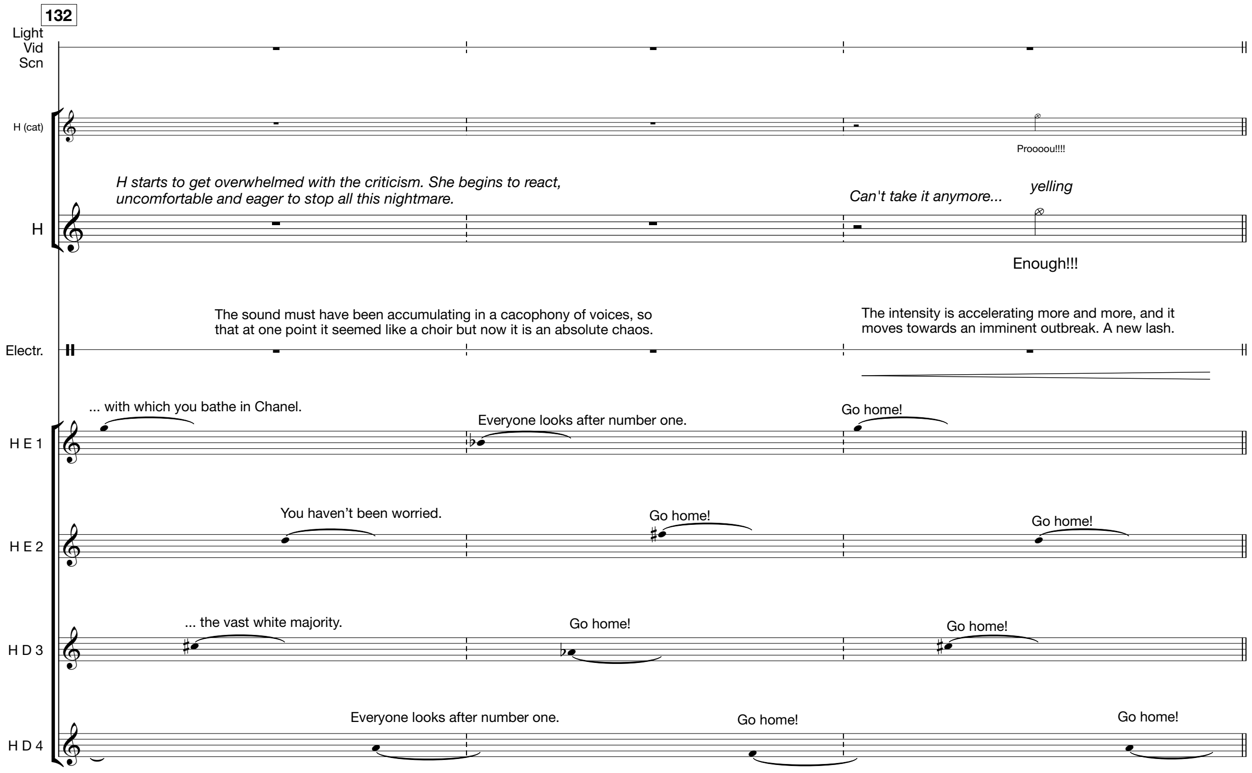
Maybe amplified to match the choir, a little reverb.

The recorded voices of H begin to be heard, coming from all possible directions. They can start whispering and gradually say their phrases in singing voice.
As the choir progresses, the voices accumulate and overlap. Echoes are heard, phrases begin at one place and end in another.
There should be a fairly clear division of messages coming from the right and the left.

Deep reverb, giving the impression of an immense and empty space.

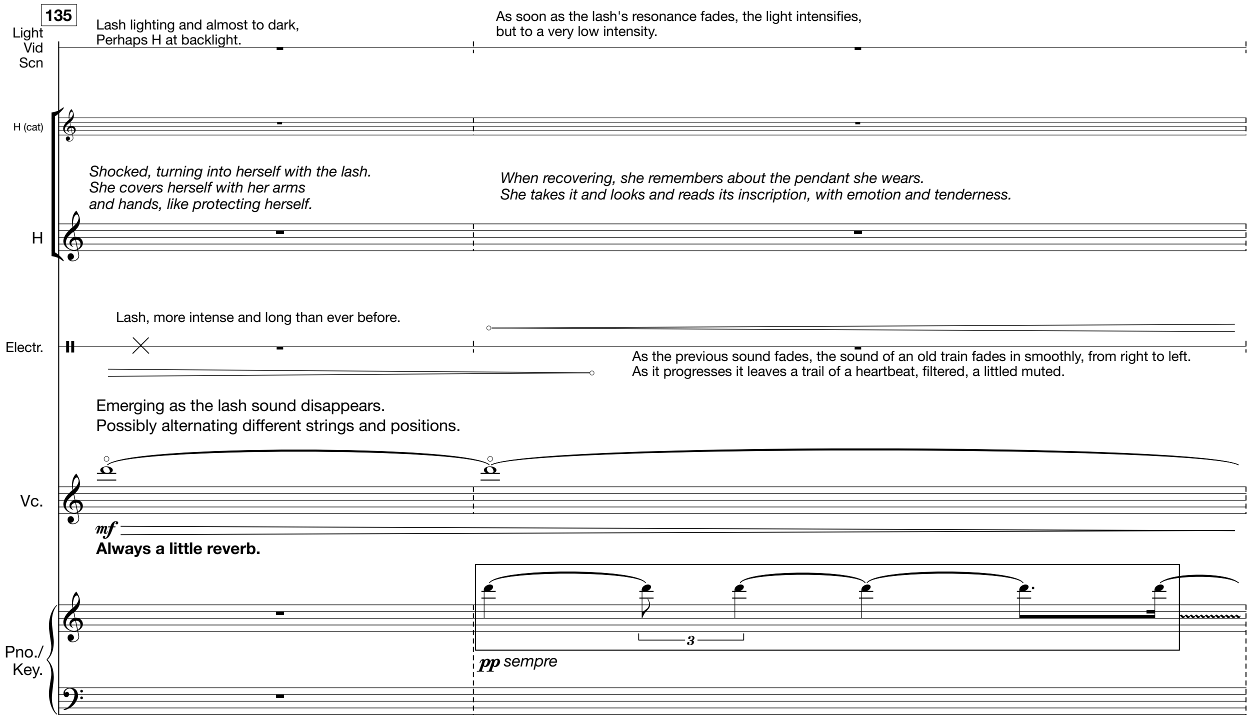
Recorded voices. The text is sung repeating the same note until the next sentence,
mechanically, without too much emotion. Cold truth.
Record each sentence:
1. like a spoken whisper,
2. singing the note assigned with free rhythm but slow and constant, and *p*
3. holding the note, *p* , 4 -5 seconds

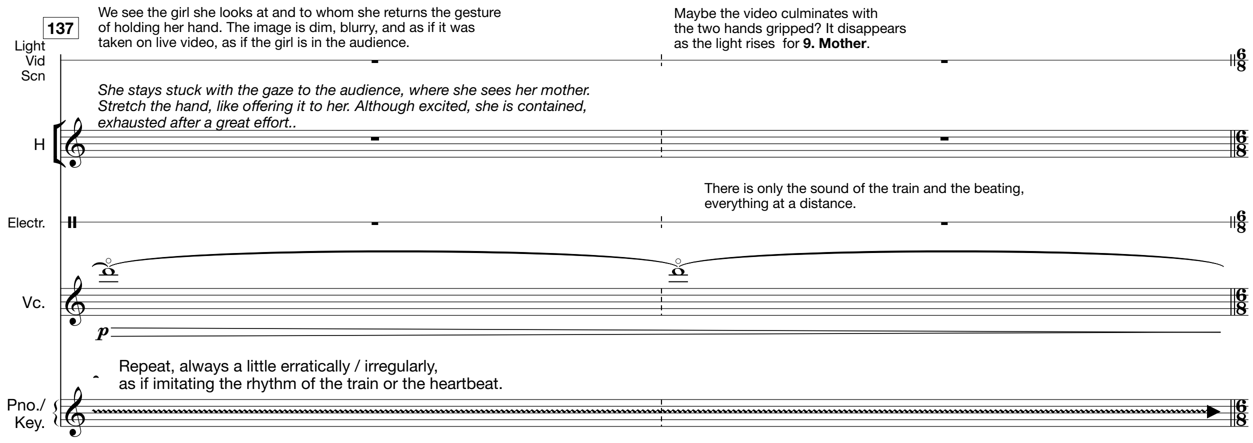
125
Light
Vid
Scn
H
Electr.
126
H E 1
H E 2
H D 3
H D 4
You have not connected with the majority.
You are not up to your speech.
Prepotent.
They've seen your true colors.
You lack charisma.
Impenetrable.
He has managed to win the whites.
He'll ban those who come to take the jobs.
To eliminate the old block.
He has promised to solve their real problems.
He'll raise walls against the outsiders.
He'll purge the establishment like you.
129
Cold and antipathetic.
... with feminist propaganda of No Abort ...
... No Racist ...
You are the corrupt system disguised as LGTBI ...
... No War ...
Smoke screen ...
He will eliminate the threat from the minorities
... are only for the Sunday rallies ...
... on the patriarchal sofa.
Because he knows that the values that you proclaim ...
... while during the week they rest ...
Values that do not pay the bills ...


132
Light
Vid
Scn
H (cat)
Proooou!!!!
H
H starts to get overwhelmed with the criticism. She begins to react, uncomfortable and eager to stop all this nightmare.
Can't take it anymore...
yelling
Enough!!!
Electr.
The sound must have been accumulating in a cacophony of voices, so that at one point it seemed like a choir but now it is an absolute chaos.
The intensity is accelerating more and more, and it moves towards an imminent outbreak. A new lash.
H E 1
... with which you bathe in Chanel.
Everyone looks after number one.
Go home!
H E 2
You haven't been worried.
Go home!
Go home!
H D 3
... the vast white majority.
Go home!
Go home!
H D 4
Everyone looks after number one.
Go home!
Go home!

8. Enough

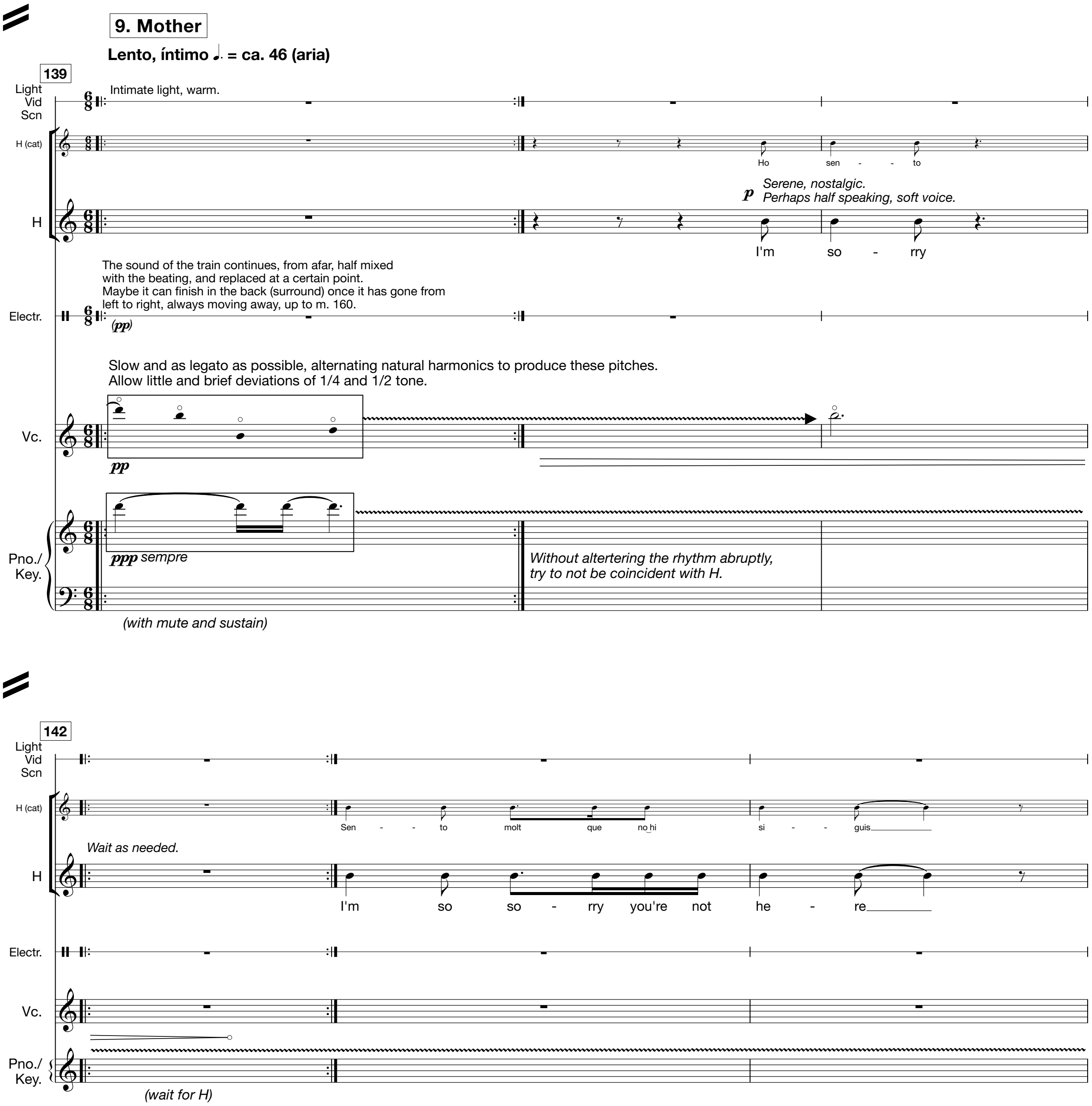
Senza tempo

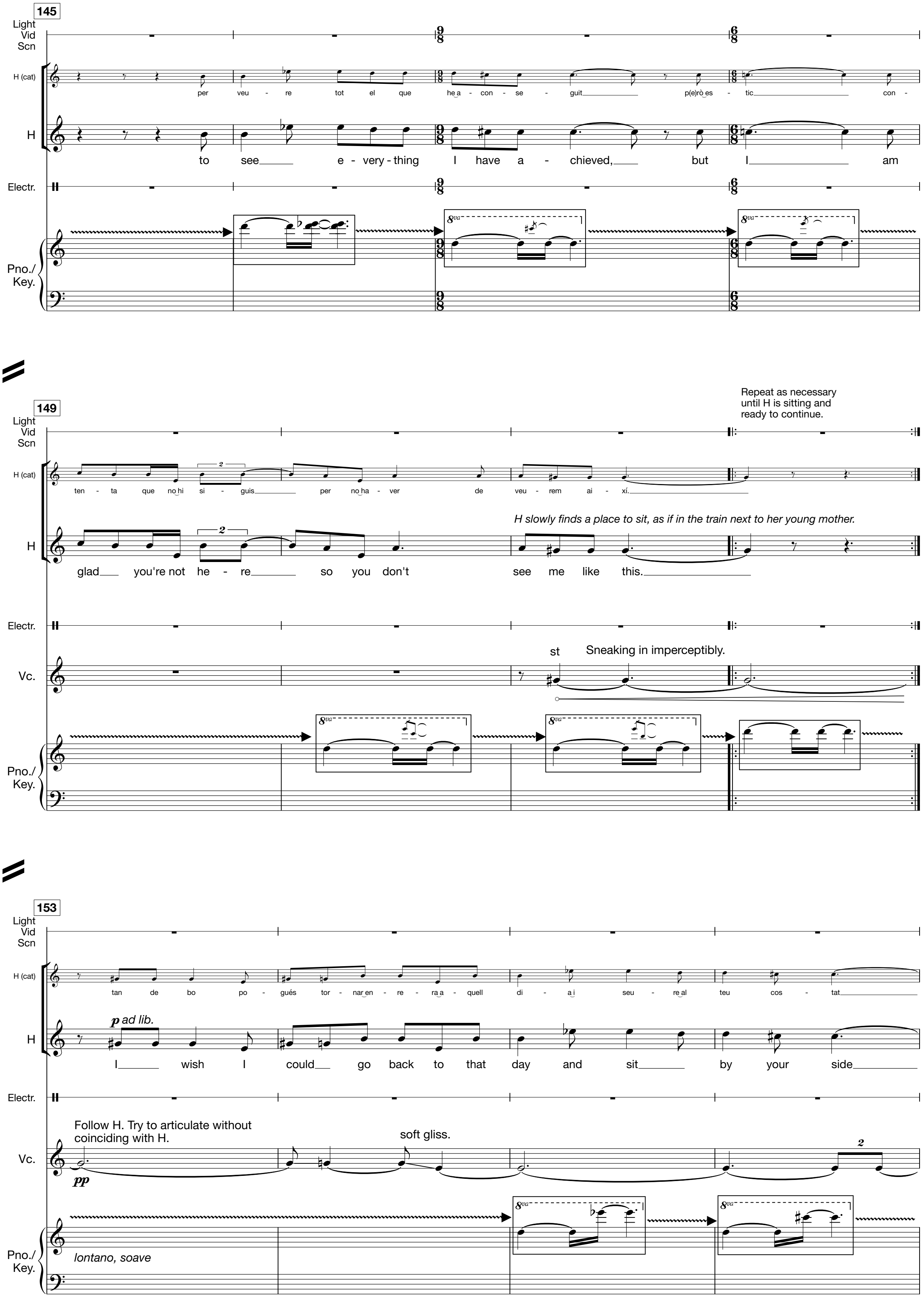

135
Light
Vid
Scn
Lash lighting and almost to dark,
Perhaps H at backlight.
As soon as the lash's resonance fades, the light intensifies, but to a very low intensity.
H (cat)
H
Shocked, turning into herself with the lash. She covers herself with her arms and hands, like protecting herself.
When recovering, she remembers about the pendant she wears. She takes it and looks and reads its inscription, with emotion and tenderness.
Electr.
Lash, more intense and long than ever before.
As the previous sound fades, the sound of an old train fades in smoothly, from right to left. As it progresses it leaves a trail of a heartbeat, filtered, a littled muted.
Vc.
Emerging as the lash sound disappears.
Possibly alternating different strings and positions.
mf
Always a little reverb.
Pno./
Key.
3
pp sempre


137
Light
Vid
Scn
We see the girl she looks at and to whom she returns the gesture of holding her hand. The image is dim, blurry, and as if it was taken on live video, as if the girl is in the audience.
Maybe the video culminates with the two hands gripped? It disappears as the light rises for **9. Mother**.
She stays stuck with the gaze to the audience, where she sees her mother. Stretch the hand, like offering it to her. Although excited, she is contained, exhausted after a great effort..
H
There is only the sound of the train and the beating, everything at a distance.
Electr.
Vc.
p
Repeat, always a little erratically / irregularly, as if imitating the rhythm of the train or the heartbeat.
Pno./
Key.

9. Mother

Lento, íntimo ♩. = ca. 46 (aria)


139
Light
Vid
Scn
Intimate light, warm.
H (cat)
Ho sen - - to
p
Serene, nostalgic.
Perhaps half speaking, soft voice.
H
I'm so - rry
The sound of the train continues, from afar, half mixed with the beating, and replaced at a certain point.
Maybe it can finish in the back (surround) once it has gone from left to right, always moving away, up to m. 160.
Electr.
(pp)
Slow and as legato as possible, alternating natural harmonics to produce these pitches.
Allow little and brief deviations of 1/4 and 1/2 tone.
Vc.
pp
Pno./
Key.
ppp sempre
Without altertering the rhythm abruptly, try to not be coincident with H.
(with mute and sustain)
142
Light
Vid
Scn
H (cat)
Sen - - to molt que no hi si - - guis
Wait as needed.
H
I'm so so - rry you're not he - re
Electr.
Vc.
Pno./
Key.
(wait for H)

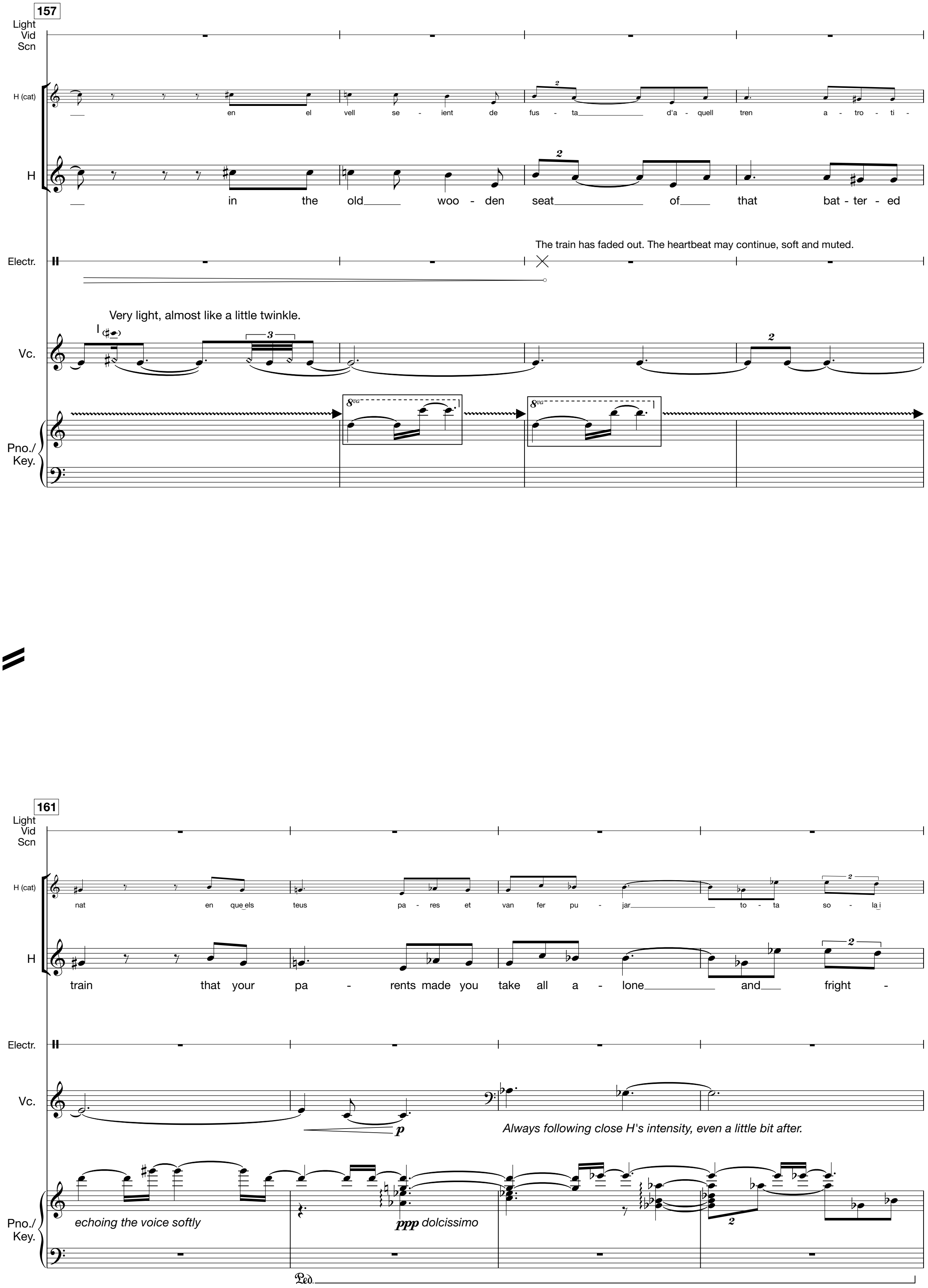

145
Light Vid Scn
H (cat)
per veu - re tot el que he a - con - se - guit p(e)rò es - tic con -
H
to see e - very - thing I have a - chieved, but I am
Electr.
Pno./ Key.
8va
149
ten - ta que no hi si - guis per no ha - ver de veu - rem ai - xi.
glad you're not he - re so you don't see me like this.
Vc.
st
153
tan de bo po - gués tor - nar en - re - ra a - quell di - a i seu - re al teu cos - tat
p ad lib.
I wish I could go back to that day and sit by your side
soft gliss.
pp
lontano, soave

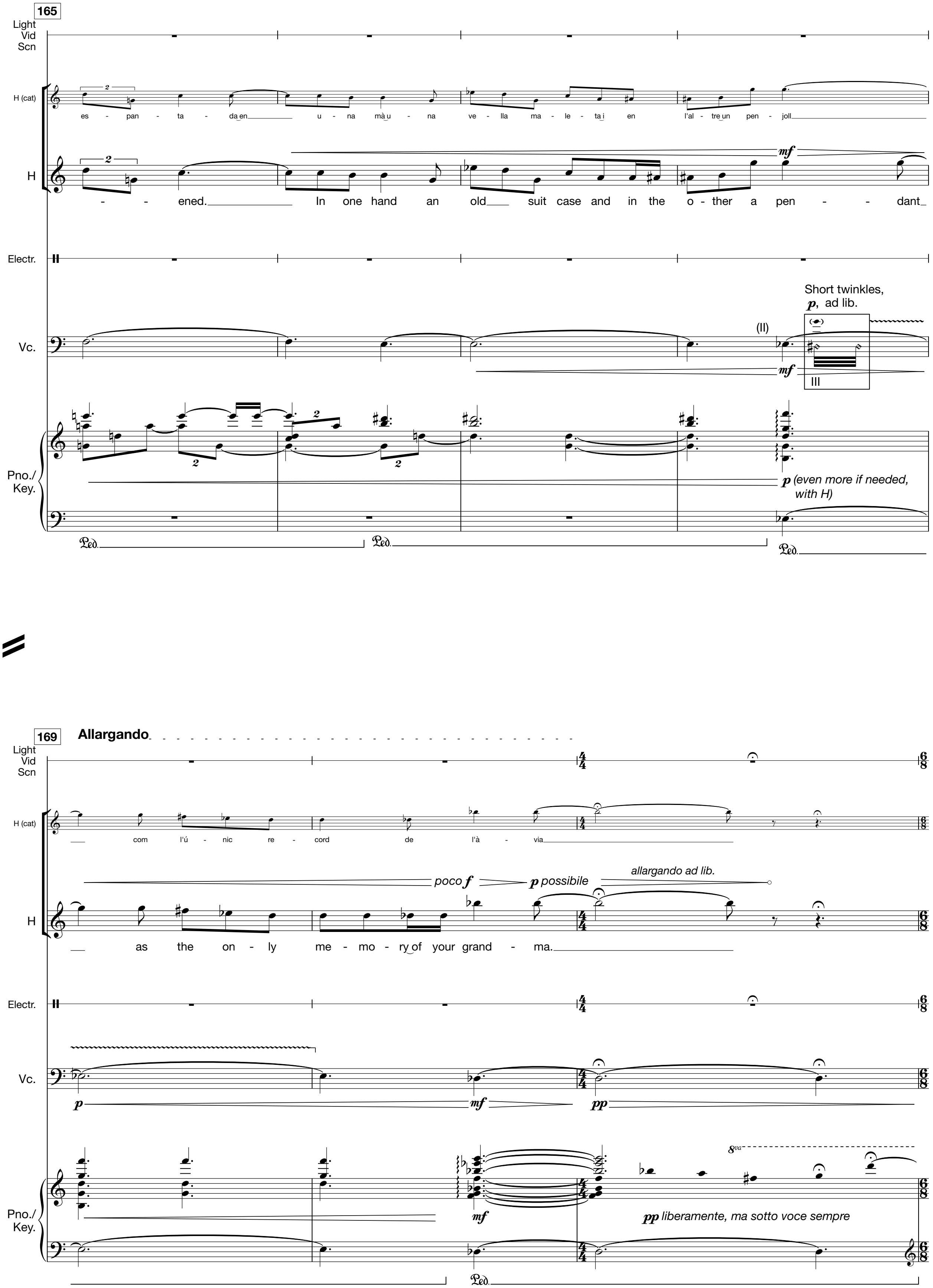
Repeat as necessary until H is sitting and ready to continue.

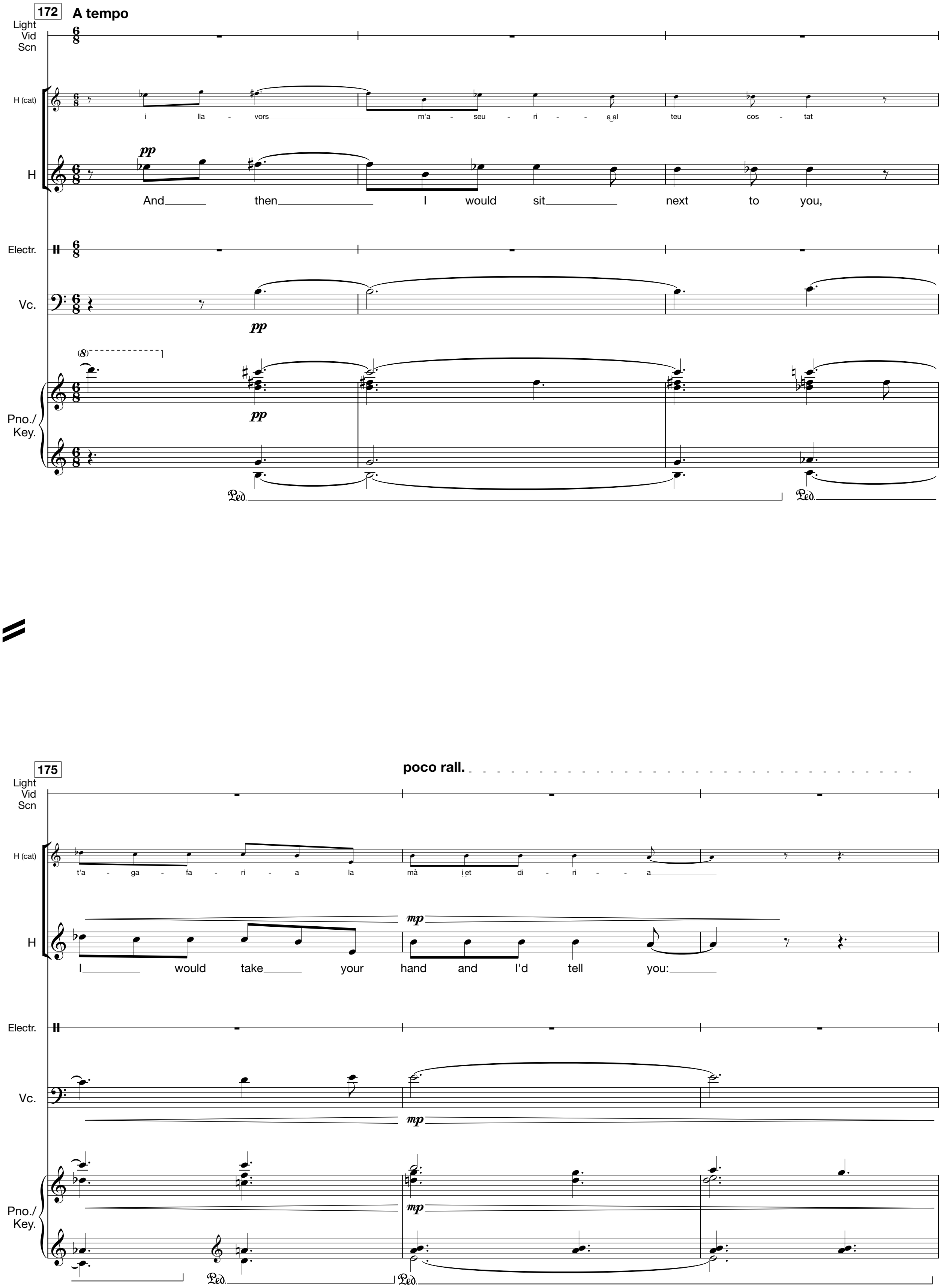
H slowly finds a place to sit, as if in the train next to her young mother.

