Accumulating Ligeti’s Techniques:
An analysis of György Ligeti’s Second String Quartet as a repertoire
of his compositional techniques in 1968.

MINOR PROJECT
SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENTS OF THE DEGREE OF
MASTER OF MUSIC
OF THE
ROYAL NORTHERN COLLEGE OF MUSIC

by

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This dissertation is my own work
and has not previously been
submitted for assessment at this
or any other institution.

SEPTEMBER 2015
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Abstract

Due to the historic importance of Ligeti's Second String Quartet confirmed by the composer himself in several interviews, some of the movements of the piece have been widely discussed. This analysis encompasses, therefore, these previous explorations and a new one in which the movements are not considered in isolation but are rather studied as part of a larger discourse. This analysis departs from identifying the kind of motion characteristic of each movement; the term motion here can be related, in a primary stage, to specific styles associated to techniques applied by the composer in previous pieces. It also includes, as contextualisation for each movement, analytical conclusions delivered by scholars about these pieces. From here, whilst each movement is approached structurally, the timbral, instrumental, harmonic, rhythmic and developmental domains are revealed in direct relationship to their roles inside the discourse of the movement in which they appear. Furthermore, these aspects are associated with the overall discourse of the quartet.
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Introduction - Literature review

In the interview conducted by Péter Várnai with György Ligeti in 1978 (Eulenburg 1983:13), the interviewer asks Ligeti to identify the work that he found most relevant up until that point in his career. The composer therefore states: “it is perhaps my Second String Quartet which reflects my ideas most clearly – where you would find all the different techniques I have used”. This assertion of the importance of the piece have led to a number of scholars using examples of it to build analytical discourses about Ligeti’s music. As introduction, this literature review intends to give a perspective of what has been proposed about this piece. It also aims to construct a framework that will allow an analysis of it. The sources under discussion are here arranged into three categories. The first set considers the contextual sources, which are the ones that give overviews and general approaches to the piece. These also include biographical, aesthetical observations and descriptive discourses, i.e., approaches that are not deep analytical or technical dialogues.

Ligeti states in the aforementioned interview several technical aspects. He also discusses aesthetical notions such as the ‘cooled expressionism’ as a feature regarding stylistic matters (1983:18). Another interview took place between Häusler and Ligeti, (Eulenburg 1983:102) just before the premiere of the piece. They discussed, firstly, the sense of responsibility associated with writing a contemporary string quartet, yet also the connection with tradition as a result. Accordingly, Ligeti argues that he has an “ambivalent attitude towards tradition” (1983:103) that emerges from the creation of new music that always has allusions to his preceding works.

1 The Second String Quartet was composed in 1968.
2 Ligeti discusses specific terms such as micropolyphony (Eulenburg 1983:15) and the patternmeccanico ‘style’ (1983:16)
3 Ligeti listed allusions found in the Second String Quartet including Bartok’s string quartet style, Berg’s Lyric Suite’s Largo desolato, and a literal quote form Tristan (1983:104).
Further ahead in this interview, a discussion about form leads to a description of the kinds of motion that define each of the five movements. This is essential since Ligeti here relates form with motion, and in this sense he declares that in the piece each movement departs from the “same musical idea,” which develops into different kinds of motion. Besides, Ligeti points out how in this quartet, his typical micropolyphony made by a complex net-formation can be found (Eulenburg 1983:106-107).

The next source, Richard Toop’s György Ligeti (1999) biographical book, approaches the piece generally. He points out how Ligeti faced the challenge of writing for a chamber ensemble with techniques that come from larger ones (Toop 1999:130). The author then goes on to briefly describe the main features in each movement. In terms of analytical discussion, a deeper approach can be found in the book György Ligeti, Music Of Imagination, written by Richard Steinitz (2003:167-174). Here Steinitz adds other considerations to his approach including the influence of other art expressions in Ligeti’s music.4

Steinitz also stresses the influence of the experience that Ligeti had whilst working with electronic music and phonetics. These two are related to linguistics and could represent “a syntactical framework with which to explain the relative significance of different elements”(2003:169). Based on this, the author offers a parallel between the Second String Quartet and the work undertaken in contemporary dance by Graham (1894-1991) and her pupil Cunningham (1919-2009), where the latter “rejected narrative in favour of abstract inventions”(2003:170). As a general impression of the piece Steinitz concludes that it conserves a notion of tradition which is a dialectic between stasis and movement” (2003:171).

