

The Graphic Design of Musical Structure:

Scores for Listeners:

Incantation and Mortuos Plango, Vivos Voco

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Deeper understanding of any music is possible through analysis. Possibilities of analysis are expanded through visualization of sonic dimensions. Traditionally a musical score is written for performance, not analysis. While a score is a graphic description of the sonic events that comprise a composition, many details of construction are left out. For electro-acoustic work, often there is no score at all.

Over the past century composers have developed many approaches to graphic notation of sound events. (Cage 1969) We can use these techniques (and invent our own) to create study scores—scores for listeners.

Even simple graphics can illuminate a musical work. Take for example a well-known, and well-analyzed piece such as Mozart's *Symphony in G minor*. The exposition is exactly 100 measures in length. If we create a simple graphic of the location of the highest (G6) and lowest (E1) notes (which, in terms of register, are the two most important moments) we see a familiar relationship. See Figure 1.

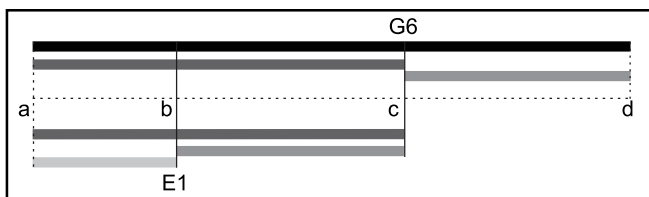


Figure 1: from Mozart's *Symphony in G minor*, exposition.

Here we can see an application of the golden section at various levels in the temporal architecture. Knowing that Mozart was a Freemason, and seeing here an application of the "secret" knowledge of the Masons, provide a deeper understanding of the work.

This relationship is even more clear when the analysis is compared to Dürer's illustration "Man Inscribed in Circle" (ca. 1521), where he illustrates the golden section as it applies to the human form.

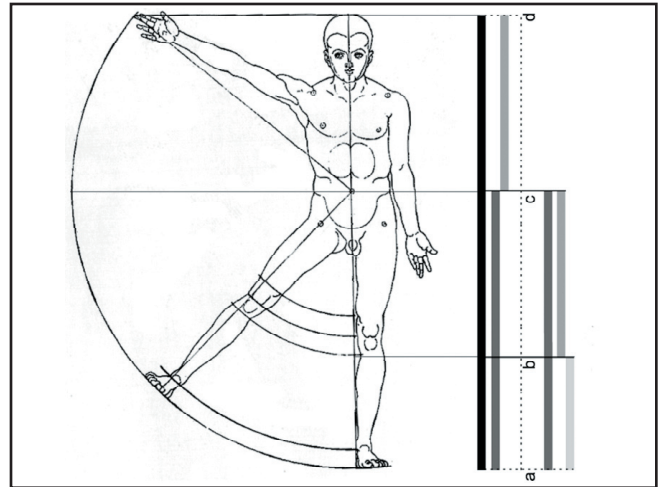


Figure 2: Dürer's "Man Inscribed in Circle" (ca. 1521).

As another example, consider Webern's *Opus 27* for piano. A simple rendering of the second movement in piano roll notation easily reveals a symmetrical structure, not readily apparent in the notated score.

From this representation, even a novice listener can see (and so perhaps hear) a significant aspect of this serial work.

Designing a graphic representation of some or several dimensions of a sonic work can provide a path into difficult music, including electro-acoustic works.

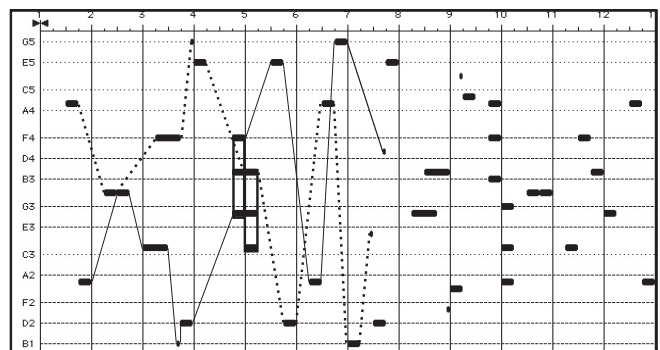


Figure 3: from Webern, *Op. 27*, 2nd movement.