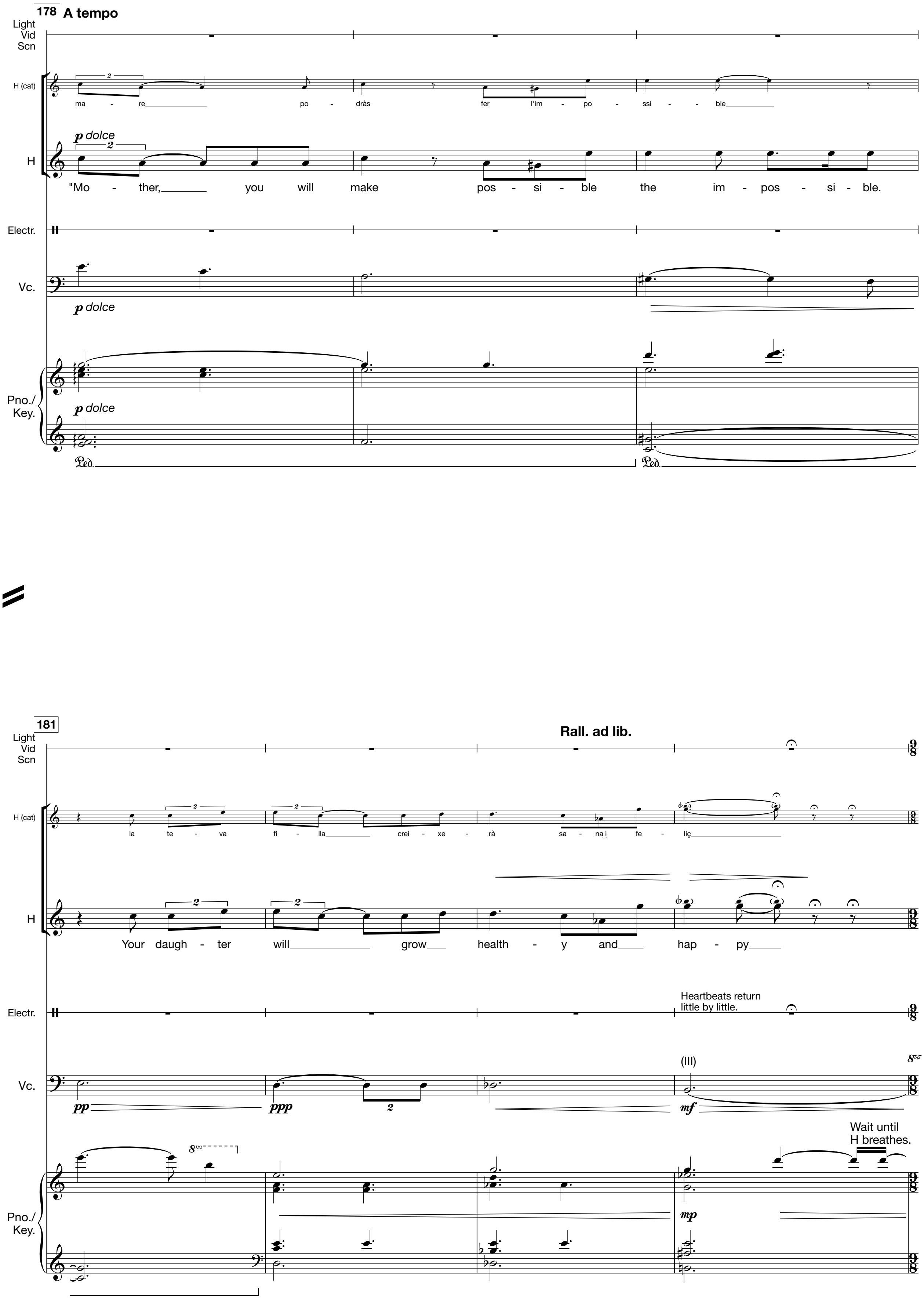
Sneaking in imperceptibly.

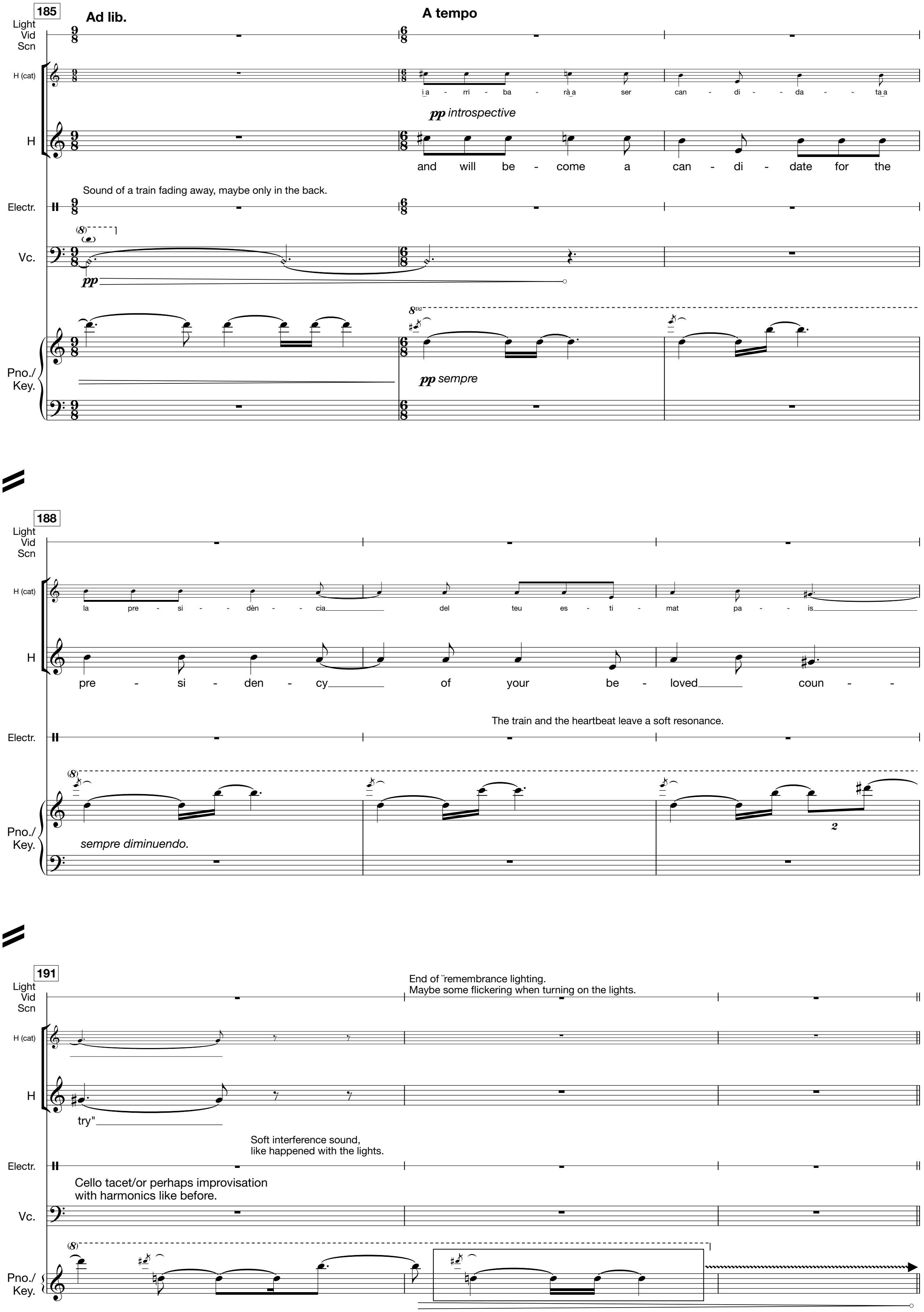
Follow H. Try to articulate without coinciding with H.

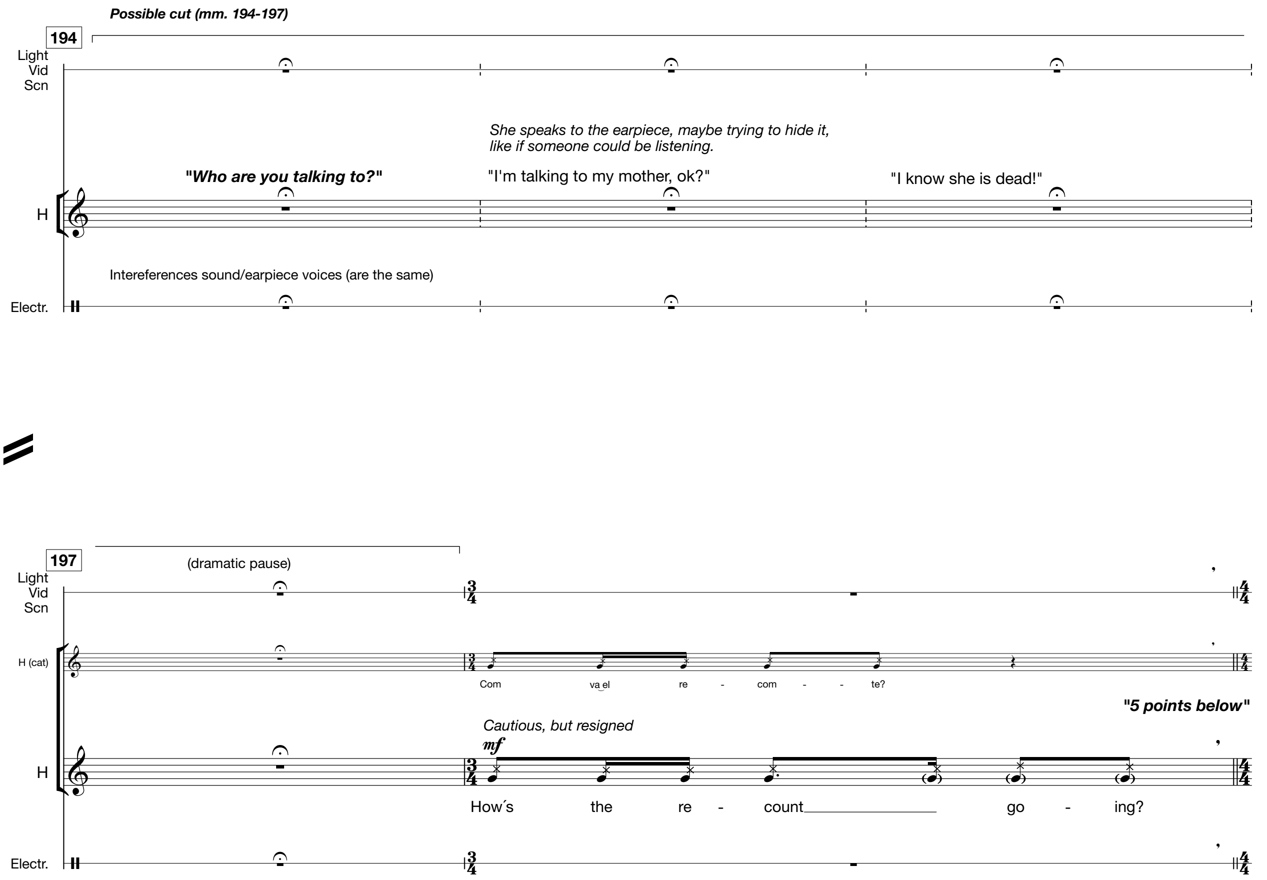

157
Light
Vid
Scn
H (cat)
en el vell se - ient de fus - ta d'a - quell tren a - tro - ti -
H
in the old woo - den seat of that bat - ter - ed
Electr.
The train has faded out. The heartbeat may continue, soft and muted.
Very light, almost like a little twinkle.
Vc.
I
3
2
Pno./
Key.
8va
161
Light
Vid
Scn
H (cat)
nat en que els teus pa - res et van fer pu - jar to - ta so - la i
H
train that your pa - rents made you take all a - lone and fright -
Electr.
Vc.
p
Always following close H's intensity, even a little bit after.
Pno./
Key.
echoing the voice softly
ppp dolcissimo
Ped.


165
Light Vid Scn
H (cat)
es - pan - ta - da en u - na mà u - na ve - lla ma - le - ta i en l'al - tre un pen - joll
H
- - ened. In one hand an old suit case and in the o - ther a pen - - dant
mf
Electr.
Vc.
Short twinkles, p, ad lib.
(II)
III
mf
Pno./ Key.
p (even more if needed, with H)
Ped.
169
Allargando
com l'ú - nic re - cord de l'à - via
poco f
p possibile
allargando ad lib.
as the on - ly me - mo - ry of your grand - ma.
p
mf
pp
8va
mf
pp liberamente, ma sotto voce sempre
Ped.

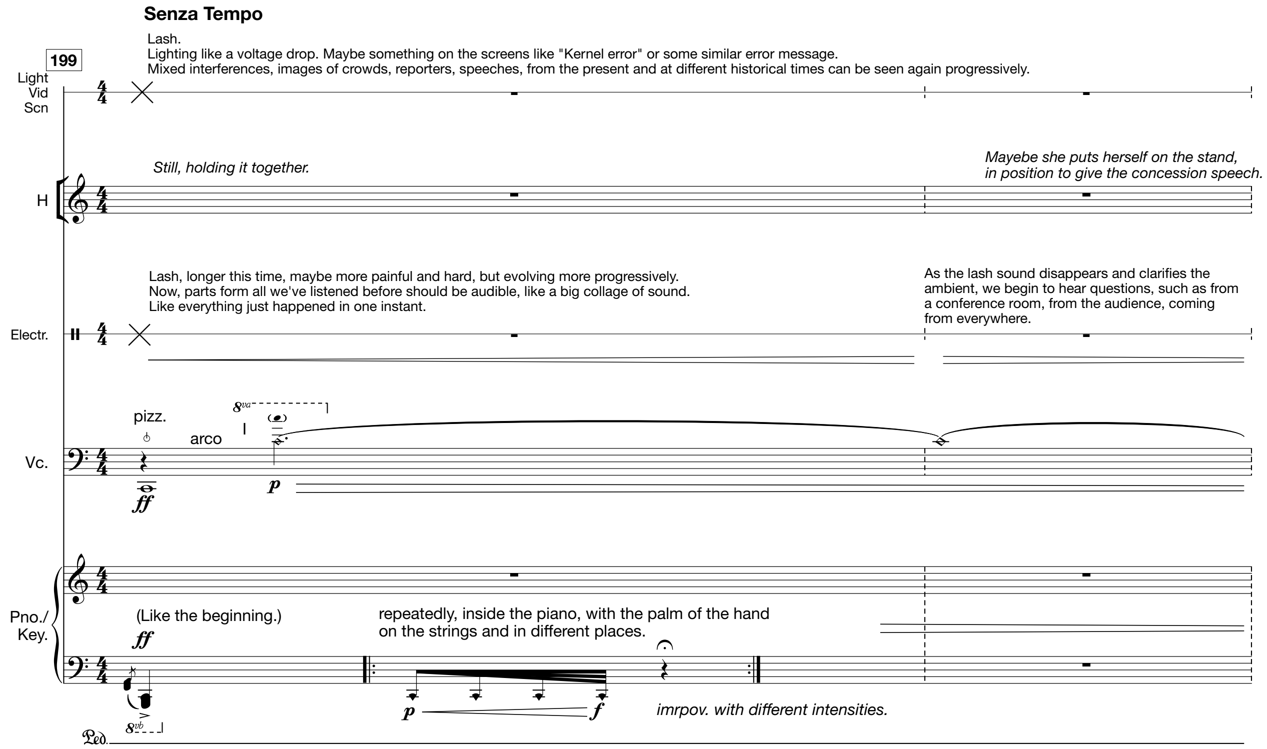

172
A tempo
Light Vid Scn
H (cat)
i lla - vors m'a - seu - ri - a al teu cos - tat
H
pp
And then I would sit next to you,
Electr.
Vc.
pp
Pno./ Key.
(8)
pp
Ped.
Ped.
175
poco rall.
Light Vid Scn
H (cat)
t'a - ga - fa - ri - a la mà i et di - ri - a
H
mp
I would take your hand and I'd tell you:
Electr.
Vc.
mp
Pno./ Key.
mp
Ped.
Ped.

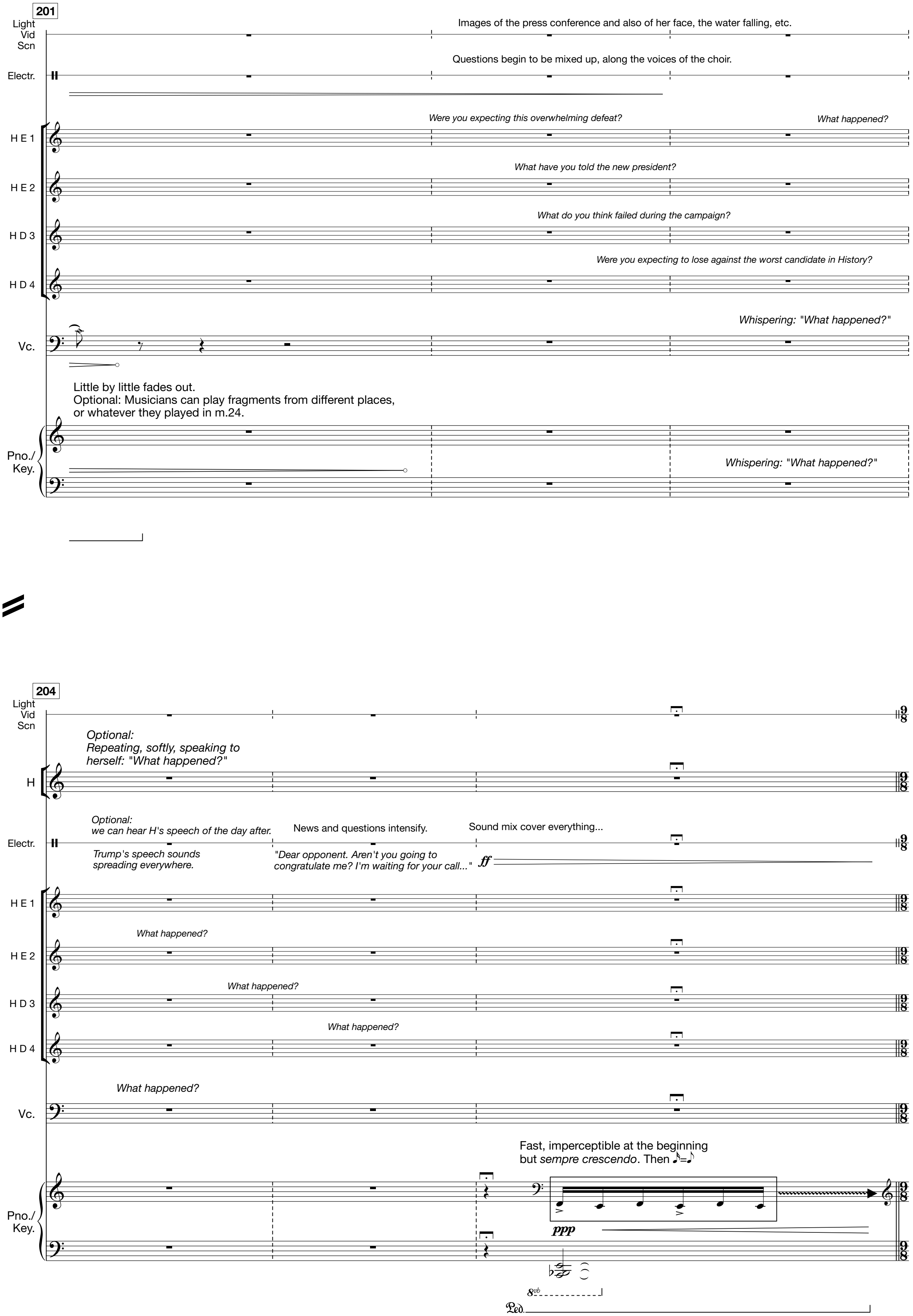

178
A tempo
Light
Vid
Scn
H (cat)
ma - re po - dràs fer l'im - po - ssi - ble
p dolce
H
"Mo - ther, you will make pos - si - ble the im - pos - si - ble.
Electr.
Vc.
p dolce
Pno./
Key.
p dolce
Ped.
181
Rall. ad lib.
Light
Vid
Scn
H (cat)
la te - va fi - lla crei - xe - rà sa - na i fe - liç
H
Your daugh - ter will grow health - y and hap - py
Electr.
Heartbeats return
little by little.
Vc.
pp
ppp
(III)
mf
Wait until
H breathes.
Pno./
Key.
mp
9/8

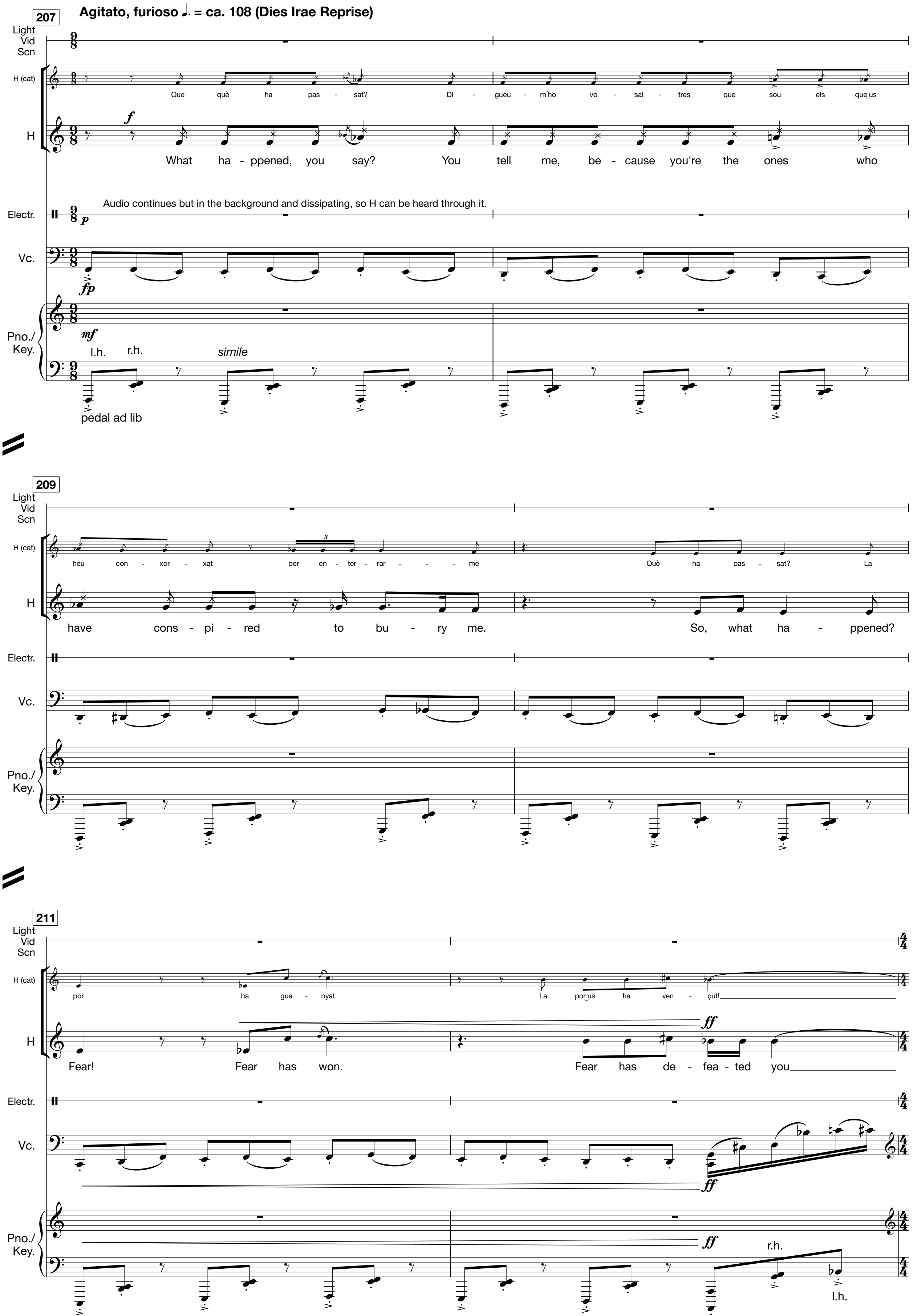

185
Ad lib.
A tempo
Light
Vid
Scn
H (cat)
i̯a - rri - ba - ra̯ a ser can - di - da - ta̯ a
pp introspective
H
and will be - come a can - di - date for the
Sound of a train fading away, maybe only in the back.
Electr.
(8)
Vc.
pp
8va
Pno./
Key.
pp sempre
188
la pre - si - dèn - cia del teu es - ti - mat pa - is
pre - si - den - cy of your be - loved coun -
The train and the heartbeat leave a soft resonance.
(8)
sempre diminuendo.
2
191
End of ¨remembrance lighting.
Maybe some flickering when turning on the lights.
try"
Soft interference sound,
like happened with the lights.
Cello tacet/or perhaps improvisation
with harmonics like before.
(8)

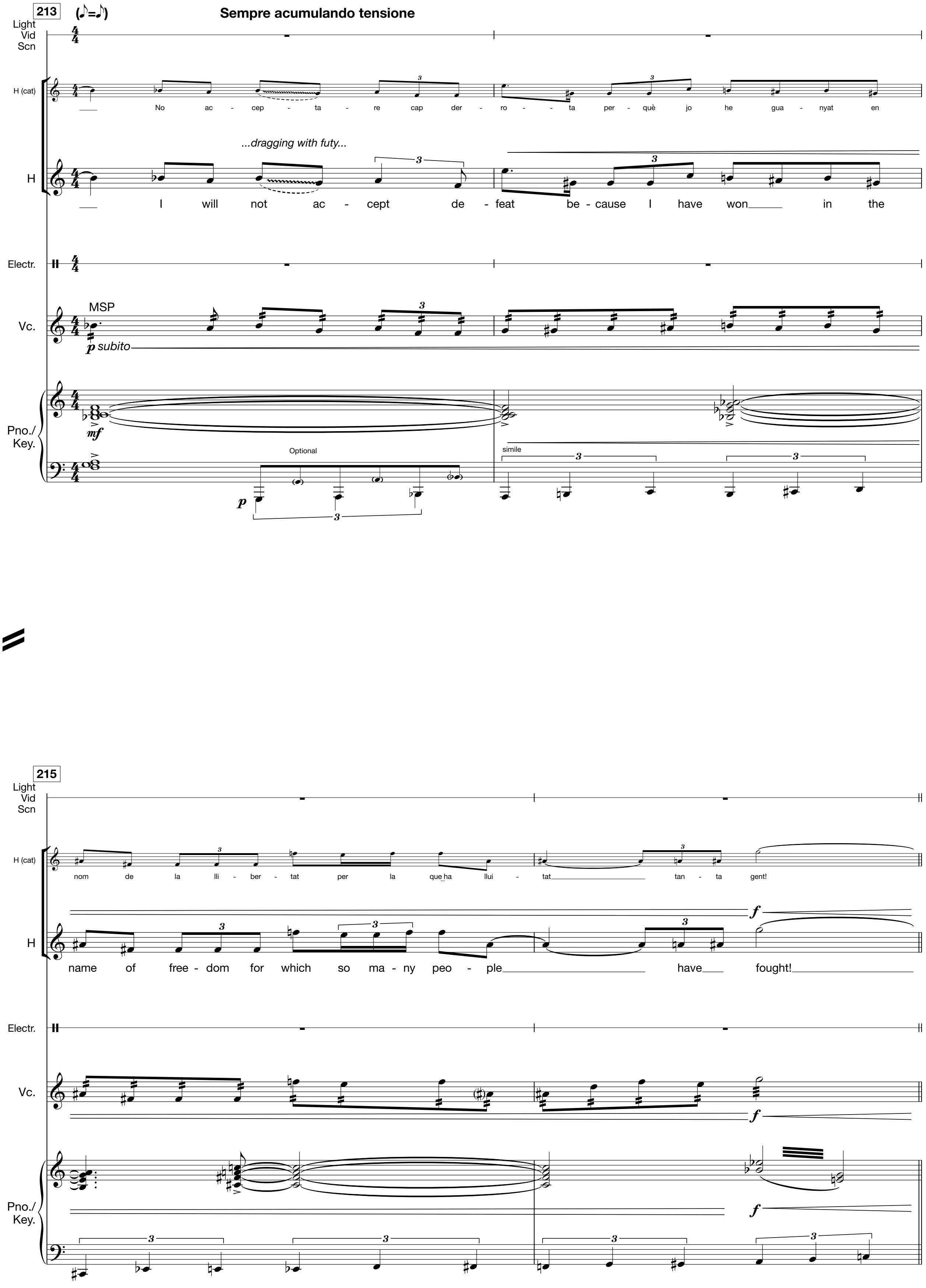

Possible cut (mm. 194-197)
194
Light
Vid
Scn
She speaks to the earpiece, maybe trying to hide it, like if someone could be listening.
"Who are you talking to?"
"I'm talking to my mother, ok?"
"I know she is dead!"
H
Intereferences sound/earpiece voices (are the same)
Electr.
197
(dramatic pause)
Light
Vid
Scn
H (cat)
Com va el re - com - - te?
"5 points below"
Cautious, but resigned
mf
H
How´s the re - count go - ing?
Electr.