The second group of sources are the ones which present analytical discussions about quartet. In György Ligeti, from The Contemporary Composers (Griffiths 1983), a number of conclusions about the complete piece are exposed. Griffiths suggests how, even with the whole piece being a summation of his techniques, three of the movements present clear relationships with some of his earlier pieces. The second

4 Among these influences Steinitz highlights the prominence of Cézanne in the “demonstration of how colour can replace contour, and how contrasting volumes and weights create form” he also points out the influence in Ligeti’s work of Buñuel’s surrealism in a filmic context, and the literature of Kafka and Joyce. (2003:169).
movement is related to *Lontano* (1967), the third with *Aventures* (1962) and *Novelles Aventures* (1962-65), and the fifth with *Continuum* (1968) (1983:67). Furthermore, Griffiths states how the unity in the piece is achieved by having the chromatic scale as main material (1983:67).

Another approach is made in *Contrapuntal Techniques in the Music of György Ligeti* (Clendinning 1989), specifically about the pieces written after 1966. Clendinning focuses on the fifth movement of the Second String Quartet, which together with other pieces serve to illustrate what is known as pattern-meccanico compositions. This analysis is based on three analytical levels: “microstructure, audible surface and macrostructure” (1989:160). Regarding this, whilst related pieces such as *Continuum* (1968) and *Coulée* (1969) are entirely discussed; only sections of the fifth movement are approached in detail (1989:160).

What Clendinning considers as pattern-meccanico behaviour in the last movement of the quartet is contradicted by Roig-Francoli in *Harmonic and Formal Processes in Ligeti’s Net-structure Compositions* (1995). The author here differentiates between the ‘meccanico’ like passages and 'net-structures'. The former term refers to passages where a “quick mechanical reiteration of only one pitch by instrument” takes place, such as the third movement of the quartet (Roig-Francoli 1995:244). The latter implies a “continuous web of finely-woven lines or repeated patterns in a constant interactive process of transformation of one or more parameters” (1995:243). This examination explores micro- and macro-harmonic relations contextualised in a formal-functional approach. (1995:243)

The third movement is also considered in *Voice Leading as a Spatial Function in the Music of Ligeti* (Bernard 1994). Here, the author departs from stating two kinds of ‘contrapuntal hearing’. Bernard proposes that the first kind of hearing is direct, meaning that the actual processes of imitation can be heard. On the contrary, the indirect hearing, related to composers such as Ockeghem and Ligeti, occurs when the imitation of all the lines is so intricate that is not discernible (1994:228). The analysis
of the third movement is here given as an example of voice leading in a non-canonical example.⁵

Another analysis of this movement has been presented as part of the Bridges organisation conference in 2001 (Luchese 2001). In this study, the author demonstrates how Ligeti applies different mathematical processes in the piece (2001:37). The first of these is the underlying relationship between the formal organisation and the golden proportion. The author also points out the symmetrical properties arraying “contour, register and registrar space”(2001:39). As a conclusion, Luchese states how the indication at the beginning of the movement, *come un meccanismo di precisione*, is not only related to the character, but also to the perceived construction by mathematical processes (2001:45).

The sources which discuss pieces aside from the Second String Quartet also represent a perspective in regards to the analytic techniques, methods or methodology. From here, it is important to consider Clendenning’s dissertation on Ligeti’s contrapuntal techniques (1987), since it is the only source that studies a wide number of pieces giving a compendium of the composer’s music. Clendinning describes here the general features of the composer’s style, including considerations about notation, metre, instrumentation, temperaments, harmony and form.

