Golden Aspen, for flute and electronics

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Abstract

Golden Aspen is a piece for amplified flute and electronics (fixed-media) composed in 2017. The piece has been presented in different international festivals by performers such as Rodrigo Frade (Brazil), Elena D'alò (Italy), Patricio de la Cuadra (Chile), Kelley Barnett (USA), Gabriella Roderer (USA) and Natalia Martorel (Chile). The piece was composed in the composer's personal studio and at the Research Center for Contemporary Music of the Federal University of Minas Gerais (Belo Horizonte/Brazil) with the financial support from the Brazilian Federal Foundation for Support and Evaluation of Graduate Education (CAPES). This paper aims to analyze the compositional procedures employed in the piece. The analysis will focus on the relations between micro and macro structure focusing on motivic development, formal articulation, timbre exploration and interaction between acoustic instrument and electronics. It will be explained how the motivic organization of the piece uses a technique entitled by Pierre Boulez as Pavlov's Reflex to enhance the perception of functionality on its internal structures. Moreover, I will also stress the importance of timbre not only on the delineation of Golden Aspen's macrostructure but also how timbre is used to create the idea of development and movement, changing the western traditional hierarchy in which harmony plays the most important role in the development of musical structures. Having in mind the structural importance of timbre, the electronic media is an important asset to expand the possibilities of timbre exploration on Golden Aspen.

Keywords

Motivic development, formal articulation, timbre exploration, mixed music, flute and electronics

1. Introduction

Golden Aspen[98], for amplified flute and electronics, was composed in 2017 and it has been performed in festivals throughout South America, North America, Europe and Asia. The piece is inspired by the Pando Tree[99], a quaking aspen (populous tremuloides) located in the state of Utah (United States). The species, under certain circumstances, exposes its roots from the soil, creating a new tree. Although it may not appear so at first glance, the new tree still shares the same root system as the first one. Thus, Pando weighs approximately 6615 tons and occupies a 42 hectares' field, creating a forest formed by only one living organism. Similarly, in the piece Golden Aspen, the musical development is created using a restricted set of musical materials that spreads itself through time.

The compositional techniques employed in Golden Aspen were highly influenced by the

98 For recordings, score, performance history, please access: https://www.levyoliveira.com/golden-aspen
99 Pando means "I spread" in Latin.

techniques found in two pieces: Matthias Pintscher's A Twilight's Song (for soprano and seven instruments) and João Pedro Oliveira's Titanium (for Piano 4-hands, 2 toy-pianos and electronics). I was analyzing both pieces a few months before composing Golden Aspen[100], therefore, many of the techniques I will be explaining in this paper are directly based on these analysis.

2. Golden Aspen's Structure

When I wrote Golden Aspen, I defined the piece's formal structure beforehand. The pre-established structure is represented in figure 1.

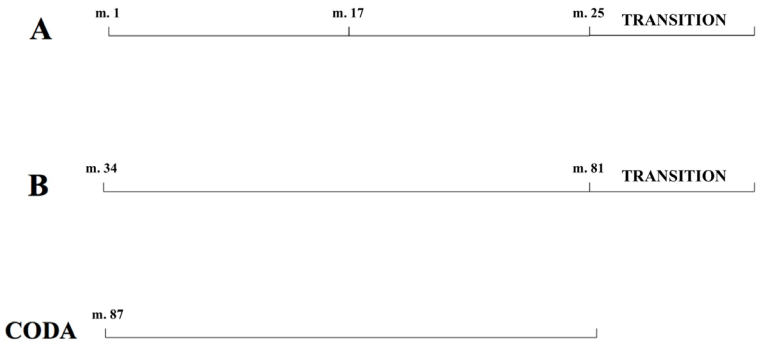

Figure 1: Golden Aspen's Structure

Golden Aspen has two main sections – A (m.1-34) and B (m. 34-81), followed by a coda (m. 87-96). The main sections are contrasting. Extended techniques are structurally relevant and create an opposition between both sections. Section A is mostly based on harmonic sounds. Few measures use inharmonic sounds (figure 2 / audio excerpt 1[101]).

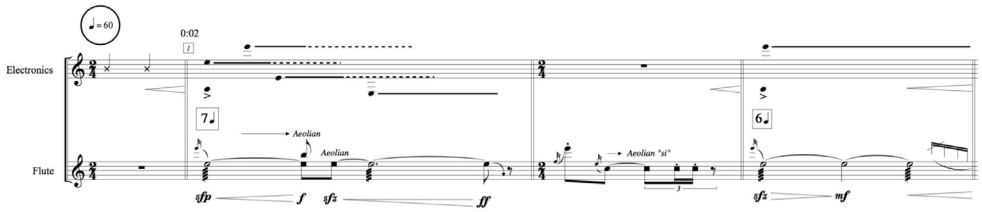

Figure 2: Golden Aspen's m. 1-3

Conversely, section B is mostly based in inharmonic sounds and there are only a few measures with harmonic sounds (figure 3 / audio excerpt 2).

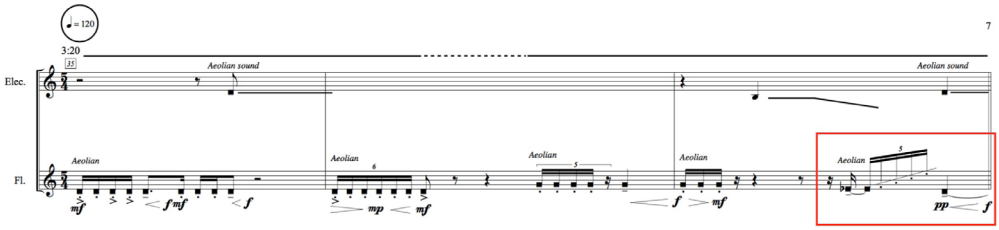

Figure 3: Golden Aspen's m. 35-37

100 The analysis are found in the following links: https://www.revistas.ufg.br/musica/article/view/48718 and https://periodicos.ufmg.br/index.php/permusi/article/view/15108 (both analysis are available only in Portuguese).