There are many electronic works where the composer has provided a graphic score to help the listener connect with the composition. From the now classic literature from the 1950s there are works such as Ligeti's *Articulation* and Stockhausen's *Studie II*.

There is a study score available to Trevor Wishart's *Vox-5* that brings us more deeply into his "imaginary landscapes," and even basic spectographs have been published, providing visual clues to musical structure in works such as Babbit's *Ensembles for Synthesizer* and Risset's *Little Boy*. (Landy 1994, Cogan 1984)

This paper provides study scores for two electro-acoustic compositions—*Incantation* by Otto Luening and Vladimir Ussachevsky, from the early years of the Columbia-Princeton Studios, and Jonathan Harvey's *Mortuos Plango, Vivos Voco* created in the late 1970s at IRCAM. The scores were created to broaden an understanding and appreciation of the works, These scores-for-listeners have proven useful in introducing the works to new audiences.

The study scores take sonic aspects of the works and develop graphic representations that can be visually followed while listening. The ability to read standard music notation, while useful, is not required. A variety of visual design elements mirror aspects of the sonic structure. Making structure visible is a powerful aid in the comprehension of new music. This is especially true of compositions that use new or unfamiliar sound vocabularies. Basic techniques of repetition, contrast and variation are more immediately perceived. The architecture and flow of a work are more apparent and more readily grasped when both seen and heard.

Incantation

Incantation was composed using the five basic tape techniques of speed change, direction change, cutting and splicing, looping and delay (reverberation). (Schrader, 1982) The basic material was developed from recordings of flute glissandi, vocal incantations and piano sounds. In the study score each of these elements is given a simple graphic representation making it easy to follow along while listening. The bell-like attack/decay envelope appears in the piano notes and is also applied in the final section in the fade out of flute materials. The overall form is apparent in a single glance and details can be followed while seen in the context of the entire work.

Mortuos Plango, Vivos Voco

The Harvey piece is built from an acoustic analysis (and subsequent synthesis) of the tenor bell at Winchester Cathedral, along with recordings of the bell and his son singing the words inscribed on the bell plus other simple vocalizations. Harvey has given a clear description of how the piece was constructed. (Harvey 1981) Synthetic sounds were constructed from the bell analysis and mixed with recorded sounds. The piece unfolds with the interplay of bell, voice and synthetic sounds, building to the final sections where the harmonic structure of the bell is sung.

Graphic renderings can assist in illustrating pre-compositional materials that later bear on the unfolding of a musical work. The Harvey composition is a good example of this. The harmonic analysis of the bell is crucial to the overall structure of the work, impacting the work in both its organizational form and material content. Pitch material is derived from the analysis, as are the pitch centers of each section. See Figure 4. The durations of the sections are inversely proportional to the frequencies of the pitch material. See Figure 5.

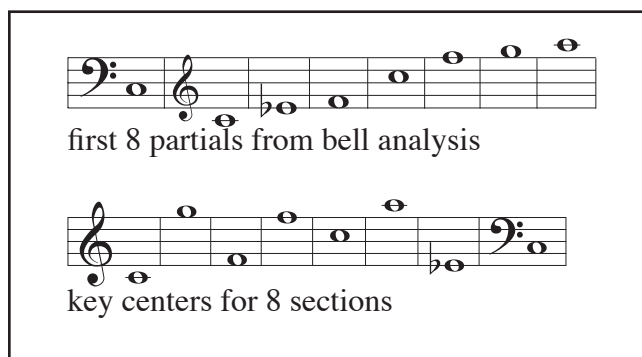


Figure 4: Pitch material from the bell analysis and pitch centers for *Mortuos Plango, Vivos Voco*.