The analytical reflections about the pieces which are related to the quartet are also important for this analysis. Some of these have already been addressed by Bernard in *Inaudible Structures, Audible music: Ligeti’s Problem and his Solution* (1987). Here⁶, the author explores the “discrepancy between what is written and what is heard” (1987:209). Comparably, the pattern-meccanico compositions are also approached by Michael Hicks in *Interval and Form in Ligeti’s Continuum and Coulée* (1993). Herein Hicks states that the brief and concentrated models of these works represent practical samples for this style’s analysis (1993:173).

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⁵ The analysis of the third movement is given in this article as contrast to the other study pieces identified as canonical: *Lux Aeterna* (1966) and *Lontano* (Bernard 1994:243).

⁶ Taking examples from pieces as *Atmosphères* (1961), *Lux Aeterna* and *Lontano* (1969)
Although not included in the present analysis, the *Requiem* and *Lux Aeterna* are two pieces that are also related to the quartet. Research has been carried out concerning these by Drott (2011) and Benjamin (2013) on the contrapuntal procedures in these works. Drott departs from the relationship between Ligeti’s music and the position of Heinz-Klaus Metzger who strongly criticised the way in which the post-war composers rejected traditional features that he considers “immutable laws of aesthetic value” (2011:4). Henceforth, Drott analyses the multiple dichotomies that result from of a single melodic line that is an active part of a larger indiscernible texture.

It is worth stating that there is significant literature about Ligeti’s music which highlights his historical importance. Nonetheless, the majority of sources that discuss the Second String Quartet focus only on the third and fifth movement, or are general descriptions of musical events in the chronological order that the piece suggests. This analysis henceforward integrates some methodologies and methods that are used in related pieces to examine the remaining movements. Additionally, it aims to expand the notions about the sections of the piece that have already been tackled.

**First movement**

One of the approaches that must guide the analysis of the first movement is the behaviour of the chromatic scale\(^7\). Another query that is vital here is about the motions\(^8\) through which the chromatic scale unfolds. In other words, it is important to identify the kinds of motion that are used within the movement. As Ligeti stated:

"In the early 60’s I was also interested in other areas of form and expression (in this case you cannot separate form from expression), in a frantic, tormented quality of sound which may seem like a disorderly, wild gesticulation; haphazard and completely uncontrolled" (Eulenburg 1983:15).

It can be inferred from here that expression is a term that suggests movement and that can be used as synonym to describe different kinds of musical material.

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\(^7\) According to this, Griffiths points out that "the basic 'idea' which is constant throughout the five movements is perhaps no more than the chromatic scale"(1983:67).

\(^8\) As stated in the introduction, Ligeti stated that each movement of the quartet is a development in different kinds of motion of the same musical idea (Eulenburg 1983:106-107).
Consequently, investigating the behaviour of the chromatic scale enables a structural analysis in which form is defined by kinds of motion.

The use of two contrasting materials is evident throughout the movement. Two samples of the first of these materials can be found in the first ten bars and between bars 19 to 22. Samples of the other kind of material can be located between bars 23 to 35 and 49 to 64. The former is fairly static; such is the case of the section comprised between bars 20 to 24, where "the cello explores progressively higher partials on its G string" (Griffiths 1983:69). The latter is rhythmically active and chromatic, matching Ligeti's description above. This cohabitation of highly contrasting materials is a fundamental feature of the piece that moves from "near stasis to frantic activity" (Toop 1993:133).

This idea is not only applicable to the study of the characteristics of each material, but also to investigate how these materials are related and determining the structure of the movement. A first step to understand this is to locate the sections in which these two materials appear juxtaposed. A second step is to assess if these juxtapositions are articulation points, i.e., the ending points towards which certain processes tend, the starting point of a new process, or if the juxtaposition is part of a same section.

