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The Conductor's Role in Electro-Acoustic Orchestral Music: Performance Practice Problems in

Kaija Saariaho's *Verblendungen*

A dissertation submitted in partial satisfaction  
of the requirements for the degree of  
Doctor of Musical Arts

by

Dean Anderson

2015

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2015

## ABSTRACT OF THE DISSERTATION

The Conductor's Role in Electro-Acoustic Orchestral Works:  
Performance Practice Problems in  
Kaija Saariaho's *Verblendungen*

by

Dean Anderson

Doctor of Musical Arts

University of California, Los Angeles, 2015

Professor Neal H. Stulberg, Chair

The pairing of electronic elements with traditional orchestral instruments confronts the conductor with many performance practice problems. These problems are examined in this dissertation using Kaija Saariaho's first work for orchestra and tape - *Verblendungen* (1984) - as a case study. The challenge for the conductor is to address issues that arise as a result of the electro-acoustic integration. These include, but are not limited to, problems of balance, articulation and conducting inflexible elements, such as recorded media. Although *Verblendungen* is Saariaho's first major work for orchestra and tape, it is performed far less than her subsequent electro-acoustic orchestra works. The composer herself felt that that work was too "stiff." Despite her reservations about the work, it is arguable that the conductor can play a vital role in relieving the work of some of its rigidity. The author uses *Verblendungen* as a template to devise strategies that can aid the conductor in developing an individual artistic interpretation of other electro-



acoustic orchestral works. To this end, several correlating performance practice issues in other similar works are examined.

The dissertation of Dean Anderson is approved.

Mark Carlson

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Edward Parson

Movses Pogossian

Neal H. Stulberg, Committee Chair

University of California, Los Angeles

2015

DEDICATION

*To my loving wife Myroslava Khomik*

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Above all, I would like to give my heartfelt thanks to my loving wife Mira for believing in me and for supporting me through the years as I pursued my passion and career. I am truly grateful to her for encouraging me to follow my dreams, to always challenge myself to grow as an artist, and to never give up.

## VITA

**Dean Anderson** is the Music Director of the Dana Point Symphony. He is also Director of Orchestra Studies at La Sierra University (Riverside, CA). He is frequently engaged as an orchestra clinician and has worked with youth ensembles from across the United States.

As a guest conductor, he has led the Grumo Festival Orchestra (Grumo, Italy), Hong Kong Chamber Orchestra, Siam Sinfonietta (Bangkok, Thailand), Yakima Chamber Orchestra, Cerritos College Orchestra, and the Southern California Chamber Ensemble in Nagoya, Japan. In 2011, he was invited to guest conduct the Ho Chi Minh City Ballet Symphony in Vietnam, becoming the first American ever to conduct the orchestra professionally there.

In 2015, he was invited to join the faculty at the Montecito International Music Festival as the Principal Orchestra Director. He also led the combined orchestras of La Sierra University and Symphony Irvine at Walt Disney Hall in the West Coast premiere of Marcos Galvany's operatic tableau *O My Son*.

As an opera conductor, he performed Giuseppe Lupis' *Il Pianista Disgraziata* in Bologna, Assisi, Binetto, Loro Piceno, and Toritto. Other opera performances include Wolf-Ferrari's *Il Segreto di Susanna* and Mercadante's *I Due Figaro* with Opera UCLA and Puccini's *Gianni Schicchi* with the Fullerton College Opera Workshop. He conducted the West Coast premiere of Daron Hagen's *Little Nemo in Slumberland*, with the La Sierra University Opera.

Mr. Anderson studied violin with John Mcleod and conducting with Edward Dolbashian at the University of Missouri – Columbia (BM1998, MM 2000). He has also participated in conducting master classes with Gustav Meier, Mark Gibson, Marin Alsop, Mihail Agafita, Daron Hagen, Don Thulean, and Lawrence Golan.

## INTRODUCTION

### Conductorial issues in electro-acoustic music

The pairing of electronic sounds with traditional orchestral instruments – referred to as “mixed-media” or “electro-acoustic” ensembles – confronts the conductor with a significant number of new issues:

- Electronic sounds are produced in many different forms. They can be produced using pre-recorded sounds that have been modified via a sound laboratory or computer program (such as in *musique concrète*); or they can be produced in real time by a live player using an electronic instrument such as a synthesizer (digital or analog) or a sound module. Some electronic sounds are produced through the modification of acoustic sounds using special amplification equipment or a sound harmonizer. The conductor must first understand how electronic sounds are produced in order to successfully pair them with the acoustic sounds of the orchestra.
- The majority of electro-acoustic works do not provide standard notation for the electronic parts, making it difficult for the conductor to prepare the score for a live performance.
- In works written for orchestra and recorded media, the conductor faces the challenge of leading an ensemble that includes inflexible elements. He or she must adhere to strict limitations imposed by the composer while achieving an individual interpretation.
- In the rehearsal process, the conductor must discover new methods to help the orchestra adapt to performing with electronic instruments.
- Conductors of electro-acoustic music must expand their skill set beyond the demands of the traditional orchestra. They must be knowledgeable in acoustic principles and stay

current about developments in audio technology in order to effectively combine electronic and acoustic instruments.

The purpose of this dissertation is to examine these conductorial issues and to devise strategies that can aid the conductor in developing an individual artistic interpretation of electro-acoustic orchestral works. Kaija Saariaho's *Verblendungen* (1984) is used as a case study.

### Why “Verblendungen?”

There are an enormous number of electro-acoustic orchestral works from which to choose in examining conductorial issues. I chose *Verblendungen* for the following reasons:

- 1) Among works originating from the Spectralist<sup>1</sup> style of composition, it features seamless integration between electronic sounds and those produced by acoustic means for the purpose of timbral development and texture. This requires the conductor to place special emphasis on balance, articulation, and tempo.
- 2) *Verblendungen* was Saariaho's first work for orchestra and tape. By the composer's own admission, it was not a piece she could approve. (She proclaimed it “stiff.”)<sup>2</sup> It is performed far less than her subsequent electro-acoustic works for orchestra. The challenge for the conductor is to find a way to add breath and flexibility to a performance of this work.
- 3) There are sections in the orchestral score where Saariaho uses tape composition techniques – sound envelope modification, frequency modulation, overtone structures,

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<sup>1</sup> According to the definition given at the Istanbul Spectral Music Conference in 2003, spectralism is a compositional style that focuses on timbre as the primary element of structure or musical language.

<sup>2</sup> Howell, T. Jon Hargreaves and Michael Rofe. *Kaija Saariaho: Visions, Narratives, Dialogues*, p.11.



and delay effects, among others - to create the seamless texture between the tape and the live players. By exploring the elements of these techniques, it is possible to obtain a deeper understanding of the score, providing a stronger basis for interpretation.

### Performance of *Verblendungen*

As part of the requirements for the Doctor of Musical Arts in degree in Orchestral Conducting at UCLA, I conducted the UCLA Philharmonia in a performance of *Verblendungen* on May 14, 2015. I also lectured about the work at the concert.

I was first introduced to the works of Kaija Saariaho during a contemporary music seminar at UCLA taught by Dr. Gloria Cheng. Upon hearing Saariaho's music, I was immediately intrigued by the emphasis on timbre as the primary element in her compositions. I was inspired to investigate her orchestral works to see if they contained any specific problems confronting the conductor. After discovering *Verblendungen*, which is written for thirty-five live musicians and tape, I decided to program it for my lecture recital and to use the work as the central piece in my dissertation.

According to the performance history records at G. Schirmer – distributor for this work in North America – *Verblendungen* had not been performed in the United States since 1997. There was no official record of who conducted the 1997 performance. (I suspect it was the performance in San Francisco by the Women's Philharmonic led by J. Karla Lemon<sup>3</sup>, but Schirmer could not confirm.) At the time of my initial research, there were no live video or audio recordings available from which to study performance practice. (I did have the great fortune of meeting Esa-

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<sup>3</sup> J. Karla Lemon was an active conductor and a passionate advocate of contemporary orchestral works, particularly works by women composers. She passed away in 2009.

Pekka Salonen at a fundraising event for the Hear Now Music Festival that took place in Los Angeles on March 15, 2015. Mr. Salonen related to me his experience with *Verblendungen* when he premiered the work in 1984 with the Finnish Radio Orchestra. He shared some important insights, particularly concerning the issue of coordinating the live musicians with the tape.)

During the rehearsal process, UCLA Philharmonia musicians proved to be an invaluable resource for solving issues of articulation and balance. Though most of the musicians had no prior experience with music of this type, they raised important questions regarding non-notated aspects of tone production in the work. As a result, I was able to make some significant adjustments that allowed certain passages to be heard more clearly in the performance. The findings I obtained from having rehearsed and conducted this work will be discussed later in this study.

### *Need for Research*

Before continuing, it is useful to take a larger look at the conductor's role as it relates to contemporary music. There are few publications by authors who focus on the subject of modern music conducting, and even fewer concerning conductorial issues in electro-acoustic music. Edwin Roxburgh's recent book *Conducting for a New Era* (Boydell Press, 2014) is one of the resources available. He explores the problems of conducting with electronics; his approach has proven highly relevant to this study. Another useful source on conducting contemporary music is *Performing Twentieth-Century Music: A Handbook for Conductors and Instrumentalists* by Arthur Weisberg (Yale University Press, 1993). The author examines basic gestures and solutions to problematic excerpts found in modern repertoire. Weisberg provides additional context which is useful to this dissertation, though it does not address the electro-acoustic genre at all. Both of

these resources provide good information for those seeking to gain insight conducting contemporary music. However, because there is much diversity among contemporary works, conductors would benefit from more scholarship that examines the conductor's role as it pertains to specific modern works or compositional styles. I believe that examining these issues on a micro-level will encourage more conductors to approach other similar works in the same manner, which could possibly lead to more performances of electro-acoustic orchestral compositions.

The body of this study is divided into three chapters. The first chapter analyzes the work's structure and timbral elements. This provides the necessary context from which to begin a discussion of important performance issues. The second chapter identifies performance issues for the conductor, specifically concerning interpretation, articulation, notation, and technical logistics. The final chapter explores similar conductorial issues in some other electro-acoustic works. These works were selected to showcase the variety of electro-acoustic writing, and to examine how they may affect the conductor's role.

## CHAPTER ONE

### **Kaija Saariaho's *Verblendungen***

#### Context

One of the characteristics of a great composer is the ability to use familiar elements to create something new. When the premiere of *Verblendungen* took place in 1984, the concept of combining electronics – specifically, pre-recorded sounds on tape – with live orchestra players was not an original idea. Otto Luening's and Vladimir Ussachevsky's joint composition *Rhapsodic Variations for Orchestra and Tape* (1954) had already preceded *Verblendungen* by thirty years. Robert Whitney led the Louisville Orchestra in the premiere of *Rhapsodic Variations* in what is considered the first live performance of a work that combined live musicians with tape. Elliot Schwartz provides some context for what he labels “orch-tech” music. He reports,

“There was widespread fascination with the newfound medium (recorded sounds) and combining it with the orchestra seemed natural, almost inevitable. Composers were naturally excited by having the ‘fixed’ medium of the tape placed next to a live human performance. There seemed an unlimited potential for creating a new kind of ensemble music, with unparalleled variety of situations and scenarios. The orchestra seemed a perfect live foil for the electro-acoustic medium. The power and volume of loudspeakers could easily compete with a full orchestra. Conversely, tape music's delicate timbral nuances could dovetail nicely with solo and chamber-like passages. For variety of tone color and dynamic range, the orchestra equaled the tape studio or synthesizer.”<sup>4</sup>

For Saariaho, the combination of electronic sounds with live performers was critical to the development of her compositional language. According to Pirkko Moisala, “Tape music and music produced and controlled by computer hold a central position in Saariaho's works of the

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<sup>4</sup> Elliott Schwartz. “Stars, Stripes, Batons and Circuits: American Music for Orchestra and Electronics.”

1980s, but new technology has been only one among the many instrumental resources that she has used in her microscopic attention to and manipulations of sound.”<sup>5</sup> It is not merely the addition of electronics to the orchestral palette that gave originality to her voice. According to the composer herself, “Harmony, texture, and timbre: those things were then, and still are, at the heart of my musical thinking” (Howell, p12).

From a broad perspective, the contemporary composers’ interest in the orchestra/tape genre can be traced to the growing demands of serialism and spectralism. In serialism, the growing desire among composers for more precise execution of rhythmic figures and untempered pitch intervals reached a point beyond human abilities. Electro-acoustic music is not simply a new form of instrumentation: it is the result of a growing compositional language. In spectralism, where we find the origins of Saariaho’s natural musical language, the combination of electronics and live sounds is designed to create new timbral possibilities.

Yet even in this context, we must differentiate further between Saariaho’s work and that of Tristan Murail and Gerard Grisey – composers who founded the Spectralist style of composition and who influenced Saariaho’s stylistic development at IRCAM (*Institut de Recherche et Coordination Acoustique/Musique*). According to Tim Howell, “Saariaho’s approach to composition is an inter-disciplinary one; it embraces a number of art forms – visual, literary and musical – in works that explore a creative dialogue between image, continuity and time.”<sup>6</sup> This combination of visual and literary art forms is apparent in her early works for orchestra and electronics. Compared to Grisey, Saariaho’s music explores more the emotional and psychological states of sound. In her own comments on Grisey, she states,

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<sup>5</sup> Pirkko Moisala. “Gender Negotiation in Finland.” *Music and Gender*, p186.

<sup>6</sup> Howell, Tim. Jon Hargreaves and Michael Rofe. *Kaija Saariaho: Visions, Narratives, Dialogues*, xv.

“Grisey’s approach did not match mine. I became his friend, but he had a very systematic way of analyzing his sonograms; his orchestration was mathematical, and my work was not at all systematic or mathematical...The technology, the machine, only gives you what you what you put into it...The machine cannot compose for you.”<sup>7</sup>

In an interview with Risto Nieminen, she says “My technique in *Verblendungen* is different. There the instrumentation relies to a great extent on intuition. It is of course planned, but not systematic.”<sup>8</sup>

Saariaho began sketching ideas for *Verblendungen* during what Pirkko Moisala terms her “third period” of compositional development. The previous two phases of her development included her initial discovery of elements that would later become the building blocks of her musical language. Her fascination with the sounds of the forest coupled with her visual perception of sound events led her to the sound laboratories of IRCAM. According to Moisala,

“During this time, Saariaho worked extensively with computers, analyzing different kinds of sounds and becoming familiar with the possibilities computers offered to her compositions...A characteristic feature of the works from this composition period is a form built up without a regular pulse, which slowly transforms sound surfaces, usually on many levels of the music texture.”<sup>9</sup>

It is during this period (1984-1986) that she completed two significant works for orchestra and electronics – *Verblendungen* and *Lichtbogen*. Both works are inspired by other art forms. *Verblendungen* is based on the visual arts (the form of a brush stroke) and the literary arts (based on the book *Die Blendung* by Elias Canetti). Moisala states that Canetti “examines how people can be dazzled by an abstract notion that renders them incapable of perceiving other things. This becomes the core metaphor for Saariaho’s composition.” (Moisala, p31) The

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<sup>7</sup> IBID, p11.

<sup>8</sup> Nieminen, R. “Kajia Saariaho: “At the moment the computer and I belong together” *Finnish Music Quarterly* (1988).