10. What Happened?

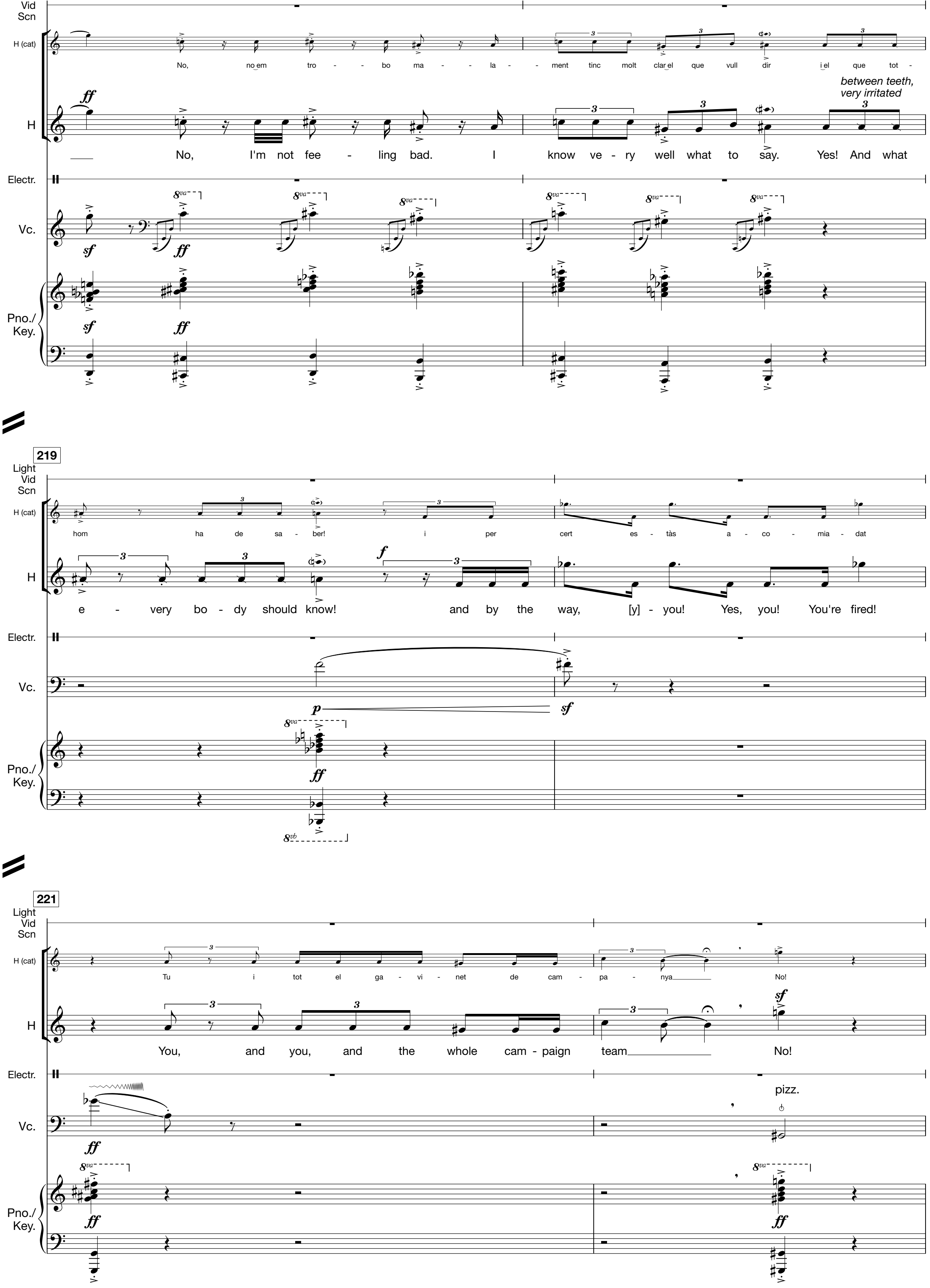

Senza Tempo
Lash.
Lighting like a voltage drop. Maybe something on the screens like "Kernel error" or some similar error message.
Mixed interferences, images of crowds, reporters, speeches, from the present and at different historical times can be seen again progressively.
199
Light
Vid
Scn
Still, holding it together.
Mayebe she puts herself on the stand, in position to give the concession speech.
H
Lash, longer this time, maybe more painful and hard, but evolving more progressively.
Now, parts form all we've listened before should be audible, like a big collage of sound.
Like everything just happened in one instant.
As the lash sound disappears and clarifies the ambient, we begin to hear questions, such as from a conference room, from the audience, coming from everywhere.
Electr.
pizz.
arco
8va
ff
p
Vc.
Pno./
Key.
(Like the beginning.)
ff
repeatedly, inside the piano, with the palm of the hand on the strings and in different places.
p
f
imrpov. with different intensities.
8vb
Ped.


201
Light
Vid
Scn
Images of the press conference and also of her face, the water falling, etc.
Electr.
Questions begin to be mixed up, along the voices of the choir.
H E 1
Were you expecting this overwhelming defeat?
What happened?
H E 2
What have you told the new president?
H D 3
What do you think failed during the campaign?
H D 4
Were you expecting to lose against the worst candidate in History?
Vc.
Whispering: "What happened?"
Little by little fades out.
Optional: Musicians can play fragments from different places,
or whatever they played in m.24.
Pno./
Key.
Whispering: "What happened?"
204
Light
Vid
Scn
9
8
Optional:
Repeating, softly, speaking to
herself: "What happened?"
H
Electr.
Optional:
we can hear H's speech of the day after.
News and questions intensify.
Sound mix cover everything...
Trump's speech sounds
spreading everywhere.
"Dear opponent. Aren't you going to
congratulate me? I'm waiting for your call..."
ff
H E 1
H E 2
What happened?
H D 3
What happened?
H D 4
What happened?
Vc.
What happened?
Fast, imperceptible at the beginning
but *sempre crescendo*. Then ♪=♪
Pno./
Key.
ppp
8vb
Ped.

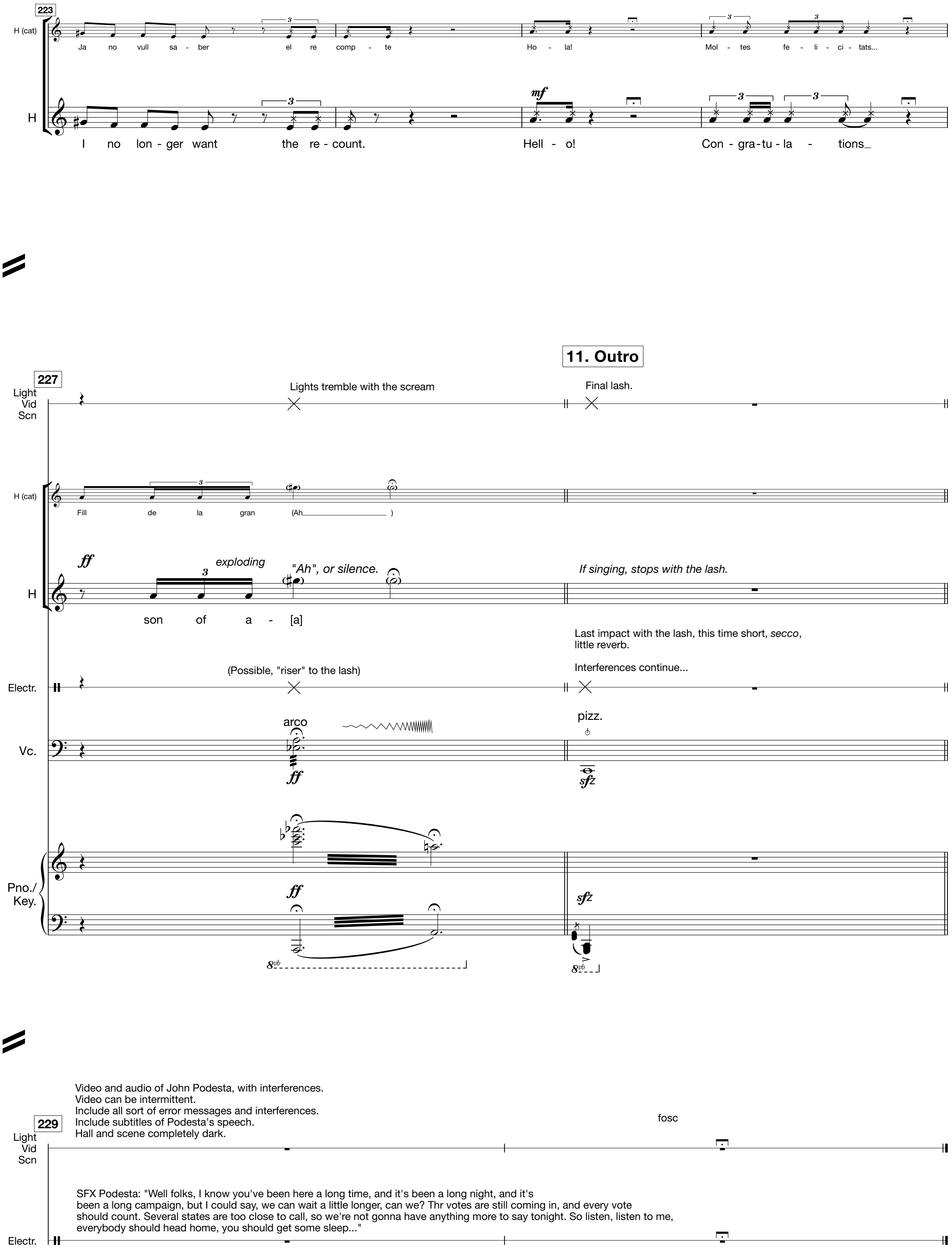

207
Agitato, furioso ♩. = ca. 108 (Dies Irae Reprise)
Light
Vid
Scn
H (cat)
H
Electr.
Vc.
Pno./
Key.
Que què ha pas - sat? Di - gueu - m'ho vo - sal - tres que sou els que us
f
What ha - ppened, you say? You tell me, be - cause you're the ones who
Audio continues but in the background and dissipating, so H can be heard through it.
p
fp
mf
l.h. r.h. simile
pedal ad lib
209
heu con - xor - xat per en - ter - rar - me
Què ha pas - sat? La
have cons - pi - red to bu - ry me.
So, what ha - ppened?
211
por ha gua - nyat
La por us ha ven - çut!
ff
Fear! Fear has won.
Fear has de - fea - ted you
ff
ff
r.h.
l.h.


213
(♪=♪)
Sempre acumulando tensione
Light Vid Scn
H (cat)
No ac - cep - ta - re cap der - ro - ta per - què jo he gua - nyat en
...dragging with futy...
H
I will not ac - cept de - feat be - cause I have won in the
Electr.
Vc.
MSP
p subito
Pno./ Key.
mf
Optional
p
simile
3
215
nom de la lli - ber - tat per la que ha llui - tat tan - ta gent!
name of free - dom for which so ma - ny peo - ple have fought!
f

217 **Poco Meno (ma veloce ed scatenato) ♩ = ca. 100**



Light Vid Scn
H (cat)
H
Electr.
Vc.
Pno./ Key.
No, no_em tro - bo ma - la - ment tinc molt clar_el que vull dir i_el que tot -
No, I'm not fee - ling bad. I know ve - ry well what to say. Yes! And what
between teeth, very irritated
ff
sf
8va
219
hom ha de sa - ber! i per cert es - tàs a - co - mia - dat
e - very bo - dy should know! and by the way, [y] - you! Yes, you! You're fired!
f
p
8vb
221
Tu i tot el ga - vi - net de cam - pa - nya No!
You, and you, and the whole cam - paign team No!
pizz.


223
H (cat)
Ja no vull sa - ber el re comp - te
Ho - la!
Mol - tes fe - li - ci - tats...
H
mf
I no lon - ger want the re - count.
Hell - o!
Con - gra - tu - la - tions_
11. Outro
227
Light Vid Scn
Lights tremble with the scream
Final lash.
H (cat)
Fill de la gran (Ah)
H
ff
exploding
"Ah", or silence.
If singing, stops with the lash.
son of a - [a]
Last impact with the lash, this time short, secco, little reverb.
Interferences continue...
Electr.
(Possible, "riser" to the lash)
Vc.
arco
ff
pizz.
sfz
Pno./ Key.
ff
sfz
8vb
229
Light Vid Scn
fosc
Electr.

Video and audio of John Podesta, with interferences.
Video can be intermittent.
Include all sort of error messages and interferences.
Include subtitles of Podesta's speech.
Hall and scene completely dark.

SFX Podesta: "Well folks, I know you've been here a long time, and it's been a long night, and it's been a long campaign, but I could say, we can wait a little longer, can we? Thr votes are still coming in, and every vote should count. Several states are too close to call, so we're not gonna have anything more to say tonight. So listen, listen to me, everybody should head home, you should get some sleep..."

Los Angeles, May 2018.

Hillary VR

The experience is intended for one participant at a time.

However, if desired, different participants could share the experience at the same time without seeing each other, or interacting, except in two sections of the piece, **1** and at **10**.

The section labels are used for reference only to indicate the corresponding part in the score. They will not have any particular visual effect, and they follow each other seamlessly.

It has an approximate duration of 10 minutes.

"Hillary" Begins

Black

1. Intro

Fragmented sounds from news programs from all over the world begin to emerge. Sound is spatialized coming from all directions and positions in space. It should feel like an overwhelming amount of information. Random sound effects of interference are also part of this.

[*If multiple participants allowed: they can see each other, their avatars, as members of the crowd expecting news from Hillary.*]

Surrounding the participant, images from news programs appear and disappear, in a mosaic way. Images are also spatialized.

The participant can interact with the images. If the participant reaches the images, they will glitch, bend, or move from their position. It will be obvious that behind the images there are more, projecting a sense of deep space. The interference sound effects also have a visual counterpart. Image and sound do not have to match.

There is to be a haptic response when touching the images.

The rest of the space is dark and empty.

A mid-high pitch emerges while the other sound is filtered. It is located in the center of the space.

2. cngrt

Previous sounds fade out while reverberation increases. Visuals dissolve.

We hear Hillary's voice (singer) "How is the recount going?"

WHIPLASH (this will happen multiple times in similar ways with variations of: Lash sound, sudden and very resonant. In sync, a visual response: everything white, and visual noise, and a tail to return to black. Haptic response accordingly.)

Dark

Music continues, only the recorded instruments and the voice. Dynamic spatialization. Each phrase comes from a different place.

Sounds of interference appear as indicated in the score. Visuals are in sync but spatialized differently.

As the music evolves and Hillary goes through different emotions, the space should show different soft tonalities of color.

WHIPLASH

3. Water

Burst of sound and images as at the beginning. A heartbeat is audible, and superimposed on the rest of the sound. It feels omnipresent.

The sound of falling water replaces the heartbeat. Like being under a cascade, with ocean waves coming from everywhere.

The visuals of light interferences emerge slowly and Hillary's face (digitalized singer) begins to be discernible.

Dark background gradually changes to soft lighting.

4. What Is This?

Hillary is now fully visible (a digitalized version of the singer), standing before a lectern with a written paper on it: her "epitaph."

During this section, the participant can move around Hillary, observing from any angle and distance. The sound is focused on her position, so it will be perceived according to the motion of the participant.

The rest of the space is dark.

From mm. 69 (the speech), the colors of the American flag will be increasingly present in all of the background but with interferences.

The sounds will turn more reverberant as she goes into the "dreamer section" (mm. 75 to 88). After that, back to the initial sound.

The sound of a press conference is softly audible.

Visuals show news programs again, flashes from photographers, interferences, etc.

The participant can interact with them again in a similar way to the beginning.

At m. 93, the light and visuals cover everything and Hillary's voice seems to be drowned, as if disappearing. Suddenly, everything stops and vanishes.

Just the music continues as in the score from mm. 94 to 113 (*Dies Irae*).

Hillary's anger has a visual response in the color of the background (red, or similar).

Haptic responses follow her rushes of fury.

(Optional: possible short visual references to things she is saying.)

WHIPLASH

5. The Cellphone

Progressively into dark.

Right on the whiplash, an obnoxious voicemail message from the elected president.

The participant has the option to replay the message. This option should be clearly visual. Replay/trash. It will replay until trashed. Then, continue.

6. The Message

Skip. Go directly to 7.

7. You Haven't Been Able to Connect

Many of Hillary's faces are progressively visible around the participant. They sing to him/her, like a choir. The sound is fully spatialized, spherical around the participant, like the visuals.

The participant may interact with each face, displacing them in space. However, their position will be replaced by another face, as if appearing from behind.

WHIPLASH

8. Enough

After the yell in m. 134, the sound of an old train blended with a heartbeat will begin to emerge. It will be present throughout until **10. What Happened?** It will continuously move around in slow circles at a considerable distance from the participant and Hillary.

She appears sitting on a bench, looking at a pendant. In the background, this image of her is inflated to larger than life size. The pendant is in her hands.

Lighting should be warm and soft on her.

9. Mother

Hillary sings, again in the center of the space.

The visuals may reflect parts of what the lyrics imply in images emerging from the background.

The participant can move around freely. He/she could also sit next to her on the bench.

The sound of the train and heartbeat fade in and out subtly. From m. 194 everything is quiet. Silence, and then the sound of interference again.

From her earpiece, a voice can be heard but is impossible to understand.

If the participant is very close or approaches it in time, he/she will hear what it says.

10. What Happened?

WHIPLASH

The sound of the conference room emerges. Voices throwing questions, flashes, etc.

If multiple participants allowed, here they appear again, as at the beginning, expecting news from the candidate.

Visuals of flashes, the questions, news, votes being counted, etc.

She stands up and walks toward a stand, with all of these visuals surrounding her.

She sings from m. 207 (*Dies Irae* Reprise).

The participant can move around, but there should be resistance to the motion so that he/she gravitates toward being placed in front of Hillary. If the participant does nothing, his/her positioning will move toward this position.

WHIPLASH

11. Outro

Dark background.

John Podesta's speech should begin to emerge, along with interferences and images like those from the beginning.

The participant can interact with them again, as at the beginning.

The credits of the show will also scroll up. The participant can interact with them (up/down).

END of "Hillary"

This VR version of *Hillary* gives the opportunity for the participant to feel the immersive part of the piece from a deeper level than the concert hall electro-acoustic original. The interactive element with music is less important due the timing established by the narrative. Likewise, a multi-participant experience was not intended originally, since part of the concept of the VR version is to try to place the participant in Hillary’s shoes. However, a possibility to extend it to multiple participants has been considered. In that case, each participant becomes part of a crowd waiting for Hillary to speak, and there they should be able to briefly interact with each other.

MEETING

This project was inspired by the homonymous sculpture by Elaine Krown Klein, an artist who, with her husband Leo, created the Elaine Krown Klein Fine Arts Scholarship[1] as an aid for UCLA students in the fields of performing and visual arts.

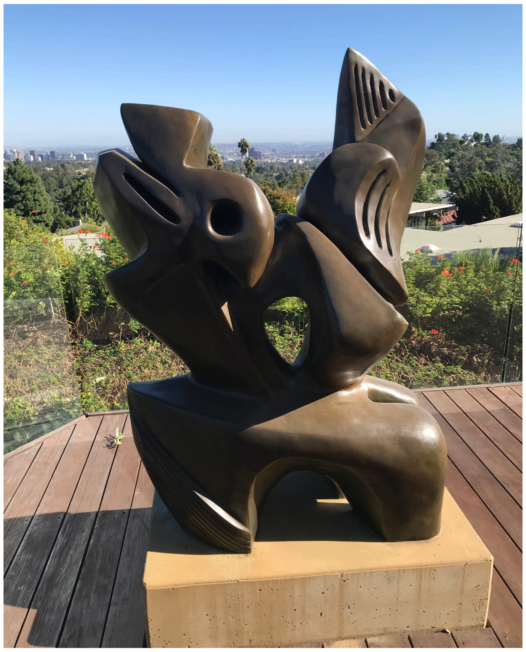


Fig. II.1 *Meeting*, sculpture by Elaine Krown Klein

The decision regarding the instrumentation of the piece was made by considering the other two award recipients from the UCLA Herb Alpert School of Music in 2017: Matthew Lombard, a saxophone player, and Maxim Kuzin, a conductor. Composing a concertino for alto saxophone and ensemble based on the concept of the sculpture, entitled *Meeting,* seemed very appropriate. Furthermore, Ms. Klein's passion for cubist art inspired the idea of creating subsequent versions of the piece: one purely electronic and possibly one for VR. The idea behind this was to explore how a composition, while preserving its identity, could be reinterpreted in different media.

---

[1] The Elaine Krown Klein Fine Arts Scholarship was founded in 1987. Since then (and until the time of writing in December 2019) it has awarded over $700,000 to 220 students.

The acoustic instrumental version was premiered on May 14, 2018, and its subsequent spatialized electronic version, *Meeting 2.0*, was presented on May 15, 2019. In this version I used the recording of the complete solo part as material for an electronic piece that would follow the structure of the original but derive all its sounds from the treatment of this recorded solo. Although it sounds like the original from time to time, processing, digital manipulation, and spatialization were used to generate all of the background and additional sounds.

The description of what I intend to be *Meeting 3.0* is included after the score of *Meeting*.

Tomàs Peire Serrate

Meeting

Concertino for Alto Saxophone and Ensemble

2018

Meeting is dedicated to Elaine Krown Klein.

It was premiered on May 14th of 2018,
at the UCLA Schoenberg Hall,
by Matthew Lombard, Alto Saxophone solo,
and Maxim Kuzin conducting
an ensemble of the UCLA herb Alpert School of Music
formed by
Irwin Hui, Darren Lou, Ryan Chou, Stephen Ryder,
Will Grace, Troy Kutch, Chris Routh, Xenia Deviatkina-Loh,
Jennifer Cho, Viola You, Jeffrey Ho and Armando Wood.

Instrumentation

Flute
Oboe
Clarinet in B♭
Bassoon

Horn in F
Trumpet in B♭
Trombone

2 Violins
Viola
Violoncello
Double Bass

Alto Saxophone

Program Notes:

In the Spring of 2017, I had the pleasure of meeting Elaine Krown Klein at the recipients' ceremony of her award. I was impressed by her kindness, generosity, and especially by the love with which she spoke of towards the many scholars that she has been unconditionally supporting for more than 30 years. In her own words: her family. This beautiul idea motivated myself as well as my colleagues and friends Maxim Kuzin and Matthew Lombard, also recipients of the scholarship in that year, to collaborate on a new project, creating, performing and conducting an original work.

In addition to being a philanthropist, Elaine is also an artist, and during a visit to her place she showed me one of her creations: a big bronze sculpture entitled *Meeting* that conveys the idea of people's reunion and gathering. It was a perfect spark to trigger the inspiration for writing this piece.

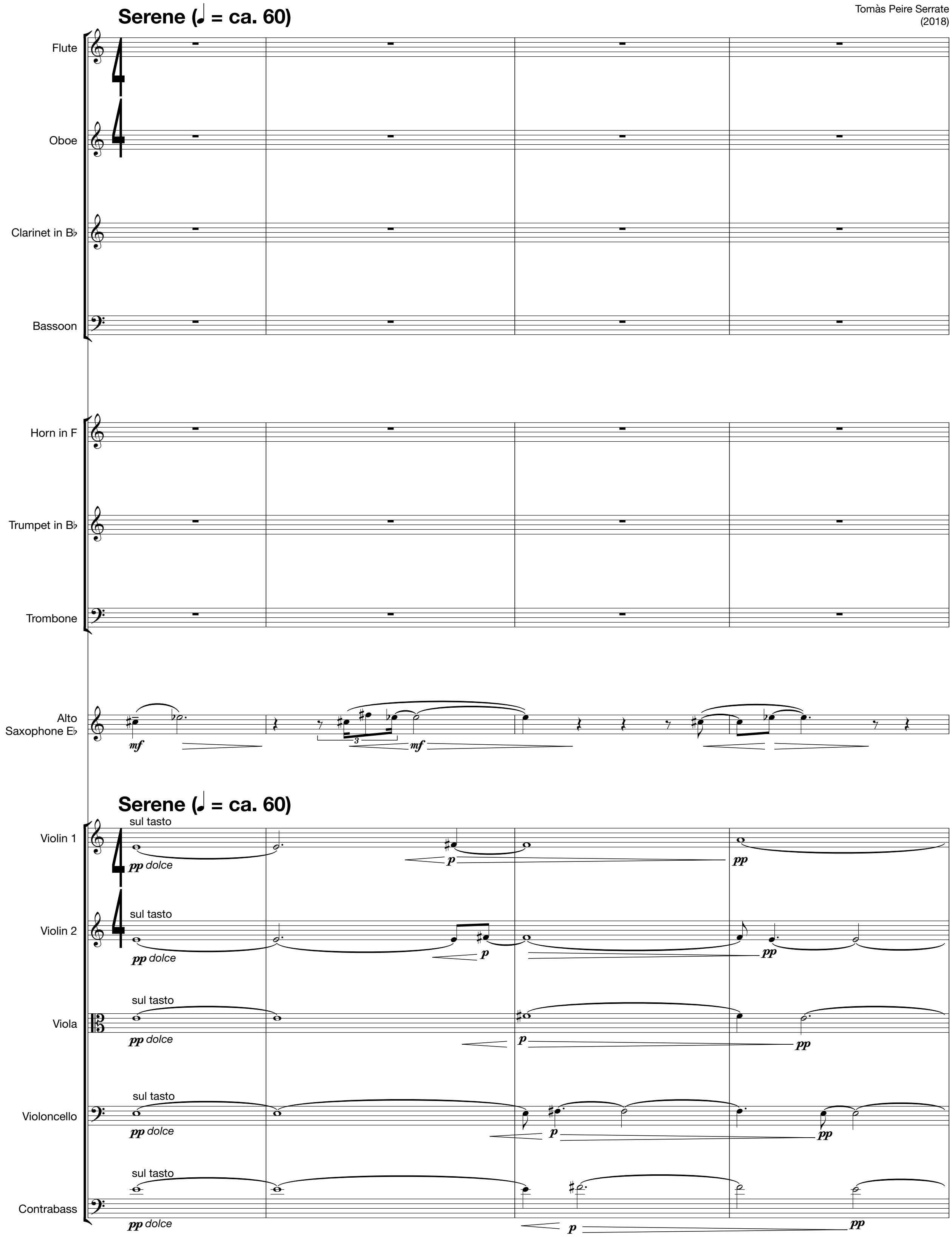
Duration: ca. 8'