101 Audio excerpts are available here: https://on.soundcloud.com/5SB09Ugn8eHAHEpEl5

This timbral organization delineates the piece's main sections. A similar procedure had already been used by the French composer Olivier Messiaen. According to Lerdahl (1987):

Think for instance of the temporal placement of instrumental combinations in Messiaen's Chronochromie (1960). The basic sectional grouping in the piece are given in the most obvious ways, by pauses; but the pauses are not sufficient to group these sections into larger sections. It is the timbral disposition that most crucially conveys these larger groupings. Without this patterning, the form of Chronochromie would be hierarchically flat, especially since the pitch structure in the piece is so amorphous. Here timbre is not just "color" but is a principal bearer of form (p. 140)

Such as in Messiaen's Chronochromie, I believe timbre is also the principal bearer of form in Golden Aspen. Nevertheless, in my piece, there is a gradual transition between both sections' timbral structures. Throughout the whole section A, the predominance of harmonic sounds is constantly interrupted by short interferences of inharmonic sounds (see figure 2). In Section A's transition (figure 4 / audio excerpt 3), the inharmonic sounds become more prominent.

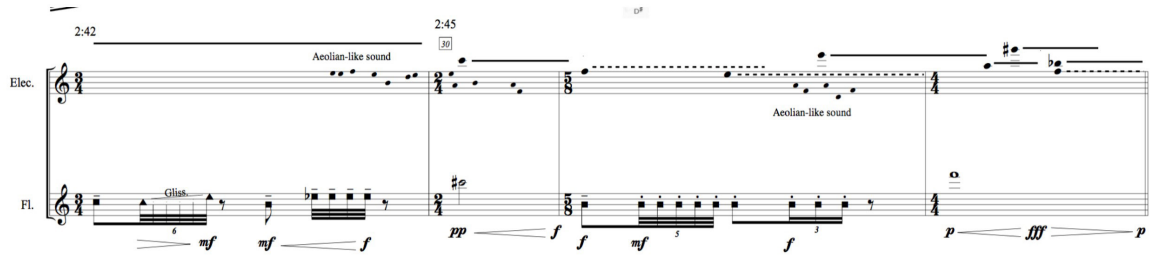

Figure 4: Golden Aspen's m. 29-32

At this point, there is an alternation between harmonic and inharmonic sounds. Each measure has a different timbral organization. Furthermore, when the flutist is playing harmonic sounds, the electronics extend the inharmonic gestures. When the inharmonic sounds finally take the main role, the electronics play for 26 seconds without any interference from the flutist. In this moment, the electronic granular sounds (derived from the Aeolian sounds) are gradually transformed into a flute pizzicato (audio excerpt 4), marking Section A's ending.

Besides the procedures discussed above, timbre has another important structural relevance in Golden Aspen. I use a technique I call timbral fading[102] to emphasize the ending of a musical section. As it is possible to see, the coda (figure 5 / audio excerpt 5) starts with the same musical motif used in the piece's initial gesture (figure 2 / audio excerpt 1), however, it has a sparse timbral continuation, signaling that the music is coming close to its ending.

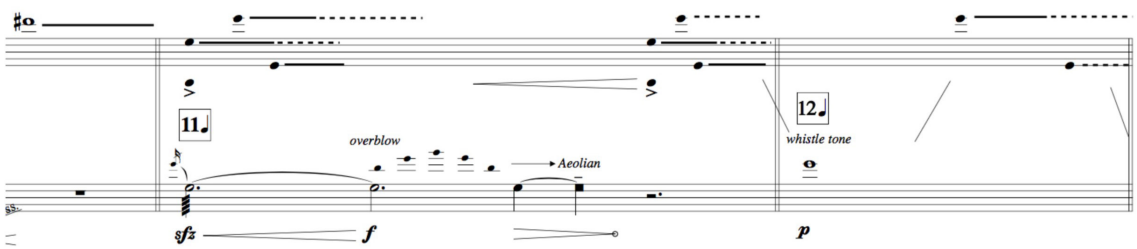

Figure 5: Golden Aspen's m. 86-88

The same effect is also used to highlight the ending of sections A and B. Here, I used as

102 This technique is inspired by the analysis I conducted of João Pedro Oliveira's piece Titanium.

reference Lerdahl's prolongational trees. The author proposes that the prolongational tree serves as a notation to define how the axis tension/relaxation was explored in a given piece. According to him, the prolongational trees have three kinds of branching nodes: (1) An open circle (figure 6a and 6d) "describes an attachment where an event is replicated; this is called strong prolongation" (LERDAHL, 1987, p.139) (2) A filled-circle (figure 6b and 6e) "describes an attachment where an event moves to a modified form of itself; this is called weak prolongation" (LERDAHL, 1987, p.139) and (3) A node without any circle (figure 6c and 6f) describes an attachment where an event moves to a completely different event; this is called progression" (LERDAHL, 1987, p.139). Moreover, Lerdahl states that another important aspect of these trees is the position of their branching connection. A right branch (figure 6a-c) "signifies a tensing motion to a less stable event" (LERDAHL, 1987, p.139) and a left branch (6d-f) signifies a relaxing motion to a more stable event (LERDAHL, 1987, p.139).

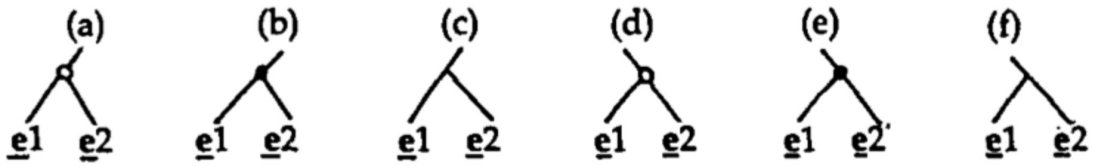

Figure 6: Lerdahl's Prolongational Trees - Source: LERDAHL (1987)

As we can see in Golden Aspen's structural graph (figure 1), before the transition to section B, section A has two subsections. To emphasize A's ending, its second subsection still has some of the musical gestures from the first subsection, nevertheless, the timbre is less rich in harmonics, indicating the lack of energy typically associated with an ending. In order to create this effect, during the second subsection (figure 7 / audio excerpt 6), the flute long notes (responsible for creating the tension in the first subsection – figure 2 / audio excerpt 1) are now played in whistle tones.