<sup>9</sup> Pirkko Moisala. *Kajia Saariaho*, p26.

correlation between this concept and specific points in the score will be discussed in the formal analysis portion of this study.

### Background and Critical Reception

Commissioned by the Finnish Radio Broadcasting Company in 1984, *Verblendungen* was Saariaho's first work for orchestra and recorded media. Its world premiere was performed under the direction of Esa-Pekka Salonen, to whom the work is dedicated. Translated into English, the title of the work means a type of blindness that results from a flash of dazzling light. Saariaho explains the concept of the work in her program notes:

“The tape part has been worked out with GRM's (*Groupe de Recherches Musicales*) digital tools for manipulating and transforming concrete sound material. The basic material for the tape consists of two violin sounds, a sforzato stroke and a pizzicato. From these two sounds I have built a quasi-string orchestra with a very wide pitch range. The timbres on the tape are very homogeneous because of this single reference spectrum.

The total plan for the use of timbre in the piece is based on the idea that the orchestra and tape are moving in opposite directions with respect to the tone-noise axis. The piece starts with a thick orchestral tutti, which is first hidden and then shaded by the noise on the tape. During the piece the orchestral coloring is transformed into instrumental noises, which, before withering away, shade the quasi-string orchestra on the tape. The orchestra is built to have a heterogeneous nature to contrast with the even colours on the tape. In spite of their different, sometimes opposite materials, the orchestra and the tape should build a common, inseparable sound world. When composing the piece an important factor has been the relation of the surface structure and deeper musical and formal structures. In my network of connections between different parameters I am searching for intersections not only vertically and horizontally on the time axis, but also in the direction of depth, as if the sounds were organized in thick layers in three dimensional perspective, starting from dry, grainy sounds in front and moving towards smooth, more resonant ones.” (Saariaho, 1984)

The composer's description of the work contains important clues to its performance that must be interpreted by the conductor and practically applied. For example, the sounds that she refers to as “dry” or “grainy” are the result of noise tones created in the strings and winds. Saariaho defines noise tones as sounds that have no clear pitch or overtone structure. When viewed through this

perspective, one can see specific areas in the score where she uses the interaction of noise and pure tones to create tension and release.

Although the work would soon gain international success at performances in Paris and London, the work initially had its share of detractors, as shown by these review excerpts from Finnish critics.

“Although the orchestral part had some distinct details, Kaija Saariaho’s ideas seem, to me, still insufficient for such large-scale works requiring a large number of performers...boring it is to listen to such almost static noise, so very boring.” (Seppo Heikinheimo, in *Helsingin Sanomat* 11 Apr. 1984)

“The pompous beginning of the new work promised more to the one-time listener of the sustained piece than earlier works by the dreamer-composer. However, when the imitation of the...bird song faded at the end, the impression of the whole remained flimsily slim.” (Heikki Aaltoila, in *Uusi Suomi* 13 Apr. 1984)

Some reviews have been even harsher, such as a critique given by Joshua Kosman in 1997 in the *San Francisco Chronicle* on a performance given by the Womens Philharmonic conducted by J. Karla Lemon. He referred to the work as a “noisefest” and “arty nonsense” that was “as ugly as it was pretentious.”<sup>10</sup>

It is evident that a performance of *Verblendungen* requires even informed listeners to be prepared to hear the work with the proper expectations. To make sense of the work, they must focus on the composer’s use of timbre as its primary driving force. Reviews such as these indicate that even those from sophisticated musical cultures can reject music that they are ill-prepared to hear. (Finnish critics later championed Saariaho once she achieved international recognition.)

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<sup>10</sup> Kosman, J. “Vivid Postcards From Philharmonic – Lemon explores Welsh, Chinese sounds” *San Francisco Chronicle*. 1997.



In Paris, Saariaho's compositional style gained broader exposure, resulting in wider acceptance of her works. *Verblendungen* had its Paris premiere at the International Computer Music Conference in October of 1984. This event also included performances of Boulez's *Répons* and Murail's *Désintégrations*. At that time, this was one of the largest contemporary music events ever organized in Europe – and it fittingly took place at IRCAM's headquarters.

### *Audience Experience*

Most published reactions about *Verblendungen* are written by music critics, some of which give only general descriptions of the work and the composer's artistic goals. The work has been recorded several times. These recordings have also received mostly descriptive reviews. I believe it is critical to understand the audience's experience of a live performance of this work because it differs greatly from simply listening to a recording. The effect of the noise/pure tone axis is much more vivid when the sound sources – both acoustic and electronic – are heard in a natural environment.

### *Reaction from UCLA Philharmonia members*

The members of the orchestra were divided in their reactions to this work. Before beginning rehearsals, I felt it was necessary to prepare them by explaining the composer's intent and the concept of timbral development as the primary driving force in the work. Throughout the rehearsal process, individual members gave me their opinion on the work. Some felt the work was too difficult to understand, even after extended rehearsal, and that the whole work continued to sound more like noise than music. Others felt that it was a nice change from the usual standard orchestral repertoire, stating that it was somewhat of a relief to shift focus from harmony and rhythm to timbre. It was particularly interesting to observe the percentage of orchestra members

who changed their opinion during the rehearsal process from apprehensive to accepting and even enthusiastic. I believe that their experience throughout the rehearsals led to a greater sense of ownership on their part. Some of them enjoyed being immersed in a wave of orchestral timbre, reporting the pleasurable interplay between dense and open intervals in addition to the noise/pure tone changes.

### Structural Analysis

While a deep theoretical analysis of this work is beyond the scope of this study, a general overview of *Verblendungen*'s structure is an important starting point to understanding some of the issues a conductor faces.

A study conducted by James O'Callaghan and Arne Eigenfeldt proposes the use of "gestural shapes" as a basis for the analysis of *Verblendungen*. They suggest an aural approach to breaking down obvious changes in orchestral texture, register, and dynamic range<sup>11</sup>. These aural gestures form different shapes based on their changes in pitch register, rhythmic density, and dynamics.

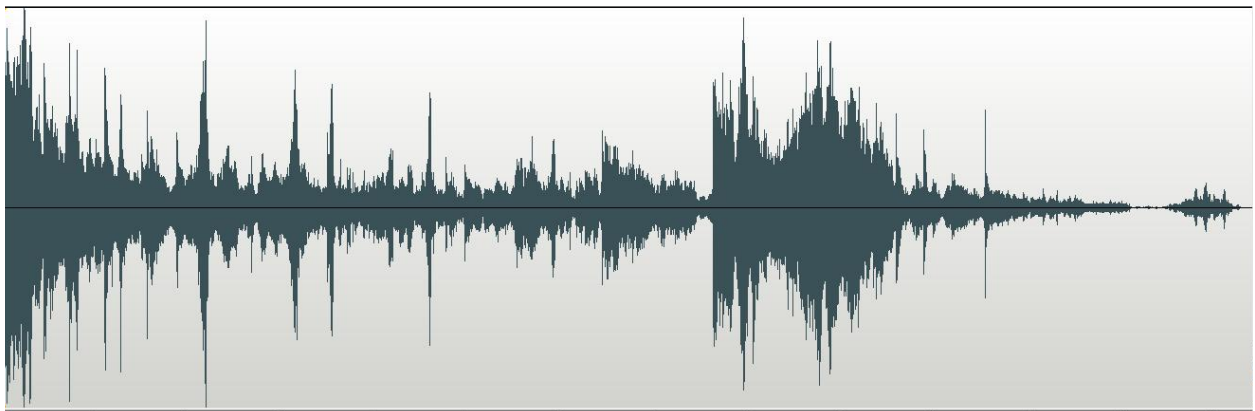
In *Verblendungen*, the overall shape is a diminuendo – which has been compared to a brushstroke (see Fig. 1a and 1b below).

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<sup>11</sup> The term "gesture" or "gestural" in this case refers to aurally perceived sound shapes and not the conductor's arm and hand signals.



*Fig. 1a - Brushstroke image that inspired Saariaho's Verblendungen*

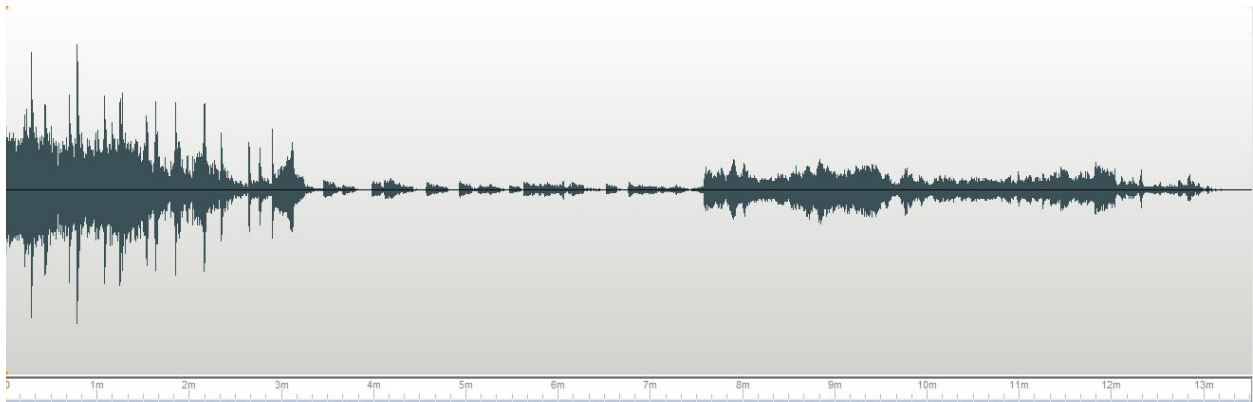


*Fig 1b - Sonographic image of Verblendungen (Orchestra and Tape Combined)*

In this dissertation, I use the O'Callaghan/Eigenfeldt study as a starting point for identifying structural pillars in *Verblendungen*. These structural points do not always occur in a clear sequence. Instead, the entrances overlap each other, producing the morphing effect of the textural transition. These structural elements are the basis for the gestural shapes that are a critical part of this type of electro-acoustic music analysis.

## SECTION ONE: mm. 1 – 40 (Letter E) - Climax

The piece opens with the aural “flash of dazzling light” which propels the work forward. The orchestra is at the maximum dynamic level of *ffff* to which the composer adds the instruction *con ultima forza*. The tape part is also at its loudest dynamic which will taper off before increasing again towards the end (see Fig. 2).



**Fig. 2 - Sonograph of the Tape Part in *Verblendungen***

## SECTION TWO: mm. 41- 61 (Letter E to K)

The structural point at Letter E is the first significant change in texture to occur in the work. The indicators that mark the beginning of this section are the drastic change in dynamic and density in both the tape part and the orchestra. In addition, the *forte* chord in the percussion and harp which is coupled with the half-step harmonic movement in the strings reinforces the effect of the timbral change.

### *Textural elements*

The textural devices used in the section create the momentum which leads to the next structural point. These devices are:

- The rhythmic interplay beginning in the Viola 1 and 2 parts and extending through the rest of the string section

Viola I: *very even*, *sempre non espr.*, slurs with fingerings 7, 0, 3, 5.

Viola II: *mf legatiss. sempre*, *very even*, *sempre non espr.*, slur with fingering 7, 0.

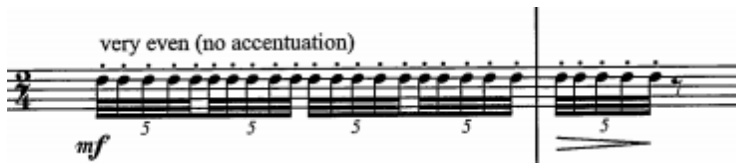
- The tremolo and trill figures that start in the Violin 3 and 4 parts and transfer to Flute, Violin 1 and 2, Piano and Harp.

Violin 3 & 4: *mf*, *pont. ord. (S.V)*, *very even (no accentuation)*. Tremolo eighth notes.

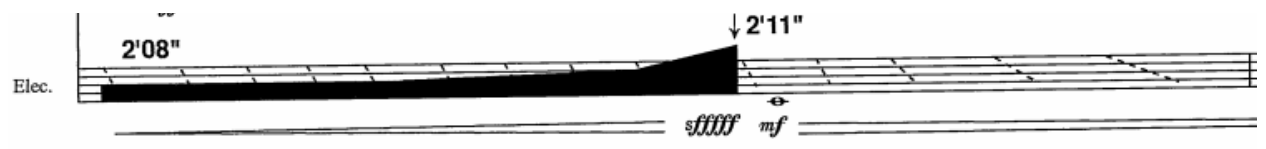
- Changes in articulation from *senza vibrato* to *wide rapid vibrato* in the wind parts

Wind parts: *mf*, *S.V.* → *wide rapid vibr.*

- Rapid repeated notes beginning in wind parts and transferring to string parts at Letter H



- Drastic change in the tape part at Letter E

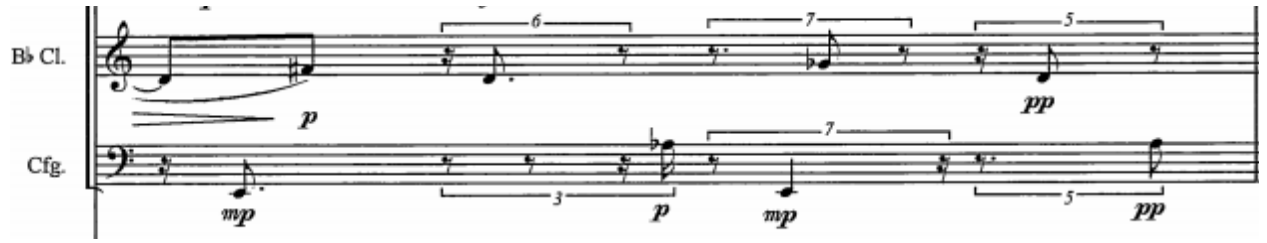


At Letter I, there is another drastic change in the orchestra texture which is preceded by a build-up of dynamics in the tape part and articulated glissandi in the string section. While some may interpret this as another structural point, one can argue that there is no new textural element introduced after this point. It is continuation of the rhythmic interplay that began at Letter E. This interplaying figure is developed in addition to the vibrato textural device which started in the wind section (*S.V to Wide Rapid*). Thus, this section can be viewed more as a secondary phrase section which will end at Letter K.

SECTION THREE: Letter K

There are two important textural devices that occur in this section:

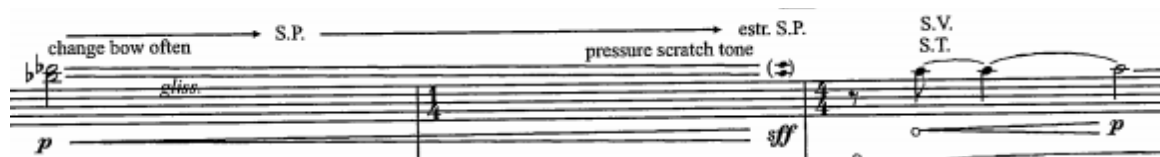
- 1) the rhythmic interplay figures in the previous section begin to break apart in to shorter staccato articulations that are spaced further apart, producing a sound texture that is more pointillistic:



- 2) the string section slowly starts adding tremolo figures that contain wider intervals – essentially creating a new texture that outlines harmonic movement.