to Elaine Krown Klein

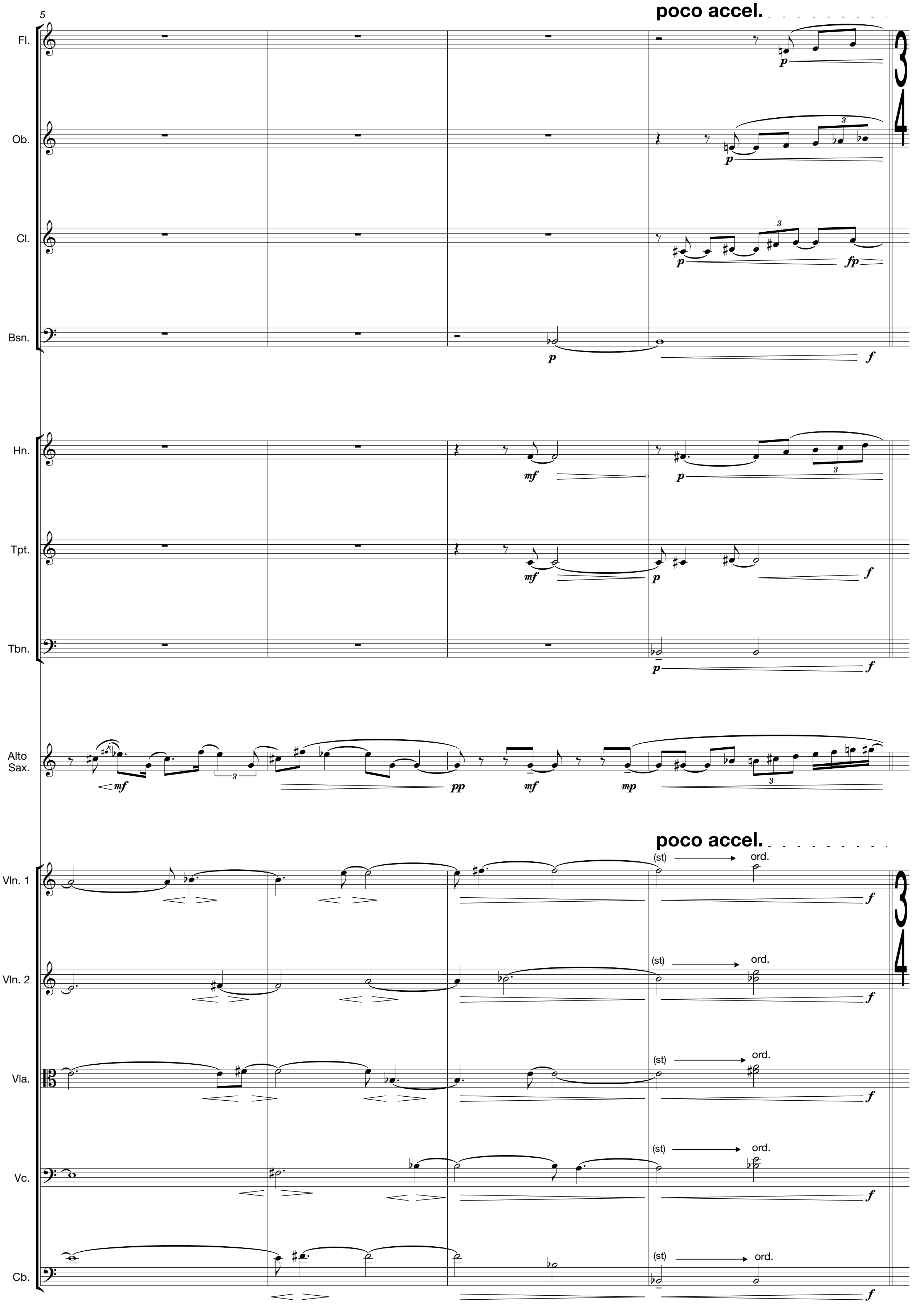
Meeting

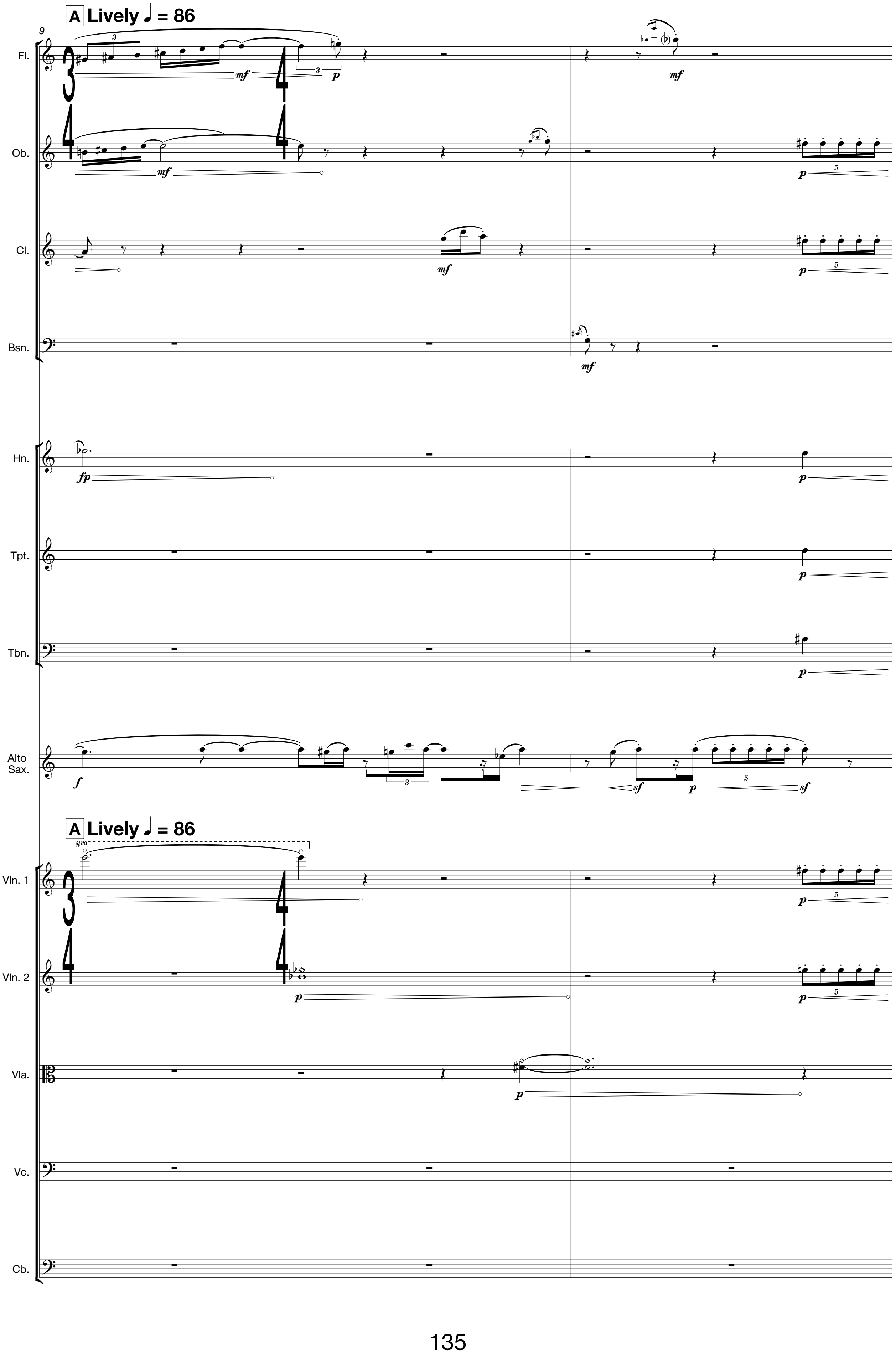
Concertino for Alto Saxophone and Ensemble

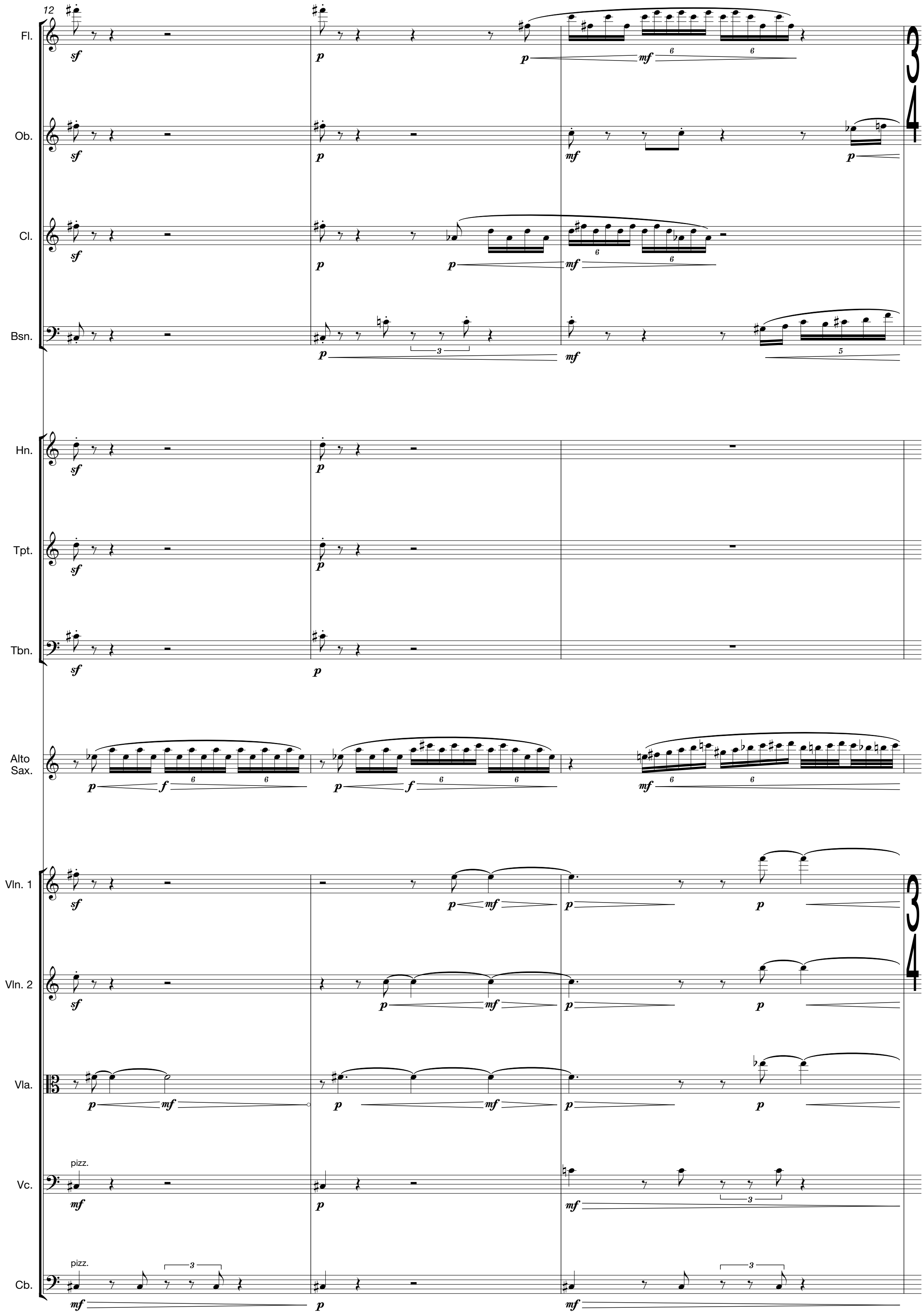
Tomàs Peire Serrate
(2018)

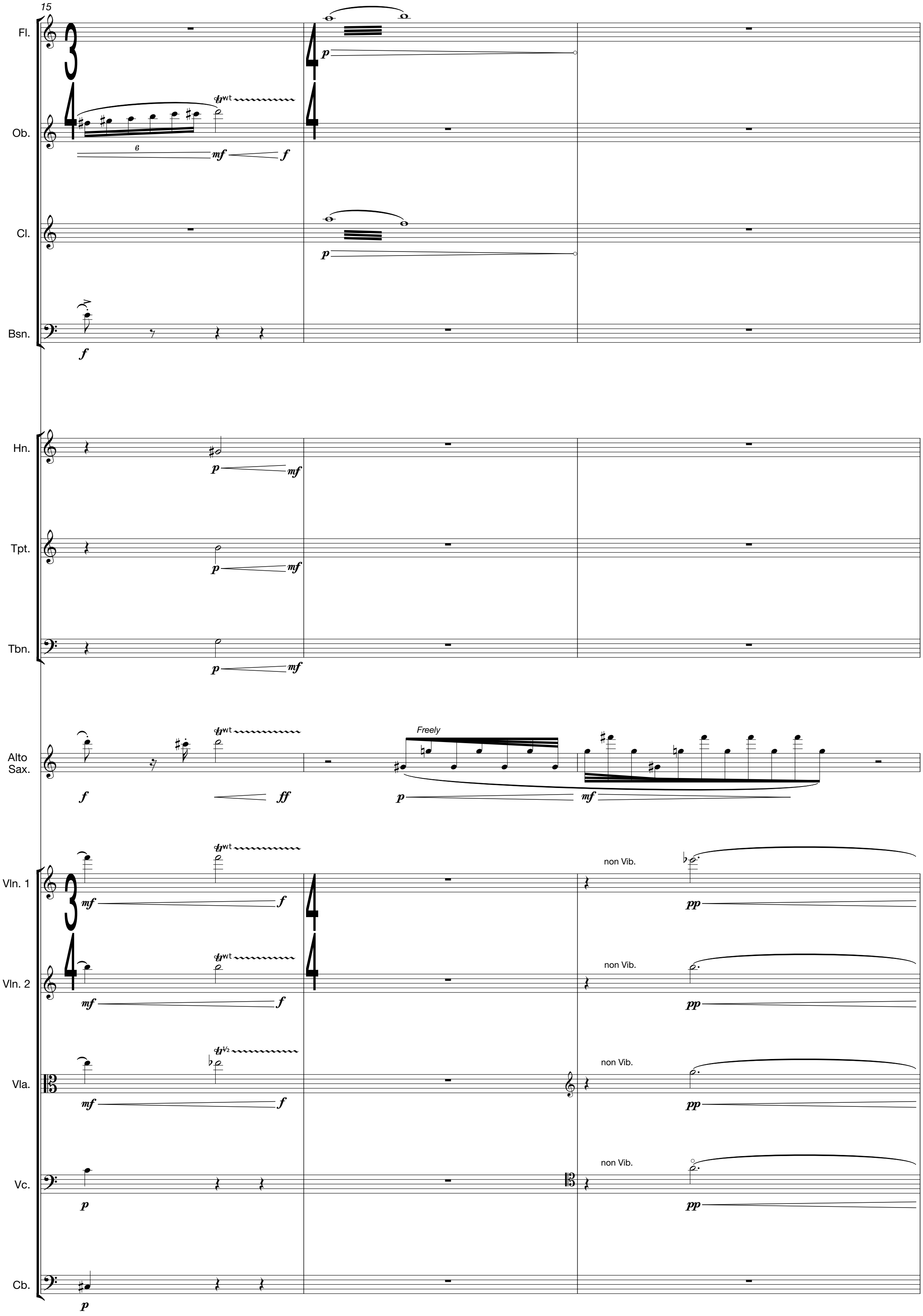

Serene (♩ = ca. 60)
Flute
Oboe
Clarinet in B♭
Bassoon
Horn in F
Trumpet in B♭
Trombone
Alto Saxophone E♭
mf
3
mf
Serene (♩ = ca. 60)
sul tasto
Violin 1
pp dolce
p
pp
sul tasto
Violin 2
pp dolce
p
pp
sul tasto
Viola
pp dolce
p
pp
sul tasto
Violoncello
pp dolce
p
pp
sul tasto
Contrabass
pp dolce
p
pp

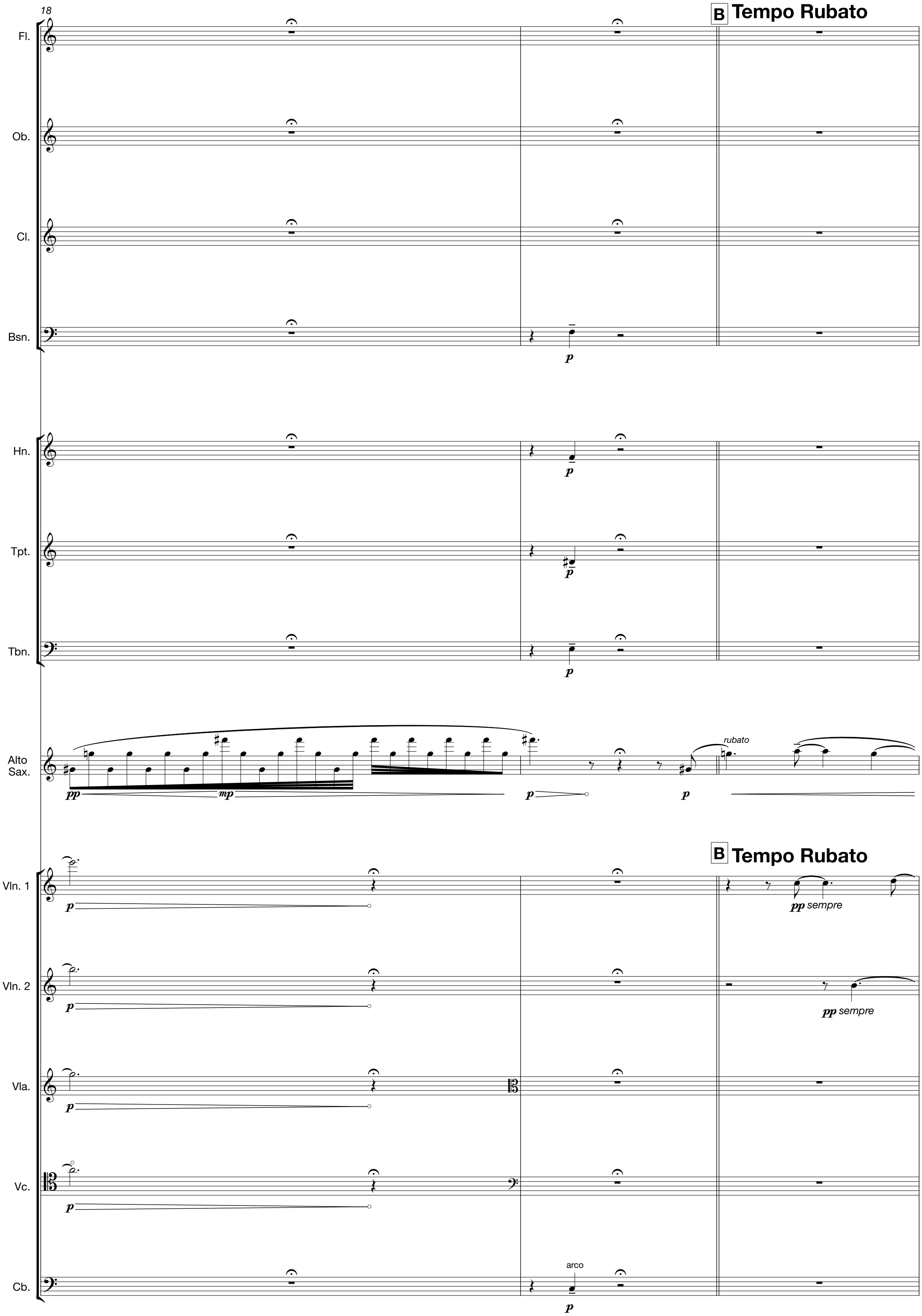
Copyright © 2018.
by Tomàs Peire Serrate (ASCAP)
All Rights Reserved.

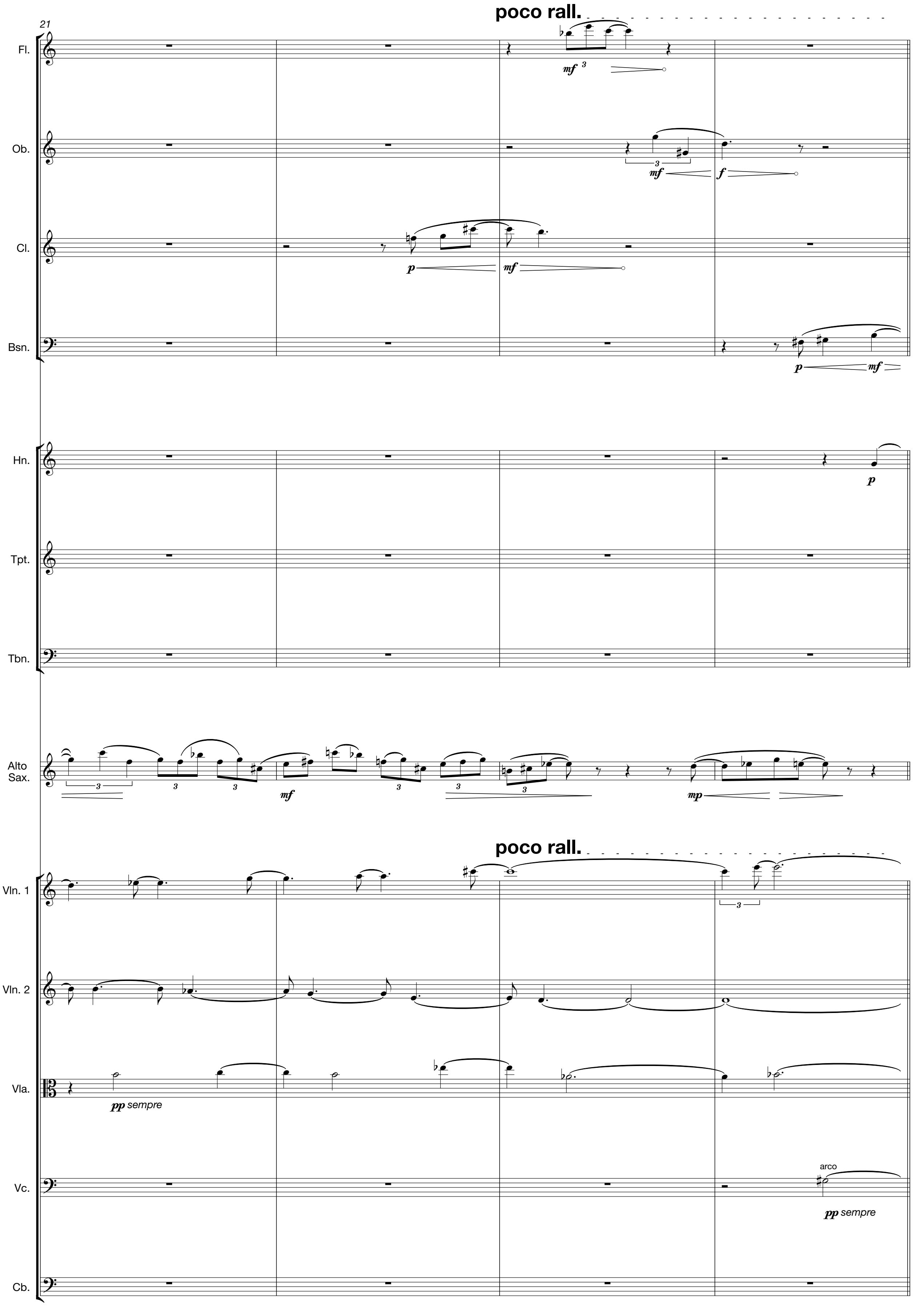

5
poco accel.
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p
fp
f
mf
mp
pp
3
(st)
ord.
3
4

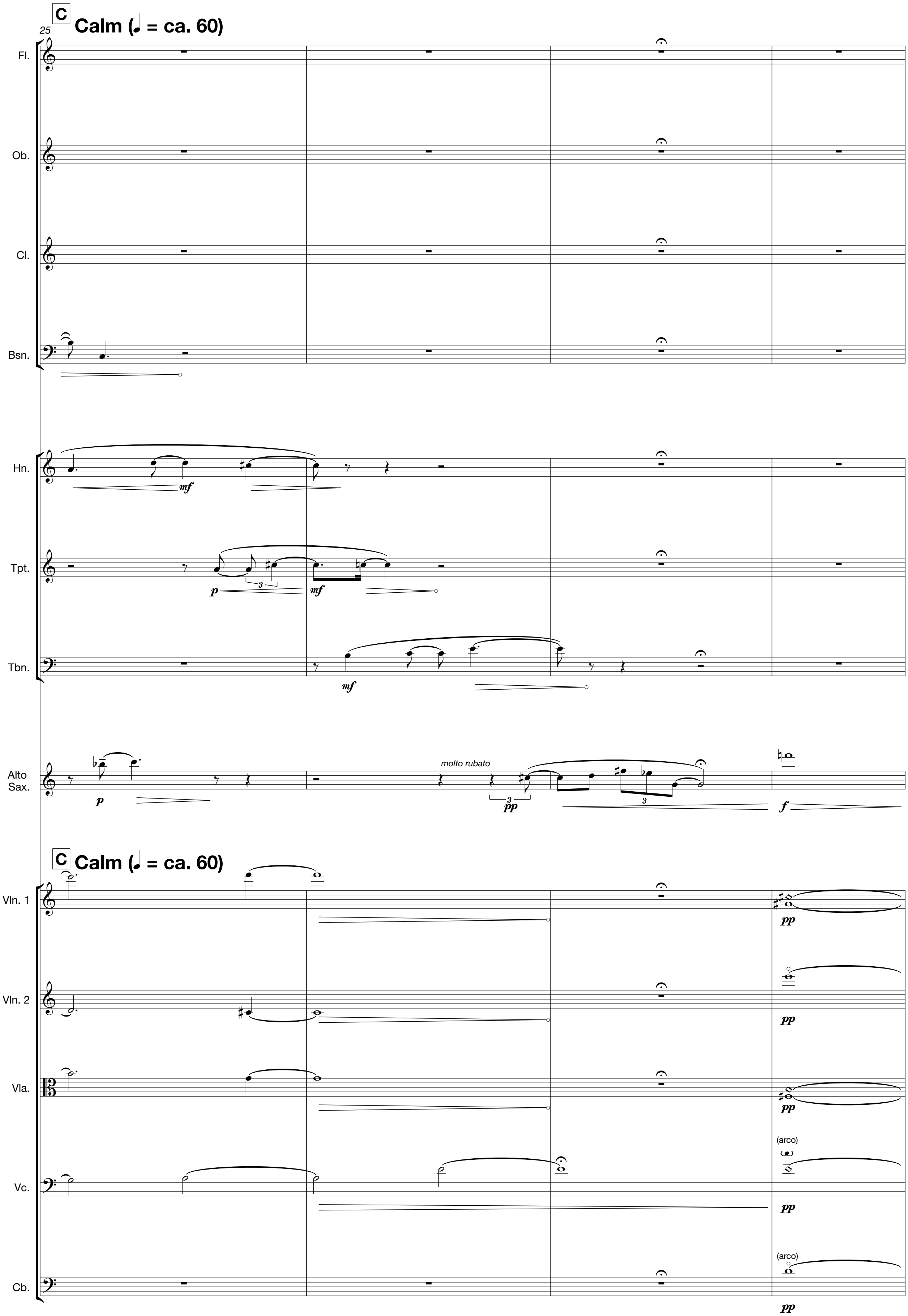

A Lively ♩ = 86
9
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
p
fp
f
sf
8va
3
5

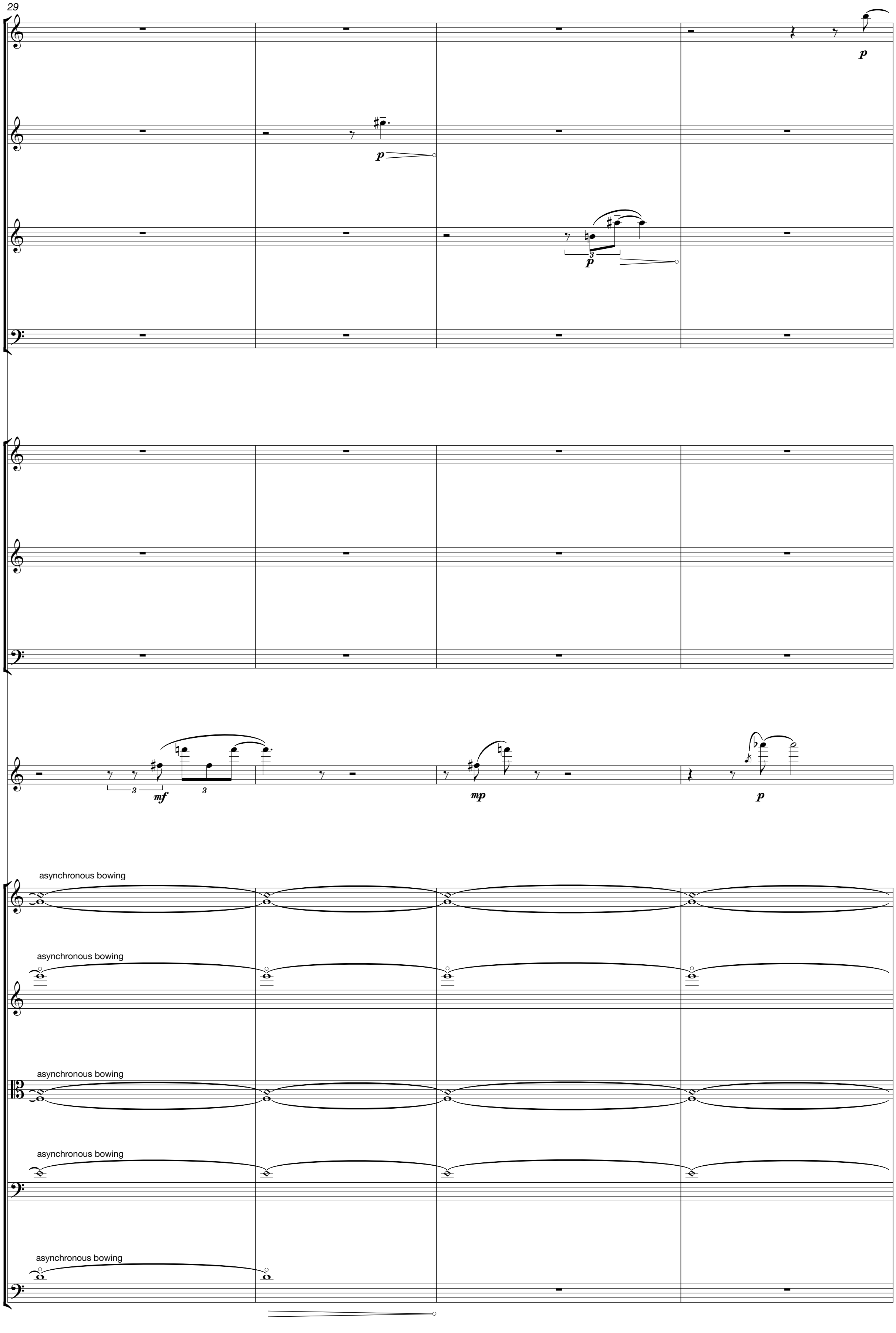

12
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
sf
p
mf
f
pizz.
3
4
3
5
6