The first juxtaposition appears in the second bar with the loud pizzicati in the first violin, viola and cello interrupting the silence established in the first bar for 8 to 10 seconds. This is followed by the tremolo over a harmonic that the second violin plays. This interruption is a first release of energy that allows the movement and the piece to begin. The next contrasting material appears in bar 15 with the tempo change. This transformation can be understood as the beginning of a new section, however this responds to a different kind of behaviour.

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9 Or two different kinds of motions
10 Ligeti indicates in the first bar of the score: silencio assoluto ca. 8"-10"
11 This is indicated by the Pretissimo sfrenato and the subito fortissimo molto feroce in the four instruments.
As it is portrayed in Figure 1, the section is, until bar 14, a process of a line in an extreme high register\textsuperscript{12} that gets thicker by means of a chromatic figuration that fills in a progressively wider interval.

**Figure 1** [harmonic reduction of the first section of movement 1 (bb. 1-14)]

The following bars (15-18) can be understood from two angles: harmonic and dynamic. Regarding the harmonic level, this material is a continuation of the previous process maintaining a chromatic fill that now presents a change of direction as it is displayed in figure 2. On the other side, the dynamic and textural change sets the transformation that can be perceived as the beginning of a new section. From these two features it can be suggested that the process that begins in bar 2 has skipped several steps jumping to the stage located in bar 15. This is emphasised if this change is compared with the next one that takes place in bar 18, where the dynamic contrast is complemented by a new harmonic configuration. Figure 3 displays an outline of the first section of the movement (bb. 1-18).

**Figure 2** [harmonic direction bb. 15-18]

The last beat of bar 18 demarks the ending of the first section with the appearance of the first interval sign\textsuperscript{13}. Here, the use of dynamic contrast generates again a dichotomy. On one hand, the melodic movement of the first section has a direction throughout the register towards this sign. On the other hand, the *pianissimo* together

\textsuperscript{12}This line is achieved by using a combination of natural and artificial harmonics in the four instruments.

\textsuperscript{13}Defined by Ligeti (Eulenburg 1983: 31), an interval sign is an interval configuration such as the octave, that with its "clarity constituted points of rest, they afforded the possibility of operating with alternate tension and resolution".
with the harmonic configuration gives the perception that the sign is not a result of the previous process but an entrance of a new section.

Figure 3 [Reduction first part of movement 1 (bb. 1-18)]

A next interval sign takes place in bar 36 with a solo B♮6 in the first violin. According to this, the next section of the movement is comprised between bars 19 to 36. Here, "the cello explores progressively higher partials on its G string"; eventually the first violin reinforces this, "while the other instruments rustle along chromatic scales" (Griffiths 1983:69). In bar 23 a process initiates in the second violin and viola. The movement along the register of these two instruments indicates that the aim is the G♮6 that the first violin holds. In bar 32 the first violin introduces a melody constructed by octave displacements of an ascending chromatic scale ending in B♮6 (G♯6-G♮5-A♮4-A♯5-B♮6). From bar 33, the figuration of the second violin and the viola continues without a movement along the register, it is worth noting that the note D is excluded here. Simultaneously, the cello holds the C♮2 as a pedal up until the last beat of bar 35 where a melody in fortissimo appears. This melody is also built from octave displacements now of a descending chromatic scale (C♮2-B♭3-A♮4). The missing B♮ is the note that the first violin holds.