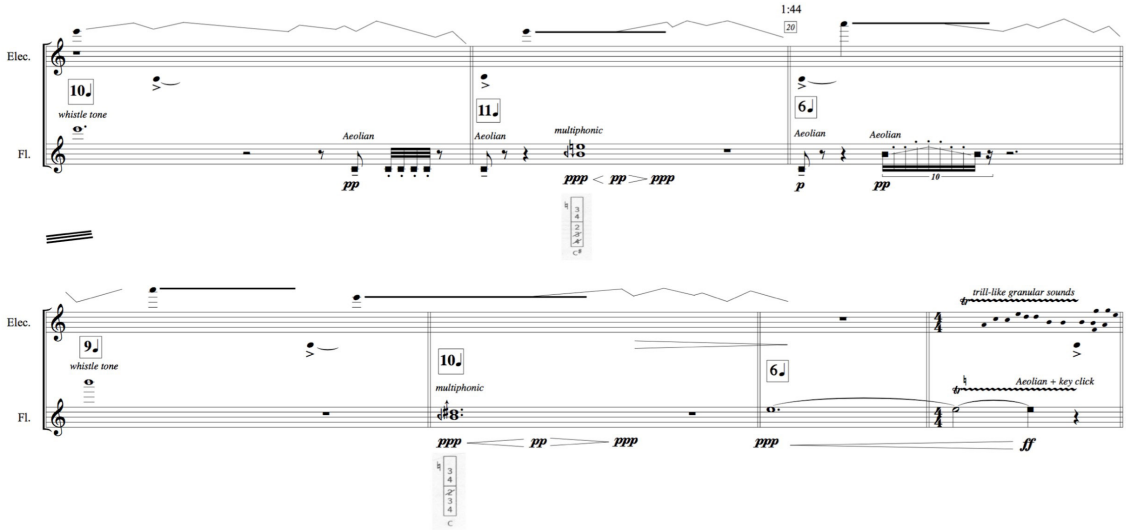

Figure 7: Golden Aspen's m. 18-24

Thus, the corresponding prolongational tree to Section A is the prolongational tree (e) (Figure 6), in which an event moves towards a modified version of itself in a relaxing motion. The harmony

used in the second subsection also accentuates the idea of relaxation/stabilization. While the flutist plays the pitch E in whistle tone (m. 18 – figure 7), the electronics also play the pitch E. Similarly, when the flutist plays the pitch B in whistle tone (m. 21 – Figure 7), the electronics also play the pitch B. Therefore, harmony also plays an important role in Section A's articulatory process.

A's first subsection is composed using only three pitches: E, F and C[103]. The second subsection – that is more stable – uses two pitches: E and B. The third subsection (the transition) needs more energy to lead the musical discourse towards a new direction, therefore, its harmony is more complex. Since I wanted to create a gradual transition, the passage begins with the pitch E (pitch polarized during the first section) and the other eleven tempered pitches are gradually added to the harmonic organization (figure 8 / audio excerpt 7). At the end of the transition, E-flat is used to polarize D, consolidating a new polarization. The vertical harmony in the transition is based in minor seconds, increasing the instability typically necessary for transitions.

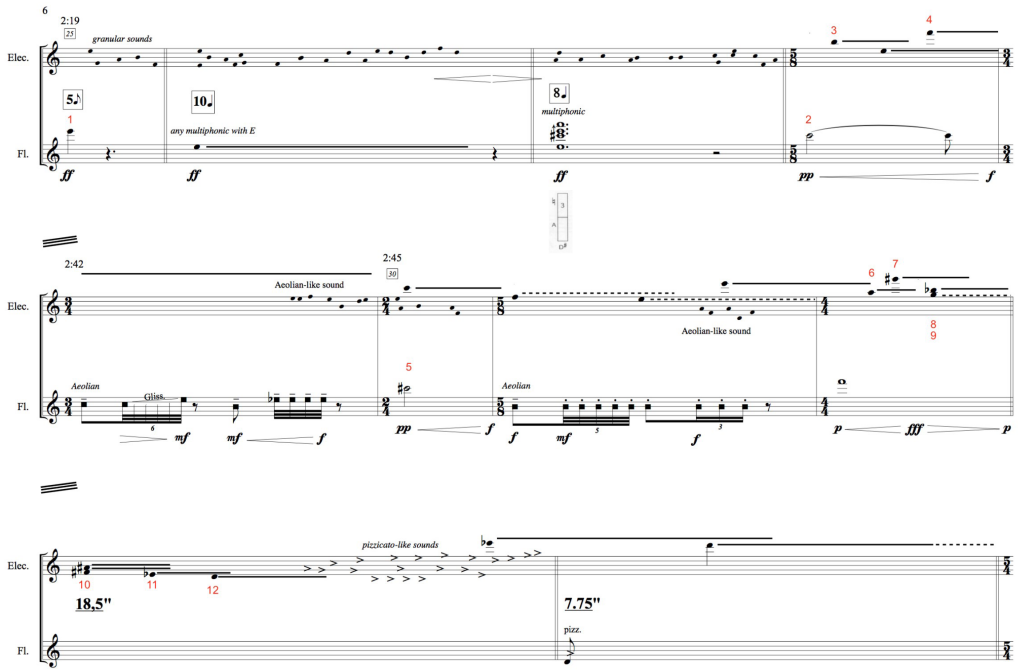

Figure 8: Golden Aspen's m. 25-34

Aside harmony and timbre, the control of dynamics is also an important aspect to stress section A's structure. As we can see by the sound waves (figure 9), the first two subsections of the piece do not have a steady tension accumulation.

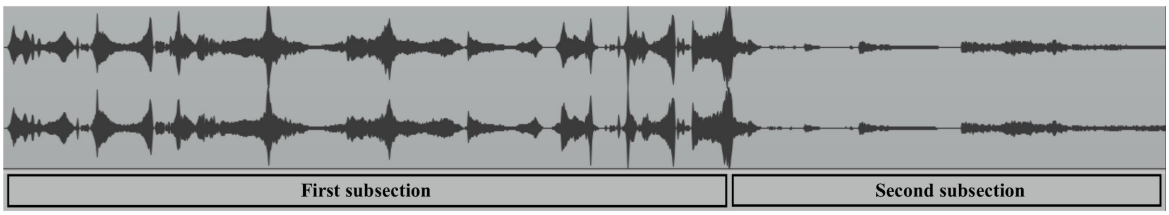

Figure 9: Wave format from Section A's first and second subsection

The first subsection, although more energetic, has many decrescendos and pauses that interrupts

103 I am not considering here the pitches found in the multiphonics and overblow, because these effects are used due to its timbral color, not because of their pitches.

the energetic flux. The second subsection, as previously stated, has a very sparse atmosphere, accumulating almost any tension. Therefore, as it is possible to see in figure 10, the transition is the first moment in Golden Aspen where tension is kept almost uninterruptedly, offering to the passage the necessary power to conduct the music to a new section.