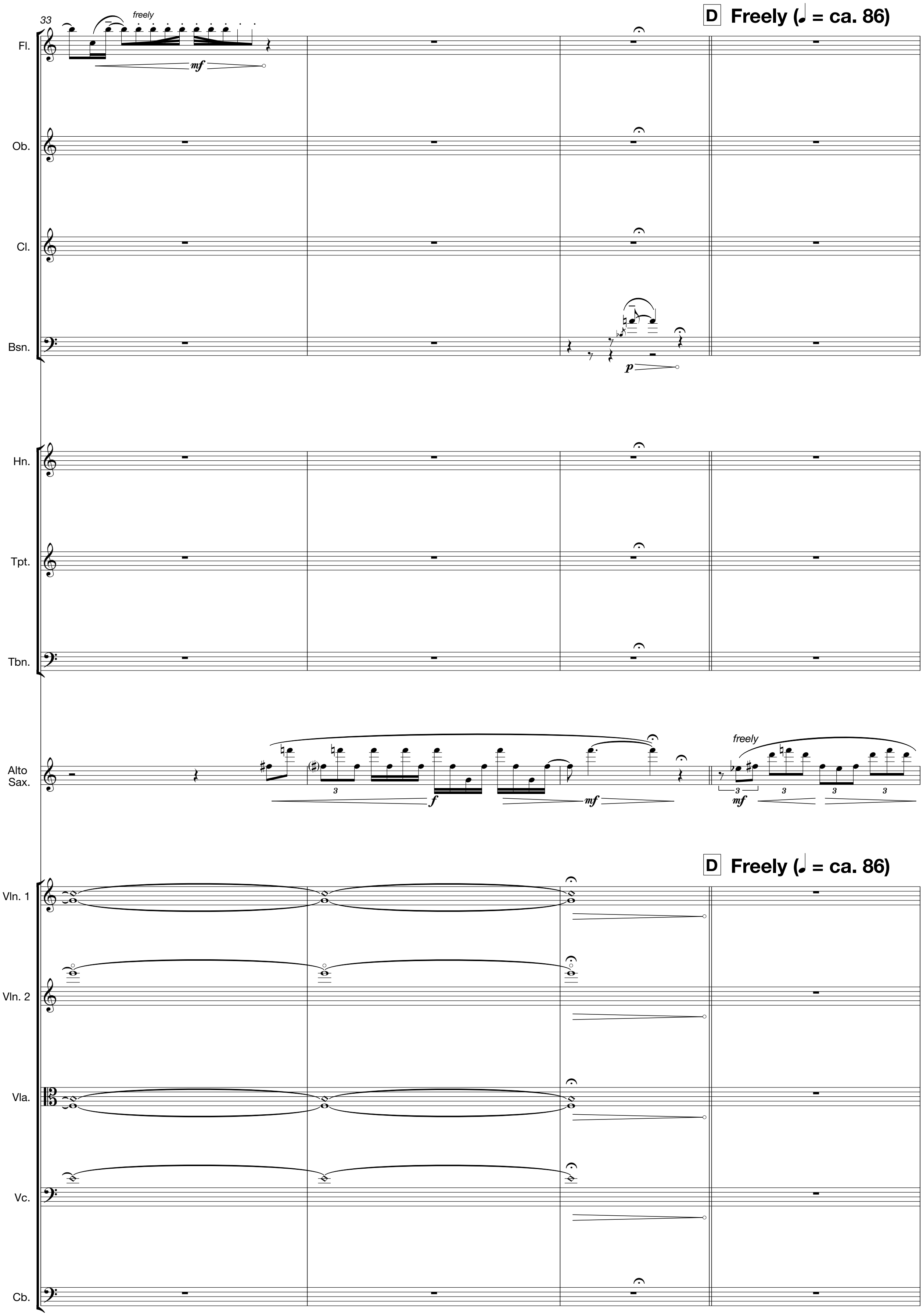

15
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
tr wt
tr ½
6
Freely
non Vib.
p
mf
f
ff
pp

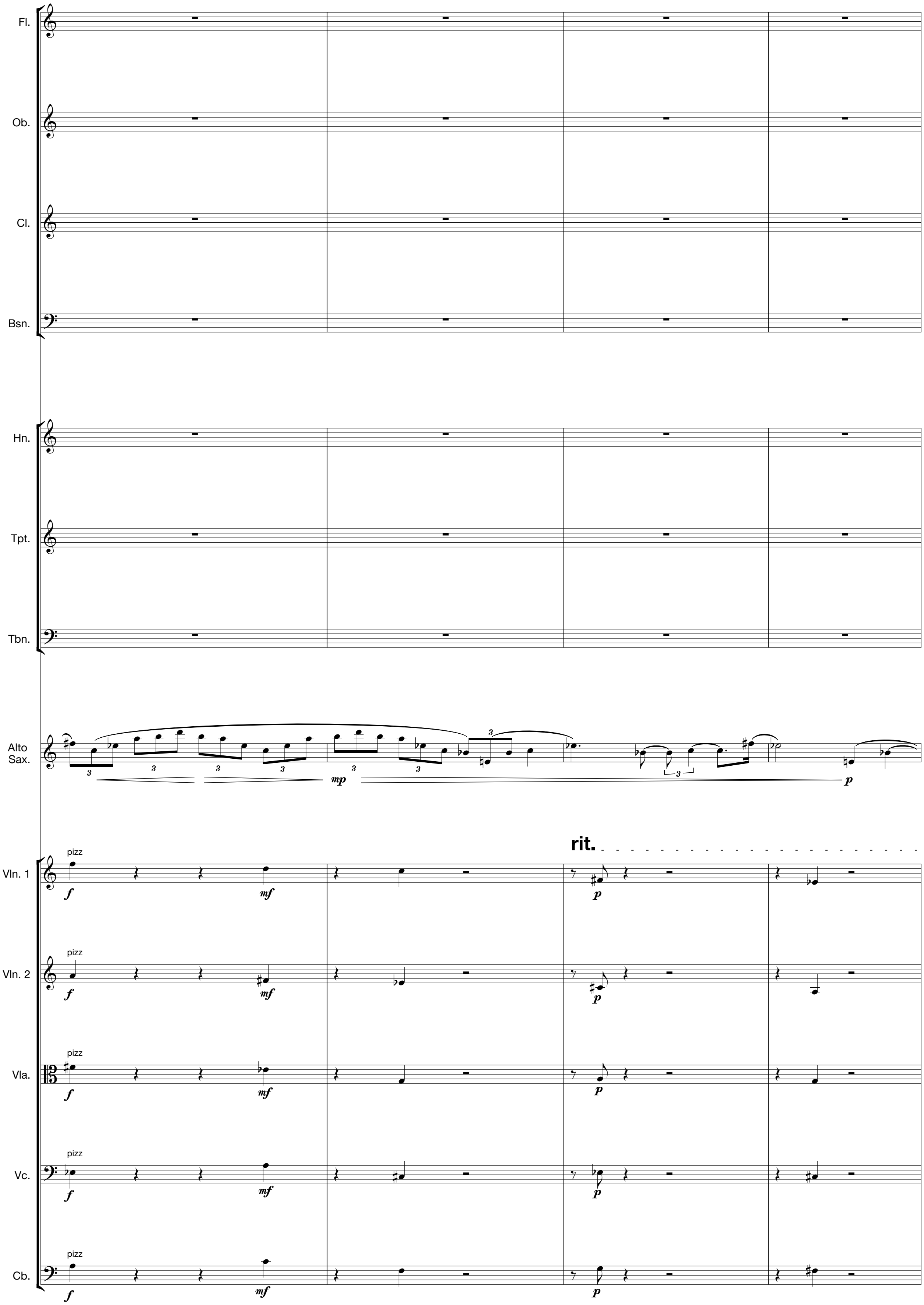

18
B Tempo Rubato
Fl.
Ob.
Cl.
Bsn.
p
Hn.
p
Tpt.
p
Tbn.
p
Alto Sax.
pp
mp
p
p
rubato
B Tempo Rubato
Vln. 1
p
pp sempre
Vln. 2
p
pp sempre
Vla.
p
Vc.
p
Cb.
arco
p

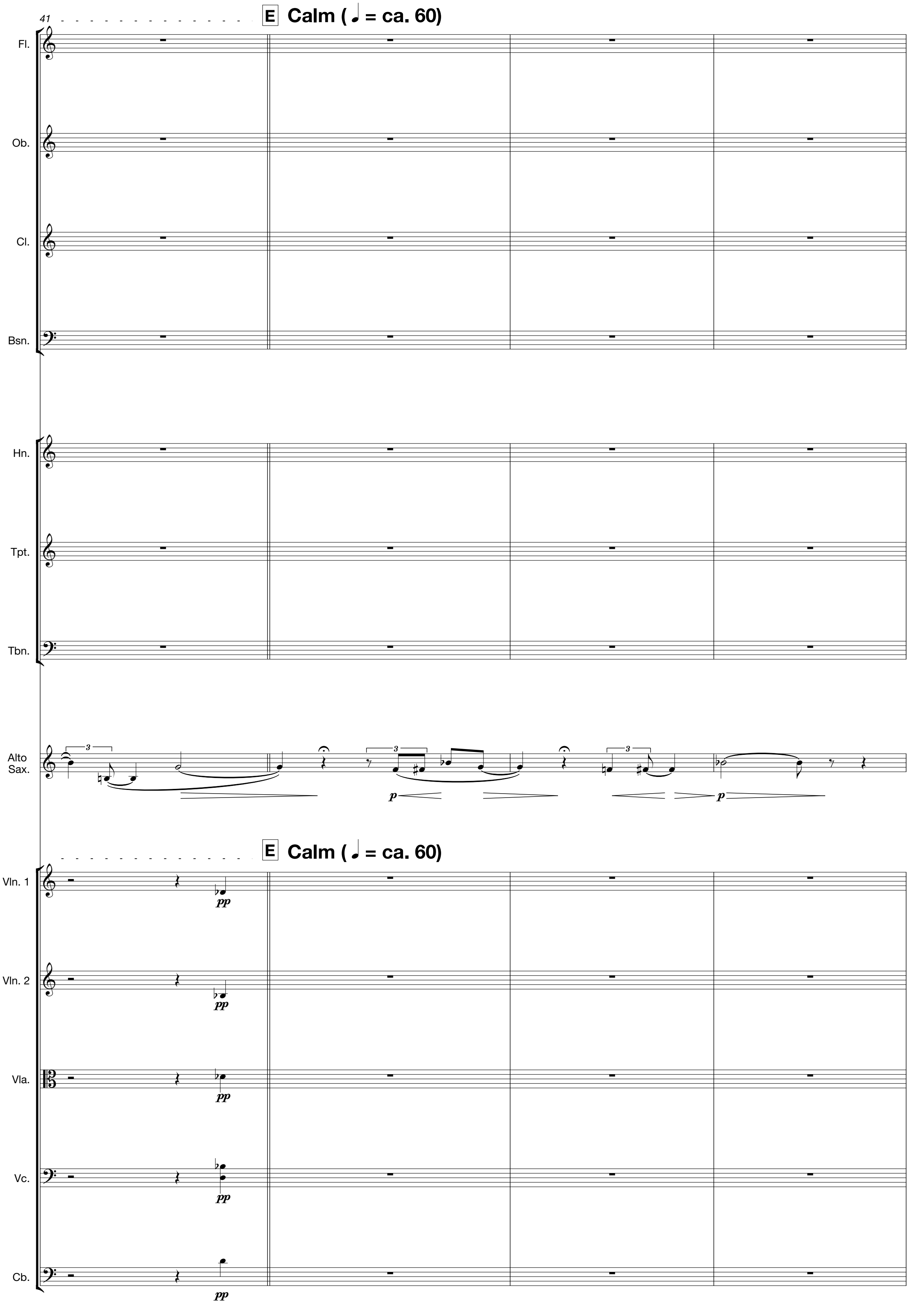
21
poco rall.
Fl.
mf
3
Ob.
3
mf
f
Cl.
p
mf
Bsn.
p
mf
Hn.
p
Tpt.
Tbn.
Alto Sax.
3
3
3
mf
3
3
3
mp
poco rall.
Vln. 1
3
Vln. 2
Vla.
pp sempre
Vc.
arco
pp sempre
Cb.

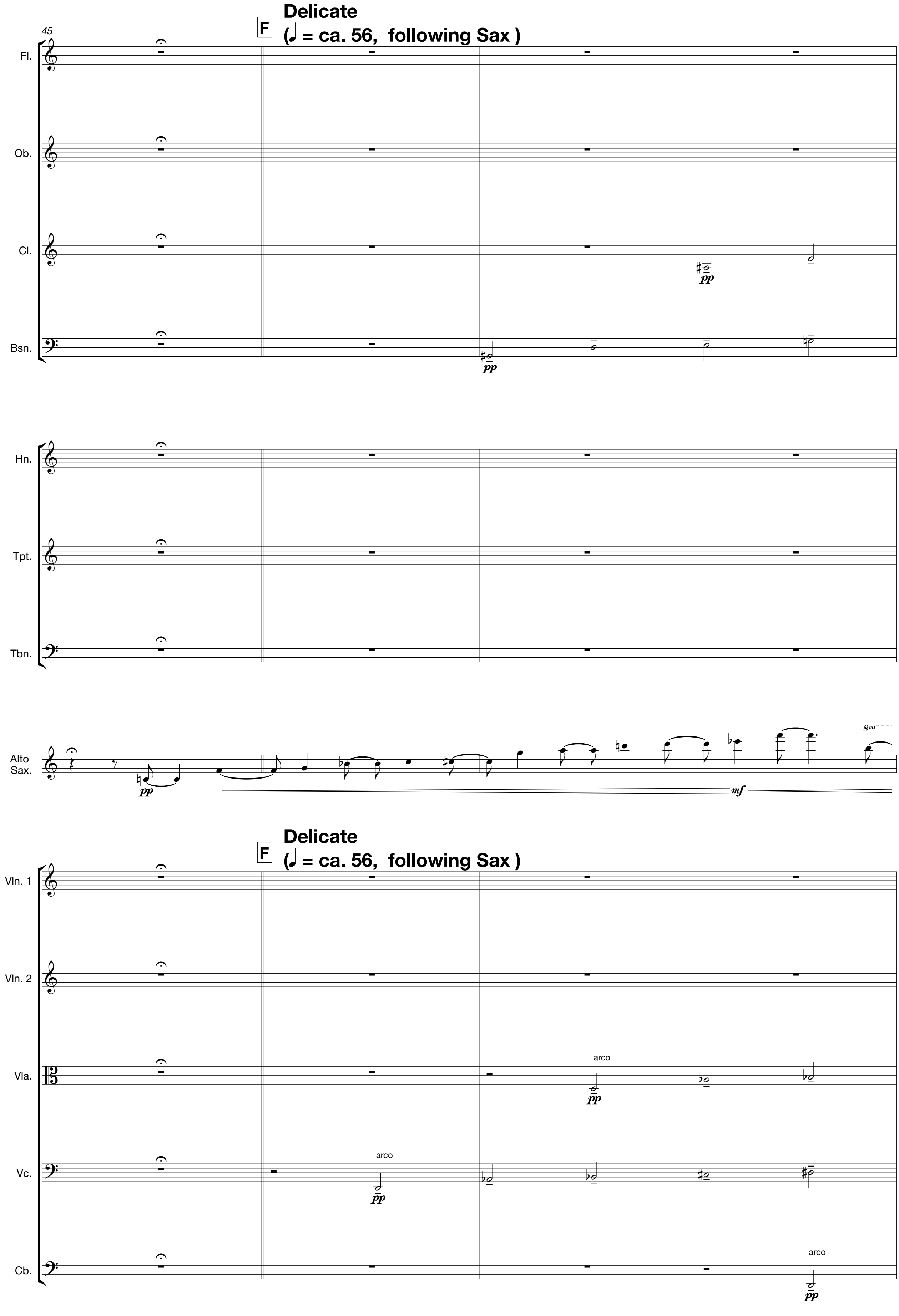

C
25
Calm (♩ = ca. 60)
Fl.
Ob.
Cl.
Bsn.
Hn.
mf
Tpt.
p
3
mf
Tbn.
mf
Alto Sax.
p
molto rubato
3
pp
3
f
C
Calm (♩ = ca. 60)
Vln. 1
pp
Vln. 2
pp
Vla.
pp
(arco)
Vc.
pp
(arco)
Cb.
pp

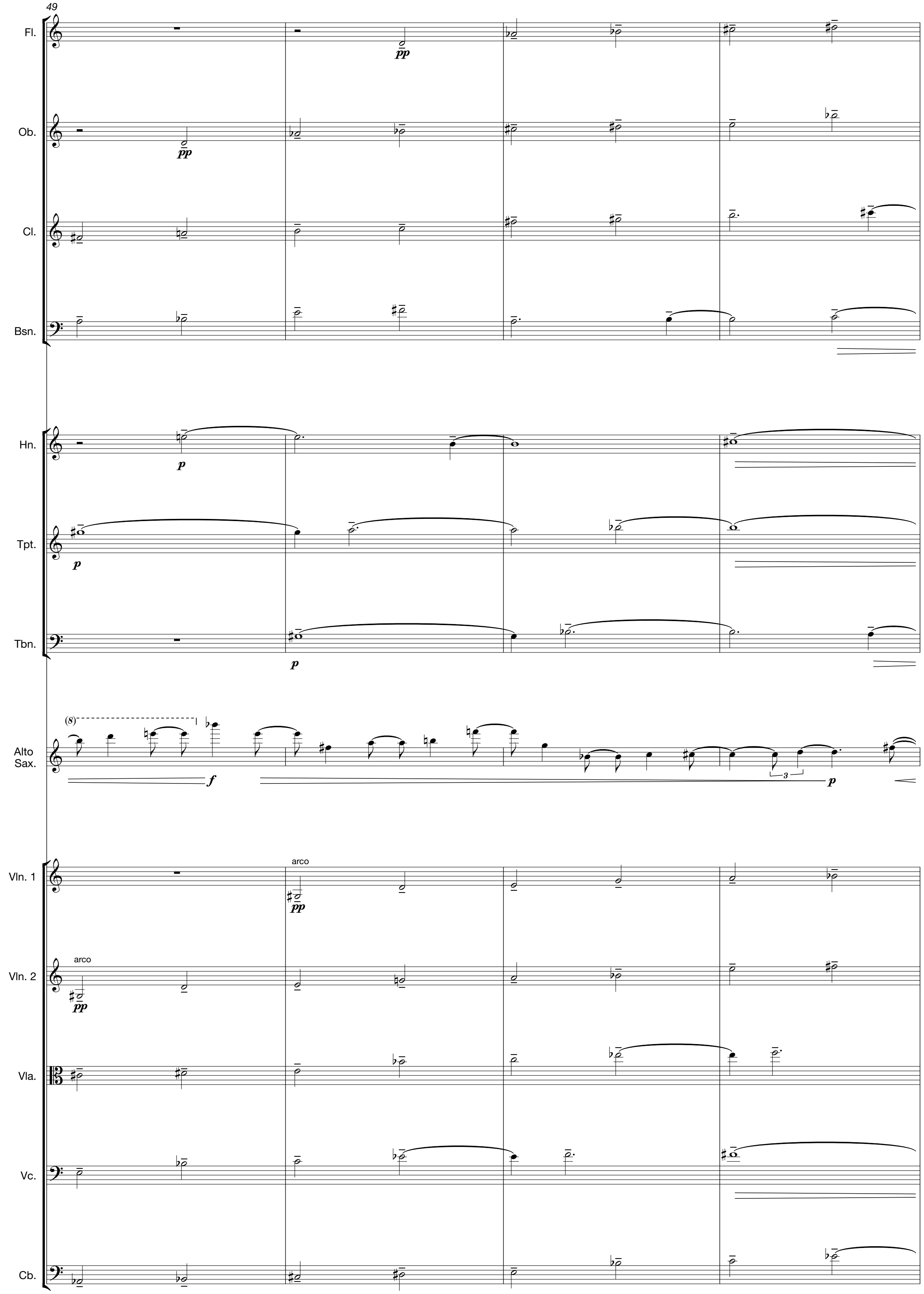

29
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
asynchronous bowing
asynchronous bowing
asynchronous bowing
asynchronous bowing
asynchronous bowing
p
p
p
mf
mp
p
3
3
3

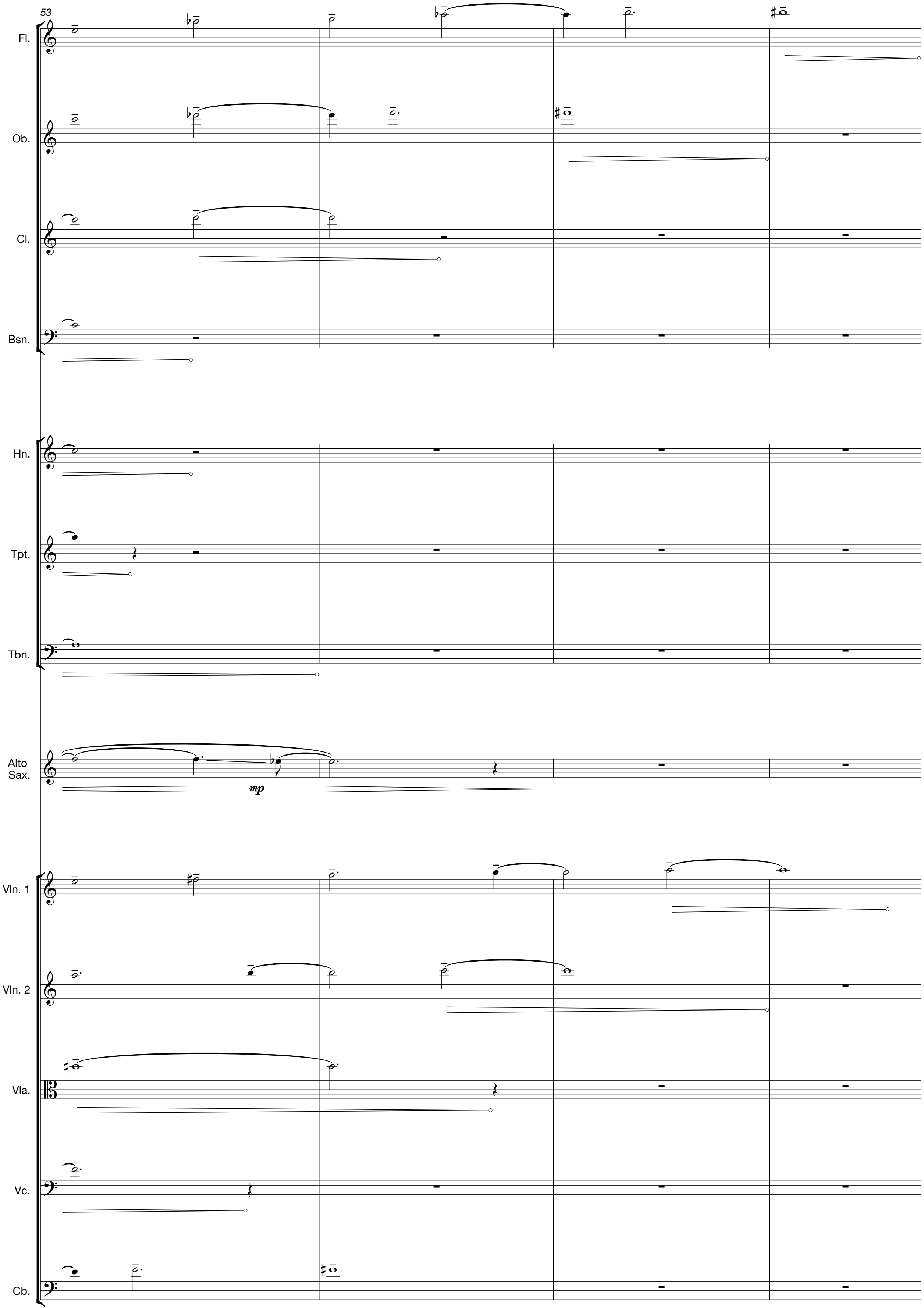

33
D Freely (♩ = ca. 86)
Fl.
freely
mf
Ob.
Cl.
Bsn.
p
Hn.
Tpt.
Tbn.
Alto Sax.
3
f
mf
freely
mf
D Freely (♩ = ca. 86)
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

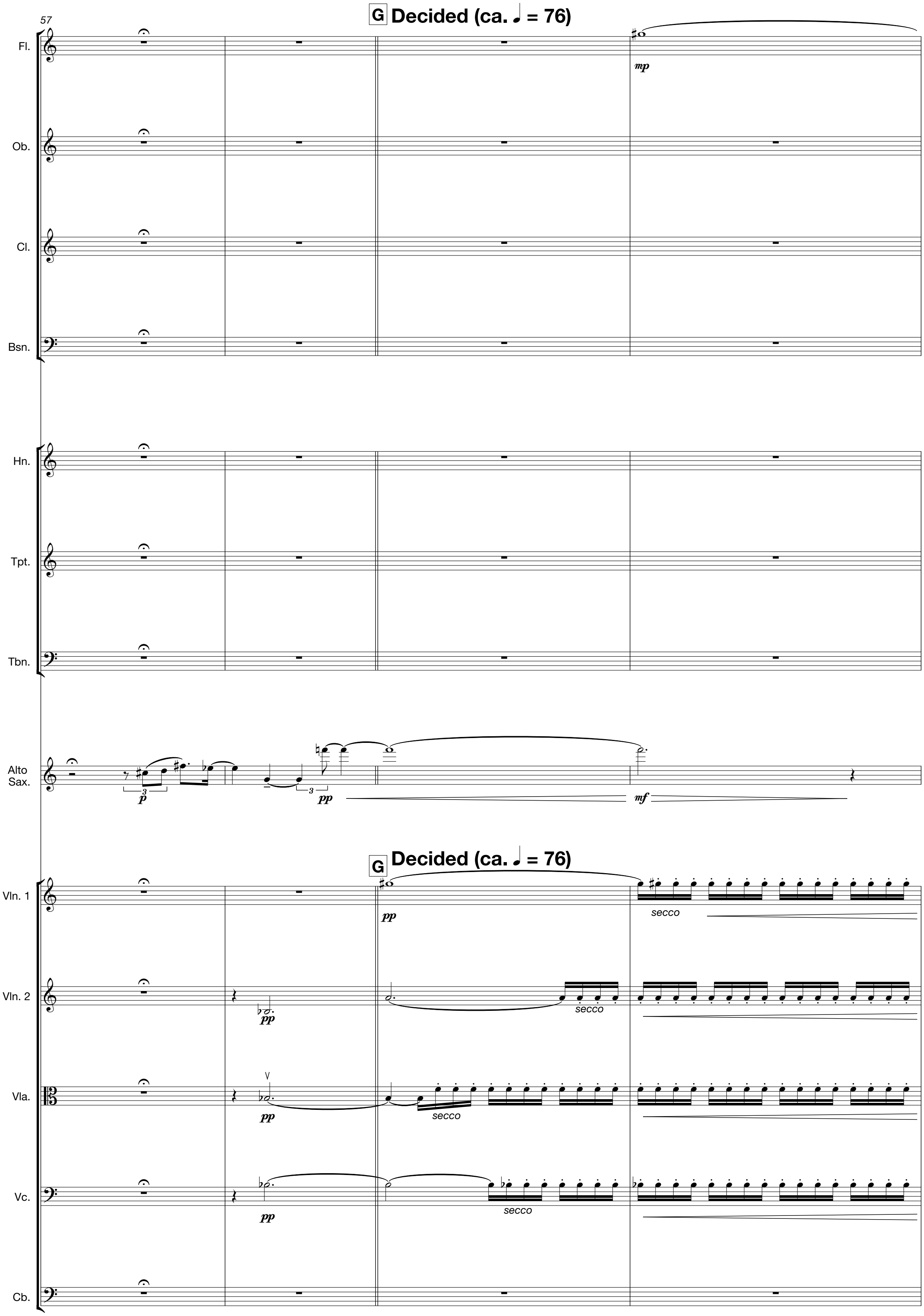

37
rit.
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
3
mp
p
rit.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pizz
f
mf
p

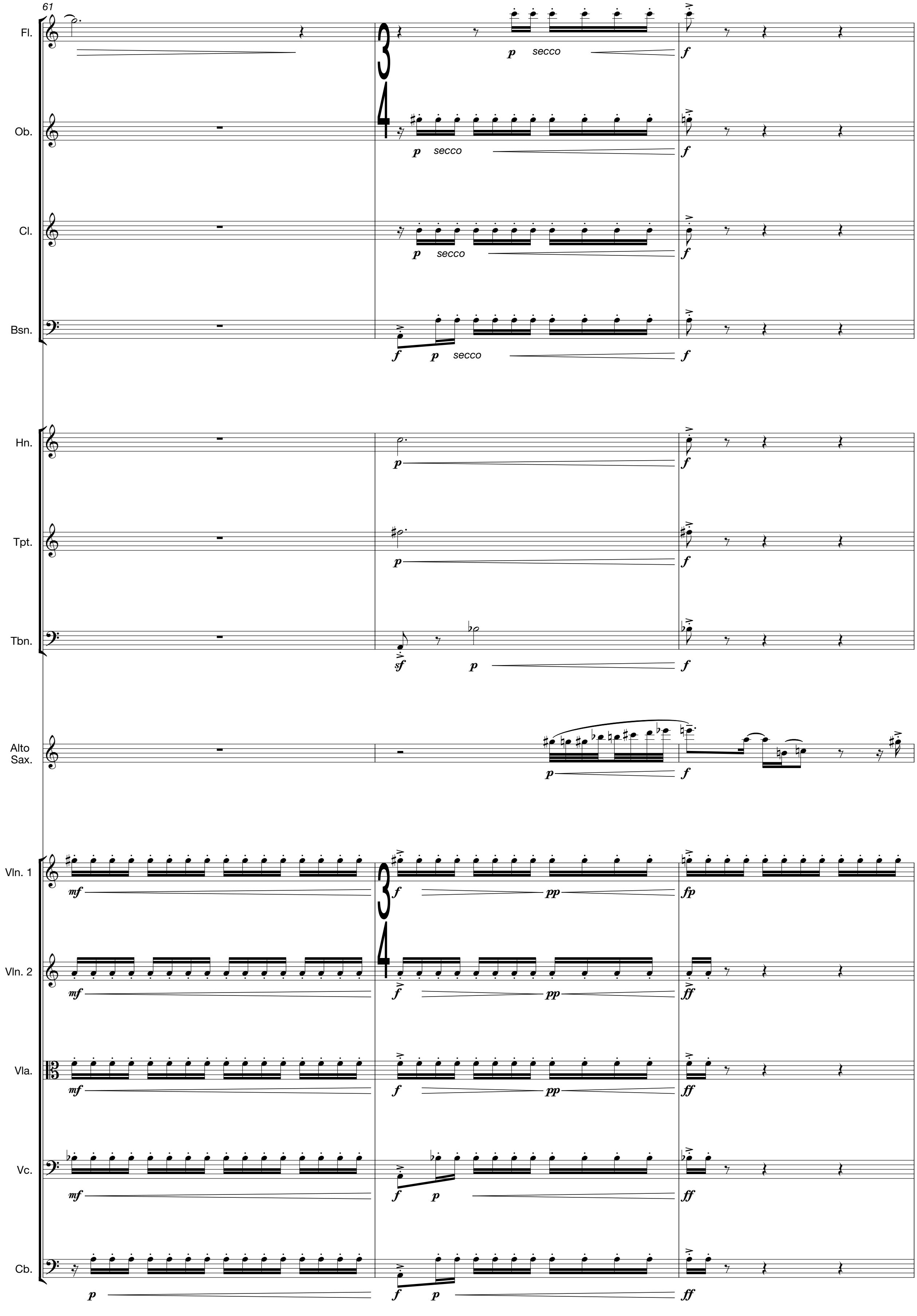

41
E
Calm (♩ = ca. 60)
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
3
p
p
E
Calm (♩ = ca. 60)
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp