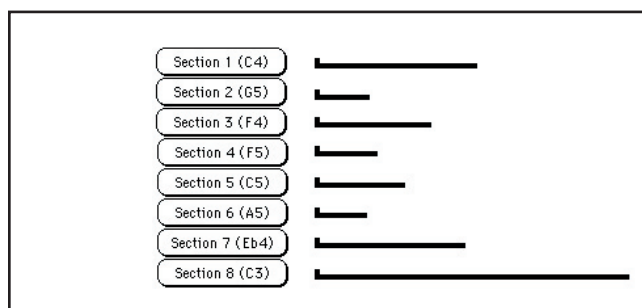


Figure 5: Section durations in inverse proportion to their pitch centers.

Through synthesis Harvey is able to play with the bell partials. One technique of note is the use of glissandi of partials as a group and independently as they cross each other through a pivot frequency. See Figure 6.

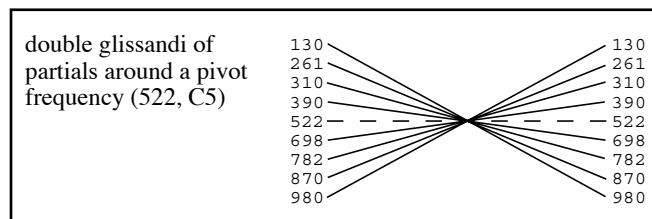


Figure 6: Graphic of cross glissandi of the bell partials, achieved through synthesis.

Basic Considerations

In making an effective score for listeners considerations include:

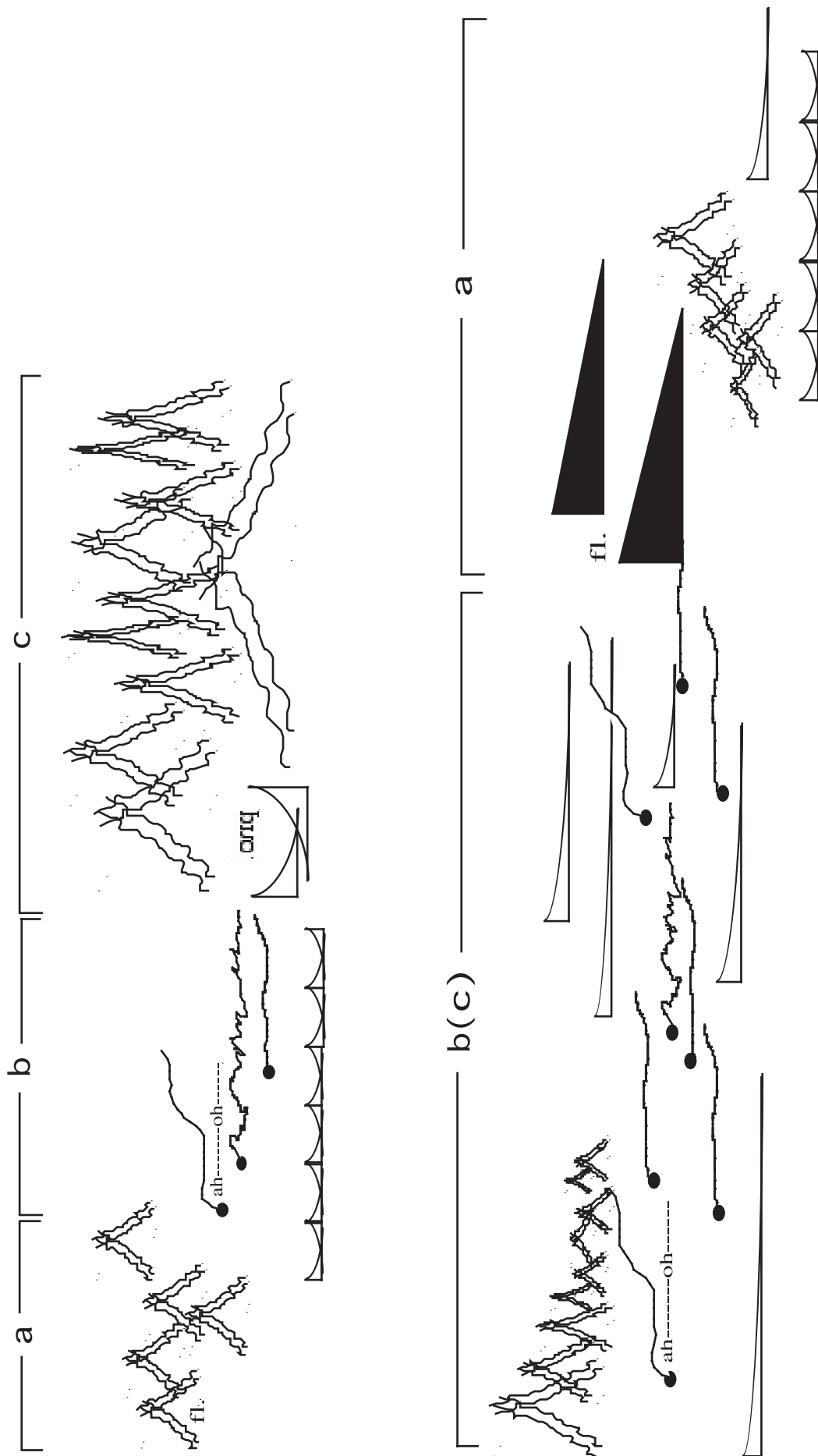
- sonic events should be simple, but visually identifiable
- temporal logic should match the spacial logic
- the full score should be visible at a glance
- score reading is *not* the most important thing
- *scores are for listening* (in service to the ear)