This lonely note is not an isolated event. In first place, it is part of the upper limit to which the process of bars 22-36 tends. In second place and considering the next bars, it works as a link between the second section and the following one. If this gesture is considered entirely (bb. 29-43), it might be concluded that the interval sign of bar 36 is the result of an elongated phrase as is portrayed in Figure 4. This phrase affects the processes that take place simultaneously in other segments of the register, either by setting up an aim, or by articulating the form. This melody is also an ascending chromatic scale. From bar 38 the second violin complements the phrase and harmonises the rest of the melody (bb. 38-43).
The third section of the movement starts in bar 39 under the aforementioned melody of the violins. The next signal harmony is located in bar 64 and it is reinstated in bar 70. It may be said that the material located between this bars (64-71) is a variation of the behaviour with which the first section (bb. 2-18) ends. Figure 5 shows a reduction of both sections exemplifying a similar motion from a higher segment of the register in *pianissimo* to a lower one. In both sections this transportation is done by a louder and frantic gesture. In the first sections this takes place during 4 bars (15-18), in the second, during one bar (b. 69). Both sections end with the same harmonic configuration.

In the third section (bb. 39-71), although the interval sign appears in bar 64, two contrasting processes are juxtaposed subdividing it into two subsections: the first from bars 39 to 48, and the second from bar 40 to the second beat of bar 64. The first has its first stage between bars 39 and 43 with the viola and the cello. In this passage both instruments build a 4-part texture using the figuration that continues during the rest of the process complemented with the use of open strings. This texture emulates the texture that follows with the four instruments (bb. 43-47), during this new stage, the
use of open strings stops. This texture gets harmonically expanded and later on contracted as it is shown in Figure 6:

Figure 6 [harmonic reduction bb. 38-47]

Together with these harmonic contractions there is also a movement along the register working as an undulating shape. Although this texture presents a harmonic formation in which a pattern is scarcely recognisable, in the rhythmic level a clear method is used. Here, the note values are organised following an ascending canonic arrangement starting from the cello [Figure 7]¹⁴.

Figure 7 [Rhythmic canon b. 39-48]

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<thead>
<tr>
<th></th>
<th>b. 39</th>
<th>b. 40</th>
<th>b. 41</th>
<th>b. 42</th>
<th>b. 43</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violin 1</td>
<td>b. 44</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Violin 2</td>
<td>b. 45</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Viola</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Cello</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>6</td>
</tr>
</tbody>
</table>

From this illustration it is important to highlight the change in the pattern in bar 48. This is the last bar of this subsection (bb. 38-48) and together with this there is a *subito fortissimo* that articulates the form. The rhythmic organisation by canons is constant thorough the movement. Another example for this happens between bars 12 and 14. The pattern here descends starting with the first violin following a numeric sequence of 4-3-4-5. Other samples of this can be found between bars 60 and 64 and 72 to 79.

¹⁴ The numbers show beat subdivisions
The next subsection (bb. 49-71) is evidence of the chromatic scale as main idea of the quartet (Griffiths 1983:67). Even though throughout the movement, and the complete piece, the harmonic language is chromatic, here, the use of the scale is so direct that patterns are easily identifiable. The most recurrent one is by octave displacement, which allows the construction of more discernible melodies within the texture. An example of this is the line in the first violin in bars 49 and 51 that uses an ascending chromatic scale [Figure 8].

Figure 8 [first violin’s melody built by octave displacements of an ascending chromatic scale]

The chromatic scale is also used in the ascending movement played by the second violin and the viola in bars 49 and 50. This is particularly important because it delivers a high textural contrast. Moreover, it is reinstated various times through the piece. From bar 53 to 60 long notes in the four instruments enrich the texture made from octave displacements. As a result of the movement of each instrument, these notes are always vertically arranged in minor and major seconds. These are abandoned in bar 61 leading to an agitated texture that keeps the octave displacement figuration until the interval sign located in bar 64, where the third section of the movement ends.

The fourth section does not begin from within the last interval sign. It starts in bar 72 clearly distinguished in harmony and rhythm and it progresses until the end of the movement in bar 88 as a complete process that is not interrupted. This process starts with wide intervals that are progressively reduced in direct relationship with the beat subdivisions. Between bars 72 and 73 the figuration uses again the octave displacement of chromatic scales. In the two subsequent bars (74-75) the octaves are mixed with sevenths and sixths. In bars 74 and 76 the interval configuration is by

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15 This is also reinstated in bars 51 and 52 by the two violins and the viola again in unison.
fourths and thirds. Between bars 77 and 79, the intervals are reduced to seconds that ultimately lead to tremoli over single notes.