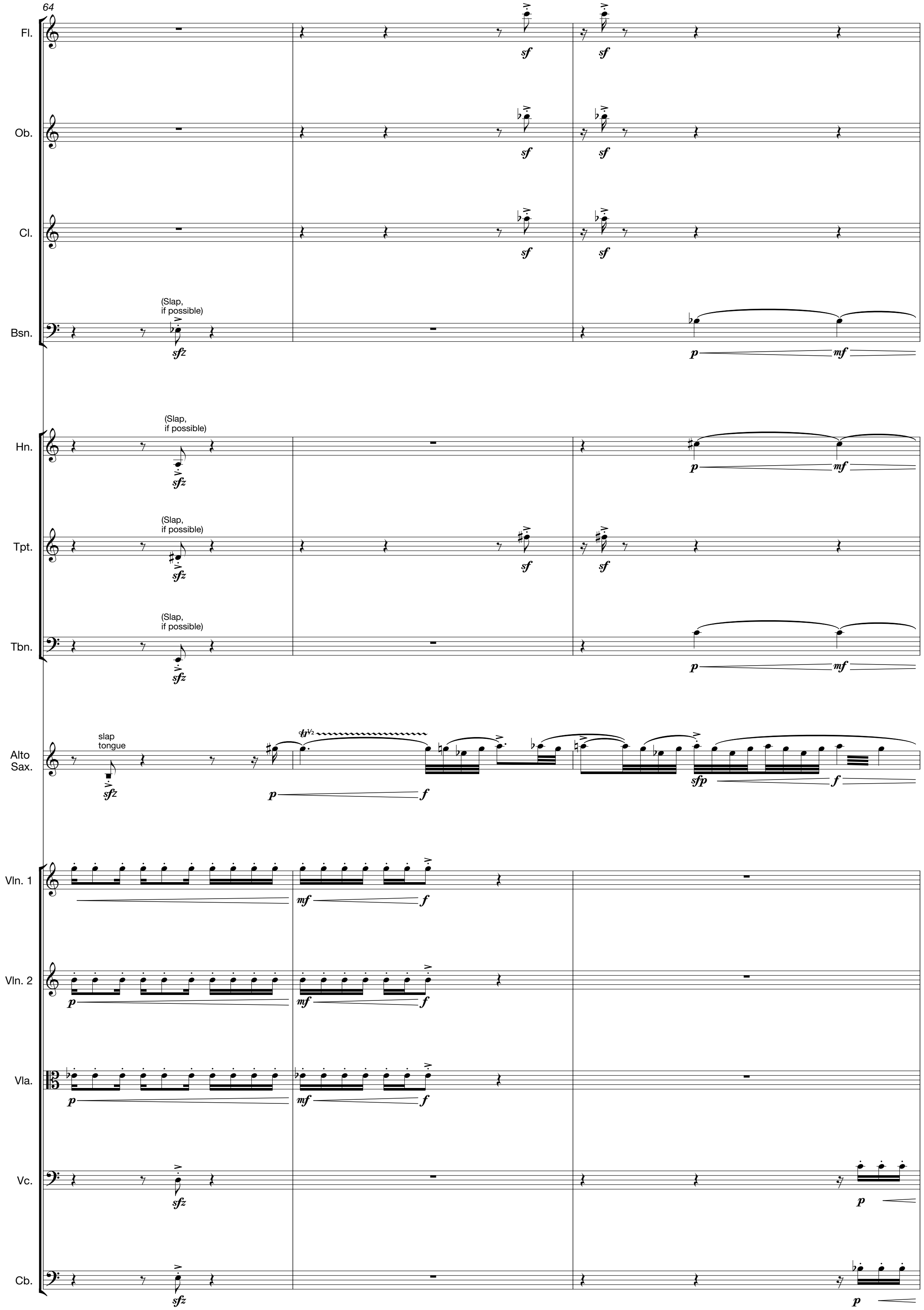

45
F
Delicate
(♩ = ca. 56, following Sax)
Fl.
Ob.
Cl.
pp
Bsn.
pp
Hn.
Tpt.
Tbn.
Alto Sax.
pp
mf
8va
F
Delicate
(♩ = ca. 56, following Sax)
Vln. 1
Vln. 2
Vla.
arco
pp
Vc.
arco
pp
Cb.
arco
pp

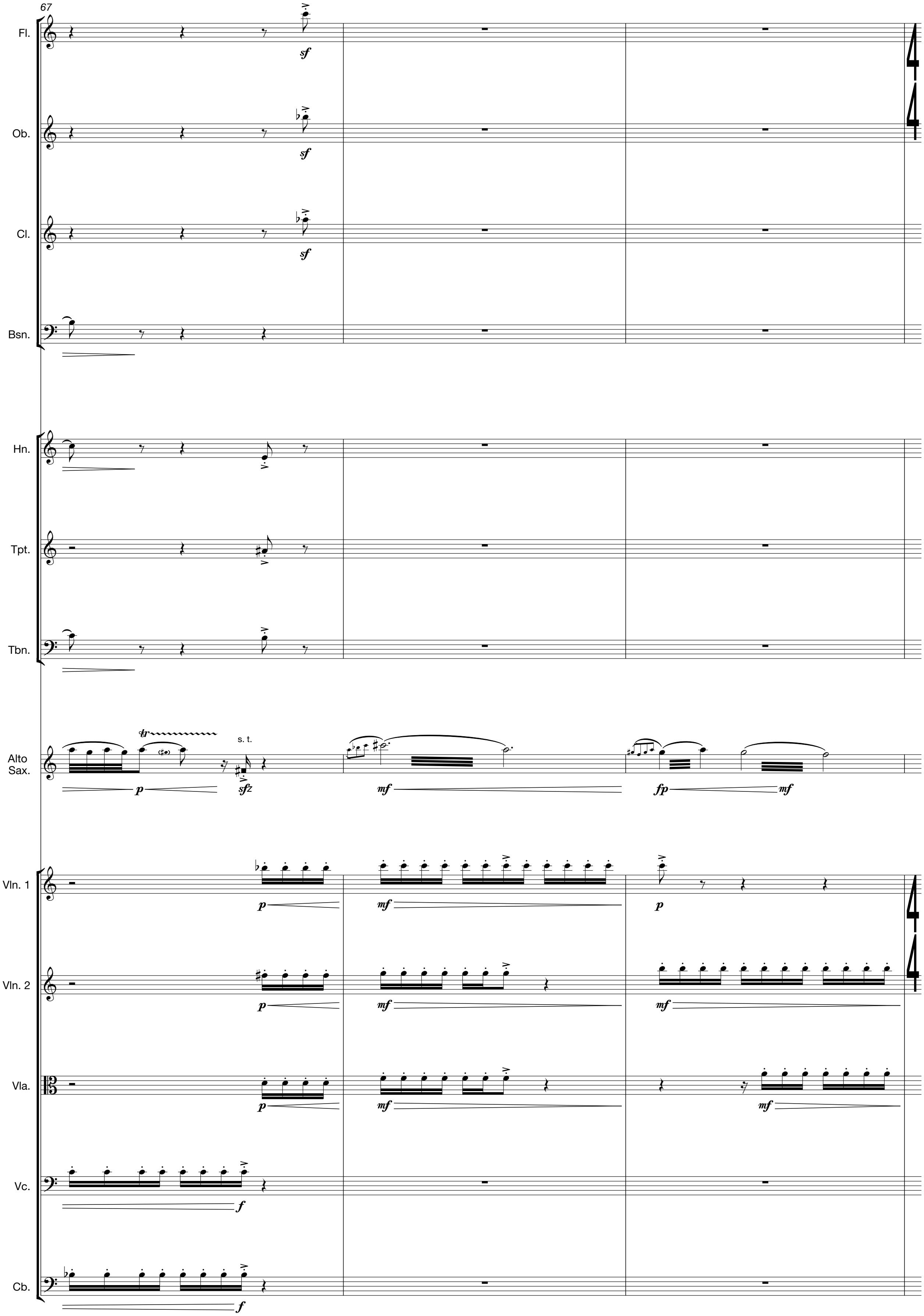

49
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
p
f
(8)
3
arco

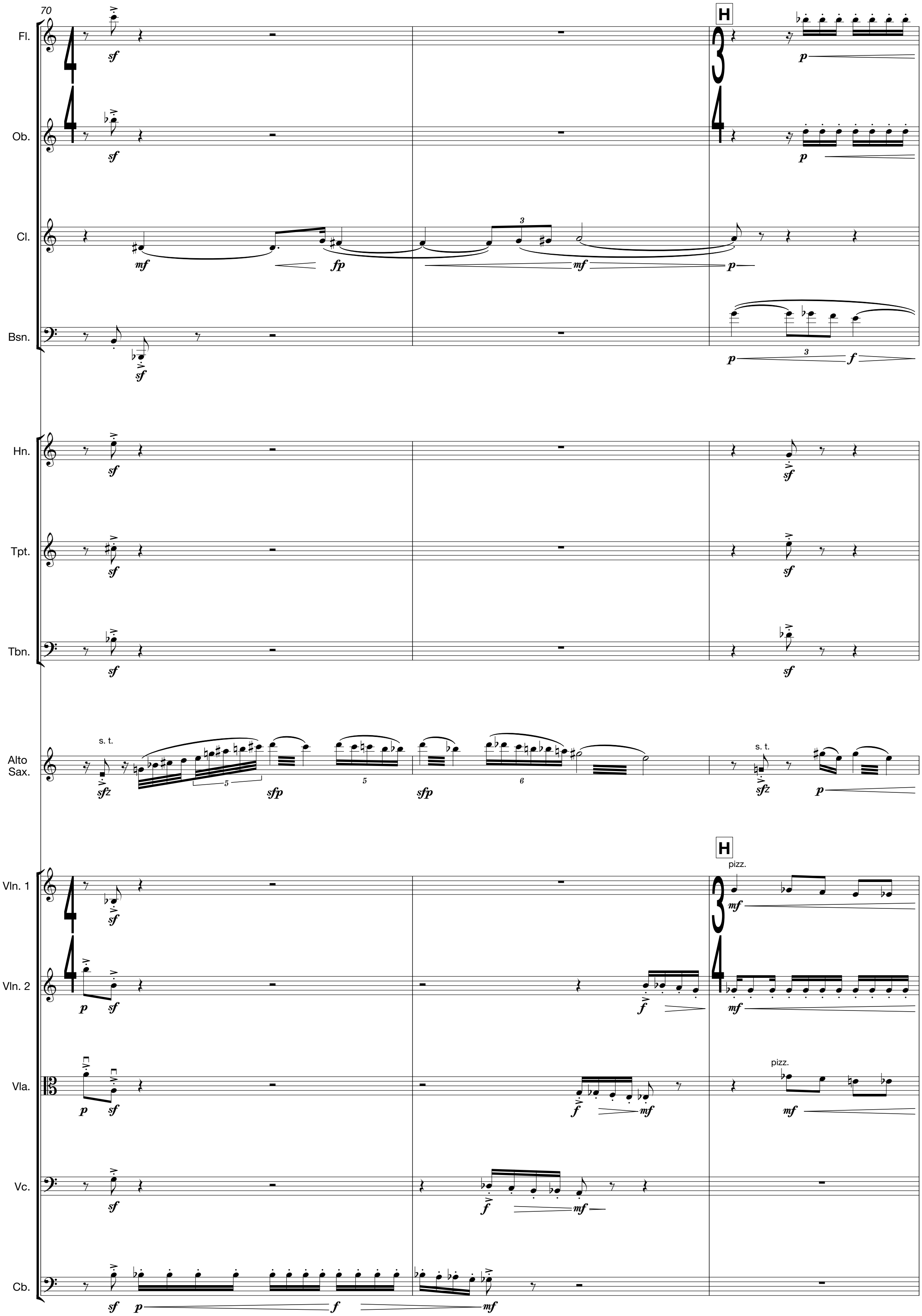

53
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
mp
Vln. 1
Vln. 2
Vla.
Vc.
Cb.

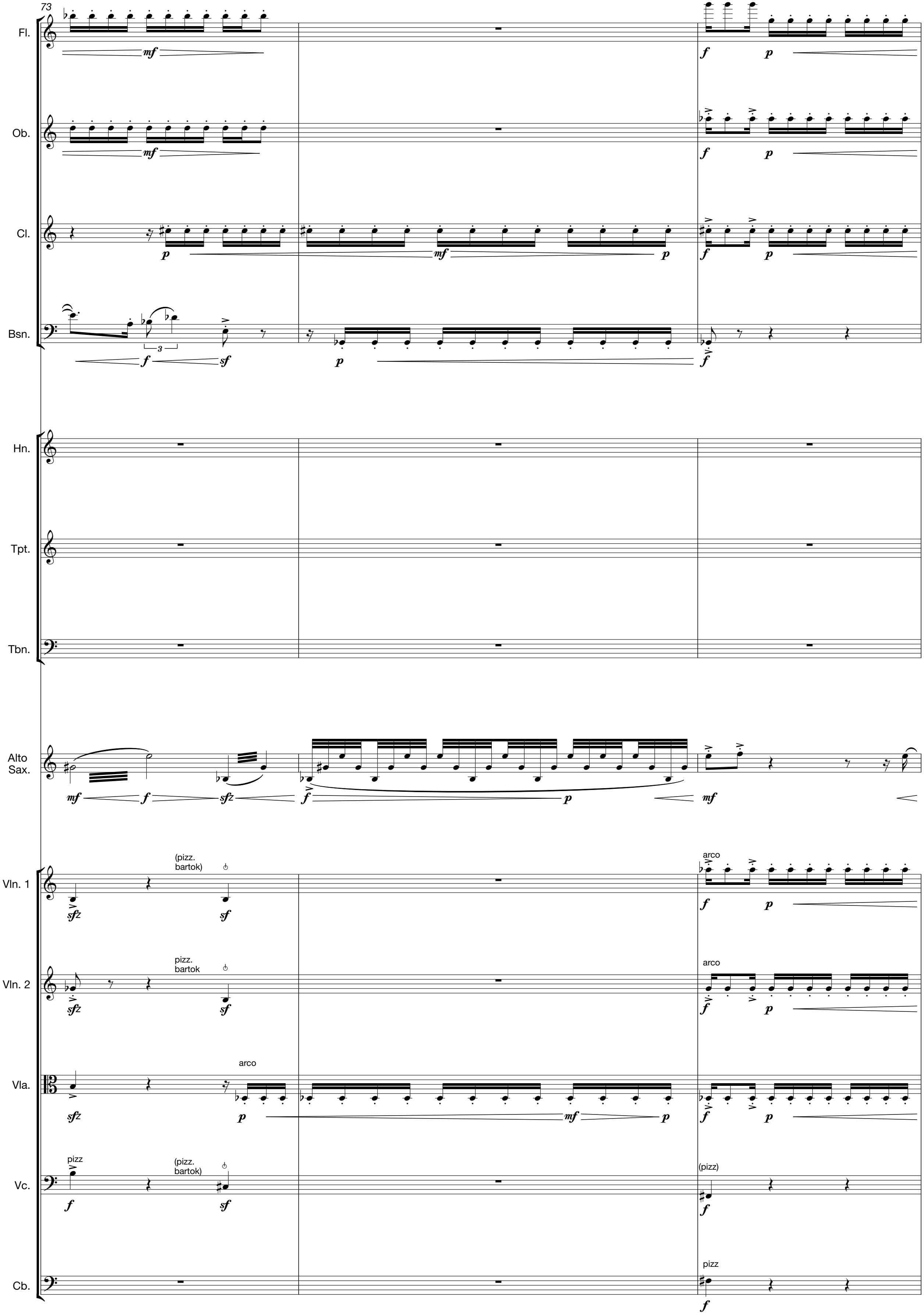

57
G
Decided (ca. ♩ = 76)
Fl.
mp
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
3
p
3
pp
mf
G
Decided (ca. ♩ = 76)
Vln. 1
pp
secco
Vln. 2
pp
secco
Vla.
pp
secco
Vc.
pp
secco
Cb.

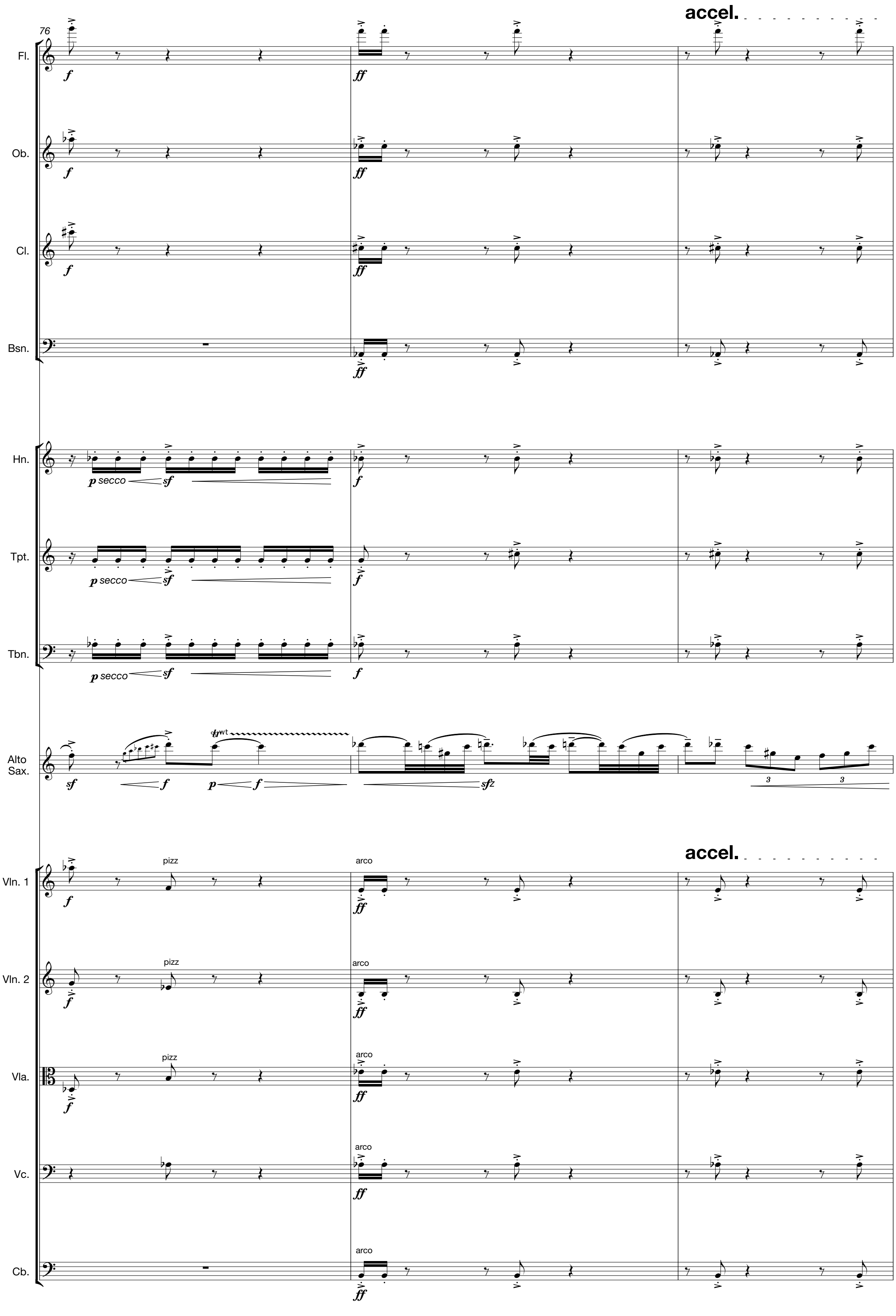

61
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
3
4
p
secco
f
mf
pp
fp
ff
sf

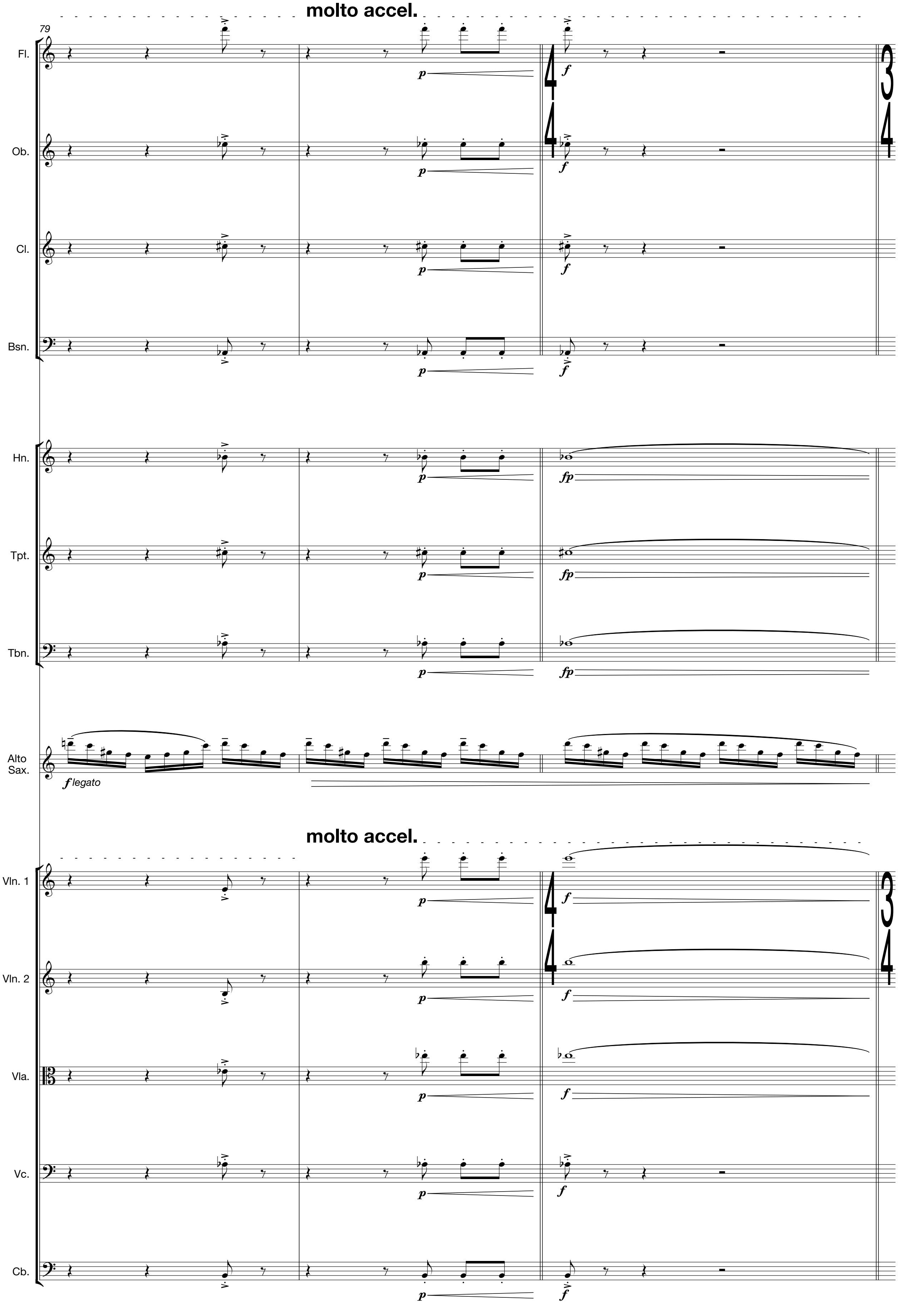

64
Fl.
sf
Ob.
sf
Cl.
sf
(Slap, if possible)
Bsn.
sfz
p
mf
(Slap, if possible)
Hn.
sfz
p
mf
(Slap, if possible)
Tpt.
sfz
sf
(Slap, if possible)
Tbn.
sfz
p
mf
slap tongue
Alto Sax.
sfz
p
f
sfp
f
Vln. 1
mf
f
Vln. 2
p
mf
f
Vla.
p
mf
f
Vc.
sfz
p
Cb.
sfz
p

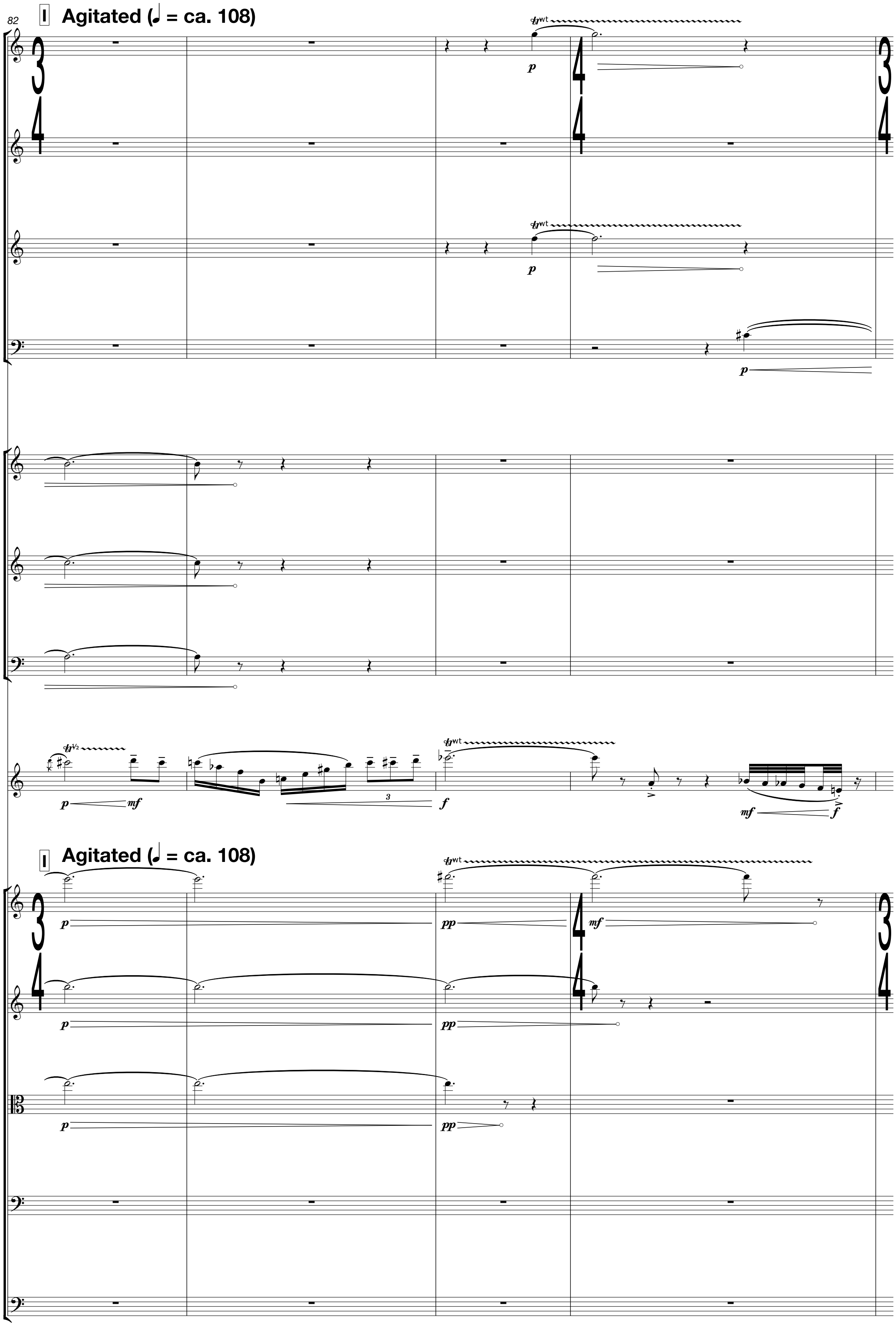

67
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
sf
sf
sf
tr
s. t.
p
sfz
mf
fp
mf
p
mf
p
mf
mf
p
mf
mf
f
f
4
4