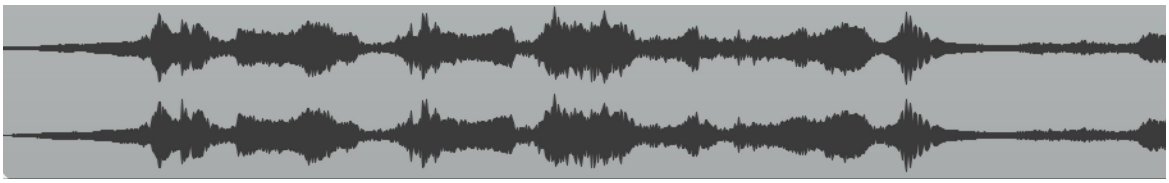

Figure 10: Wave format from Section A's transition

Hence, Golden Aspen explores the combination of timbre, texture, dynamics and harmony to enhance the effectiveness of its transitions. The association of these parameters can be collaborative or defective, creating contrast between sections composed using the same musical material. Golden Aspen's second transition (figure 11 – audio excerpt 8) is composed with the same musical material employed in section A's second subsection (figure 7 / audio excerpt 6). Nonetheless, now, this material is not employed to create stability (as it was before), but to create movement, what requires instability. In order to do that, the harmony, previously based in unisons, is now based in minor seconds.

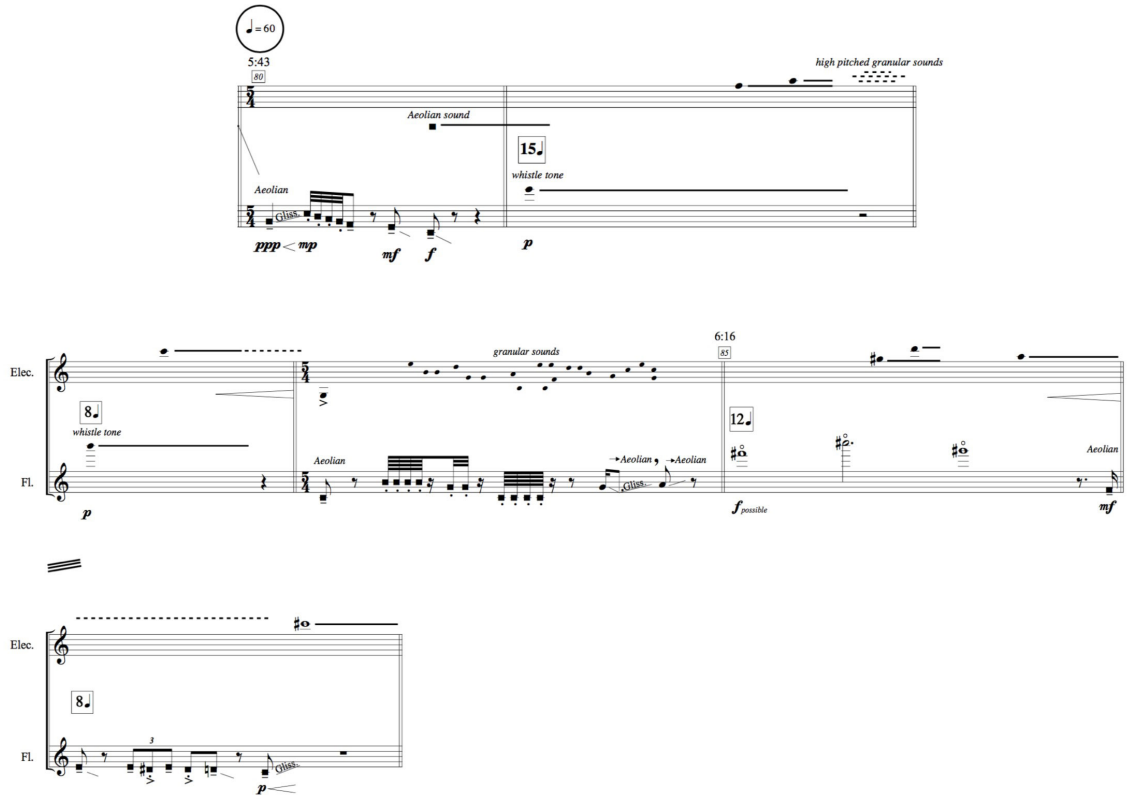

Figure 11: Golden Aspen's m. 80-86

To create even more tension, low sounds were added in the electronics. Besides creating the foundation necessary to keep the tension through the excerpt, the low sounds were very useful to the passage, because they do not overshadow the whistle tones and the soft harmonics played by the flutist.

3. Golden Aspen's Section B

According to Lerdahl (1987), defining hierarchies is very important to the development of rich musical structures. In order to produce timbral hierarchies, Lerdahl (quoted by Saariaho and McAdams, 1985, p. 372) suggests the creation of family of sounds – that is, a grouping of sounds that, although different from each other, still shares some spectromorphological resemblances. According to Saariaho and McAdams (1985):

(The creation of family of sounds) allows the expression of varying degrees of contrast, cognitive 'distance', constraints on the acceptable paths from one family to another, as well as relations that vaguely resemble the functional dissonance and dominance one finds in tonal pitch structures which seem especially rich in their ability to bear intricate forms of this nature (p. 372).

In Golden Aspen's section B, I used a family of sounds to create musical development. Three kinds of Aeolian sounds are used in this section: Aeolian sound, Aeolian sound played with close embouchure and an Aeolian sound mixed with a recognizable pitch. Figure 12 (audio excerpt 9) shows the spectral analysis of these sounds.

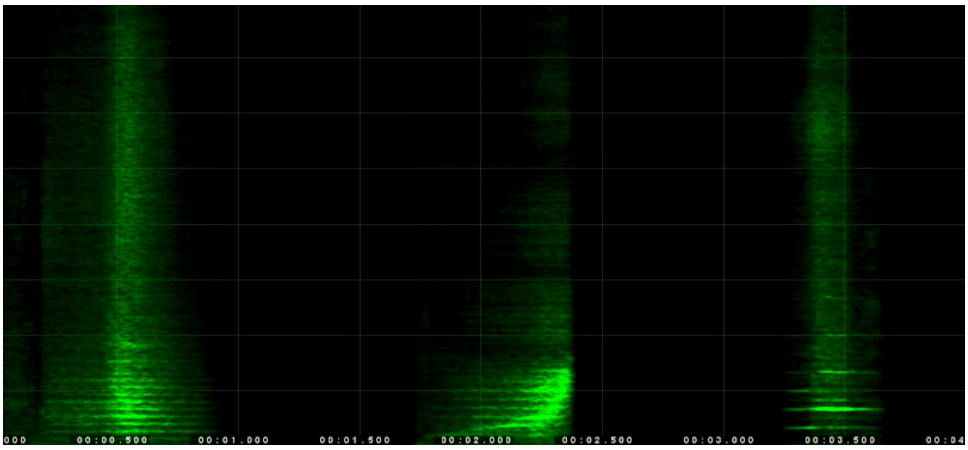

Figure 12: Aeolian sound, Aeolian with closed embouchure and Aeolian sound with recognizable pitch

As we can see, all these sounds share spectral similarities. They are rich in harmonics (resembling a pink noise), nonetheless, it is also possible to notice the differences in their formants. These similarities are also perceptible when we analyze the Aeolian sounds played in tenuto, in staccato, the pizzicato and tongue ram (figure 13 / audio excerpt 10).