The section between Letter M and N serves as a transitional phrase. It is marked by the abrupt dropping of the intervallic tremolos in the strings. Additionally, scale figures are introduced in the wind section that will be further developed in the next section. A significant textural marker occurs in the measure before Letter N. The strings are instructed to increase the “scratch tone” (see Fig. 3 below) right before the change to a pure tone on the downbeat of Letter N. This is significant because it is the first time the orchestra produces a noise tone. This is the beginning of the noise/pure tone interplay which will be further developed in subsequent sections.



**Fig. 3 – Scratch tone**

**SECTION FOUR: Letter N to m.155**

The section between Letter N and m.155 can actually be divided into three sub-sections. The sections are outlined at Letter P and S. The reason this should be perceived in this fashion as

opposed to three larger structural points is that the textural materials are more developmental results based on earlier ideas.

In the first sub-section the composer introduces rapid arpeggio figures in the strings. These figures are played *spiccato* at first and then transition to *alla corda* – on the string – and gradually moving towards the tip of the bow. This texture occurs under upward scale figures in the winds until transforming into rising articulated glissandos.



At Letter P there is the rhythmic interplay figure (which was first introduced at Letter E) which is underscored by the tone color figures executed by the string section. The tone color changes in this section are a variation of the earlier figure demonstrated before Letter N, only this time instead of moving between noise (scratch) tone and pure tone, they are moving between the glass-like tone of *ponticello* and a normal pure tone. The final sub-section begins at Letter S, and it contains more of the earlier figures. It begins with more emphatic use of artificial harmonics in the strings.

#### SECTION FIVE: Tape Solo m. 155

The entrance of the tape solo occurs at approximately 7'36" into the piece. It is significant because it is the intersecting point where the tone functionality of the orchestra and tape switch places. From this point until the end of the work, the orchestra produces more noise tones while the tape part produces pure tones. (The MIDI transcription of the tape solo is displayed in Chapter Two.)



SECTION SIX: Letter Y – Orchestra noise tones

Saariaho uses the low pitch registers in the strings to create the subtle entrance of the orchestra. The goal is to produce a seamless integration of electric and acoustic timbre. The winds are given special notation to indicate the production of air tones. The grating sound of the guiro is also introduced in this section.

The image shows a musical score for two flutes. The top staff is labeled 'Fl.' and the bottom staff is labeled 'Fl. A.'. Both staves are in 4/4 time. The Fl. staff has a treble clef and a key signature of one sharp (F#). The Fl. A. staff has a treble clef and a key signature of one sharp (F#). The Fl. staff has a wide slow vibrato marking over a long note, with a *pp* dynamic marking. The Fl. A. staff has a wide slow vibrato marking over a long note, with a *ppp* dynamic marking. Below the staves, there are two lines of text: '(S.V. sempre)' and '(see prelim. performance notes)'. There are also some circled symbols and arrows indicating performance instructions.

SECTION SEVEN: Letter DD to EE - Noise Tone Rhythmic structures

In the penultimate section, the introduction of noise tones is coupled for the first time with prominent rhythmic figures. The string section is producing only noise tones at this point.

The image shows a musical score for a string instrument. The staff is in 4/4 time. The key signature is one sharp (F#). The score starts with a boxed 'EE' and the instruction 'air through instrument, no fingering'. The first measure has a quarter note. The second measure has a quarter note. The third measure has a quarter note. The fourth measure has a quarter note. The fifth measure has a quarter note. The sixth measure has a quarter note. The seventh measure has a quarter note. The eighth measure has a quarter note. The ninth measure has a quarter note. The tenth measure has a quarter note. The eleventh measure has a quarter note. The twelfth measure has a quarter note. The thirteenth measure has a quarter note. The fourteenth measure has a quarter note. The fifteenth measure has a quarter note. The sixteenth measure has a quarter note. The seventeenth measure has a quarter note. The eighteenth measure has a quarter note. The nineteenth measure has a quarter note. The twentieth measure has a quarter note. The twenty-first measure has a quarter note. The twenty-second measure has a quarter note. The twenty-third measure has a quarter note. The twenty-fourth measure has a quarter note. The twenty-fifth measure has a quarter note. The twenty-sixth measure has a quarter note. The twenty-seventh measure has a quarter note. The twenty-eighth measure has a quarter note. The twenty-ninth measure has a quarter note. The thirtieth measure has a quarter note. The thirty-first measure has a quarter note. The thirty-second measure has a quarter note. The thirty-third measure has a quarter note. The thirty-fourth measure has a quarter note. The thirty-fifth measure has a quarter note. The thirty-sixth measure has a quarter note. The thirty-seventh measure has a quarter note. The thirty-eighth measure has a quarter note. The thirty-ninth measure has a quarter note. The fortieth measure has a quarter note. The forty-first measure has a quarter note. The forty-second measure has a quarter note. The forty-third measure has a quarter note. The forty-fourth measure has a quarter note. The forty-fifth measure has a quarter note. The forty-sixth measure has a quarter note. The forty-seventh measure has a quarter note. The forty-eighth measure has a quarter note. The forty-ninth measure has a quarter note. The fiftieth measure has a quarter note. The fifty-first measure has a quarter note. The fifty-second measure has a quarter note. The fifty-third measure has a quarter note. The fifty-fourth measure has a quarter note. The fifty-fifth measure has a quarter note. The fifty-sixth measure has a quarter note. The fifty-seventh measure has a quarter note. The fifty-eighth measure has a quarter note. The fifty-ninth measure has a quarter note. The sixtieth measure has a quarter note. The sixty-first measure has a quarter note. The sixty-second measure has a quarter note. The sixty-third measure has a quarter note. The sixty-fourth measure has a quarter note. The sixty-fifth measure has a quarter note. The sixty-sixth measure has a quarter note. The sixty-seventh measure has a quarter note. The sixty-eighth measure has a quarter note. The sixty-ninth measure has a quarter note. The seventieth measure has a quarter note. The seventy-first measure has a quarter note. The seventy-second measure has a quarter note. The seventy-third measure has a quarter note. The seventy-fourth measure has a quarter note. The seventy-fifth measure has a quarter note. The seventy-sixth measure has a quarter note. The seventy-seventh measure has a quarter note. The seventy-eighth measure has a quarter note. The seventy-ninth measure has a quarter note. The eightieth measure has a quarter note. The eighty-first measure has a quarter note. The eighty-second measure has a quarter note. The eighty-third measure has a quarter note. The eighty-fourth measure has a quarter note. The eighty-fifth measure has a quarter note. The eighty-sixth measure has a quarter note. The eighty-seventh measure has a quarter note. The eighty-eighth measure has a quarter note. The eighty-ninth measure has a quarter note. The ninetieth measure has a quarter note. The ninety-first measure has a quarter note. The ninety-second measure has a quarter note. The ninety-third measure has a quarter note. The ninety-fourth measure has a quarter note. The ninety-fifth measure has a quarter note. The ninety-sixth measure has a quarter note. The ninety-seventh measure has a quarter note. The ninety-eighth measure has a quarter note. The ninety-ninth measure has a quarter note. The hundredth measure has a quarter note. The hundred and first measure has a quarter note. The hundred and second measure has a quarter note. The hundred and third measure has a quarter note. The hundred and fourth measure has a quarter note. The hundred and fifth measure has a quarter note. The hundred and sixth measure has a quarter note. The hundred and seventh measure has a quarter note. The hundred and eighth measure has a quarter note. The hundred and ninth measure has a quarter note. The hundred and tenth measure has a quarter note. The hundred and eleventh measure has a quarter note. The hundred and twelfth measure has a quarter note. The hundred and thirteenth measure has a quarter note. The hundred and fourteenth measure has a quarter note. The hundred and fifteenth measure has a quarter note. The hundred and sixteenth measure has a quarter note. The hundred and seventeenth measure has a quarter note. The hundred and eighteenth measure has a quarter note. The hundred and nineteenth measure has a quarter note. The hundred and twentieth measure has a quarter note. The hundred and twenty-first measure has a quarter note. The hundred and twenty-second measure has a quarter note. The hundred and twenty-third measure has a quarter note. The hundred and twenty-fourth measure has a quarter note. 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The hundred and fifty-ninth measure has a quarter note. The hundred and sixtieth measure has a quarter note. The hundred and sixty-first measure has a quarter note. The hundred and sixty-second measure has a quarter note. The hundred and sixty-third measure has a quarter note. The hundred and sixty-fourth measure has a quarter note. The hundred and sixty-fifth measure has a quarter note. The hundred and sixty-sixth measure has a quarter note. The hundred and sixty-seventh measure has a quarter note. The hundred and sixty-eighth measure has a quarter note. The hundred and sixty-ninth measure has a quarter note. The hundred and seventieth measure has a quarter note. The hundred and seventy-first measure has a quarter note. The hundred and seventy-second measure has a quarter note. The hundred and seventy-third measure has a quarter note. The hundred and seventy-fourth measure has a quarter note. The hundred and seventy-fifth measure has a quarter note. The hundred and seventy-sixth measure has a quarter note. The hundred and seventy-seventh measure has a quarter note. The hundred and seventy-eighth measure has a quarter note. The hundred and seventy-ninth measure has a quarter note. The hundred and eightieth measure has a quarter note. The hundred and eighty-first measure has a quarter note. The hundred and eighty-second measure has a quarter note. The hundred and eighty-third measure has a quarter note. The hundred and eighty-fourth measure has a quarter note. The hundred and eighty-fifth measure has a quarter note. The hundred and eighty-sixth measure has a quarter note. The hundred and eighty-seventh measure has a quarter note. The hundred and eighty-eighth measure has a quarter note. The hundred and eighty-ninth measure has a quarter note. The hundred and ninetieth measure has a quarter note. The hundred and ninety-first measure has a quarter note. The hundred and ninety-second measure has a quarter note. The hundred and ninety-third measure has a quarter note. The hundred and ninety-fourth measure has a quarter note. The hundred and ninety-fifth measure has a quarter note. The hundred and ninety-sixth measure has a quarter note. The hundred and ninety-seventh measure has a quarter note. The hundred and ninety-eighth measure has a quarter note. The hundred and ninety-ninth measure has a quarter note. The hundredth measure has a quarter note.

## SECTION EIGHT: Letter HH (CODA)

The final section of *Verblendungen* is marked by the soft entrance of the crotales at Letter HH. At this point the remaining tones are produced only by the string section and the tape. The interplay between noise and pure tones that was prevalent throughout the entire work now resolves to shades of noise textures that are based on open fifth intervals (see below). The tape part produces intermittent static gestures until the very end.



The image shows a musical score for three violin parts: Vln. I, Vln. II, and Vln. III. The score is written in treble clef with a key signature of one sharp (F#). Vln. I and Vln. II play a series of notes with a long, sweeping slur over them. Vln. III plays a similar series of notes, but with a glissando (gliss.) indicated by a wavy line and the word 'gliss.' written above the staff. The notes are: Vln. I: G4, A4, B4, C5; Vln. II: E4, F4, G4, A4; Vln. III: C4, D4, E4, F4.

### Tension and Release in *Verblendungen*

One of the most powerful musical concepts in *Verblendungen* is that of tension and release. In traditional harmonic languages, composers achieve tension and release through intervallic structures that are perceived on a spectrum of consonance and dissonance. Composers use movement through various tonal regions to accomplish the same effect on a broader scale. In *Verblendungen*, Saariaho uses noise tones to create tension and pure tones to achieve release. It is this interplay that produces a gripping effect on the listener, proving that the emphasis on timbre can have as much of an emotional impact as the traditional musical elements of harmony

and rhythm. In an article that was published in the same year as the premiere of *Verblendungen*, she remarks,

“I have not yet found musically meaningful models for a complex compositional organization of timbre. In my instrumental music writing I have already started to use the tone-noise axis as a timbre parameter in order to build musical form by regulating the degree of tension. In my mind the tone-noise axis replaces, to a certain degree, the concept of dissonance and consonance in its abstract non-tonal sense.”<sup>12</sup>

Stringed instruments produce these sounds through “scratchy” bowing (when there is too much weight applied at a low tension sounding point in relation to the bridge). They can also be produced through left-hand dampening of the strings. For wind instruments, noise tones are produced by blowing excess air through the instrument’s tubing while simultaneously creating resistance through partial closing of valves or keys.

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<sup>12</sup> Saariaho, K. “On *Verblendungen* – (a talk)” *Moving Letters*, Vol. 1 Issue 2. (1984).

## CHAPTER TWO

### **Conductorial Issues in *Verblendungen***

#### *Problems with Interpretation*

In general, a conductor is expected to provide artistic guidance to the orchestra. In this regard, there is no difference between a conductor's approach to interpreting an electro-acoustic work by Saariaho or a Beethoven symphony. He or she can provide an interpretation of the work while simultaneously attempting to adhere to the composer's apparent wishes<sup>13</sup>. Regarding this aspect of the conductor's role, Max Rudolf states "When we speak of interpreting music, we think of an essential factor in musical performance that, transcending the sound of notes, communicates the music's meaning, its spirit and emotional content" (Rudolf, 355). The definition of interpretation is a highly personal subject. Rudolf addresses this further by stating that "Attitudes toward musical interpretation oscillate between two extremes. One extreme would be marked by taking unrestricted liberties with the score, the other by literal adherence to it. In the first instance, a performer 're-creates' the music by molding the score according to personal judgment. This can include changing notes, markings, tempo instructions, and orchestration." (Rudolf, 357)

This interpretation strategy can be used to solve performance issues in *Verblendungen*. The reader should be reminded that the goal of this study is not to declare a definitive interpretation of the work. Instead, we will explore the problems that arise in applying an interpretation strategy to a work that contains such strict instructions regarding tempo and

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<sup>13</sup> Contemporary views on following a composer's score instructions verbatim may have shifted since the 1980s. Notation and score markings provide limited interpretive information. Conductors must understand the composer's intent in order to apply the instructions logically to the work.

articulation – two factors that are customarily variable (within stylistic reasonability) and available as interpretive tools for the performer. In addition, we will examine the conductor’s approach to timbre modifications using information obtained from a study of tape composition techniques.

So how does one offer an individual interpretation of *Verblendungen*? Adjustment to tempo – whether at specific phrase points or on a broader scale – is only one of the methods a conductor can contribute to an interpretation (i.e. one conductor’s interpretation of Mahler’s Fourth Symphony could be significantly slower than another’s.). Is an adjustment in tempo a feasible option in *Verblendungen*, where the composer instructs to conduct at precisely sixty beats-per-minute? With the inflexibility of the tape part, it would seem the only logical recourse remaining is the adjustment of the live elements (the orchestra). The composer felt that the work was too restrictive in this manner, which may be the reason she changed her approach to electronics in *Lichtbogen*.

“Things changed enormously between the two pieces. I think that *Verblendungen* is still very stiff. It was very consciously planned, and I carefully stuck to my plans, so there is a stiffness in its expression...I feel that *Lichtbogen* is a piece I can approve. It’s breathing music, where *Verblendungen* is not.”<sup>14</sup>

It is understandable that Saariaho used tape more cautiously as the electronic element in her compositions for orchestra after *Verblendungen*. (Her next work to feature tape was *Io* – written for chamber orchestra, tape, and live electronics. She also continued to use tape in her chamber works.). Her use of electronics served to create new timbral possibilities, but she still desired to retain the vitality and vividness of human expression. The transition to MIDI synthesizer and harmonizer in *Lichtbogen* allowed for a live performer to execute the electronic

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<sup>14</sup> Howell, p11.

elements in real time, giving the performers room to “breathe.” Despite the composer’s sentiment towards *Verblendungen*, it is arguable that the conductor can play a vital role in relieving the work of some of its “stiffness.”