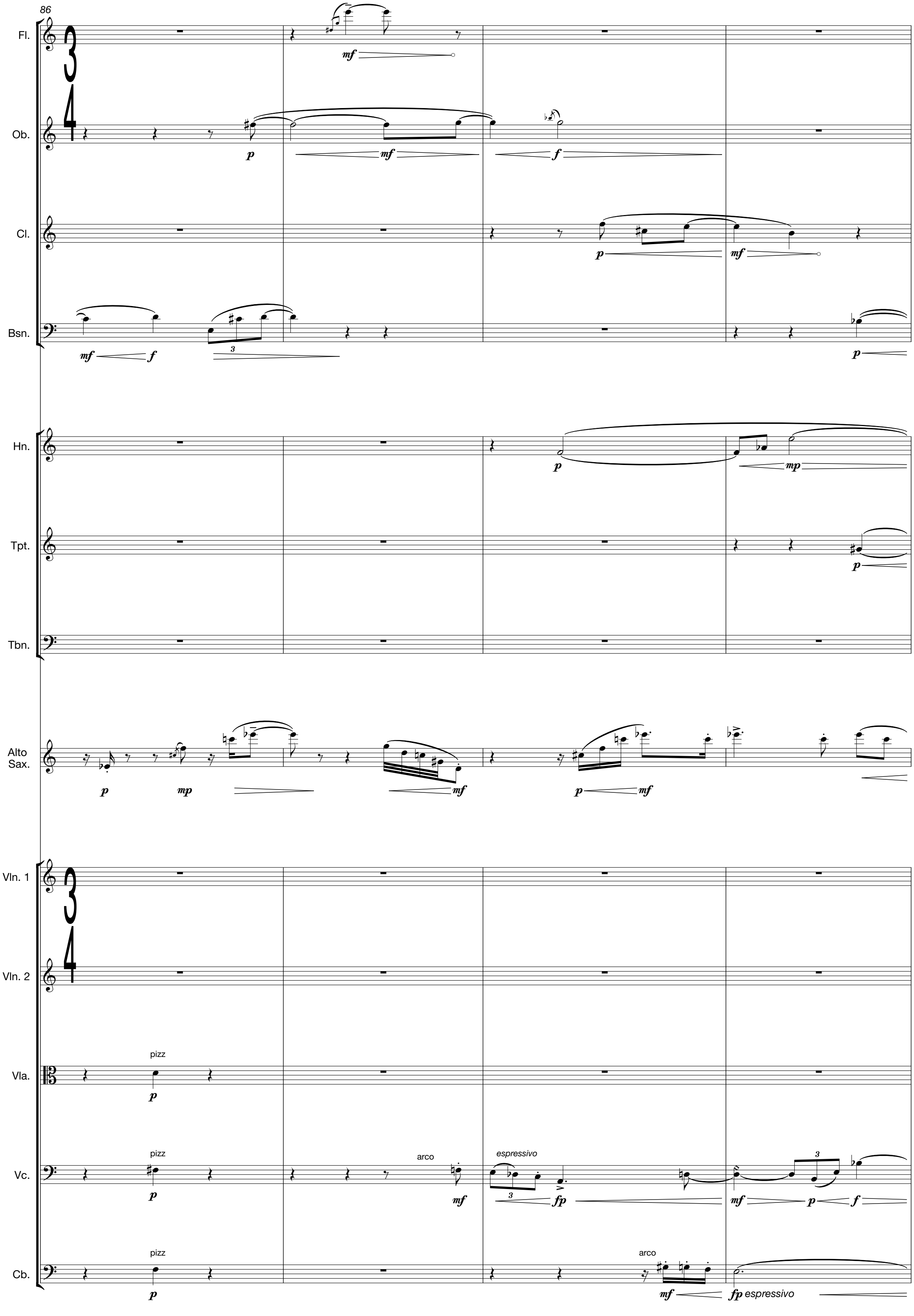

70
H
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
sf
p
mf
fp
f
s. t.
sfz
sfp
pizz.
3
5
6

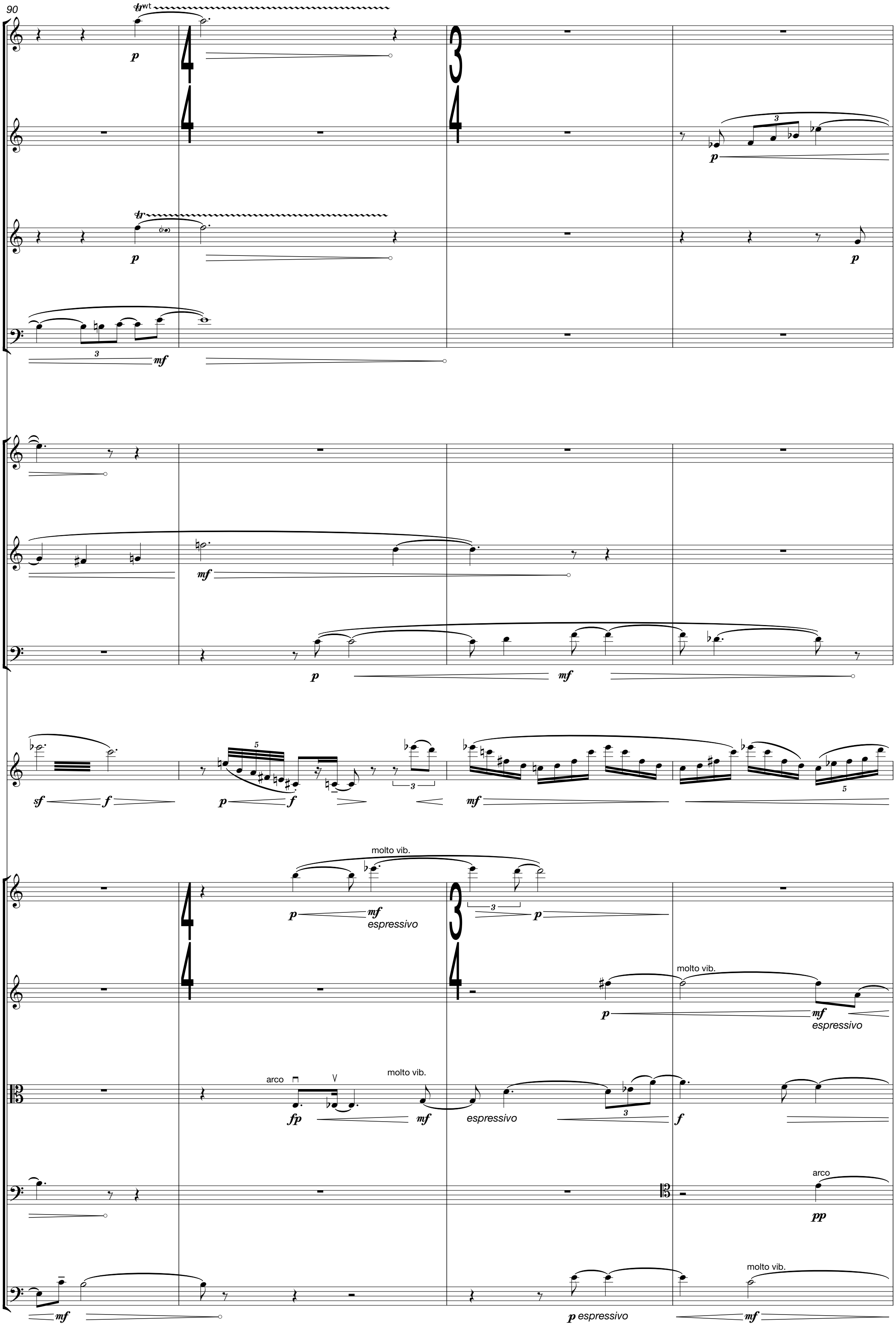

73
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
f
p
sf
sfz
3
(pizz. bartok)
pizz. bartok
arco
pizz
(pizz)


76
accel.
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
f
ff
p secco
sf
p
sfz
wt
3
pizz
arco

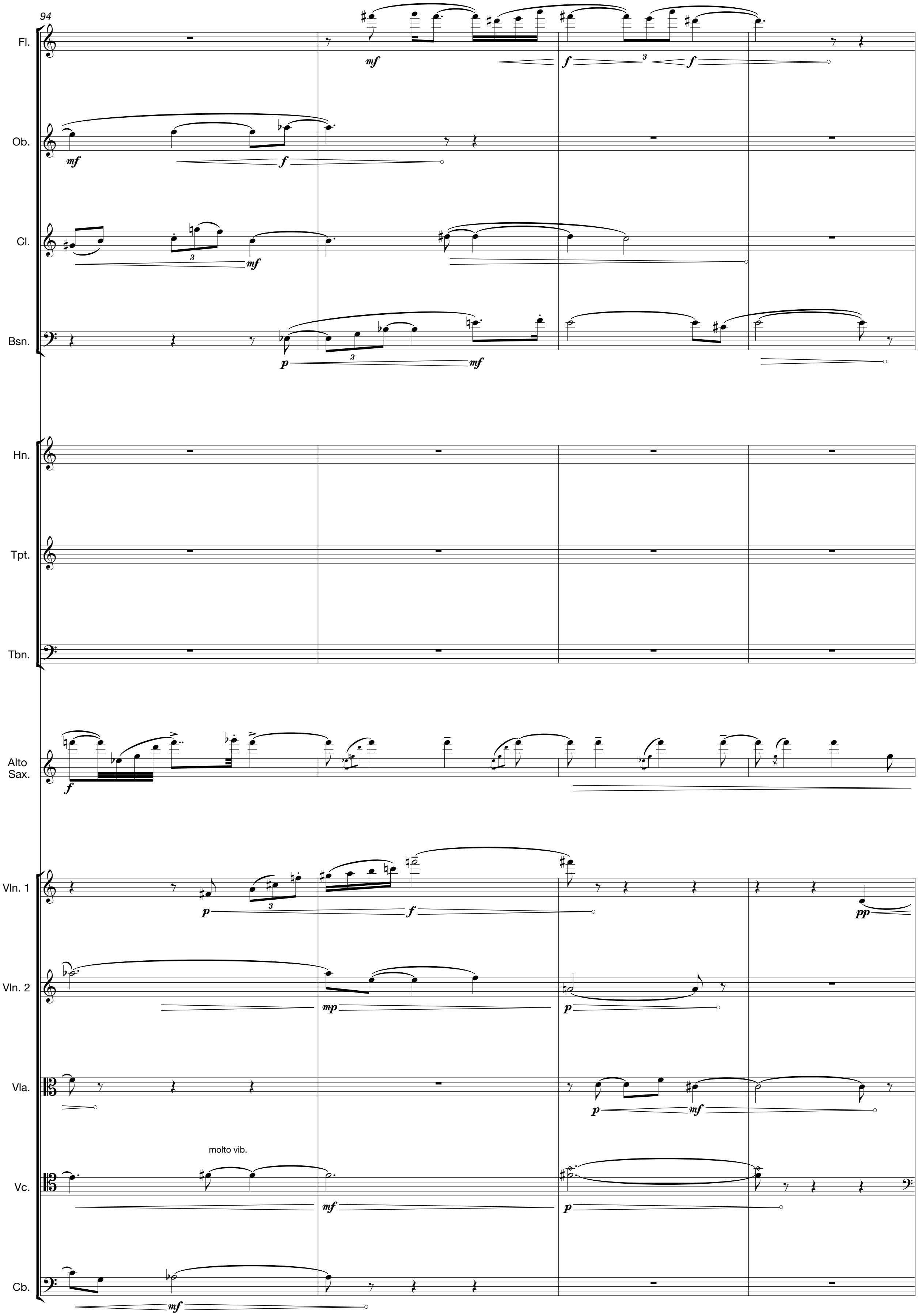

molto accel.
79
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p
f
fp
f legato
4
4
3
4

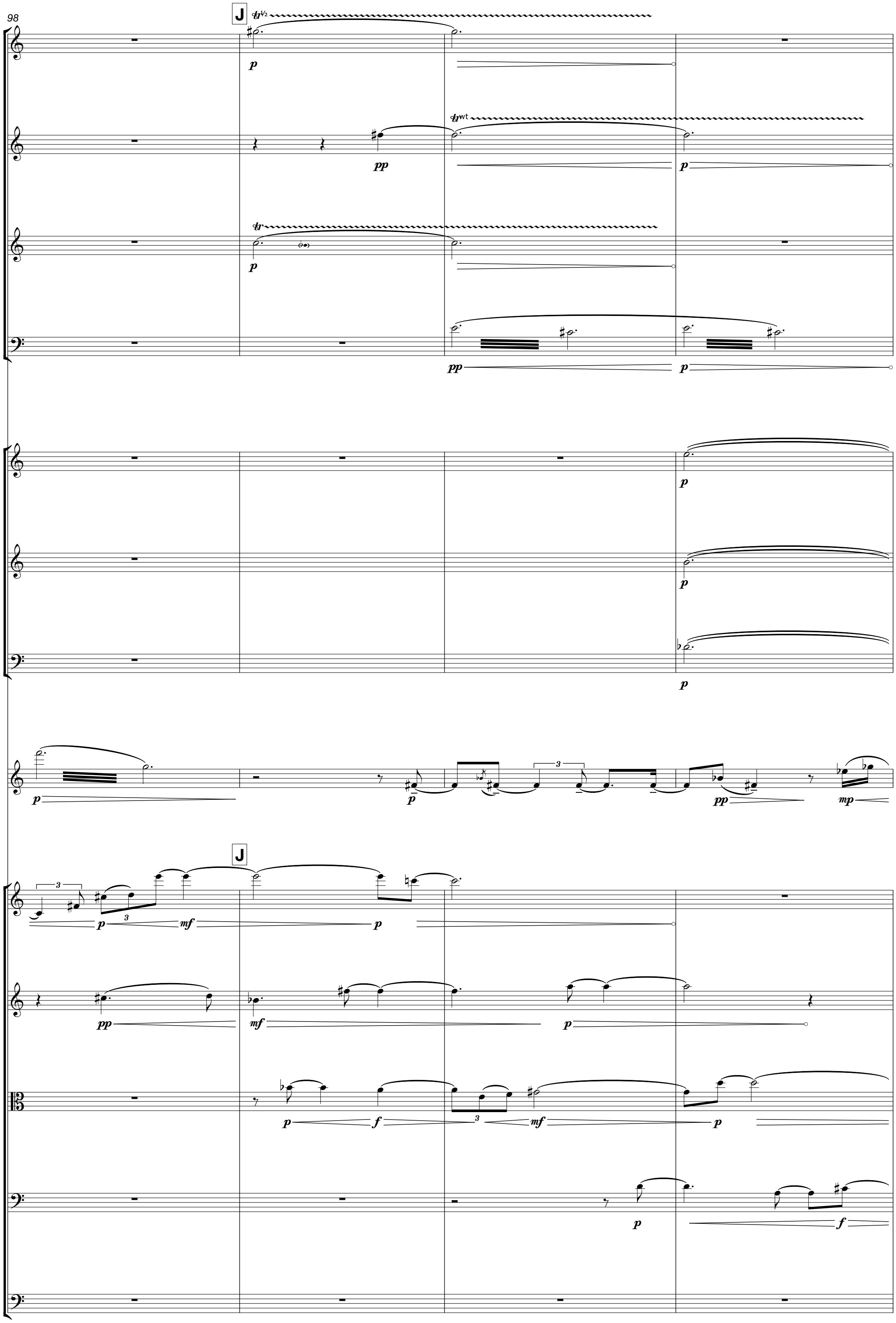

82
I
Agitated (♩ = ca. 108)
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
tr wt
tr ½
p
mf
f
pp
3

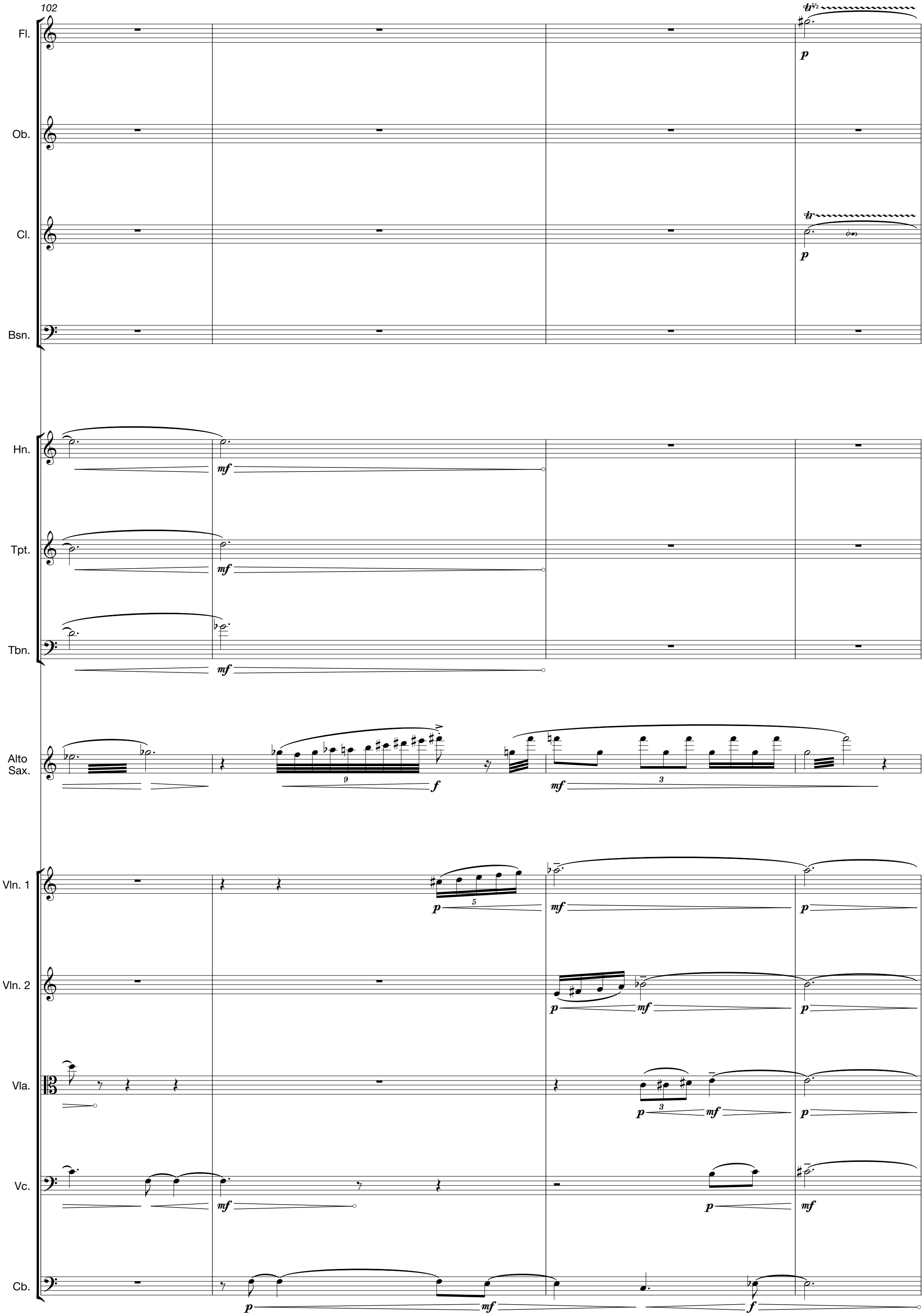

86
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
p
mf
f
p
mf
mf
f
3
p
mp
p
mp
p
mf
p
mf
pizz
p
pizz
p
arco
mf
espressivo
3
fp
mf
p
f
pizz
p
arco
mf
fp espressivo

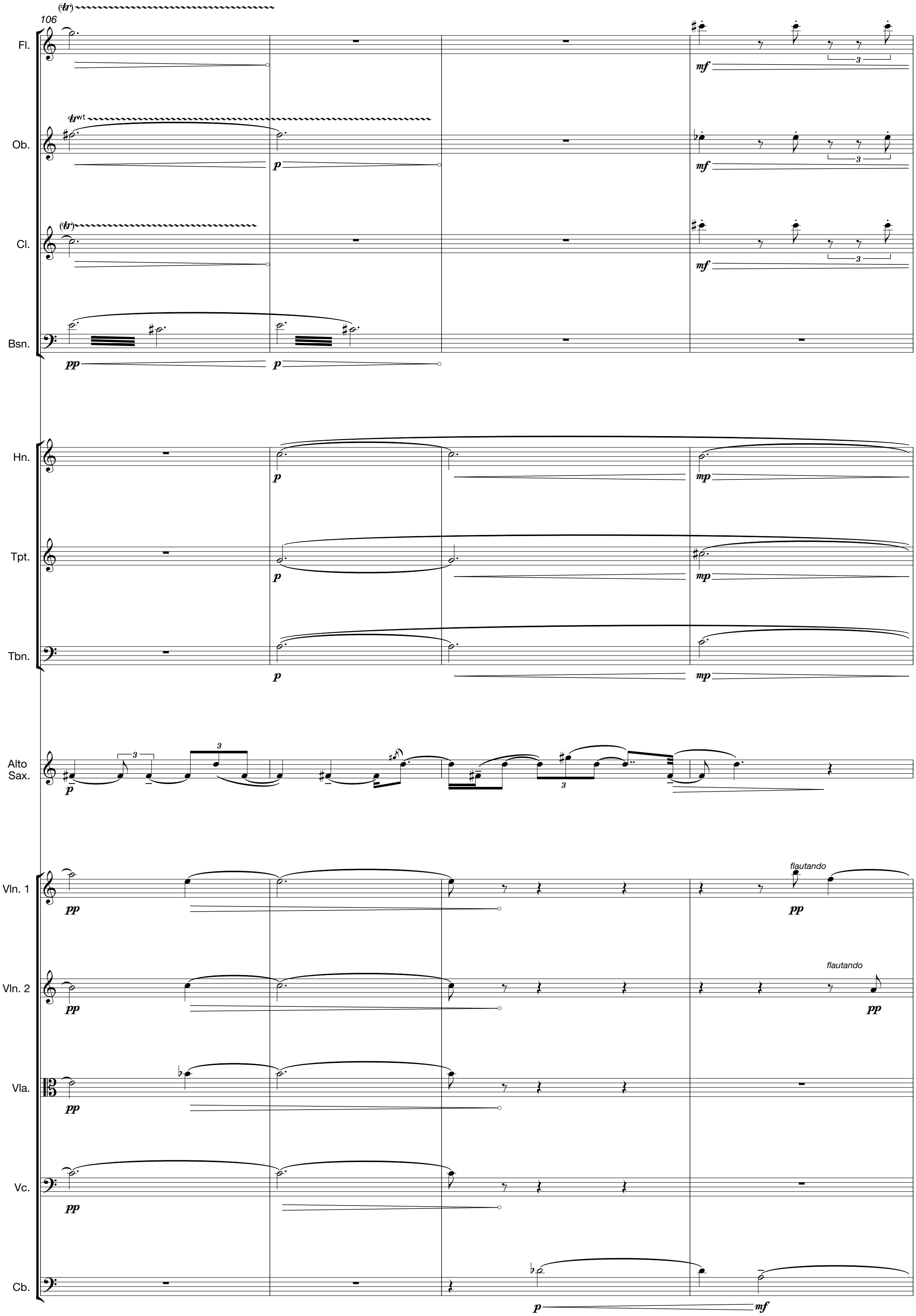


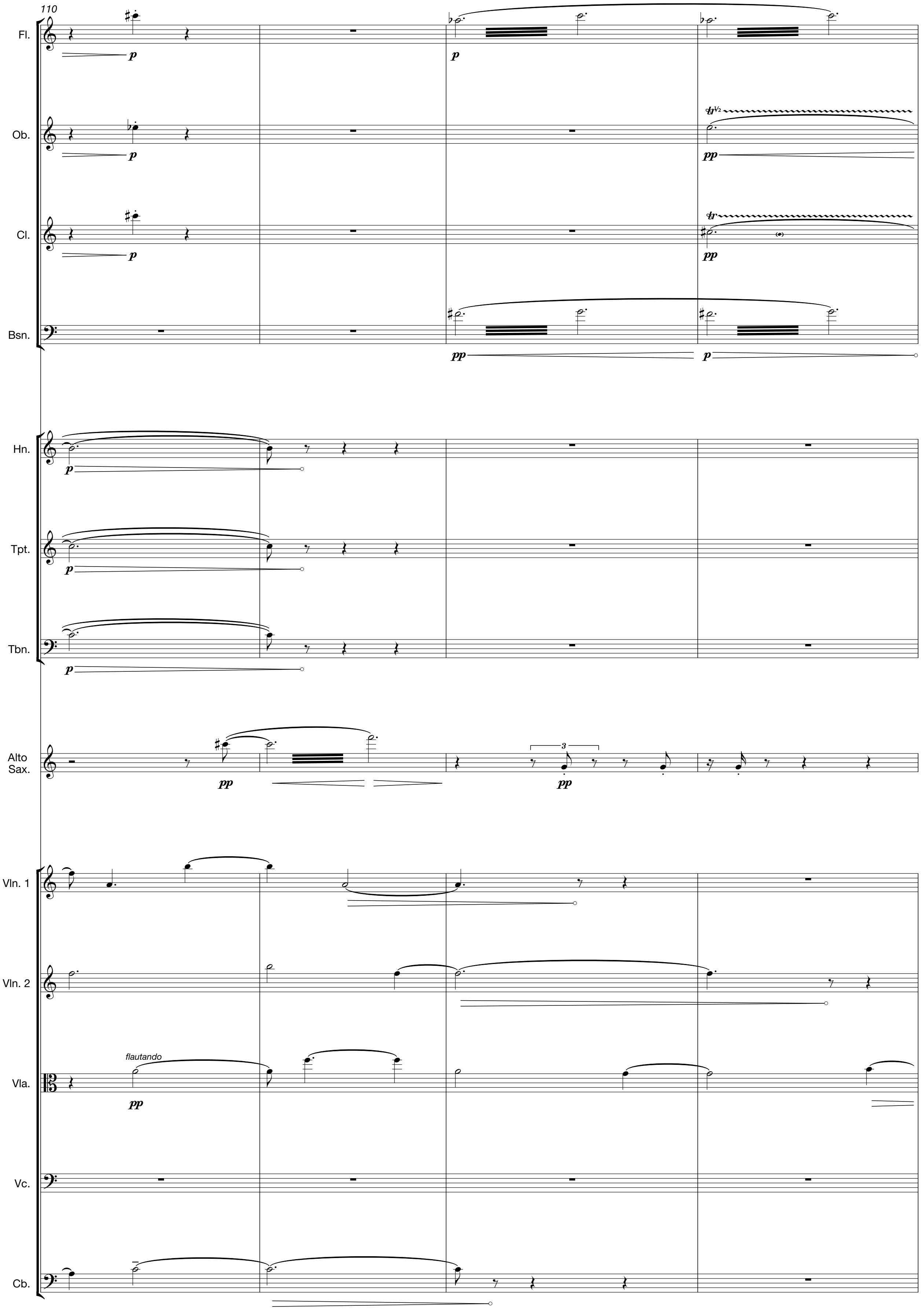
90
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
tr wt
tr
p
mf
sf
f
fp
pp
molto vib.
espressivo
p espressivo
arco
3
5

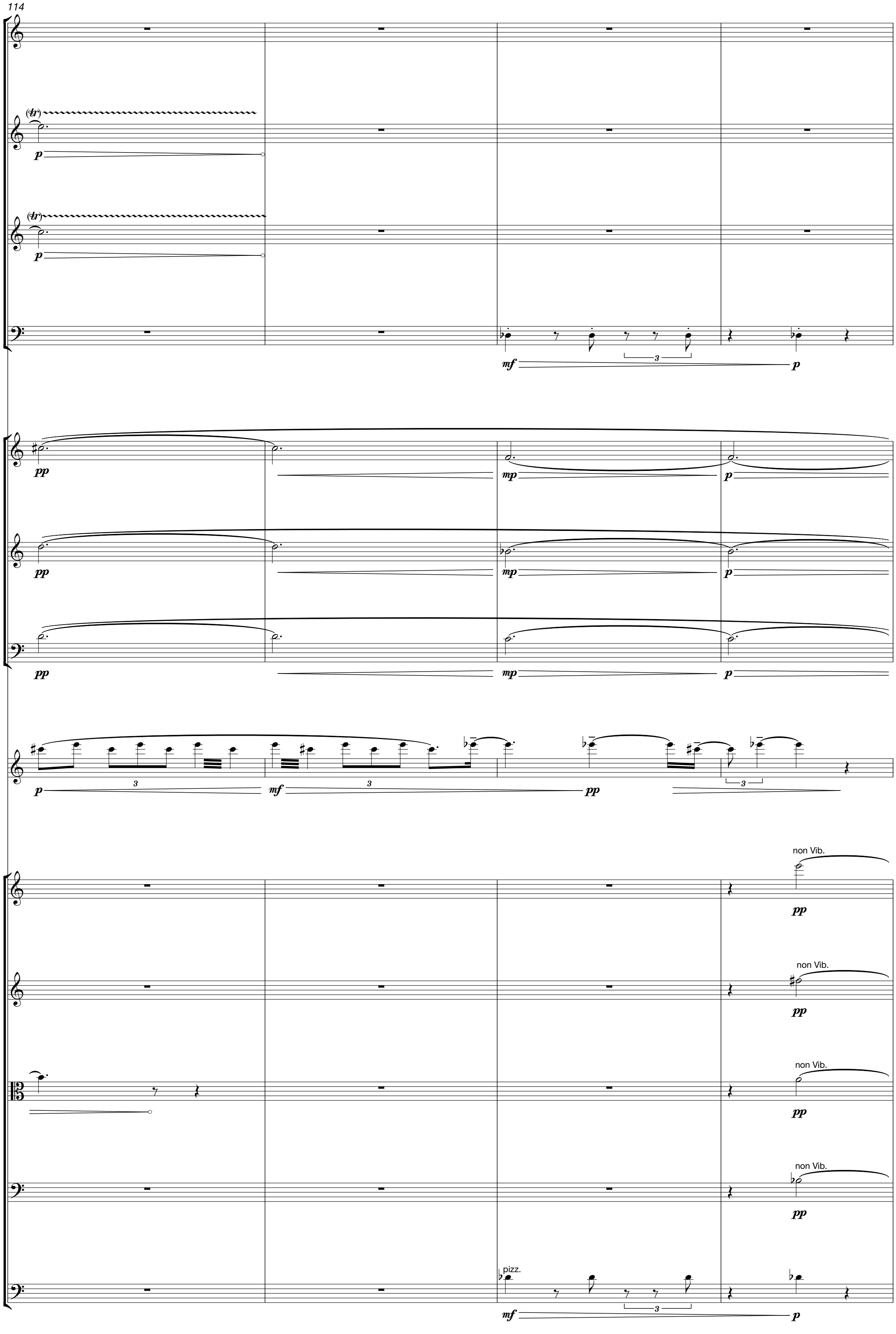

94
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
mf
f
p
mp
pp
3
molto vib.