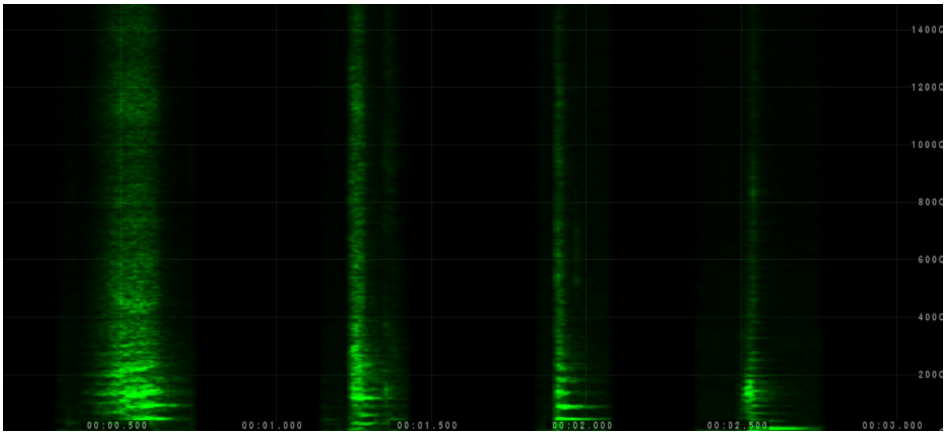

Figure 13: Aeolian sound in tenuto, in staccato, pizzicato and tongue ram

Again, these four techniques, although different, share similar spectral characteristics. In this case, the formants lose strength from one to another (figure 13), a process similar to subtractive synthesis, but now, realized in an acoustic instrument. These similarities have an important role in the consolidation of Section B's microstructure. According to Saariaho (1987),

To qualify the traditional conception of timbre's and harmony's respective functions, I would say that the function of timbre is considered as being vertical and that of harmony as horizontal. Harmony therefore provides the impetus for movement, whilst timbre constitutes the matter which follows this movement. On the other hand, when timbre is used to create musical form it is precisely the timbre which takes the place of harmony as the progressive element in music (p. 94)

As we can see in Figure 14 (audio excerpt 11), the alternation between techniques that shares similar spectromorphological aspects is the responsible for creating the idea of development in Golden Aspen's section B. Therefore, in this case, as stated by Saariaho (1987), "the timbre takes the place of harmony as the progressive element in music" (p. 94).

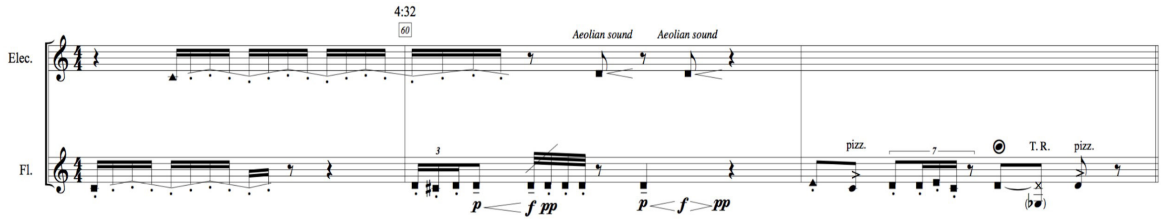

Figure 14: Golden Aspen's m. 59-61

Kaija Saariaho uses, in her piece Im Traume (1980), extended techniques to create tension and traditional techniques to create relaxation. According to her:

For some years now I have a tendency in my music to relate the control of timbre with the control of harmony. Initially I began to use the sound/noise axis to develop both musical phrases and larger forms, and thus to create inner tensions in the music. In an abstract and atonal sense the sound/noise axis may be substituted for the notion of consonance/dissonance. A rough, noisy texture would thus be parallel to dissonance, whilst a smooth, clear texture would correspond to consonance (SAARIAHO, 1987, p. 94)

While I was composing Golden Aspen's section B, I realized this procedure might be reductionist, because there are noisy extended techniques that might present both functions, depending on the context they are employed. When I used the Aeolian sounds in the end of measure 37 (red square in figure 3 / audio excerpt 2), my intention was to build tension – the electronics helps the process. The same is noticeable in measure 62 (in red – figure 15 – audio excerpt 12).

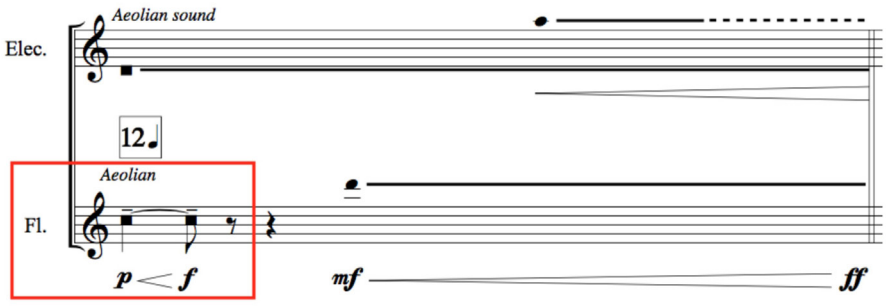

Figure 15: Golden Aspen's m. 62

Nonetheless, the same Aeolian sound, as presented in measure 56 (in red – figure 16 / audio excerpt 13), is responsible for dissolving the tension accumulated in the previous measures.