The composer gives instructions for strict adherence to sixty beats per minute between m. 1 and m. 155 in order to match the recorded media playback. The conductor must decide how to accomplish this as accurately as possible. Although some conductors will rely on their own sense of pulse, it is quite difficult to judge the tempo when there are no apparent rhythmic structures that serve as a consistent motor to move the piece forward. It is necessary to use some sort of mechanical assistance such as a click track or metronome. The inclusion of this mechanical assistance will present some new issues which the conductor must negotiate. For example, using an audible click track means the conductor must wear an earpiece. This creates an audible distraction to the conductor that can make it more challenging to adjust for balance during a live performance. Another solution would be to use a metronome that is set to pulse rather than produce an audible beat. This method was used by Esa-Pekka Salonen to create a physical sense of the beat. He simply kept the metronome in his pocket during the live performance<sup>15</sup>. In my performance of this work, I used a separate stopwatch in order to match with the time markers given in the score. These time markers are given at critical moments in the score. They reflect key changes in texture and gestural shape (see below). Thus, it is important that the orchestra is accurately synched to these markers.

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<sup>15</sup> Based on my conversation with Mr. Salonen, he did keep a beating metronome in his pocket to give him the sense of 60 beats per minute during the performance. In order to prevent the metronome from sounding during the performance, he set the metronome to pulse rather than sound.



With such an inflexible element required in the score, the problem of how to achieve individual artistic expression is apparent. Boulez felt that conducting with tape inhibited the possibility of interpretation. In a conversation with Cécile Gilly, he related his perspective as a composer and conductor of works that combined tape and orchestra.

“It was unremitting torture to be a composer who was entirely reliant on the guidance of a pre-recorded tape part which couldn’t be altered, except in terms of secondary criteria such as dynamics or spatial layout. I found this extremely arbitrary, fundamentally anti-creative: one’s concentration is focused entirely on keeping in time with the pre-recorded tape part, and the *interpretation is destroyed by this obsessive activity.*” (Italics supplied)<sup>16</sup>

While I would not describe my experience conducting with tape as “unremitting torture,” it did require some time to get comfortable with the rigidity of the tape playback. I discovered that it is possible to achieve a sense of freedom within the restrictive parameters but only after many repetitions of conducting with the tape. This aspect of conducting with tape revealed an important interpretive element that is examined in the next section. In any given orchestral work, it is often the changes in tempo, both in large or specific phrase points that allow a conductor’s interpretation of the piece to come alive. In the following section, we will explore this issue and examine how the conductor can take an interpretive approach to conducting with tape.

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<sup>16</sup> Pierre Boulez. *Boulez on Conducting: Conversations with Cécile Gilly*, p85-86.

## Conducting with Recorded Media

While simple in concept, conducting a live orchestra in sync with any recorded media can present several challenges. Otto Luening shared Robert Whitney's reaction to conducting *Rhapsodic Variations* with tape in an interview with Bruce Duffie: "The thing that irritates me is that I can't look it in the eye and make it follow me."<sup>17</sup> Roxburgh emphasizes how important it is for the conductor to be well acquainted with the sounds produced by the tape. Depending on the work, he suggests a time marker technique that can be applied to *Verblendungen*, particularly for the tape solo portion at m. 155 which does not have any graphical notation. Roxburgh remarks,

"When the notation for the instruments is free or spatial...an aspect of learning the tape part relates to determining the events as they are introduced by counting in seconds. This is a safeguard which accommodates the entry of each sound on the tape. Simply learning the tape sounds without a breakdown in seconds can create poor coordination."<sup>18</sup>

The primary issues that arise from conducting with tape in *Verblendungen* are synchronization, balance, and electronic notation. The following sections include a brief examination of these issues and a report of solutions I discovered during my rehearsals with UCLA Philharmonia. Conductors are free to explore other solutions, and much will depend on their particular circumstances. They should address these problems for the sake of clarity and efficiency in rehearsals. More importantly, they should view the solving of these issues as opportunities for applying an individual interpretation.

*Synchronization problem #1 - The opening of Verblendungen*

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<sup>17</sup> Interview with Bruce Duffie which was broadcast on WNIB, Classical 97 in Chicago (1985).

<sup>18</sup> Roxburgh, E. p82-83.



As previously mentioned, the climax of the work is at the beginning. The orchestra and recording enter at highest marked dynamic level of the work - *ffff*. Because of this explosive entry, it is critical that the orchestra and the tape begin together precisely. The options of starting the recorded media have changed since the work's premiere in 1984, when an audio engineer simply pressed the play button on the cassette deck<sup>19</sup>. The publisher now sends a compact disc with the rented materials. At my performance, I played the recording as a .wav file stored on a tablet computer. This allowed me to time the downbeat with the recording as precisely as possible, adjusting for some latency that was reported by a colleague listening from the hall. Placing the tablet on the conductor's stand next to the score also allowed for monitoring of the playback timer that proved helpful in syncing to the score's time markers.

#### *Synchronization problem #2 - Textural changes*

Drastic changes in texture occur simultaneously for both acoustic and electric elements (see mm. 41 and 62). During my rehearsals with the UCLA Philharmonia, I discovered that the time markers designated in the score were not consistent with the time markers listed on the recording of the tape part (see Fig. 4a). Some of the drastic changes on the tape part occurred two seconds earlier than indicated. This may not be as critical in other sections of the piece – in fact the composer indicates that after m. 155 it is not necessary for an exact synchronization between orchestra and recording. However, the crescendos building in both the orchestra and the recording followed by the sudden change in dynamic, register, and texture in mm. 41 and 62 suggest that they must be timed perfectly in order to achieve an effective transition. This means the conductor has to beat slightly faster than sixty beats per minute in order for the orchestra to

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<sup>19</sup> These issues pertain to electro-acoustic music composed during the 1980s. There have been significant improvements in technology that have simultaneously solved and created new issues for the conductor. Some of the issues discussed in this work may not be present in more recent works.

arrive two seconds earlier than the time markers preceding these points (see Figure 4a, 4b, and 4c below).

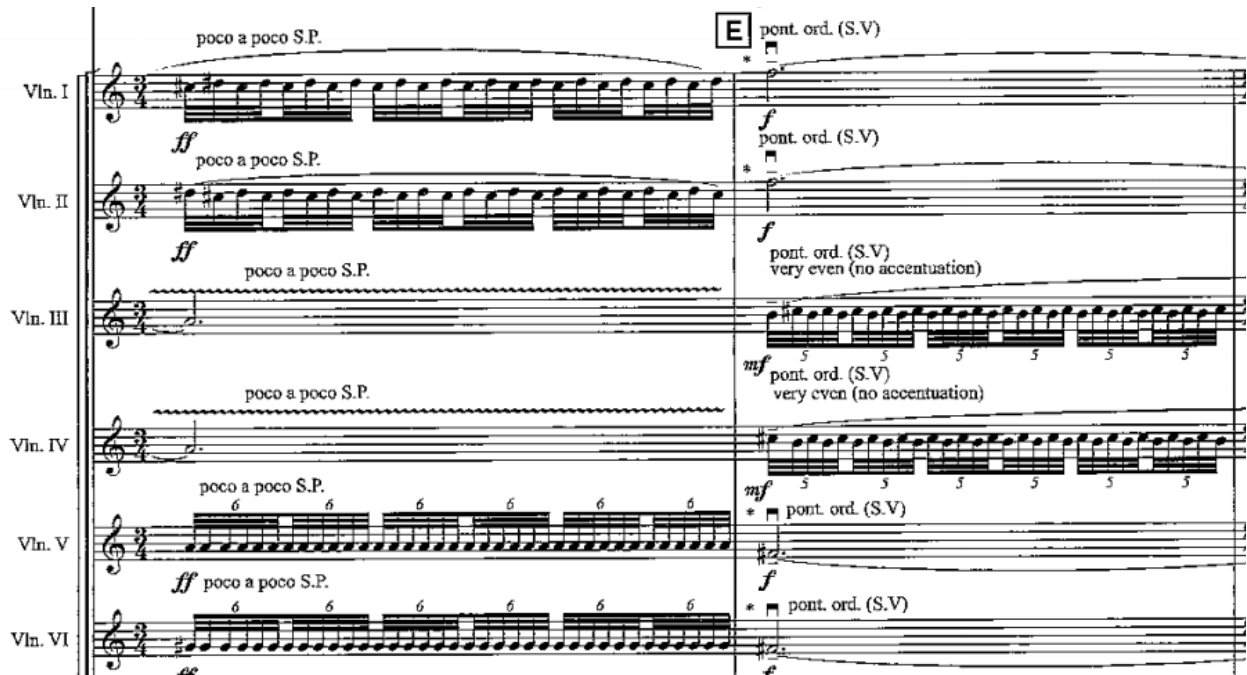
Fig. 4a – Graphical representation of tape part at Letter E.



Fig. 4b – Corresponding textural change in winds at Letter E.



Fig. 4c – Corresponding textural change in the strings at Letter E.



### *Synchronization problem #3 – Orchestra entrance after the tape solo*

The tape solo begins at approximately time marker 7'36" – or five measures after Letter X. The entrance of the solo is preceded by two measures of soft tremolos in the strings. The glissandi tremolo in the Violin 1 part must be heard above the static tremolos in the other sections. This glissando has a direct connection to the crescendo in the tape part, which leads to the sudden *forte* in the tape solo. In this section, the conductor has some artistic license concerning where he can time the tape solo's entrance. By taking a slightly faster tempo beginning at Letter X, it is possible to arrive at the Violin 1 glissando early enough to give some time for it to be heard as a clear transition to the tape's crescendo. From a gestural perspective, it may be clearer to stop beating in the third bar of Letter X and to show the glissando part with the left hand.

Once the tape solo begins, the indication in the score is to hold m. 155 (after showing the diminuendo and cutoff in Violin 1 and Bass 2) for forty-nine seconds. However, the composer states that after this bar, there no longer needs to be an exact sync between the tape part and the orchestra, and that the conductor is free to make tempo adjustments. The tape part around time marker 8'25" (Letter Y) is abstract and subtle in texture and volume. The orchestra's entrance is also very soft, beginning with tremolos in the bass and harp. Based on these factors, it is possible to delay the orchestra's entrance until a few seconds later. Delaying the entrance of the orchestra by sixty to ninety seconds can produce some interesting colors when matching the live players with specific events on the tape. During the rehearsal process, it was discovered that a much broader tempo was more effective in producing the noise tone colors. This caused some problems for the wind section between Letter EE and HH, where there are fast rhythmic figures that lose their effectiveness when taken too slowly. The composer instructs the conductor to let

the tape play to the end. Therefore, one can choose between delaying the orchestra's entrance, or simply taking a slower tempo from m. 156 to the end.

*Balance problem #1 – Seamless integration of electronic and acoustic sounds*

The issue of balance between the acoustic and electric elements is of critical importance. There must be a seamless blending of the two sounds, and ultimately the audience must not be able to discern which sounds are being produced by the recording or the orchestra. The conductor and audio engineer must possess the same vision of the piece in terms of balance. While the recording has already been mastered and its levels preset, the audio engineer might need to make real-time adjustments to compensate for the venue's acoustics and equipment. Of particular importance is the entrance of the tape solo at approximately the 7'36" time marker. The solo begins with a sudden shift to a louder dynamic level. This entrance is meant to be intrusive but not overly so. The audience should not detect that the tape solo has begun. The audio engineer needs to adjust the tape level slightly before the solo begins - depending on the venue's acoustic capabilities.

*Balance problem #2 – Loudspeaker placement*

Depending on the performance venue, the conductor has options of where to place the loudspeakers in relation to the orchestra. The speakers must not be positioned too far from the orchestra; otherwise, the audience will hear the difference between the electronic and acoustic sounds. The conductor should be aware of the type of loudspeaker used, though he or she need not be an expert in this area. It is sufficient for the conductor to know the capabilities of the loudspeaker, particularly in two areas:

1) The ability of the loudspeaker to produce high, mid and low frequencies. This will vary depending on the number and size of the loudspeaker's tweeters (high frequencies) and subwoofers (low frequencies). By understanding the strengths and capabilities of the loudspeakers, the conductor can determine their best placement within and around the orchestra to create maximum seamlessness.

2) The projection tendencies of the loudspeaker. Some loudspeakers are designed to project the sound in a triangular fashion (the narrow point starting at the loudspeaker and widening as the sound moves away from the loudspeaker). Others are designed to project in a circular fashion to create a sense of surround sound or to blur any perception of sound source location.

After experimenting with various loudspeaker placements in Schoenberg Hall (where UCLA Philharmonia performed *Verblendungen*), we discovered that the best option, given the acoustic nature of the hall and the type of equipment available, was to place the loudspeakers on the stage in front and behind the orchestra. For the sake of ear safety, the conductor should be aware of the proximity of the loudspeakers to the musicians, particularly since the work begins with maximum dynamic force in the tape part.

#### *Electronic notation problem – Tape Solo*

In *Verblendungen*, the composer provides a graphical representation of the tape part. However, the indicated tape solo at m. 155 does not include any graphical representation. The conductor is simply instructed to hold for forty-nine seconds before cueing the orchestra to continue. While this may be simply executed during a performance, there is value in having an approximate representation for the conductor to follow. This can be accomplished by tools that are presently

available. The conductor is encouraged to create a graphic score of the tape solo through aural analysis. As a starting point, he or she can first convert the audio file to a MIDI file using any audio file conversion program. The file can then be opened in a notation program such as Finale or Sibelius. Below is a sample of the tape solo transcription using this method.

## MIDI Transcription of Tape Solo from Verblendungen

The image displays a MIDI transcription of a tape solo from the piece 'Verblendungen'. It consists of four systems of musical notation, each with a treble and bass staff. The notation is complex, featuring many beamed notes, triplets, and various accidentals. The first system starts with a treble staff containing a series of beamed eighth notes and a bass staff with a similar rhythmic pattern. The second system continues with more intricate melodic lines in both staves. The third system shows a dense texture with many beamed notes and triplets. The fourth system concludes with a final melodic phrase in the treble staff and a corresponding bass line. The transcription is presented in a clean, black-and-white format, typical of a MIDI score.

The image shows a musical score for piano, consisting of four systems of music. Each system is labeled with a measure number: 13, 17, 21, and 25. The score is written for two staves: a treble clef staff and a bass clef staff. The key signature is one sharp (F#) for the treble and one flat (Bb) for the bass. The time signature is common time (C). The music features a complex rhythmic pattern with triplets and slurs. The treble clef part has a key signature of one sharp (F#) and a common time signature. The bass clef part has a key signature of one flat (Bb) and a common time signature. The score is divided into four systems, each starting with a measure number (13, 17, 21, 25).

### Articulation

Articulation is one of the important elements in this work that a conductor can modify to suit a particular interpretive goal. However, several problems arise if the conductor seeks to only follow the composer's notes regarding articulation without understanding the intention behind this instruction. For example, the composer states "attack always very quietly and imperceptibly, except when marked sforzato." Yet, there are areas where a specific rhythmic figure is given (see Fig. 5 below).