An anthology of study scores for a large body of significant electro-acoustic works is now developing. This will do much to further performances of the repertoire and expand its audience. (See for example the work of GRM, Le Groupe de Recherches Musicales, and the interactive study scores and analyses of several important electro-acoustic works they developed and put online at <http://www.ina.fr/grm/acousmaline/polychromes/>.)

References:

- Cage, John, *Notations*, 1969, New York: Something Else Press.
- Cogan, Robert, *New Images of Musical Sound*, 1984, Cambridge, MA: Harvard University Press.
- Harvey, Jonathan, “*Mortuos Plango Vivos Voco*, A Realization at IRCAM,” *Computer Music Journal*, 1981, Cambridge, MA: MIT Press.
- Landy, Leigh, *Experimental Music Notebooks*, 1994, Chur, Switzerland: Harwood Academic Pub.
- Schrader, Barry, *Introduction to Electro-Acoustic Music*, 1982, Englewood Cliffs, NJ: Prentice Hall.

Incantation (1953) - Luening/Ussachevsky



Mortuos Plango, Vivos Voco

Jonathan Harvey (1980)

Horas Avolantes Numero, Mortuos Plango:
 Vivos ad Preces Voco. (I count the fleeting
 hours, I lament the dead: the living I call to
 prayer.)

SECTION 1

- event density = bell envelope
- introduction of “tune”

synth chords
 the “tune”
 c g f f c a e b c

VOX VOX

mort...

SECTION 2

- percussive consonants
- double gliss (intro to 3)

horas...

SECTION 3

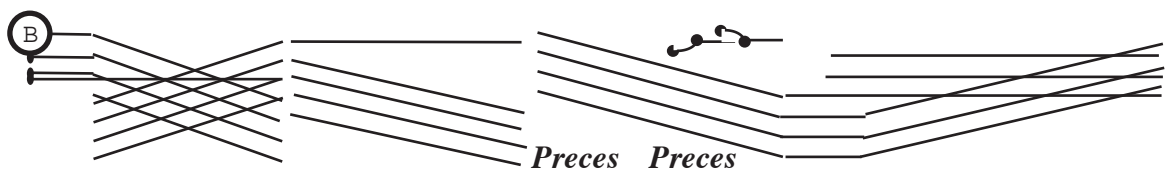
- double gliss sines
- no voices

SECTION 4

- voices and sines
- Bb minor triad

SECTION 5


- double gliss voices
- contrary and oblique motion



The diagram shows two voices, labeled 'B' and 'V', with lines representing their pitch contours. The lines cross and move in opposite directions, illustrating 'double gliss voices' and 'contrary and oblique motion'. The word 'Preces' is written twice below the notation.