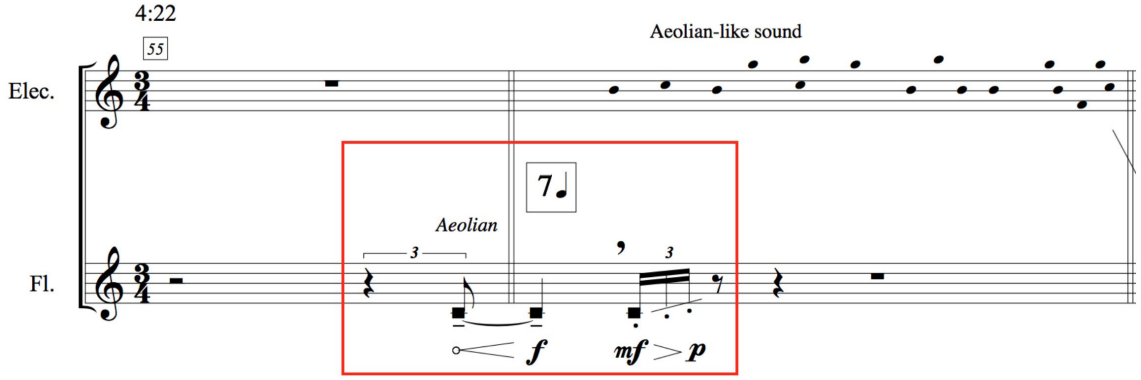

Figure 16: Golden Aspen's m. 55-56

Furthermore, the tension/relaxation axis can also be the contraire of what Saariaho proposed. In figure 17 (audio excerpt 14), the musical phrase beginning in measure 12 ends with an Aeolian sound in measure 13's beginning. In this gesture, traditional technique builds tension and extended techniques dissipate it.

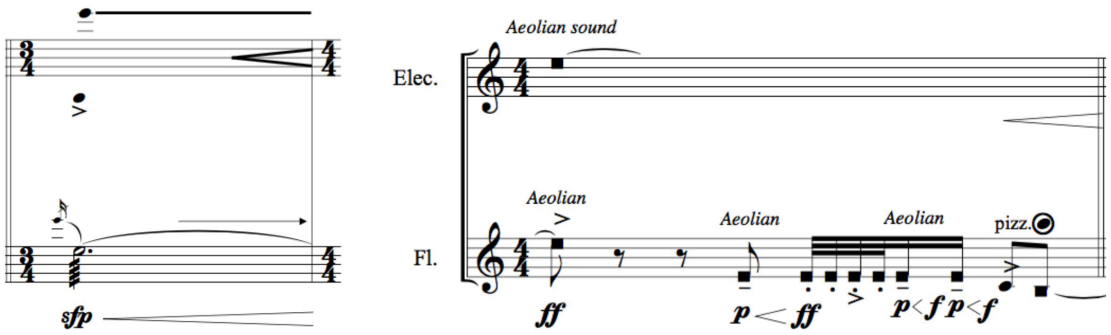

Figure 17: Golden Aspen's m. 12-13

4. Functional motives in Golden Aspen

In Golden Aspen, some musical motives are always used in specific parts of the musical discourse to help the listeners to locate themselves in the musical structure. Boulez calls this technique Pavlov's Reflex and he uses it in his piece Sur Incises (2001). The composer uses the repetition of the same pitch in the beginning and in the ending of the piece's first section. According to him:

(in the end) It is exactly the same note as before, perhaps not the same situation, the same octave, but the same note and it is a feature you cannot but hear, as I am calling up in you a kind of Pavlovian reflex: 'Heard that already, do not know what it is but recognize it'. And it is exactly in this way that we should intuitively understand, on first hearing a piece of music (verbal information)[104]

In Golden Aspen, the leap of an octave (in appoggiatura) – first used in the opening gesture of the piece (m.1 – figure 2 – audio excerpt 1) - is used solely in the beginning of sections. The same

104 From the film A Lesson by Pierre Boulez (2000), directed by Andy Sommer.

motif also initiates A's second subsection (m. 12 – figure 17 – audio excerpt 14) and the coda (m. 87 – figure 5 – audio excerpt 5). Hopefully, the repetition of this motif will help the listener (even if unconsciously) to associate its appearance with the beginning of a new section of the musical discourse. The motif played in whistle tone is always used in the ending of musical sections. It appears in section A's ending (m. 18-21 – figure 7 – audio excerpt 6) and also in the end of the piece (m. 91-96 – figure 18 – audio excerpt 15).

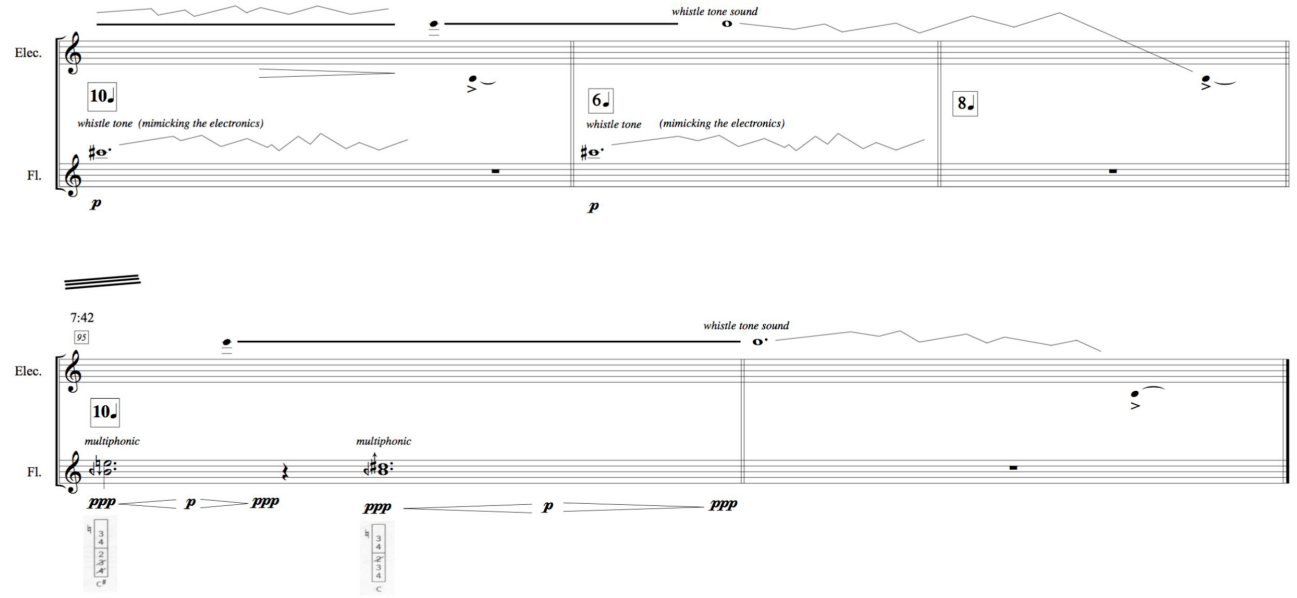

Figure 18: Golden Aspen's m. 92-96

The function of ending section is also attributed to the multiphonics. Throughout the piece, there are dissonant multiphonics (played in fortissimo) and "consonant" multiphonics (played in pianissimo). These multiphonics are distributed through the musical discourse in a way that the first type is always employed to create tension and the second type employed in points of relaxation, therefore, the second often sounds as a resolution of the first. In the ending of A's first subsection (figure 19 - audio excerpt 16), the opposition between these two types of multiphonics become clear.