**Fig. 5 – Rhythmic figures**



In this case, there is no *sforzato* marking. How can one produce a rhythmic figure without a clear attack? The composer's intention behind this general instruction must relate to timbral development. The elements that differentiate one sound from another are the nature of the attack – how the sound is initially produced – and its decay or release (this is discussed again later in this study in correlation with the electronic composition technique of sound envelope modification). Some tone types carry similar overtone structures, such as an oboe and a trumpet. In addition to each instrument's unique overtones, the attack is usually the most distinguishing feature in which the listener can differentiate one instrument's timbre from another. If one were to remove the attack portion of the sound, the only method for discerning the difference in timbre would be the instrument's inherent overtone structure. Saariaho's intent is to manipulate timbre and color in a manner that would better allow the audience to hear subtle changes in movement and texture. To accomplish this effectively, it is logical for the attack portion of the sound to be removed or minimized. The conductor must understand this intention in order to apply the instruction appropriately throughout the work.

The decay of a sound event occurs immediately after the attack and lasts the full duration of the sound being made. Saariaho employs special techniques in the decay of certain instruments in order to achieve certain textural qualities. These decay techniques can be divided into the categories listed below.



## *Glissandi*

The instructions regarding *glissandi* are that they “should always be played very evenly, without vibrato and accentuations, starting immediately at the beginning of the note value. The pitches within the brackets...during the glissandi are there to show the approximate speed of the glissandi, and are not to be played with any accentuation or tenuto.” The composer is clear about how the glissandi should be executed, but it is for the conductor to understand the significance of this gesture and to identify sections in the work where there is a difference in their purpose and function. By identifying these sections, the conductor can decide when the glissando gesture should stand out as a primary textural component, and when it serves the function of subtle transition from one pitch to another.

## *Vibrato*

The composer uses vibrato to produce marked changes in texture and color. She specifies exact moments where instruments should perform without vibrato (S.V. is her notation for *senza vibrato*) and where they should transition to a fast, wide vibrato. The conductor must decide the desired speed of the vibrato and the degree of oscillation. This is where a conductor can recommend a particular interpretive approach to the performer which can strikingly change the resulting effect. For example, between Letter F and G the flutes are instructed to transition from a non-vibrato tone to a “wide, rapid vibrato.” This marking is preceded by rhythmic figures alternating between the pitches of D and F (see Fig. 6). By understanding the concept of the piece, we can see that these changes are to facilitate a change in texture. So we can propose that the vibrato should alternate evenly between these same pitches although this is not specified in the score.

**Fig. 6**

The image shows a musical score for two flutes, Fl. and Fl. A., in 4/4 time. Both parts feature a tremolo passage starting at measure 46, marked with a box containing the letter 'F'. The tremolo is written as a series of eighth notes with a '5' below each note, indicating a quintuplet. Performance instructions include 'very even (no accentuation)', 'legatiss.', and 'mf'. Following the tremolo, both parts have a sustained note with 'S.V.' (Sostenuto) and 'wide rapid vibr.' (wide rapid vibrato) markings. The dynamic 'mf' is also present for the sustained notes.

### *Tremolo*

Most of the tremolo indications are straightforward. However, certain options exist for instrumentalists who may have some difficulty with execution of the tremolo. In the case of the tremolo indication for clarinet after Letter D, it is possible to substitute a growling articulation for the usual flutter-tongue technique. This type of articulation would not be foreign to Saariaho's approach to creating special wind effects. (In some of her important works for flute, she instructs the performer to sing or speak while producing the tone.)

In many instances, Saariaho uses tremolo as a textural device in the work. This technique complements the frequency and amplitude modulation of the tones on the tape. By understanding the process by which this is achieved electronically through tape manipulation, the conductor will have additional insight on how to convey this concept accurately to the members of the orchestra.

Tape modulation is a common technique that electro-acoustic composers use to achieve timbres that could not be achieved via live acoustic means. Schrader discusses two strategies that are critical to the process of timbral development. The first is amplitude modulation, which is "a process by which the amplitude of a signal is changed. In music, the effect of this process is referred to as *tremolo*, a slight, usually periodic, variation in the volume of a sound." (Schrader,

p.88). The author explains the technical process for working with amplitude modulation, which is useful information albeit extraneous for the purpose of this study. Schrader compares this technique to that of a singer who produces a tone while repeatedly alternating between a loud and soft dynamic. This differs slightly from the method that a string or wind player would produce tremolo – that being fast articulations of repeated notes. One can see just how difficult this would be to execute, particularly at a fast rate. However, through electronic means and tape modulations, this can be much more easily achieved, resulting in the new timbre. When viewed in this manner, the tremolo figures in the wind and brass parts may actually be closer to the tape modulation process using a growl technique versus flutter-tongue.

The second technique for timbral development is frequency modulation. This occurs when the pitch's frequency raises or drops in alternation, known musically as "vibrato." The conductor can benefit greatly from understanding how frequency modulation is created in the tape part. He can apply these fundamentals when working with the orchestra.

### *Noise tone production*

The composer places timbral contrast as the primary musical force in *Verblendungen*. The interplay between light and shadow is audibly represented by the drastic changes between pure and noise tones. It is critical for the conductor to understand how these noise tones should be produced in order to achieve this powerful contrast effectively. Notation of noise tones can create some confusion, and this is an area that will hopefully be standardized among Spectralist-leaning composers.

In this work, the composer notates how noise tones should be produced by the sections of the orchestra (See Appendix A). However, some of the noise tones were almost inaudible when

performed in a live setting. The section between Letter EE and FF, where the instructions are to blow “air through instrument, no fingering” is almost impossible to hear above the string glissandi background. The composer includes the marking “*p(sf poss)*” to indicate that extra air pressure should be exerted in order to aid the articulation. However, this improved the sound minimally. In order to produce this particular noise tone (which differs from the other markings of “breath tone” or “add air to tone”) additional air resistance was needed, such as placing a hand over the mouth piece, or blowing air between closed teeth. The brass players were able to create air resistance by pressing their valves halfway down.

For the string section, the noise tones are achieved through increased bow pressure (creating a scratching noise), *ponticello*, and a special notation indicating the use of all fingers, the fourth (pinky) finger lightly placed on the indicated note (not completely stopped) and the other fingers also touching in order to mute the pitch and produce a noise tone. It is necessary to place all finger down on the string not only for the purpose of producing the noise tone, but also to avoid an inadvertent harmonic tone.

### Rehearsal Strategy

#### *Rehearsing the UCLA Philharmonia*

I had six rehearsals to prepare the orchestra for the concert. In addition to *Verblendungen*, the program included a tuba concerto by Bruce Broughton and Hindemith’s *Symphonic Metamorphosis on Themes by Carl Maria von Weber*. It was critical that the rehearsal plan be as efficient as possible. Regarding the Saariaho score, I decided to prioritize the following rehearsal goals:

### 1) Verbal introduction of *Verblendungen* to the orchestra

Because the majority of the musicians in the orchestra had not performed a composition of this type, I felt it was necessary to take a few minutes to explain the concept of the work before launching into the rehearsal. This may not be necessary with a professional orchestra, but I believe it is a critical part of the rehearsal process in an academic environment. I explained the basic concept of Spectralism in order to help them understand the meaning of the musical gestures that were in their parts. To help with this, I had the orchestra participate in a few sound production experiments to reinforce the fundamental elements that are present in the work, as follows:

### 2) Demonstrating the noise/pure tone axis

To demonstrate the noise/pure tone axis, I had the string section alternate between playing with a light bow over the fingerboard and gradually increasing bow pressure until we achieved the harsh, grainy noise tone and then decreasing the pressure until the pure tone returned. For the winds and brass, I instructed them to produce their normal pure tones and then gradually add more air. I also had some of the brass players adjust their valve openings in order to create more air resistance, creating more noise tones.

### 3) Textural devices

It was critical for the orchestra to understand how the textural devices work in *Verblendungen*. Without this understanding, the musicians would view some sections as repetitive nonsense. I located specific sections that demonstrated the composer's use of tape composition techniques such as frequency and amplitude modulation and tape delay effects

(more details are discussed in the *Tape Composition Techniques* section below). To demonstrate frequency modulation, I instructed the first and second flutists to play an oscillating figure between the pitches of D and F. I asked the first flutist to play at a faster speed than the second flutist, first individually, then simultaneously so that the whole ensemble could hear the new texture that was created when the layering occurred. The orchestra seemed to better grasp this concept and they found it applicable to other similar sections of the work.

Although the complex rhythmic figures are designed to achieve a textural goal - and therefore the adherence to strict execution of the figure is not necessary within one's part – it is important that the musicians understand how these figures are layered with other parts. The excerpt below demonstrates how the conductor can help them understand how their notes must be produced sequentially (see Fig. 7).

The image shows a musical score for three instruments: Percussion (Perc.), Piano, and Harp. The score is written on three staves. The Percussion staff has a blue vertical line at the beginning of the first measure, followed by three red vertical lines above the staff, and another blue vertical line at the end of the first measure. The Piano staff has a blue vertical line at the beginning of the first measure, followed by three red vertical lines above the staff, and another blue vertical line at the end of the first measure. The Harp staff has a blue vertical line at the beginning of the first measure, followed by three red vertical lines above the staff, and another blue vertical line at the end of the first measure. The notes in the Percussion staff are marked with numbers 1, 2, and 3. The notes in the Piano staff are marked with numbers 1, 2, 3, and 4. The notes in the Harp staff are marked with numbers 1, 2, 3, and 4. The score is in 3/4 time and features complex rhythmic patterns with various note values and rests. A small box with the letter 'K' and the word 've' is located at the bottom right of the score.

*Fig. 7*

The three vertical lines above the staff are the main beats in the bar. The numbers over the notes represent the sequential order of the notes. I took sections like these at a very slow tempo and gradually increased the speed as they became more comfortable with the sequence.

#### 4) Synchronization with tape

The first two rehearsals were dedicated to helping the orchestra understand how their parts fit together without the tape. Once they demonstrated progress in this area, I began to include the tape part in the rehearsal. I first let them listen to sections of the tape part by itself. This is especially important in the opening bars of the work because specific chord structures on the tape needed to synchronize precisely with those in the orchestra. There was a certain level of discomfort at first until we adjusted the balance of the tape. As the rehearsals progressed, the orchestra began to feel more at ease with the tape part and understand better how the electronic and acoustic tone elements intertwined.

#### *Tape composition techniques*

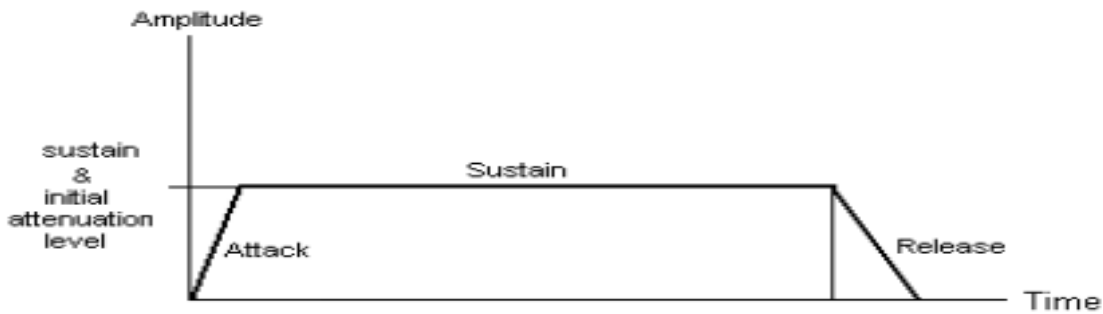
By understanding the techniques used in electro-acoustic music, the conductor can communicate deeper insight of the score to the live players. In *Verblendungen*, there are specific areas where Saariaho uses an electronic writing approach to the orchestration. She does this through the following elements:

##### 1) Sound envelope modification

The technique of sound envelope modification allows the composer to adjust specific aspects of a sound in order to create new sounds. Schrader states that “the envelope of a sound is a description of its amplitude characteristics with respect to time. A *simple envelope* consists of three stages: attack time, sustain time, and decay time.”<sup>20</sup> The basic diagram of the sound envelope is:

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<sup>20</sup> Schrader, p24.



The technique of sound envelope writing is evident throughout the work. Saariaho instructs the players to bring each tone with an “imperceptible attack” whenever there is no accent marked. She wants to blur the lines between the different timbres of the various instruments. This produces a shading effect on the tone color.

\*\* Attack always very quietly and imperceptibly, except when marked sforzato (>)

The beginning of the work can be perceived as a series of attacks that are produced by the brass and percussion instruments. These attacks are sustained primarily by the wind and string sections. As the work progresses, Saariaho begins a series of “releases” that are designed to emphasize the closing part of the sound envelope. This is done through a series of overlapping diminuendos in the brass and wind sections. This frequently occurs before a gestural transformation takes place.



## 2) Overtone Structures

In addition to the attack of a sound produced on a given instrument, the overtone structure is one of the most important distinguishing features. According to Schrader, “Each sound has its own individual overtone structure. The sound of a flute, for instance, is strong in its first three harmonics. A clarinet sound is strong in its odd (1,3,5,7,etc) harmonics.”<sup>21</sup> Saariaho takes these overtone structures into account when she is creating new colors with the orchestra and the tape. Using a special computer program<sup>22</sup>, she is able to manipulate sounds electronically, bringing certain overtones to the forefront of the orchestral color. Below is an example of how these structures are built, first on the tape, and then by the orchestra.

<sup>21</sup> Schrader, B. p.30.

<sup>22</sup> CHANT was a sound synthesis program developed by Xavier Rodet and Yves Potard

### 3) Tape delay techniques in the orchestra at Letter E

The technique of tape delay was used to create an artificial reverberation. Schrader discusses the actual techniques used in the sound laboratories, which may be beyond the scope of this study. However, it is useful to be able to identify how Saariaho creates this in effect in *Verblendungen*. The sample below begins in the viola section (Fig. 8). It occurs at the first distinct textual change at Letter E.

*Fig. 8*



#### Conducting gestures

In general, one should take a cautious approach when offering suggestions for conducting gestures for any particular orchestral work. It is such a subjective topic; conductors are free to use their own unique gestures. As long as it is clearly understood by the orchestra, and does not inhibit their ability to perform their task, it is an acceptable gesture. In regards to a contemporary work such as this, it is necessary to address specific areas where special conducting gestures would be advantageous. This concept is not without precedent. Boulez found it necessary to give specific instructions regarding conducting gestures in *Répons* and some of his other works. In his conversation with Cécile Gilly, he discusses the need for a new set of visual signals that would not only control tempo and dynamics, but also the order in which parts of the score were performed. In *Répons*, special gestures were created to address the issue of the ensemble's layout

– the composer instructs the soloists to sit in a circle around the conductor, which means half of the soloists are behind him.