SECTION 6

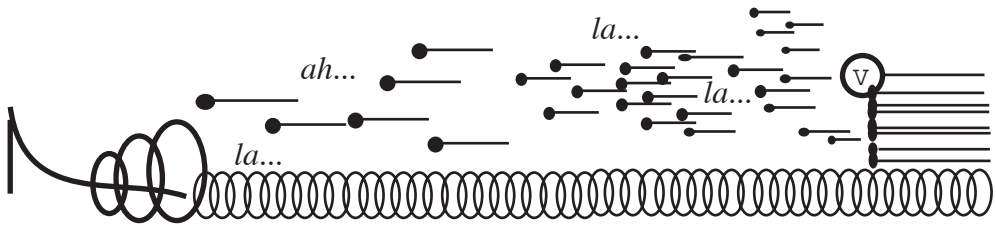
- bell.voice pedal
- rotating and percussive voice



The diagram shows two voices, labeled 'B' and 'V'. The 'B' voice has a long, low line representing a 'bell.voice pedal'. The 'V' voice has a series of dots and lines that form a rotating and percussive pattern.

SECTION 7

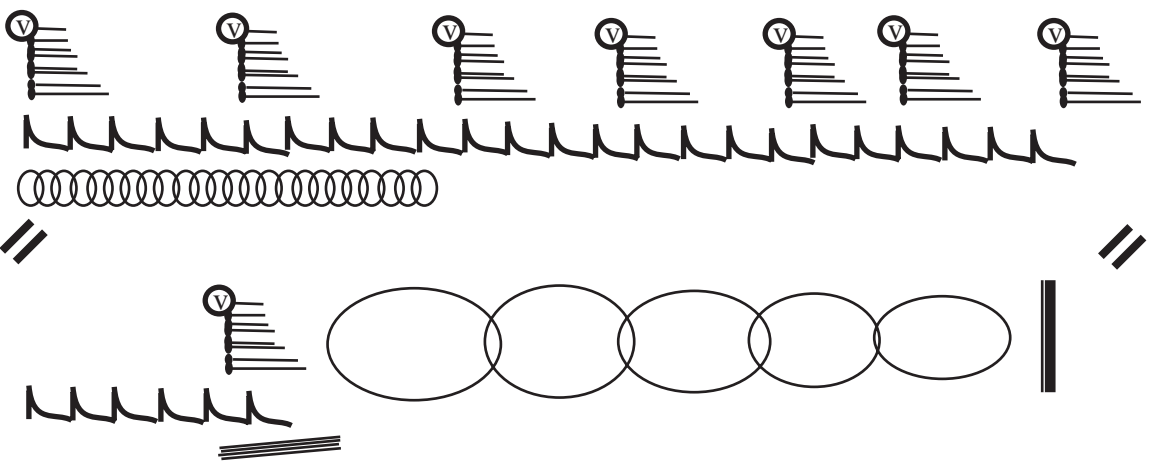
- rotating bell
- voices on bell partials (vox-bell)



The diagram shows a 'rotating bell' represented by a series of overlapping circles. Above it, two voices, labeled 'B' and 'V', have lines representing their pitch contours. The word 'la...' is written above the 'V' voice, and 'ah...' is written above the 'B' voice. The word 'la...' is also written above the 'B' voice.

SECTION 8

- bell drone
- voices on partials



The diagram shows a 'bell drone' represented by a series of overlapping circles. Above it, two voices, labeled 'B' and 'V', have lines representing their pitch contours. The word 'la...' is written above the 'V' voice. The diagram also includes a series of vertical lines and a thick vertical bar.