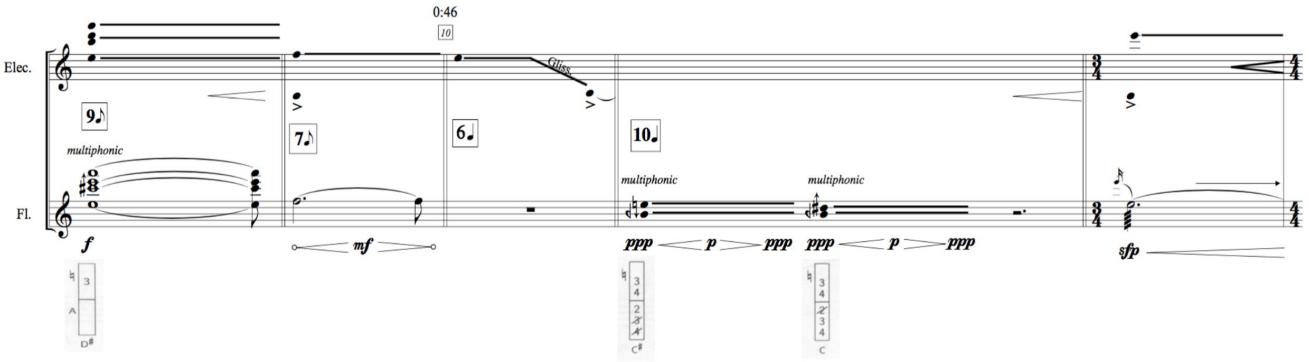

Figure 19: Golden Aspen's m. 8-12

In m. 8 (first measure in figure 19), there is a dissonant multiphonic (played in forte) and, in m. 11, it resolves in two "consonant" multiphonics, played in pianissimo. This procedure gives to the passage an interesting sense of closure. Therefore, it was used again in the climax of the piece

(section B's ending) (figure 20 – audio excerpt 17).

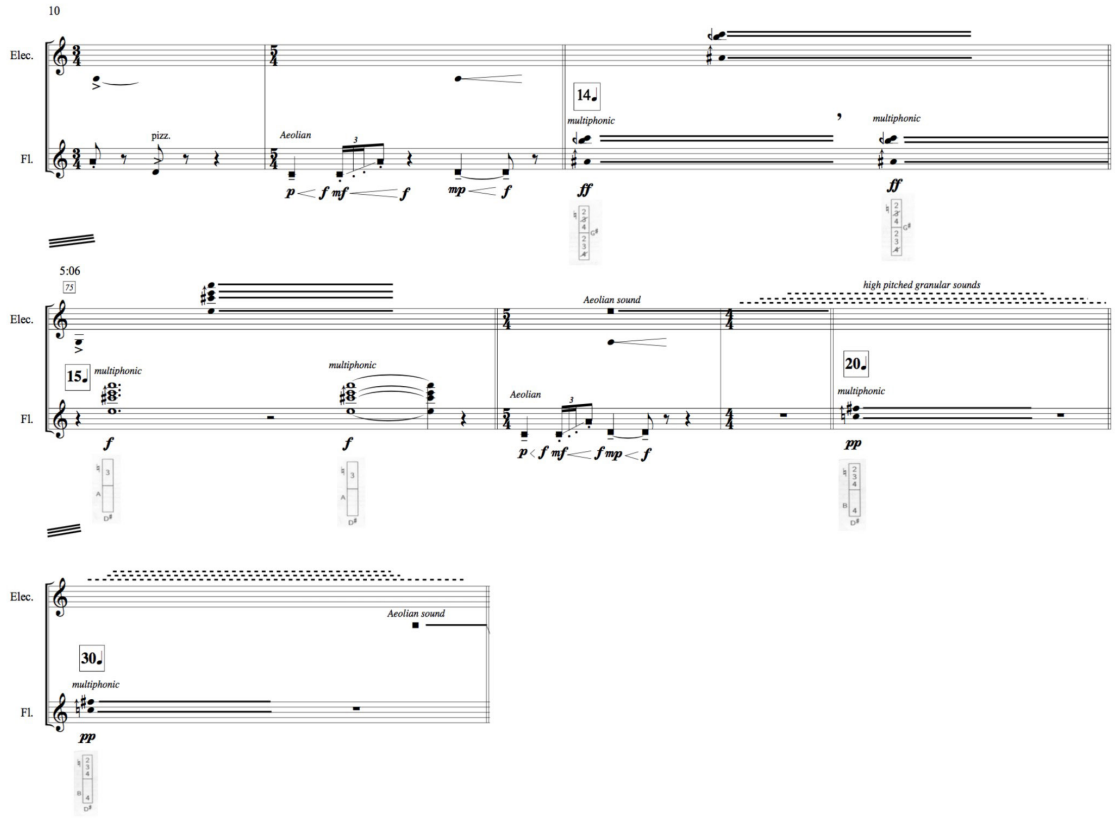

Figure 20: Golden Aspen's m. 71-79

Initially, to build tension, I used two dissonant multiphonics (m. 74-75 – figure 20). Each is repeated one time and it is prolonged by the electronics, creating an unstable atmosphere that lasts for 16 seconds. This instability is then resolved using a "consonant" multiphonic (m. 78-79). As previously stated, hopefully, the distribution of these musical motives in specific structural points will help the listener to better understand how Golden Aspen's musical discourse is organized, emphasizing the beginning and ending of each section.

5. Interaction between instrument and electronics

Golden Aspen is for flute and fixed-media, therefore, the flutist plays the piece following a click-track to ensure the synchrony between acoustic and electronic sounds. Many procedures are used to enhance their interaction. In the first gesture of the piece (figure 2 – audio excerpt 1), the electronic sound triggers the instrumental gesture (m.1 – figure 2) and, then, ends it (m.3 – figure 2). This kind of interaction is constantly used throughout the whole piece. In figure 16 (audio excerpt 13), the same interactive model is applied again, however, the instrument is responsible for triggering the gesture that will be performed by the electronics (marked in red in figure 16). More examples of this kind of interaction can be found in almost every audio excerpts from this paper.