“I began by composing the works, and then found the technique to conduct them. All these sequences, which could appear in any order, these methods of ‘breaking up’ or ‘exploding’ the group and then restoring it – these are the compositional elements that I thought of right at the start.”<sup>23</sup>

In *Verblendungen* there are several places where the use of special gestures is necessary. These gestures need to address the following issues:

1. Marking structural points

The conductor must indicate the beginning of structural points through clear left-hand gestures. This can be accomplished through a simply downward pointing hand signal. It is necessary to explain to the orchestra how to interpret this gesture. Because there are no rhythmic figures that can serve as a pulse, and no perceivable sense of phrase (such as a four or eight bar phrase), this gesture will make the orchestra feel much more comfortable, which is vital especially if rehearsal time is limited.

In the section leading to the structural point at Letter N, it is important to lead the orchestra through the preceding bars at a slightly faster rate than 60 bpm in order to take a little more time in the  $\frac{1}{4}$  measure right before Letter N. This allows more time for the strings to execute the pressure scratch tone leading into the downbeat of Letter N. Instructing the orchestra to follow the left hand gesture in this bar is of critical importance.

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<sup>23</sup> Boulez, p97.

## 2. Conveying the transitions between noise and pure tones

Although Saariaho gives clear indications of when sounds should transition between noise and pure tones, or from one sound type to another (such as *senza vibrato* to wide rapid vibrato), there are some areas that still need further definition. The conductor needs to decide how these sound transitions should be performed, and how they should be indicated through gesture. In the case of the transformation between noise and pure tones, a left hand gesture starting with an up-turned, open palm can convey a pure tone. The conductor can show the transformation to noise tones by simply closing the palm, making a tight fist, before transitioning back to an open palm. Another option is to begin with a downward facing open palm and then showing the transformation by turning the palm upward. There are several options that the conductor can choose to convey this transition, as long as it is clearly executed.

## 3. Dictating the rate of glissandi

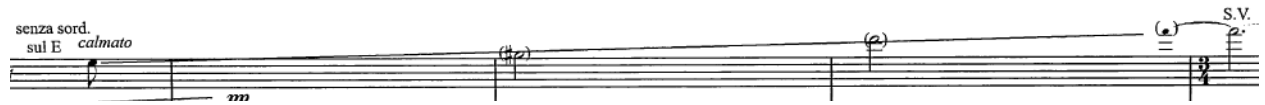
The instructions are to begin the glissando immediately after the articulation of the note. In cases where the glissando occurs over a short duration and between wider intervals, this task seems easy enough for the live player (see Fig. 9a and 9b).

**Fig. 9a - Short glissando**



However, in cases where the glissando occurs over a longer duration, and between smaller intervals such as a major second or minor third, this is much more difficult.

**Fig. 9b - Long Glissando**



This is also a challenge for the conductor to show through gesture since it occurs over several beats. As a suggestion, the conductor can make use of gestural planes to indicate upward movement in the sound. These gestural planes exist within the “conducting box” that is introduced to conductors as a fundamental technique. The conductor can use the right hand to beat at the lowest plane and begin the ascent at the desired rate of glissando, or vice versa to show a descending glissando. This method releases the conductor’s left hand to do other things.

## CHAPTER THREE

### **Conductorial issues in other electro-acoustic orchestral works**

*Verblendungen* can be seen as the perfect introduction for a conductor who is new to electro-acoustic orchestral works. First, the integration of the tape with orchestra is simple in concept – there are no breaks in the tape part and the requirement for exact synchronicity between the tape and orchestra is limited (compared to Murail's *Désintégrations*). Second, the nature of the work is more abstract and there is some room for flexibility in areas of balance and articulation. The tape composition techniques in the score are more easily identifiable, which can aid the conductor in providing helpful insight to the orchestra.

Can a thorough study of the conductorial issues in *Verblendungen* yield positive results in the approach to conductorial issues found in other electro-acoustic works? I believe so. Do the issues described above correlate to those found in other electro-acoustic works? I discovered that some conductorial techniques that apply in *Verblendungen* were also applicable to some of the issues in the following works. For this study, I have selected these works to examine how some of the conductorial issues found in them correlate with those in *Verblendungen*. Three of the selections (*Lichtbogen*, *Désintégrations*, and *Répons*) were composed contemporaneously with *Verblendungen* and were chosen because of their compositional similarities. The works by Subotnick (*Lamination I* and *Play No. 2*, composed in the 1960s) were written much earlier than the others and were selected to examine correlating issues in extended conducting techniques.

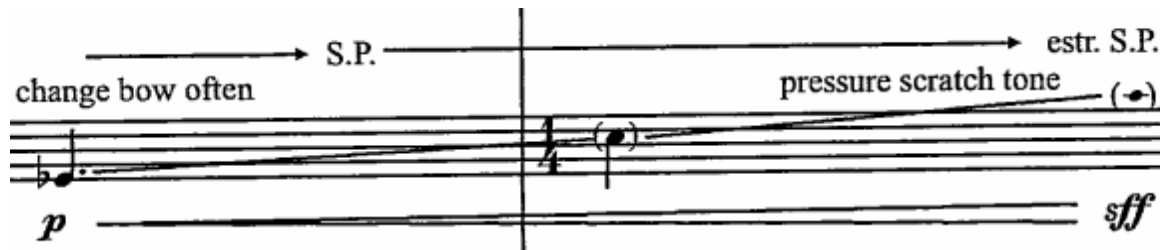
Saariaho's *Lichtbogen* (1986)

It is appropriate to investigate the conductorial issues in *Lichtbogen* for several reasons. First, the composer completed the work within two years of the *Verblendungen* premiere and therefore was still in the same compositional style period – where she focused mainly on timbral development and textural transformation. Although the two pieces are similar in this regard, she made significant changes in her approach to the integration of electronic and acoustic sounds. The most apparent changes in *Lichtbogen* are the use of a live player for the electronic elements (as opposed to the pre-recorded tape part in the preceding work) and the increased specificity of notation for the production of noise tones.

*Noise Tone Production*

The composer adds new notation that visually represents the changes in noise tone intensity for the strings. This was not previously used in *Verblendungen* but can easily be integrated in order to give more specific instructions to the string section (see comparison below).

In *Verblendungen*



In *Lichtbogen*

↙ add bow pressure to produce a scratching sound, in which the audible pitch is totally replaced by the noise



The conductor's experience with noise tones in *Verblendungen* will do much to prepare them for the noise tones in *Lichtbogen*, which are used more extensively. (For further examination of the score instructions in *Lichtbogen*, please refer to Appendix B.)

#### Morton Subotnick *Lamination I* (1965) and *Play No. 2* (1964)

Morton Subotnick holds a significant place in the electro-acoustic music genre. While most electronic music composers at the time were exploring the musical possibilities of available technology, Subotnick put his efforts into developing his own hardware and software in order to improve the connection between live performers and computers. Concerning the interaction between performers and technology, he states,

“Since my first work with electronics in music, I have felt strongly that music should come from one human to another and that the medium should always be at the service of the artist. The electronic medium has the possibility, where desirable, to bypass the performer who has traditionally acted as the intermediary between the composer and the audience. It is this directness which has always attracted me to this medium and has informed most of my research as well as creative output... In order to accomplish these things I needed to develop a software which was always ‘in service’ to the composer/musician.”<sup>24</sup>

<sup>24</sup> Subotnick, M. “The Use of Computer Technology in an Interactive or ‘Real Time’ Performance Environment” *Contemporary Music Review*, Vol. 18, (1999), p113-117.





In *Lamination I for Orchestra and Electronic Sounds*, Subotnick incorporates elements which present specific performance issues similar to those found in *Verblendungen*.

*Electronic sound notation in Lamination I*

Subotnick notates electronic sounds in a drastically different manner than Saariaho. He differentiates white noise from sounds with undefined pitch (see below).

**Tape Notation:**

 = Undefined pitch  
 WN  = White noise

When placed in context, it is obvious to see the electronic sounds more vividly and accurately represented in the conductor's score.



This musical score snippet illustrates the notation for electronic sounds. The top staff, labeled 'Tape', contains a sequence of symbols: a square, followed by 'WN' (white noise) and upward-pointing arrows (undefined pitch). Below these symbols are three time intervals: '1 3 sec.', '2 2 sec.', and '1 4 sec.'. The bottom staves are for Flute 1 (Fl. 1) and Flute 2 (Fl. 2), which are currently blank.

Continued below:



This continuation of the musical score shows further electronic sound notation. The 'Tape' staff features 'WN' and upward-pointing arrows. Below are three time intervals: '2 5 sec.', '3 3 sec.', and '4 3 sec.'. The Flute parts (Fl. 1 and 2) are shown below, with some musical notation appearing in the first flute part during the 5-second interval.

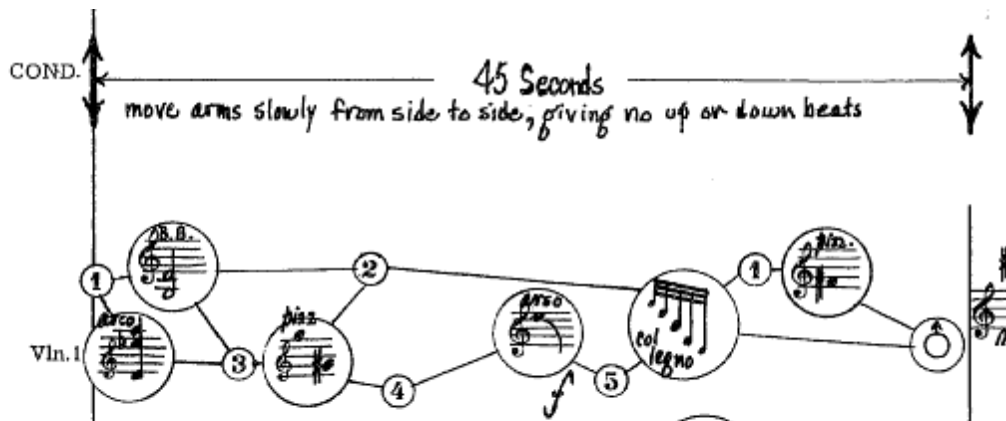
This style of electronic sound notation differs greatly from that of *Verblendungen* in that actual pitches are represented in addition to the graphic notation of noise tones.

*Conducting gesture and timing issues in Lamination I*

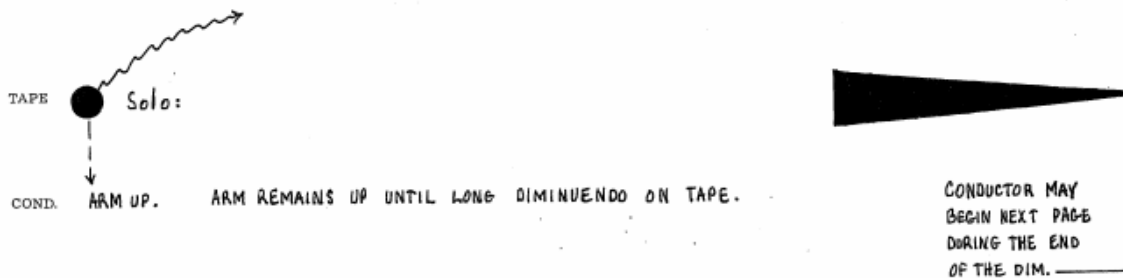
As in *Verblendungen*, the conductor is instructed to beat recognizable patterns for the sake of coordination. However, Subotnick adds a difficult element to this directive by assigning different duration amounts to certain beats. In the example above, the conductor would beat a two-pattern, holding the downbeat for 3 seconds, and the second beat for 2 seconds. In the next bar, the conductor would beat a four-pattern, holding the downbeat for 4 seconds, the second beat for 5 seconds, and so forth.

*Extended conducting techniques in Play No. 2*

In this work, the composer gives specific instructions to the conductor concerning the coordination of the tape part with the orchestra. In addition, he specifies exact physical movements on the part of the performers such as “each player turns to look at neighbor” and “conductor’s head turns to face the orchestra.” The conductor’s role is viewed as a compositional resource because he is given a choice of when sections of the music should occur. This allows the conductor much room to deliver an individual interpretation.



The challenge for the conductor in this work is to negotiate the tape solo which occurs in the middle of the piece. Unlike the tape solo in *Verblendungen*, there is an abbreviated graphic score to help the conductor follow the sound events and specific instructions regarding arm gesture. It is apparent in this work that Subotnick wanted to bring technology to a more intuitive connection with the live performer – a philosophical approach that would lead to his experiments with the MIDI conducting baton and other software tools.



I was fortunate to have the opportunity to speak with Mr. Subotnick regarding his perspective on technology and composition. Both *Lamination* and *Play No. 2* were composed in the 1960s, well in advance of his work with MIDI. Yet it is possible to see the interaction between conductor and electronic elements in these early works that forecast Subotnick's interest in developing technology that would adjust to the conductor, such as the MIDI baton.

### Tristan Murail *Désintégrations* (1983)

I chose Murail's *Désintégrations* because of its compositional similarities to *Verblendungen* – both are primary examples of Spectralist works. Murail's use of electric elements differs from Saariaho's because the purpose of the overtone structures on the tape is to fracture or “disintegrate” the overtone structures of the orchestra (Saariaho instead uses the tape to create tension between noise and pure tones). Murail states that “Often the tape exaggerates the character of the instruments, diffracts or disintegrates their timbre, or amplifies the orchestral effects.”<sup>25</sup>

#### *Timing issues*

The level of synchronization between the tape and the orchestra is more extensive than in *Verblendungen*. Because of this, the composer integrates the use of a click track which the conductor must follow precisely. In the opening section of *Désintégrations*, there are a series of chord clusters that are produced by the tape. These are much more distinct sound events that must coordinate with chord structures performed by the orchestra (see Fig. 10 below).

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<sup>25</sup> Score notes from Tristan Murail's *Désintégrations* given by the composer.

## DESINTEGRATIONS

T. MURAIL

The score for 'DESINTEGRATIONS' by T. Murail is a complex orchestral work. It features a variety of instruments including Clixes, Bando, Filtes, Clarinettes, Flutes et saxophones, Violes, and Cloches. The score is divided into measures 4, 3, 3+1/2, and 5. A section marked 'I' is indicated at the beginning. The score includes dynamic markings such as *f*, *mf*, *pp*, and *ppp*. There are also performance instructions like 'vibrato lent, selon le rythme indiqu , mais pas trop large d'amplitude' and 'sans vibr.'. The score is annotated with red circles highlighting specific musical passages, likely related to tape composition techniques.

**Fig. 10**

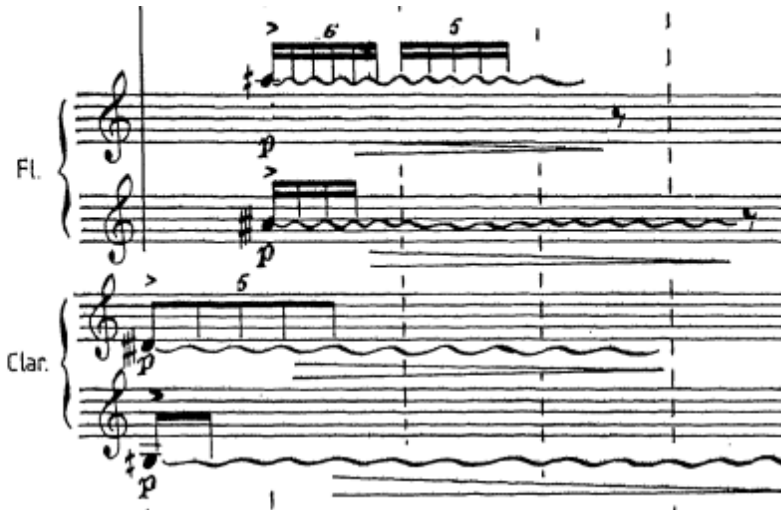
### *Tape composition techniques*

The tape composition techniques used in *D sint grations* are similar to those in *Verblendungen*. The conductor can easily use a similar approach in rehearsals to achieve the same textural effects (see Fig. 11a and 11b below).