98
J
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
tr½
trwt
tr
p
pp
mf
mp
f
3

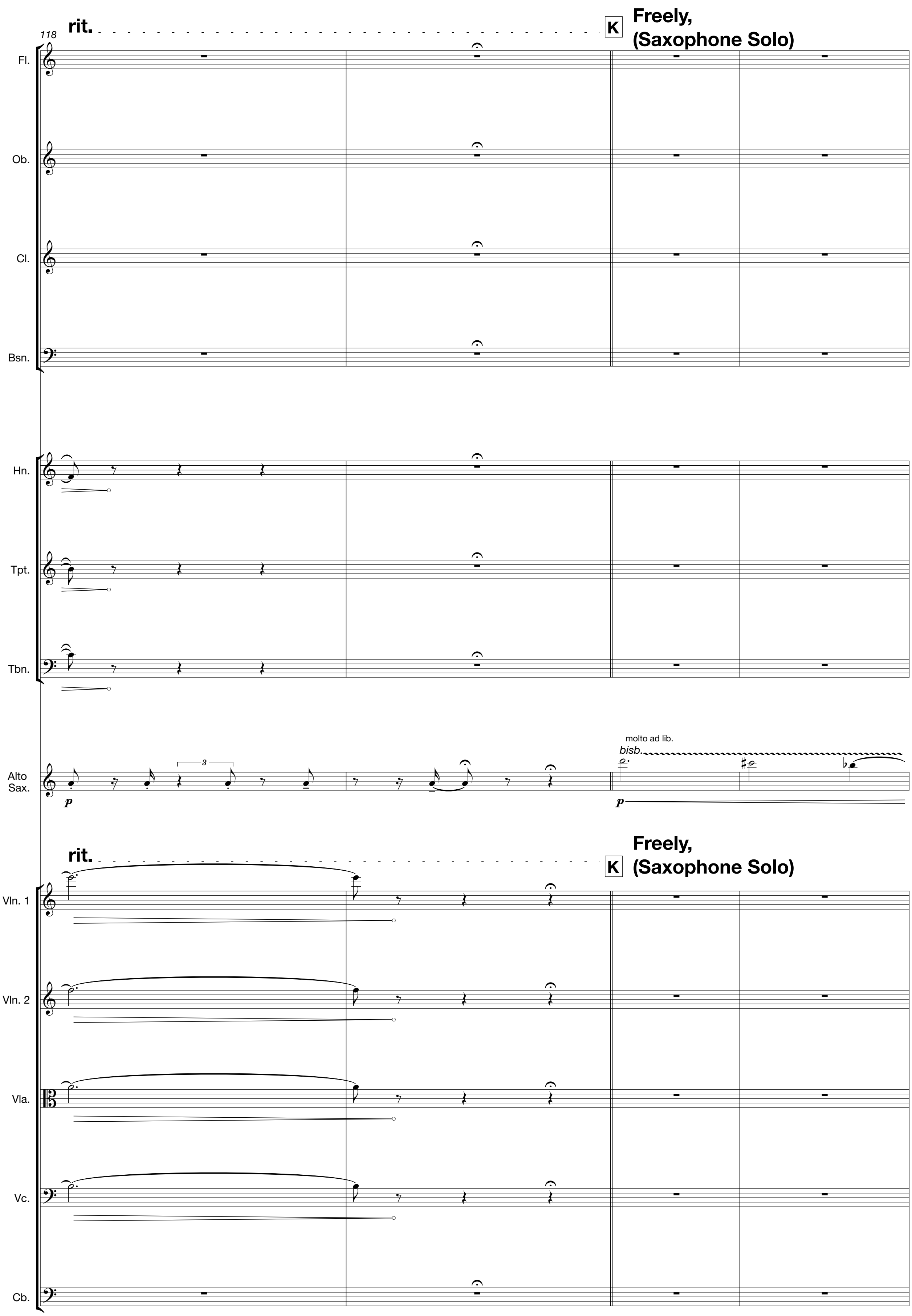

102
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p
mf
f
9
3
5

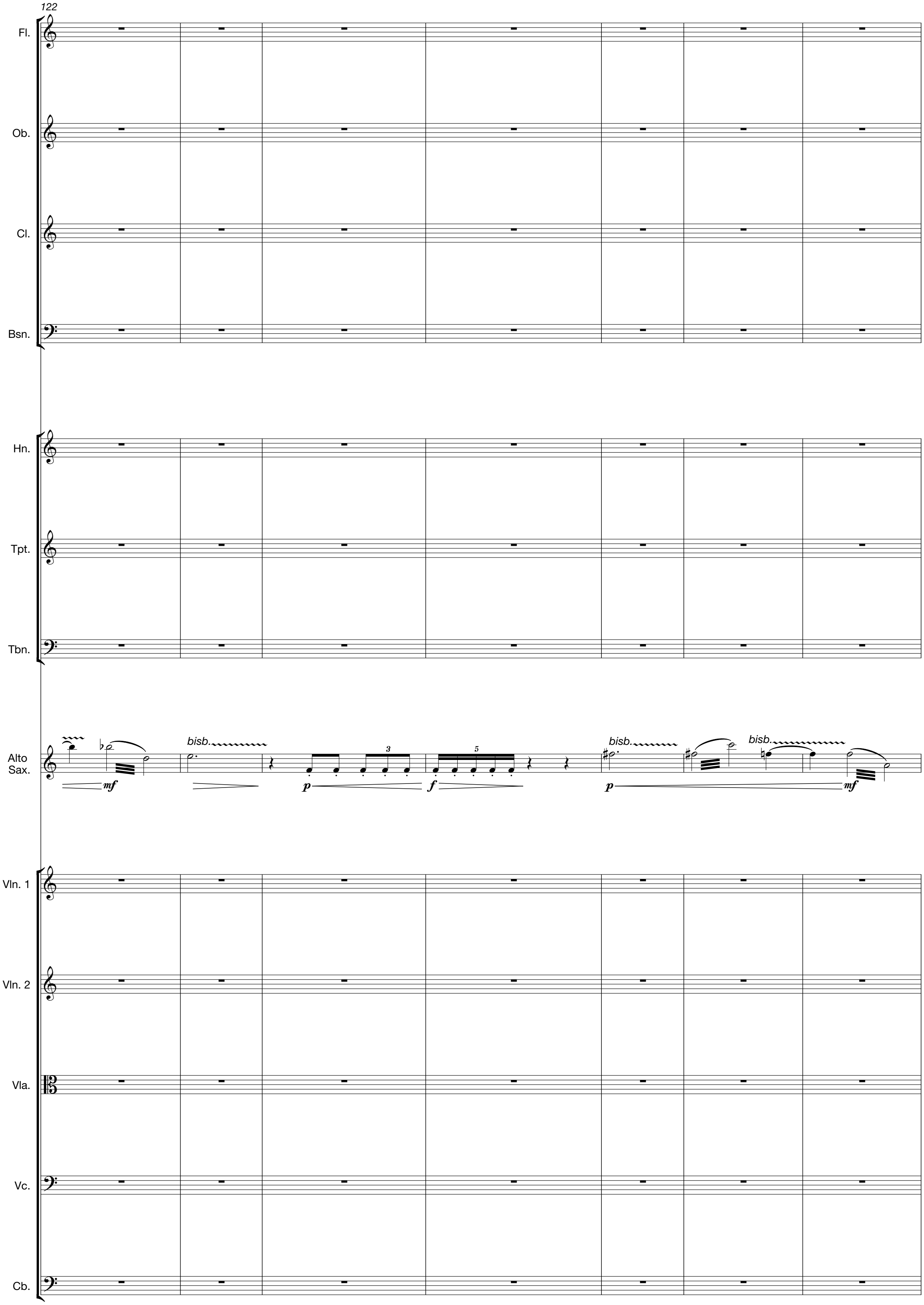

(tr)
106
Fl.
tr wt
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
p
mf
mp
3
flautando

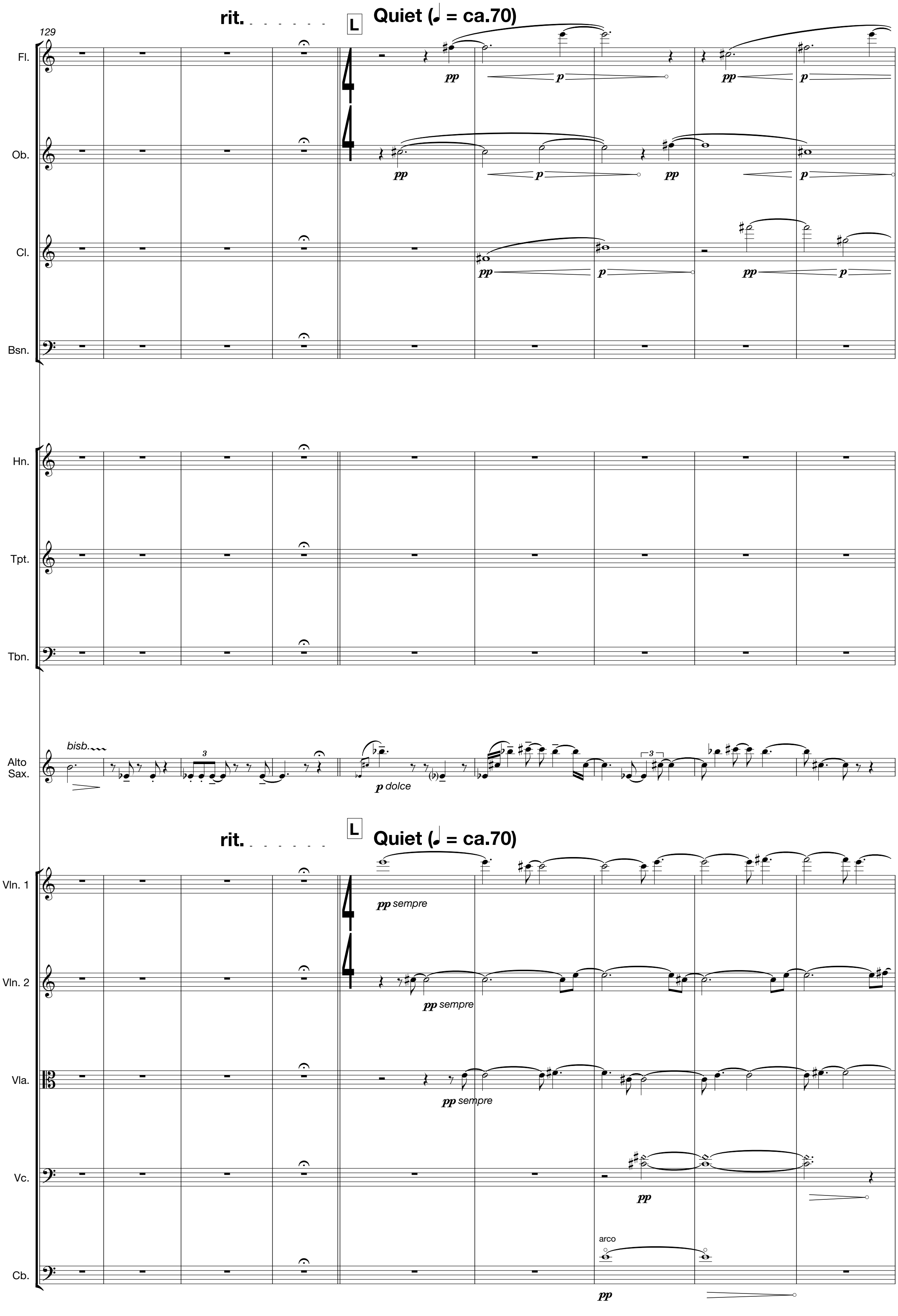

110
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p
pp
tr½
tr
3
flautando

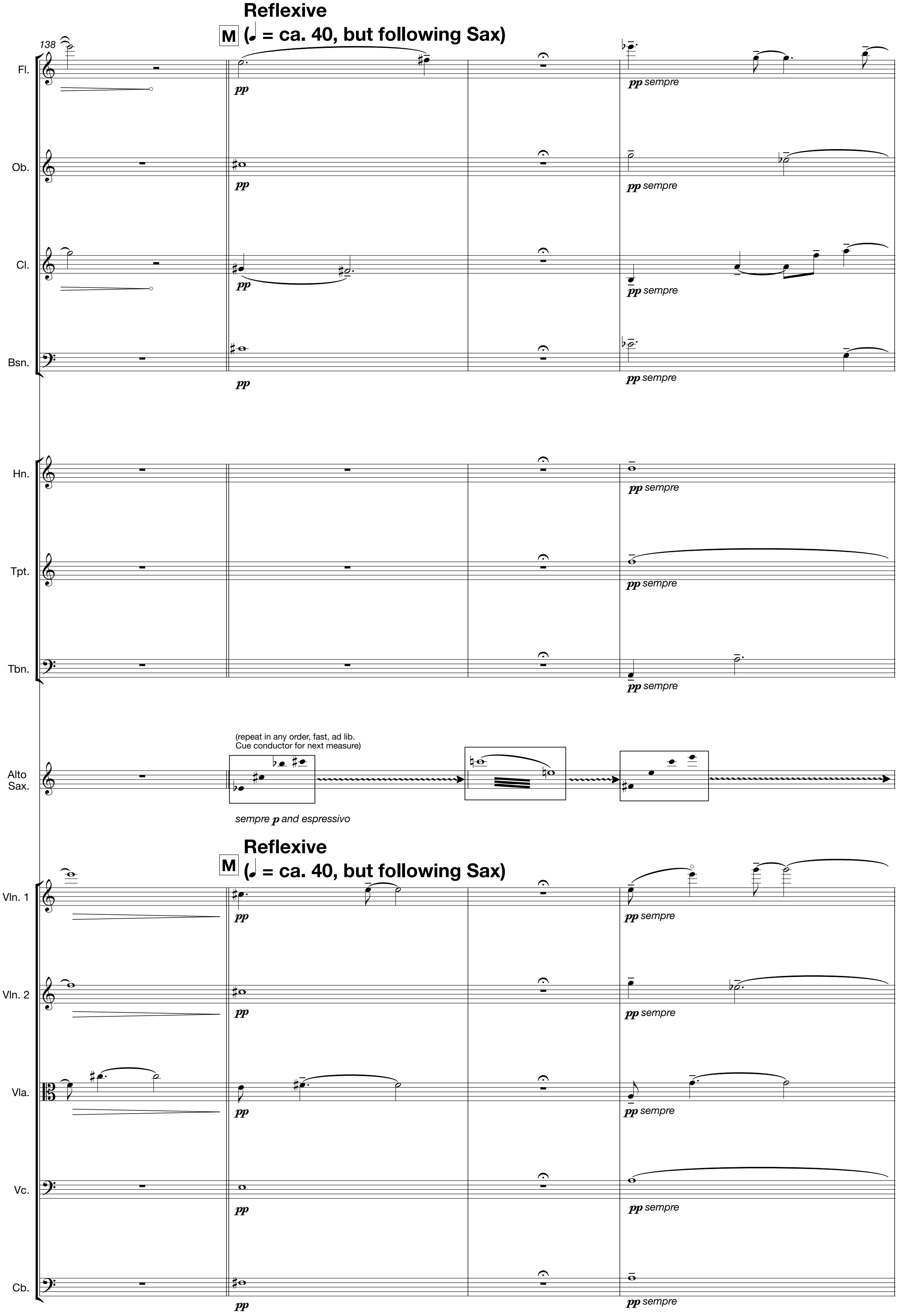


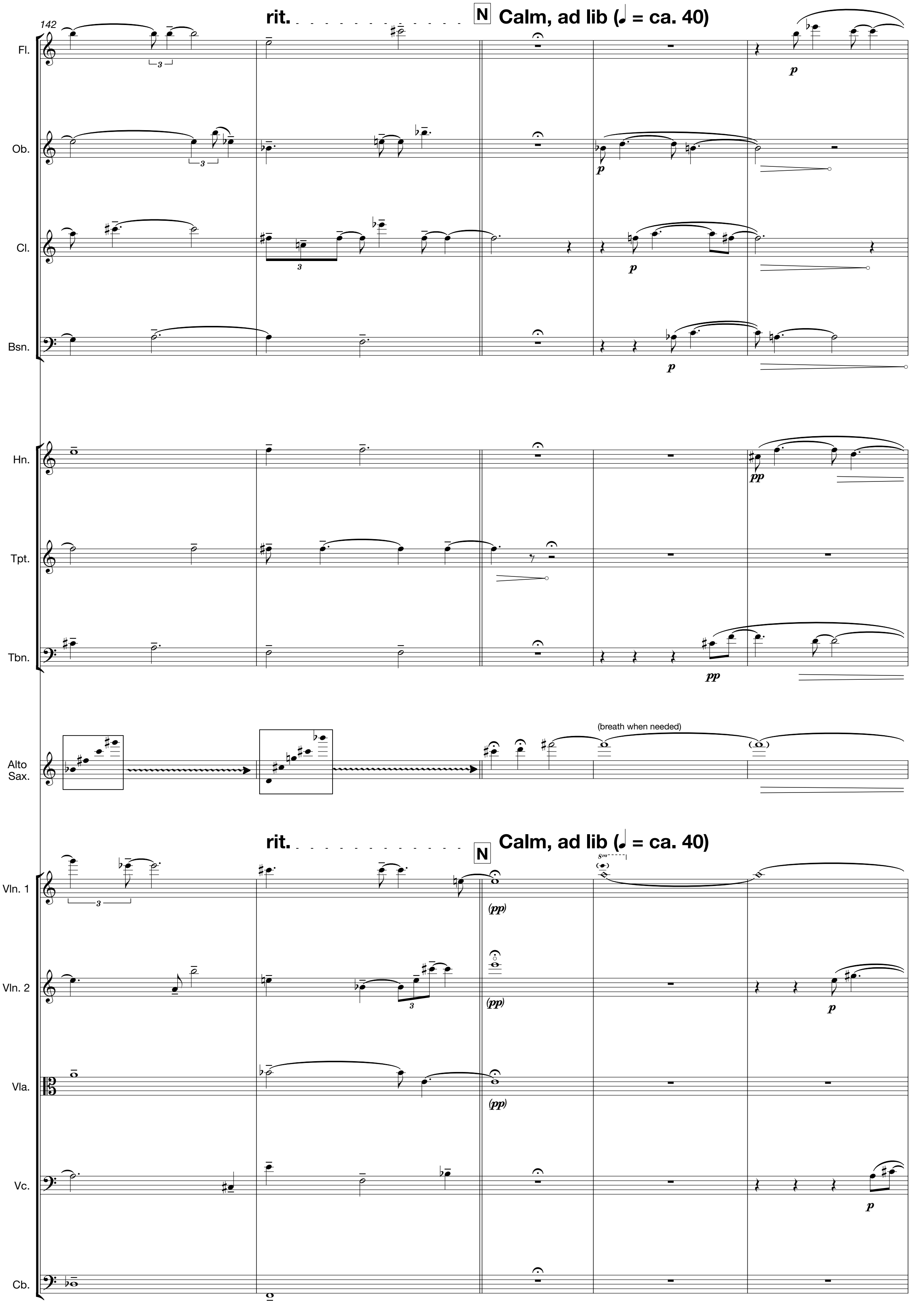
114
Fl.
Ob.
(tr)
p
Cl.
(tr)
p
Bsn.
mf
3
p
Hn.
pp
mp
p
Tpt.
pp
mp
p
Tbn.
pp
mp
p
Alto Sax.
p
3
mf
3
pp
3
non Vib.
Vln. 1
pp
non Vib.
Vln. 2
pp
non Vib.
Vla.
pp
non Vib.
Vc.
pp
pizz.
Cb.
mf
3
p

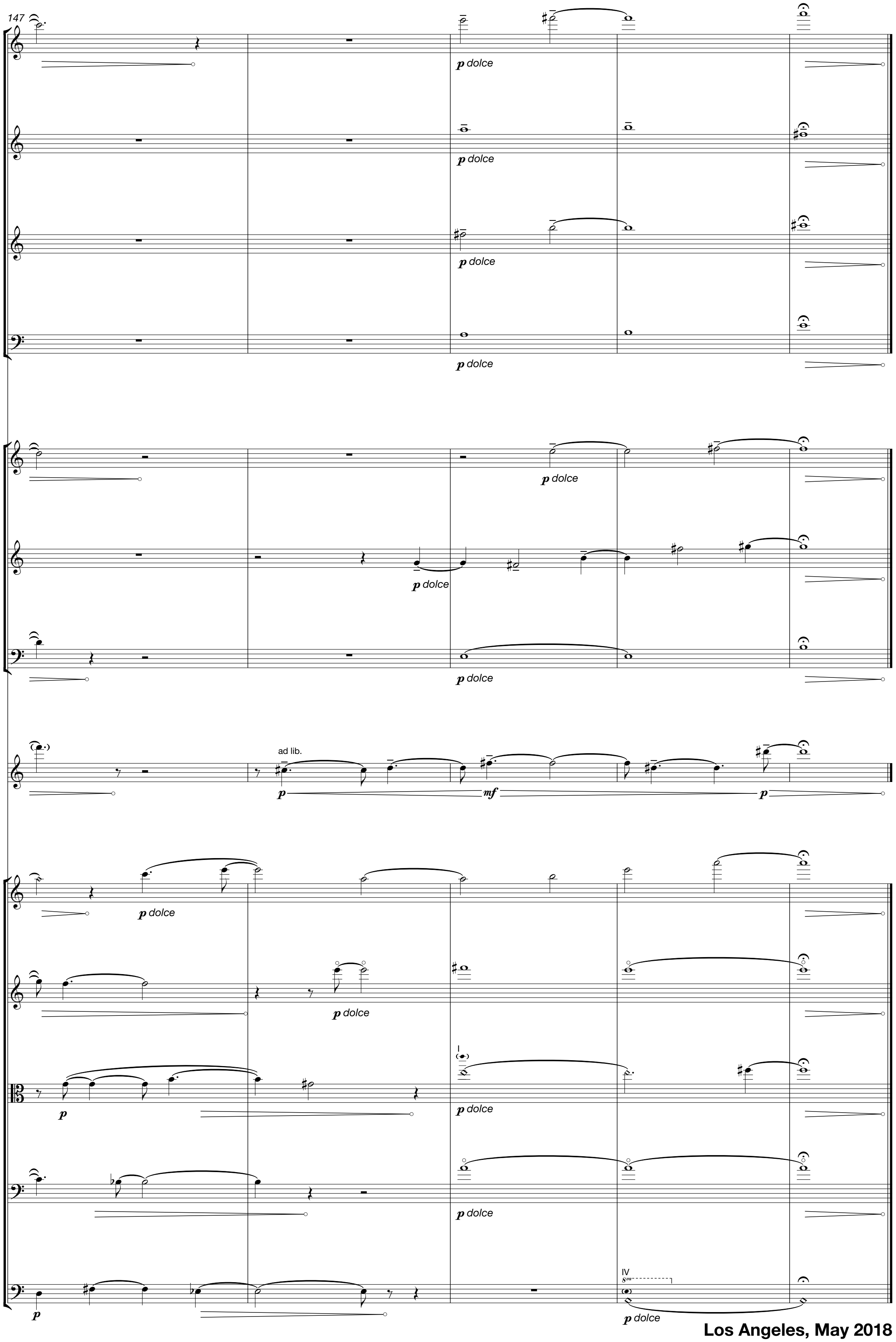

118
rit.
K
Freely,
(Saxophone Solo)
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
3
p
molto ad lib.
bisb.
p
rit.
K
Freely,
(Saxophone Solo)
Vln. 1
Vln. 2
Vla.
Vc.
Cb.


122
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
bisb.
mf
p
3
f
5
bisb.
bisb.
p
mf
Vln. 1
Vln. 2
Vla.
Vc.
Cb.


rit.
L
Quiet (♩ = ca.70)
129
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
bisb.
p dolce
3
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
p
pp sempre
arco


Reflexive
M (♩ = ca. 40, but following Sax)
138
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
pp
pp sempre
(repeat in any order, fast, ad lib.
Cue conductor for next measure)
sempre p and espressivo
Reflexive
M (♩ = ca. 40, but following Sax)


142
rit.
N
Calm, ad lib (♩ = ca. 40)
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
(breath when needed)
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
3
p
pp
(pp)
8va


147
Fl.
Ob.
Cl.
Bsn.
Hn.
Tpt.
Tbn.
Alto Sax.
Vln. 1
Vln. 2
Vla.
Vc.
Cb.
p dolce
ad lib.
p
mf
I
IV
8va

Los Angeles, May 2018

Meeting 3.0

The experience is intended for multiple participants.

Participants, share the same space and can move around freely, in any direction. Each participant has a symbolic representation of their position, like a quasi-transparent amorphous group of particles in motion with a halo. It is visible to all the participants. They can interact with the sound and music in specified places.

The rehearsal letters (squared) are used to refer to sections or musical materials in the score. The music in *Meeting 3.0* is derived from musical motives of the solo part in the original *Meeting.* The electronic version, *Meeting 2.0,* inspires the electronic sounds, textures, and overall structure in Meeting 3.0. They will not have any visual effect *per se*. A recording of meeting 2.0 can be found with the documentation of this dissertation.

Meeting 3.0 has an approximate duration of 8 minutes.

"Meeting 3.0" Begins

Dark. The background space is dark throughout. The participants' halo has a soft white light on it.

Section 1 – Intro – *Expect*

The sound of an alto saxophone begins to emerge, spatialized, each long note coming from a different place in a wide space. Notes are sustained for few seconds while the sound is moving around.

Progressively, the sounds (single notes and short motives) begin to generate visuals, like trails of particles (one for each note) moving in the space. They have different tonalities of the same color (darker for lower pitch, clearer for higher pitch).

The sound is a constant hybridation in progress between acoustic saxophone (all of the family, all registers) and a digitalized version of the the saxophone sound. The digital component is not hidden; on the contrary it is part of the sound. It evolves through time, like being part of its sound envelope.

The perception of the sound is based upon each participant’s position in space.

Section 2 – (approx. at 1’) – *Play*

Once the music has been presented (at $\boxed{\text{A}}$), it creates an echoing space. Each note, or motive, seems to generate ramifications taking different directions in the space. The music has an overall static texture, with many active elements in it, motives repeating, answering each other, moving around, etc.

While the music continues to generate the sense of an constantly growing space, participants can interact here with musical motives by “capturing” one or two at a time. Once “captured”, the sound can be manipulated in real time (while it is still playing) by:

1. Modifying pitch by microtonal transposition, inversion, and spatial rotation (pitches closer, and farther away).
2. Modulating the sound as additive synthesis, changing parameters that will be visually available when the sound is “captured”.

3. Stretching the duration of the sounds within a reasonable ratio.
4. Propelling the sound motive towards a particular direction, and therefore “freeing” it.

After two minutes in this section, all motives, gestures, and notes begin a process of compression and consolidation toward a single note in the high register, as at $\boxed{\text{G}}$.

The participants will feel a resistance while playing with the music at this point, until they are allowed to move toward the consolidation area.

The consolidation area should feel as if it is in the center of the space, almost like a concentrated mass of sound. It should be visible, with a mutating color and constantly reshaping.

Section 3 (approx. at 4’) – *Hold*

A long high pitch lasts for a few seconds, increases in volume, and unexpectedly fades away in all directions, like in an explosion, although not necessarily loud. After a few more seconds of the sound vanishing, it seems to come back in a granulated form, like a stream of micro particles of sound (very short notes). It comes back from afar and toward the participants. It feels as if it is travelling at great speed because of the extreme granulation of the sound.

Each participant becomes a pole of attraction to the sound from all directions, no matter where they go.

There is a haptic response to this stream of sound, like a tingle. It should be as global as possible around each participant’s body, and completely uniform if the participant does nothing.

If he/she moves (for example extending a hand as if trying to stop the particles):

1. There will be a haptic response, an increase in the pressure as a reaction.
2. The motion of the participant will microtonally detune the pitch of the particles of sound when reaching the contact (up or down depending on the gesture).
3. If the participant’s movement is abrupt, the particles will produce an additional sound of distortion due to the impact.

The effect of this interaction is audible but only at a very close range, most likely only heard by each participant, unless they are really close to each other.

There is a visual realization of the particles moving fast toward each participant.

Section 3 (approx. at 5’) – *Run*

A saxophone begins to play a very fast solo (a mix of $\boxed{G}$ and $\boxed{H}$ elements).

It moves all over the place and seems to attract and absorb the particles. The solo repeats while extending a few notes in each phrase after every repetition. When the sound gets closer to the participant, or vice versa, it reveals more of the notes in-between the original solo, such as faster rhythmic levels in between the notes perceived from afar.

There is a visual representation of the solo, similar to that of the motives in section 1, but larger, thicker, and richer in coloration.

The sound leaves a subtle trail of “digitalized” sound.

Participants can interact with the solo by touching it as it approaches them. This contact will generate soft and brief alterations in the notes by:

1. Filtering frequencies
2. Increasing the volume of the digitalized trail
3. Dividing momentarily the sound into two or three distinct tones (although they will be very close to each other).

Section 4 (approx. at 7') – *Away*

Once the space is cleared, the solo disintegrates and breaks into a few different contrasting motives at different registers. The music is progressively gets sparer, with more space for silence in between the motives and notes.

The participants can "chase' some of these motives in the space. They will distance themselves from the theoretical center, but this does not matter. Gradually, sounds will reappear in different positions, making it harder to follow them, and ultimately losing the participant and disappearing.

Motives will be recognizable in color and shape, but will lose definition throughout the last minute of the piece.

Dark.

END of "Meeting 3.0"

Meeting 3.0 tries to propose an interactive experience based on the musical motives of *Meeting,* and the immersion and digitalized sound world of *Meeting 2.0*. The aim is to treat the musical elements almost like physical objects in a shared space with the participants. Immersion in this case, comes from the complete spatialization of the musical material. Interestingly, the elements' spatial location, motion and acoustic treatment (for example the different types of reverb that could be applied to each of them individually) are what end up defining the space, rather than hypothetical dimensions.

The solo and the derived musical motives, which were in the original acoustic version, is based and evolves, from repetition towards expansion; a sort of feedback process where the material is defined, extended, and consolidated. This gives the opportunity to generate a section in the piece, and a space, where the participants can interact for a while with the musical material, modify it and even share it (send it towards, in the description) with other participants.