Another interactive model frequently found in Golden Aspen is the timbre complementation and superposition. In this case, a similar sound is assigned to flute and electronics, aiming to create a perceptive distortion or a better spatial movement. In figure 19 (audio excerpt 16), the multiphonic played by the flutist was recorded and an altered version of it was assigned to the electronics. The climax (figure 20 – audio excerpt 17) is another moment of the piece that displays the same concept.

The multiphonics performed by the flutist are distorted by the electronics.

Both procedures discussed above were also used combined. In figure 14 (audio excerpt 11), the instrumental gesture – that triggers the electronic gesture – was recorded beforehand, modified in the studio and used in the electronics. This technique enables the composer to create timbral modifications that would be otherwise impossible using only the acoustic instrument, therefore, the electronics expands the flute timbre pallet. In m. 29-31 (figure 8 – audio excerpt 7), pre-recorded flute sounds were used to explore a spatial movement that could not be done by the flutist. The gesture initiated by the flutist passes to the electronics and moves to the left and right speakers. The same method is applied in m. 35-37 (figure 3 – audio excerpt 2).

Imitation, one of the oldest forms of interaction between two distinct sound sources, is also found in Golden Aspen. When listening to audio excerpt 18 (figure 20), it is easily perceptible the imitation game between both medias.

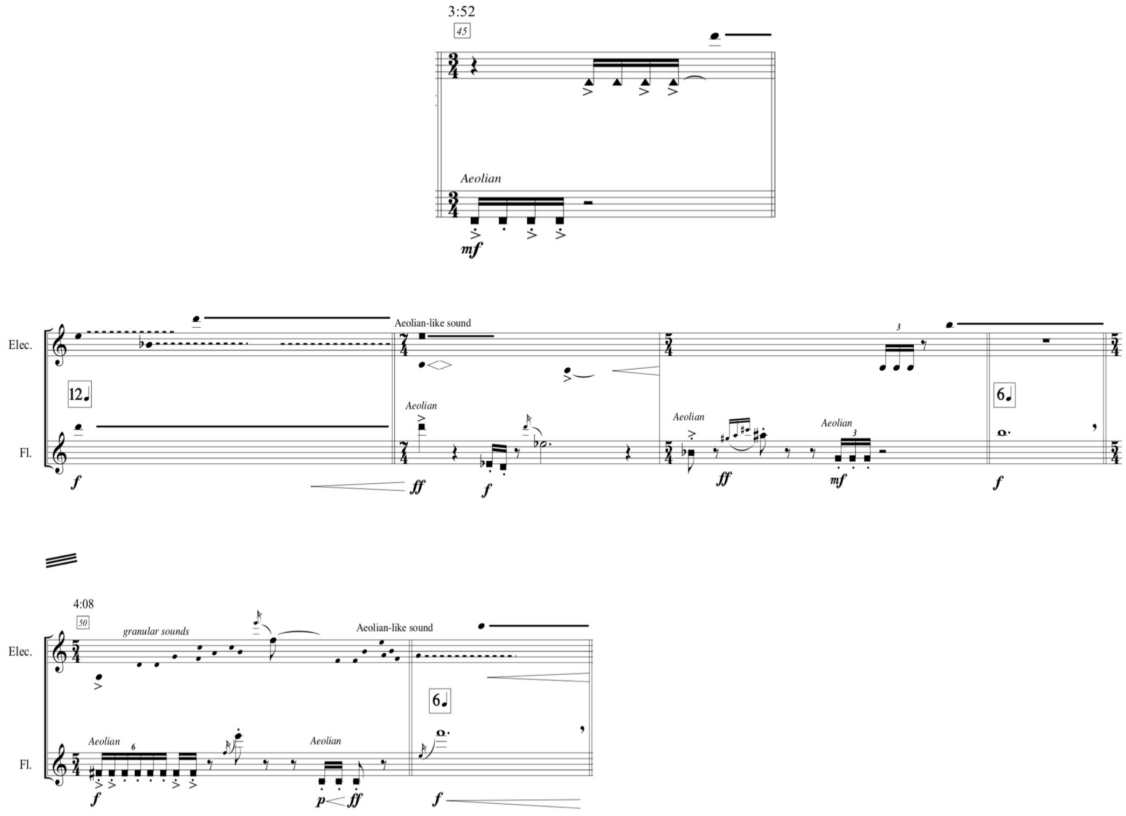

Figure 21: Golden Aspen's m. 71-79

This procedure is especially interesting because, although there is a strong interaction between medias, both maintain their independence. In the previously discussed models of interaction, flute and electronics blended and both sounded almost as a single hyper instrument.

The use of the same pitch can also be a fruitful method of interaction. In figure 2's first measures (audio excerpt 1), the flutist plays E and the electronics plays the same pitch in different octaves. At m.1's ending, the bend performed by the flutist is also followed by a glissando in the low E played by the electronics. A similar process of interaction is created through the use of similar registers. Both medias do not play necessarily the same pitch, nevertheless, the interaction is guaranteed by the closeness of their register. In the beginning of A's second subsections (figure 7

– audio excerpt 6), the flutist plays whistle tones accompanied by similar sounds in the electronics. The same method is used in the end of the piece (figure 18 – audio excerpt 15). Again, the whistle tone sounds are replicated in a similar register by the electronics.

6. Conclusion and acknowledgments

In this paper, I analyzed some of the techniques employed in my piece Golden Aspen, for flute and electronics. The piece was composed in 2017 in the scope of my master's research, supervised by the Portuguese composer João Pedro Oliveira, at the Federal University of Minas Gerais (Brazil), with the financial support from the Brazilian Federal Foundation for Support and Evaluation of Graduate Education (CAPES). I hope this paper helps to elucidate how I conceived the piece's structure and how the interaction between acoustic instrument and electronics was achieved. Such as Golden Aspen's process of composition was highly influenced by the analysis of João Pedro Oliveira's Titanium and Matthias Pintscher's A Twilight's Song, I hope that the analysis conducted in this paper inspire other composers to use the techniques discussed here in their own artistic work.

7. References

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Levy Oliveira is a Brazilian composer and his music is being frequently performed in Brazilian and international festivals and it has also been awarded in competitions in Brazil and abroad. The study of psychological terms such as habituation and processing fluency has been a rich source of information to be explored in his music. Electronics is often applied as a way of breaking expectations, increasing the spatial and timbral possibilities available to surprise the listeners. Nonetheless, he has composed for different instrumentations that goes from acousmatic pieces to orchestral music. For more information, please access: www.levyoliveira.com