### *Fig. 11a – Delay effects*

The score for Fig. 11a shows five staves of music for different instruments: FL (Flute), Fl en sol (Flute in G), C.a. (Clarinet in A), Clar. (Clarinet), and Cl.b. (Clarinet in B). The music is written in a single system and includes various rhythmic patterns and dynamics. A triplet of eighth notes is marked with a '3' above it. The score illustrates delay effects, which are a key tape composition technique.

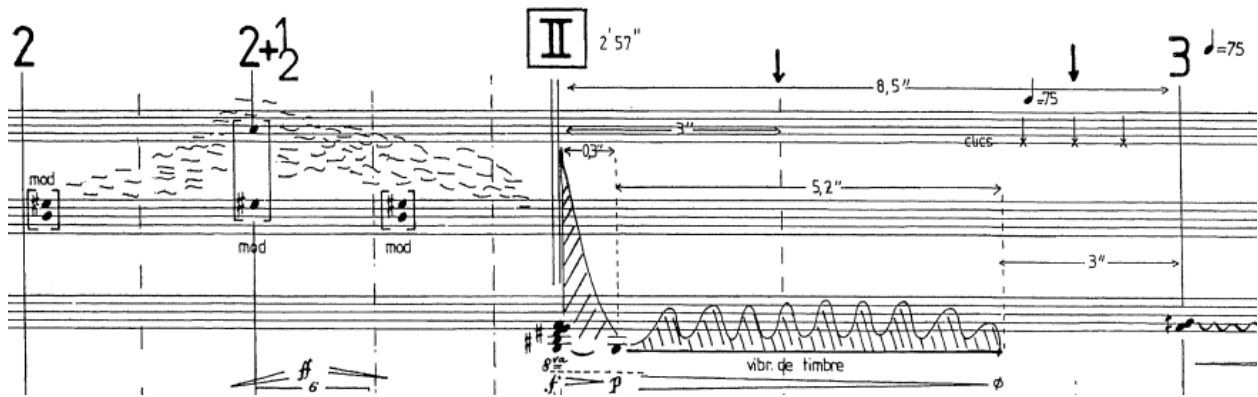
*Fig. 11b – Frequency and amplitude modulations*



*Electronic specifications*

The specifications for the electronic elements are much more detailed in this work. These apply to the following areas<sup>26</sup>:

1) Graphic score notation



Murail includes actual pitch notation in addition to graphical representation of the tape sounds. He also provides detailed time markers in tape solo sections (such as in section II above) to allow

<sup>26</sup> For a complete list of electronic specifications refer to Appendix C.

the conductor to follow the individual sound events that occur within the tape solo. This is more difficult to conduct because of the level of precision that is required, which is the reason that Murail integrated the use of a click track. In my performance of *Verblendungen*, I found a stopwatch to be a helpful tool in coordinating the tape with the orchestra. It also allowed me to gauge the overall pace of the orchestra which gave me some flexibility. In *Désintégrations*, this is also possible, though at a more microscopic level. In the excerpt above, the room for any flexibility would be limited to sections between the click track guidelines.

## 2) Sound diffusion

In *Verblendungen*, the issue of loudspeaker placement is not addressed by the composer. The primary goal is to create a seamless sound fusion between the orchestra and the tape. It is the responsibility of the conductor to solve these balance issues and much will depend on the venue and audio equipment available. This experience will do much to prepare the conductor for more complex sound diffusion issues like those in *Désintégrations*. Murail instructs the conductor to use four different click tracks and specifies how these tracks should be distributed to the loudspeakers (see below).

### ***SOUND DIFFUSION***

*There are two versions of the tape for Désintégrations: 1/2' and 1/4', with or without DBX (or Dolby). The preferable version is of course the 1/2' with DBX.*

*Tracks 1 and 2 of the tape should be diffused in stereo on the front loud-speakers placed on the same sound level as the ensemble.*

*Track 3 should be diffused on the loud-speakers to the rear of the hall.*

*Track 4 consists of synchronisation clicks that the conductor listens to with open ear-phones of the "walkman" type. The conductor should be able to control the sound level of his ear-phones himself.*

*The tape should, generally speaking, be in perfect balance with the ensemble. In order to achieve this it might be necessary to adjust the diffusion level during performance.*

*Passages that may need such boosting are:*

- page 8, first bar of section II (low "piano" sound)*
- page 43, 2 last bars of section VI*
- pages 45-47, bars 25-42 of section VII. Return to the normal level for bar 43*
- pages 54-57. Section X is one of the rare moments in which the tape stands out somewhat from the ensemble.*
- page 66, bar 64 of section XI*

*Track 3 is only active at certain moments (sections I,V,VIII-IX,XI). Track 3 can be reinforced for section VIII in order to highlight the movement of the sound in space, as well as right at the beginning of the piece (bar 1).*

*At the end of the piece, the sound should be made to die away very gently as it accompanies the bass drum's decrescendo, in accordance with the conductor's gestures.*

### Pierre Boulez *Répons* (1981)

It would not be possible to study the impact of electro-acoustic orchestral works on the conductor's role without the inclusion of *Répons*. This work holds a significant place in the electro-acoustic genre due to its innovative use of electronics to transform acoustic sounds in real time. According to Jonathan Goldman, this work was intended to showcase the capabilities at IRCAM during the early 1980s. Goldman writes,

*"[Répons] was used as a demonstration piece of IRCAM's potential. It was taken on a highly successful American tour, and performed in successive 'premieres' as Boulez reworked and lengthened the original piece. Not surprisingly, the, so-called 'mixed' works (i.e. works for instruments and electronics) conceived at IRCAM or other musical research institutions, began to form an important part of French avant-garde musical production beginning in the late 1970s, inaugurating a central focus of many French composers which endures to the present day."<sup>27</sup>*

Due to the scope of this dissertation, only certain conductorial issues are touched upon. In *Répons*, the score notes contain specific instructions for the conductor and performers. These performance instructions create a certain amount of difficulties depending on the performing

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<sup>27</sup> Goldman, J. *The Musical Language of Pierre Boulez*, p. 12.



space. This work was selected as part of this study in order to highlight three relevant conductorial issues:

### *Special conducting gestures*

In his interview with Cécile Gilly, Boulez raises two important concepts for the contemporary music conductor: “conducting through gesture” and “metrical conducting.”<sup>28</sup> In this work, the soloists and the audience members are seated in a circle around the conductor and the orchestral ensemble. This layout creates problems for the conductor if he or she employs only metrical conducting. The distance between the soloists and the conductor also creates a challenge for the conductor and Boulez suggests “gesture conducting” as a solution.

”The soloists are conducted for most of the time by gestures that don’t relate to tempo, while the orchestra in the centre is for the most part conducted metrically. Metrical conducting can also be applied to the soloists, but in this case the tempo will be inevitably slow, because, with the distance that separates me from the soloists, the beat cannot be too irregular or fast, otherwise the orchestral players will not have time to adapt simultaneously to reading the score and following the conductor.”<sup>29</sup>

The concept of “conducting through gesture” can be applied to a performance of *Verblendungen* and other similar Spectral works. The conductor must be able to execute both “gestural” and “metrical” conducting to account for any problems that arise from the spatial layout of the performers.

### *Ensemble layout*

The score calls for six soloists to perform on the following instruments: harp, piano/organ, piano, cimbalom, vibraphone, and xylophone/glockenspiel. Boulez instructs the

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<sup>28</sup> Boulez, P. *Boulez on Conducting*, p.103.

<sup>29</sup> *Ibid*, p. 104.

conductor to place the soloists in a circle on the outer edge of the orchestral ensemble. This particular layout can present issues of sound delay due to the distance between the soloists and the ensemble. The conductor must be aware of the venue's acoustic characteristics to determine the most effective placement for the soloists.

### *Loudspeaker issues*

The goal of the electronic elements in *Répons* is to transform the acoustic sounds in real time, creating specific reverberations. This differs from the use of electronics in *Verblendungen* and presents new issues for the conductor. In *Répons*, the loudspeakers are placed between the soloists and are facing the center of the ensemble. This can make it difficult for the soloists to hear each other over the sound of the ensemble. As in *Verblendungen*, the conductor must experiment to find the best placement for the electronic sound sources.

## SUMMARY AND CONCLUSION

As stated in the introduction to this dissertation, *Verblendungen* was selected as a case study to examine conductorial issues in electro-acoustic orchestral works. History will show if audiences will find this work more approachable as their understanding of timbral development increases. It is widely accepted that Kaija Saariaho has achieved success as one of the most prominent living composers of our time. Her works continue to captivate and inspire new generations of composers and audiences. Even those who may not understand her music still find some of the elements in her style of composition intriguing. It falls on the shoulders of artistic directors, music educators, and conductors to find ways to connect this style of music with audiences. It is my hope that this dissertation in some small way might encourage more conductors to perform works such as *Verblendungen* – works that use timbral transformation as the primary force for creating tension and release using electro-acoustic means.

We live in a time where the pairing of electronic and acoustic instruments is no longer a groundbreaking idea. Computer programs that allow anyone to learn, write, and perform music are commonplace. So why is it important for conductors of today to give special attention to electro-acoustic works? Perhaps it is because conductors remain the driving force for orchestral music in society. In music that combines electronic and acoustic instruments for the purpose of creating new textures and tones, the conductor plays a vital role in making this music relevant to audiences and therefore must be well-versed in the technical and artistic requirements that will help them to achieve a convincing interpretation.

*Verblendungen* does not enjoy the same popularity as *Lichtbogen* or *Désintégrations*, yet these works are similar in terms of their artistic goals – they all use electro-acoustic means to

transform timbre and create new textures. Why is *Verblendungen* less popular? As quoted above, Saariaho herself felt that *Verblendungen* was too inflexible, and did not allow for the “breathing” of the music as did *Lichtbogen*. This could be seen as a normal judgment placed by a composer on their first foray into a new genre. (Boulez placed an even harsher judgment on his first work for orchestra and tape – *Poésie pour pouvoir* – to such a degree that he deleted it from his list of compositions.) Presently, we have the technology to allow recorded media elements to respond in real time to live performers via sound or visual impulses (using a program like Cadenza Pro or motion capture programs). Perhaps it would be worthwhile to examine the impact of modern technology on these works. Whatever the case, the conductor should view these strategies for solving issues in electro-acoustic orchestral music as critical to developing a convincing interpretation. A conductor’s carefully considered approach to a work like *Verblendungen* can make a significant impact on its reception among performers and audience members, which may in turn help lead to a wider acceptance of this important new genre of composition.

## APPENDIX A

### Score instructions in *Verblendungen*

Kaija SAARIAHO

VERBLENDUNGEN

for orchestra (35 musicians) and computer tape

(1982-84)

commissioned by the Finnish Radio  
the tape is realized at GRM's digital  
studio, Paris

ORCHESTRA

1 flute  
1 alto flute in G (also piccolo)  
1 oboe  
1 clarinet in B flat  
1 bassoon (also contrabassoon)

4 horns in F  
1 trumpet in C  
1 alto saxophone in E flat  
1 trombone (tenor-bass)  
1 tuba (basstuba in F)

percussion: crotales  
(2 players) 1 glöckenspiel  
2 xylophones  
1 vibraphone  
1 marimba  
1 bass-drum  
1 guiro  
sandblocks

1 pianoforte  
1 harp

8 violins  
5 violas  
3 violoncellos  
2 contrabasses ( with 5 strings)

## APPENDIX A Cont.

page 2

### NOTATION

In the score the quarter note is equal to one second. Until bar 155 on page 33, the conductor should follow exactly the tempo  $\text{♩} = 60 \text{ mm}$ , because the orchestra and tape parts are synchronised, ie strictly co-ordinated. From bar 155 onwards the parts are more independent, and the conductor is free to make slight tempo changes. (The indications for interpretation don't apply to tempo before bar 156.)

The bar lines serve mostly as a means of synchronization, so bar lines and beats never mean an accentuation. All accents are precisely indicated, and in spite of them the music should flow smoothly. Also, when not marked otherwise, all instruments should enter with an imperceptible attack (even when this is not specifically prescribed). In particular, brass instruments should enter with the softest possible attack.

The tape part is marked in the score very generally to indicate some landmarks to the conductor. It is not supposed to precisely notate the sounds on the tape, nor to give an idea of the total piece when reading the score.

The tape part is marked only until bar 155, where the exact synchronization between orchestra and tape ends.

The score is written in C. Piccolo, Xylophone, Contrabassoon and Contrabasses are marked in the usual octave transpositions. Also all harmonics in the Contrabasses' parts are marked in octave transposition. Crotales and Glockenspiel sound two octaves higher than written. The harp harmonics should be played to sound an octave higher than written.

APPENDIX A Cont.

page 3


When the dynamic mark is followed by " - - - - - " the dynamic level should be kept as even as possible for the period indicated. However, when marked "pp (sempre)", the pp should be considered a general dynamic level, within which the player can make the usual slight microvariations in dynamic.

When vibrato markings are not specified, players can use their usual vibrato.


Tremolo should always be as dense as possible.

Glissandi should always be played very evenly, without vibrato and accentuations, starting immediately at the beginning of the note value. The pitches within the brackets "(c)" during the glissandi are there to show the approximate speed of the glissandi, and are not to be played with any accentuation or tenuto.

General marks

 change very gradually from one sound or one way of playing (etc) to another

 diminuendo al niente

 crescendo da niente

microintervals:  $\uparrow$  note raised a 1/4 tone (between  $\sharp$  and  $\sharp\sharp$  upwards)  
 $\downarrow$  note lowered a 1/4 tone (between  $\flat$  and  $\flat\flat$  downwards)

$\blacktriangle$  highest note

APPENDIX A Cont.

page 4

6

Strings

S.P. sul ponticello

estr. S.P. estremamente sul ponticello

S.T. sul tasto

N normal



place the fourth finger on the pitch indicated,  
and place the other fingers on the strings so as  
to mute the pitch and produce noise

Wind instruments



breath tone: ie when marked on the stave, use the  
fingering needed to produce the marked pitch,  
however, don't produce the normal tone but just  
blow air through the instrument  
When marked  $\downarrow, \star$ , the air should be added to the  
normal tone  
When the breath tone is marked under the stave,  
air should be blown through the instrument without  
any fingerings

Piano



stroke the strings with timpani mallets on the  
indicated pitch area, to produce a continuous  
soft tone field

tape



noise  
pitched string material.  
the low E  
string cluster



## APPENDIX B

### Score notes from *Lichtbogen*

The general character of the piece is light and flowing. To intensify the airy atmosphere and to allow the musicians to play with a light touch throughout the piece, the instruments should be amplified.

#### Notation

The bar lines serve mostly as a means of synchronization, so bar lines and beats never mean an accentuation. The music should flow smoothly. Piccolo, Xylophone and Double Bass are notated in the usual octave transpositions.

Likewise, all harmonics in the Double Bass' part are marked in octave transposition, except for the natural harmonics in treble clef, which are marked in the pitch in which they are played. The Harp harmonics should be played to sound an octave higher than written.

Crotales and Glockenspiel sound two octaves higher than written. Alto Flute in G is written with its usual fourth transposition. The Harp should always be allowed to ring as long as possible.

When the dynamic mark is followed by »- - -« the dynamic level should be kept as even as possible for the period indicated. However, when marked »pp« or »pp (sempre)« the pp should be considered a general dynamic level, within which the player can make the usual slight microvariations in dynamic.

When vibrato markings are not specified, players can use their usual vibrato. »Molto vibrato« always means a rapid and narrow vibrato, unless otherwise specified. Tremolo should always be as dense as possible.

#### General marks

—————→ change very gradually from one sound or one way of playing (etc.) to another

—————>>> diminuendo al niente

<<<————— crescendo da niente

S.V. senza vibrato

L.V. let vibrato (always as long as possible)

#### Microintervals

♯ note raised a 1/4 tone

♯♯ note raised a 3/4 tone


♭ note lowered a 1/4 tone

♭♭ note lowered a 3/4 tone

#### Glissandi

 or  this glissando should always be played very evenly, without vibrato and accentuations

 or  glissando with much vibrato





 for the strings:  
glissando with artificial harmonics, in which the upper finger is constantly moving and thus creating a rich sound with vividly varying pitches, instead of one gliding pitch.

All the glissandi should be started immediately at the beginning of the note value. The pitches within the brackets »( )« during the glissandi are there to show the approximate speed of the glissandi, and are not to be played with any accentuation or tenuto.

# APPENDIX B Cont.


page 2

## Strings

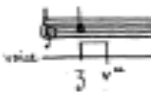
- S.P. always *estremamente sul ponticello*  
 S.T. *sul tasto*  
 N normal (used with S.P. and S.T., otherwise ord.)  
 always natural harmonic  
 add bow pressure to produce a scratching sound, in which the audible pitch is totally replaced by the noise  
 as above but move back from noise to tone again  
 tap the strings on the pitch indicated with the fingertips

When playing long sustained tones the bow changes should always be made imperceptible and independently of the other players. During long slurs which include several long sustained notes, a change of note should preferably not coincide with a change of bow.

## Flutes

-  breath tone: use the fingering needed to produce the marked pitch, however, do not produce the normal tone, but just blow air through the instrument

## Flutes






-  whisper the given phonemes into the instrument in the rhythm indicated, while simultaneously playing the pitches and other events as marked.

The phonemes are marked following the international phonetic alphabet, and are pronounced as follows:

- |                         |                           |
|-------------------------|---------------------------|
| ɑ as in English palm    | ʀ r as in English raw     |
| ɔ as in English do      | ʁ r as in French sur      |
| ɛ e as in English sled  | ʂ s as in English sue     |
| ɕ ch as in German Ach   | ʒ z as in English vision  |
| ɪ i as in English slid  | ʃ s as in English mission |
| ʌ l as in English few   | ʋ v as in English five    |
| ɸ n as in English no    | ʈ t as in English to      |
| o o as in English float | ʎ w as in German fühlen   |
| ɸ p as in English pat   |                           |

The small vowels written before or after the phonemes are supposed to be pronounced as quickly as possible before/after the principal phonemes.

## Piano

-  strike the strings with timpani mallets on the lowest register, to produce a continuous soft tone field  
 pizz.  pizzicato on the strings (mark the pitches beforehand)  
 P  pedal  
 gliss.  glissando on the strings, with fingertips  
 tap the strings on the pitch indicated with fingertips

*Kajja Saarialho*

## APPENDIX B Cont.

page 3

### Electronic part

**Amplification**

6 microphones (flute, vln 1 & 2, va, vlc, cb)

**Digital reverb**

(for example Lexicon pcm 70 or Yamaha rev7)

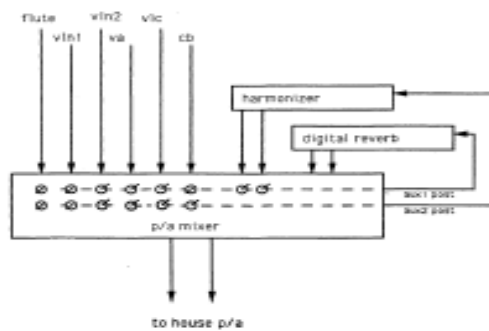
**Harmonizer**

(Yamaha SPX90, or comparable, with a pitch change programme)

**Mixing table**

(8 inputs, 2 outputs, 2 auxiliaries)

**2 loudspeakers**



Set the SPX90 to the programme 22 = pitch change B as follow:

- 1 pitch = 0
- 1 fine = +40 (cents)
- 1 dly = 20ms
- 2 pitch = 0
- 2 fine = -35
- 2 dly = 25ms

The reverb time in the digital reverb should be set, depending on the acoustics in the hall, to 2,5 - 4 seconds.

The harmonizer is marked in the score **H** and the reverb **R**.

The movements of the harmonizer are marked and those of the reverb

The use of the effects is marked with approximate percentage numbers, so that for example

**H** **75** **25**

means that the level of the harmonisation starting from 0 is raised until 75%, and then drops back to 25%.

The amount of the input to the effects is marked  $\varnothing$  = 0%,  $\odot$  = 25%,  $\bullet$  = 50% etc.

For the best result two persons would be needed: one for the actual mixing, and an assistant for turning the pages and following the score.

## APPENDIX C

### Score notes from Murail's *Désintégrations*

TRISTAN MURAIL

#### DESINTEGRATIONS

*for computer-synthesized tape and 17 instruments*

*Désintégrations* was composed after extensive work on the notion of "spectrum". All the material used in this piece (that on tape as well as in the score), its microforms, its systems of evolution, have as their origin analyses, decompositions or artificial reconstructions of harmonic or inharmonic spectra.

Most of the spectra are of instrumental origin. Those particularly employed are low piano sounds, brass, and cello sounds.

For all that the tape does not seek to reconstruct instrumental sounds. These only serve as a model for the construction of timbres or harmonies (in any case I make little distinction between these two notions), and even for the construction of musical form.

Several types of spectrum treatment are used in this piece:

- fractioning: one region only of a spectrum is used (e.g. bells sounds at the beginning, obtained by fractioning piano sounds)
- filterings: certain component elements are exaggerated or toned down
- spectral exploration: movement within a sound; the component elements are heard one after the other, the timbre becoming melody (e.g. 3<sup>rd</sup> section - sounds of small bells arising from the disintegration of clarinet and flute timbres)
- creation of inharmonic spectra. Those that are linear are made by adding or subtracting frequencies (by analogy with ring or frequency modulation); the "non-linear" are made by twisting a spectrum or by describing a frequency curve (e.g. penultimate section - the gradual twisting of a low trombone sound).

The tape was calculated by "additive synthesis", in which all dimensions of every sound component are described. This seemed to me necessary in order to be able to play on the spectra in the particular way I wanted, research that had begun long before this piece was started, in instrumental or orchestral works. Moreover the same compositional procedures were used on the tape (which has been really "written") and in the orchestra.

Since the classic synthesis programmes were too heavy and too slow, we used, for the first time in this application, the new "4X" machine of IRCAM, which permits real time synthesis. Nonetheless as hundreds of parameters have to be defined for each sound, I wrote an aid programme, "Syntad", which ran on the central computer and which calculated all the necessary parameters in terms of data formulated in a more musical way.

The orchestral writing has also taken advantage of the power of the computer for the definition of the pitches and durations. Certain micro-forms have also been designed directly by "Syntad".

There is therefore one origin for both tape and instruments, their relationship being one of complementarity. Often the tape exaggerates the character of the instruments, diffracts or disintegrates their timbre, or amplifies the orchestral effects. It should be in perfect synchronisation, hence the necessity of the synchronising "clicks" that the conductor must follow.

Eleven moments can be distinguished, eleven "stages" in the piece. The passage from one to the next is made by transition-transformation or by the unleashing of a "threshold effect". Each moment emphasises a different kind of spectrum treatment, each stage makes it evolve from the harmonic to the inharmonic or vice versa. This creates movements of shade and light, accompanied by movements of increasing or decreasing agitation, of rhythmic ordering or disordering.

The synthesis on the computer was realised with the help of Andrew Gerszo, and the final realisation on tape with that of Didier Arditti.

*Désintégrations* was commissioned by IRCAM and was first performed at IRCAM on February 15th 1983 by the Ensemble InterContemporain, conducted by Peter Eötvös.


# APPENDIX C Cont.

## page 2

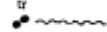




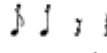
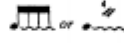
### SYMBOLS

#### ACCIDENTALS





$\sharp\sharp$ $\flat$ $\sharp$ $\sharp\sharp$	-3/4, -1/4, +1/4, +3/4-tone
$\uparrow$ $\sharp$	very slightly higher (by an 1/8-tone) than $\flat$ or $\sharp$
$\sharp$ $\downarrow$	very slightly lower (by an 1/8-tone) than $\sharp$ or $\flat$
$(\sharp)(\sharp\sharp)$	play these 1/4-tones if possible (otherwise $\sharp$ becomes $\flat$ , $\sharp\sharp$ becomes $\sharp$ )


 Accidentals are valid for one beat only, not for a complete bar. All the same, most frequently, each note has its own accidental, except in obvious cases (repeated notes, repetitive or symmetrical formulae). Accidentals are never valid for a note of the same name in a different octave.

#### OTHER SYMBOLS

$\emptyset$	as quietly as possible (if possible, without an attack)
$\emptyset \leftarrow p \leftarrow f$	from nothing to <i>p</i> then from <i>p</i> to <i>f</i> (without an intervening diminuendo)
	trill between the two indicated notes
	repeat the formula in the square in accordance with the length of the double line
	tremolo (strings) or fluttertonguing (winds)
	move from the smooth sound to tremolo (or to flutt.)
	end of tremolo (or flutt.)
	triplet eighth-note, triplet quarter-note (crotchet) and respective rests (notation used in the "fractional bars")
	vibrato as per the indicated rhythm, with normal amplitude
<i>nv</i>	non vibrato

#### SYMBOLS FOR THE STRINGS

<i>sp</i>	sul ponticello
	very close to the bridge so that the harmonics are heard more than the fundamental
<i>st</i>	sul tasto
$\longrightarrow$ <i>sp</i>	move gradually towards the bridge
<i>ord</i>	return to normal play
	exaggerate the bow pressure on the string (thus producing a noiselike sound about an octave too low)
	return to normal pressure
$\longrightarrow$ 	gradually increase the bow pressure
$\rhd$	to and fro of the bow, light pressure (quasi flautando); at first play quickly, then slow down

 The strings should play with normal vibrato unless otherwise indicated. the horizontal strokes are simply indications of duration.



# APPENDIX C Cont.

## page 3

### SYMBOLS FOR THE WINDS

- ▷ *Breath only (no precise pitch should be perceptible)*  
▼ *Sound mixed with breath (the pitch should be perceptible)*

### PIANO AND PERCUSSION

-  or *lv* *Indicates, for the piano and vibraphone, that the sound should be left to vibrate until no longer sounding (or until a pedal indication is reached)*  
 *Always let the crotales, glockenspiel and tubular bells vibrate until the sound dies away naturally.*

### RHYTHMIC NOTATION

*In order to ensure perfect co-ordination between the tape and the ensemble the conductor should follow the "clicks" recorded on the fourth track. There exists a two-track working version of the tape, with the clicks on one track and a monophonic reduction of the tape on the other.*

*The first beats of each bar are indicated by a louder and more high-pitched click. Occasionally preparatory clicks enable the conductor to start off in the correct tempo after a pause. They are indicated by small crosses in the upper part of the score in the space reserved for a schematic rendering of the tape part.*

*The sounds on the tape are represented by musical notation or graphisms on the upper staves of the score. The indications *hnb*, *rbn* etc. merely indicate a resemblance to instrumental sounds.*

### THE BEAT

*In the score each beat is indicated by a light line, the bars being separated by thick lines. On the parts the beats are marked only when necessary, by light or dotted lines.*

*The quarter-note (crotchet) is the basic rhythmic unit. Held notes are often represented by horizontal lines whose length indicates the actual duration of the note.*

*Time signatures such as 2, 3, 4, etc... indicate bars of 2, 3, 4, ... quarter notes.*

*1/2, 2/3, 3/4, etc... are fractions of quarter notes, i.e. beats equal to: one eighth note (quaver), two triplet eighth notes, three sixteenth notes (semi-quavers), etc...*

*examples:*





$3 + 1/2$  is a bar containing four beats of different duration, i.e.: quarter - quarter - quarter - eighth

$1 + 3/4$  is a bar containing two beats of different duration, i.e.: quarter - dotted eighth

$2 + 3$  = two beats:  $2/3^4$  of a quarter, quarter, or: 2 triplet eighth notes, then 3 triplet eighth notes

$2 + 1/3$  = three beats: quarter - quarter - triplet eighth

etc...

*The following symbols     represent a triplet eighth-note and a triplet quarter-note and their respective rests. They are used in the «fractional bars» mentioned above.*

### SOUND DIFFUSION

*There are two versions of the tape for Désintégrations: 1/2" and 1/4", with or without DBX (or Dolby). The preferable version is of course the 1/2" with DBX.*

*Tracks 1 and 2 of the tape should be diffused in stereo on the front loud-speakers placed on the same sound level as the ensemble.*

*Track 3 should be diffused on the loud-speakers to the rear of the hall.*

# APPENDIX C Cont.

## page 4

Track 4 consists of synchronization clicks that the conductor listens to with open ear-phones of the "walkman" type. The conductor should be able to control the sound level of his ear-phones himself.

The tape should, generally speaking, be in perfect balance with the ensemble. In order to achieve this it might be necessary to adjust the diffusion level during performance.

Passages that may need such boosting are:

- page 8, first bar of section II (low "piano" sound)
- page 43, 2 last bars of section VI
- pages 45-47, bars 25-42 of section VII. Return to the normal level for bar 43
- pages 54-57. Section X is one of the rare moments in which the tape stands out somewhat from the ensemble.
- page 66, bar 64 of section XI

Track 3 is only active at certain moments (sections I, V, VIII-IX, XI). Track 3 can be reinforced for section VIII in order to highlight the movement of the sound in space, as well as right at the beginning of the piece (bar 1).

At the end of the piece, the sound should be made to die away very gently as it accompanies the bass drum's decrescendo, in accordance with the conductor's gestures.

### GRAPHIC REPRESENTATION OF THE TAPE

The sounds on the tape are represented by traditional musical notation, by graphisms, or by a combination of the two. Traditional notation enables the pitch of the instruments to be checked and facilitates rhythmic co-ordination.



examples of chord or spectra graphisms, the components of which disappear or appear one after the other.



fundamental of a spectrum (not audible)

$2^0$   
 $11$

or:  $h_7, h_7$  harmonic ranks

env. = envelope

htr, trb etc... sound synthesized from spectral analysis of the indicated instrument



simulation of a modulation with the note in the square



simulation of an intermodulation between the two notes (which are not necessarily audible)



simulation of a frequency modulation between the two notes ( $p$ =carrier,  $m$ =modulating frequency)



simulated reverberation effect

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