Rhythmically, the process is arranged as a canon similar to the ones already described, this time the imitation occurs from the violin to the cello. By mean of the simultaneous reduction of note values this canon presents a progressive acceleration towards the tremoli in bar 79. This presents a dichotomy in which the most accelerated gesture can be perceived as static. Lastly, "it is entirely appropriate that this movement should end with a descending chromatic scale heard in the fluting sounds of harmonics in octaves" (Griffiths 1983:70). This is materialised between the third beat of bar 84 and the first beat of bar 87\(^\dagger\). It is remarkable that the note D is excluded from this scale, the same note that was excluded from the figuration at the end of the second section (bb. 33-35).

**Second Movement**

The second movement of the quartet has to be addressed departing from its stated relationship with Lontano. In this movement the music is "now coming from a distance" whereas the title Lontano also means distant (Eulenburg 1983:55). The movement is not only related to its orchestral predecessor by this synesthetic representation, but also by specific features that are an example of how Ligeti translated some orchestral behaviours to a chamber ensemble (Toop 1999:130). The first similarity is the "slowly disturbed unison" with which the movement starts (Griffiths 1983:67): In Lontano this unison is on an A\(_\flat\) whilst in the present movement is on a G\(#\). The second similarity is the way in which the first section of the movements ends. Whilst Lontano constantly uses octaves to demarcate the ending of formal units (Bernard 1987:232), the first section of the present movement concludes with an F\(#\) in four octaves (b.12).

\(^\dagger\) Also a chromatic scale arranged by octave displacements.
The similarity goes further taking into account that Ligeti describes *Lontano* as "a vast space of sound in gradual transformation [...] through a constantly changing pattern of colour [...]" (Eulenburg 1983:56). In the second movement of the quartet, specifically in the first section, Ligeti uses the idiomatic possibilities of the four string instruments to achieve a similar effect. As it is portrayed in Figure 9, the transformation of timbre takes places as a canon of playing techniques starting in the first violin and moving downwards towards the cello.

**Figure 9** [timbral canon first section second movement]

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<tr>
<td>Violin 1</td>
<td>sul tasto, sempre senza vibrato</td>
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<tr>
<td></td>
<td>flautando</td>
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<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Violin 2</td>
<td>sul tasto, sempre senza vibrato</td>
</tr>
<tr>
<td></td>
<td>flautando</td>
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<tr>
<td></td>
<td></td>
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<tr>
<td></td>
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</tr>
<tr>
<td>Viola</td>
<td>sul tasto, sempre senza vibrato</td>
</tr>
<tr>
<td></td>
<td>flautando</td>
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<td></td>
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<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Cello</td>
<td>sul tasto, sempre senza vibrato</td>
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<tr>
<td></td>
<td>flautando</td>
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Together with this colour transformation, the strings with which each note is played constantly change adding another level of variation. According to Ligeti, "what is involved here is a change of string in the production of the same pitch. A pitch sounds quite different when produced on the D-string instead of the G-string." (Satory 1990:105).

This canon develops until bar 7, where each line starts to gain independence. The introduction of microtones, which according to Ligeti are slightly changes in intonation rather that precise pitches\(^{17}\), adds individuality to each of the lines. This also generates an increase in the energy that the process has achieved up until this point. Once again, the interval sign located in the third beat of bar 12 appears interrupting the process rather than being a result of it. Except for the first four bars where G♯ is the only note played, the complete section gravitates around G♮ and A♮. In bar 9 it seems that the texture moves higher presenting a C♮⁴ followed by a B♮⁴ on the cello and a B♭⁴ on the violin. The B♭⁴ appears again in bar 11 just before the sign.\(^{18}\)

\(^{17}\) Ligeti annotates in the Instructions for performance of the piece that "What is meant by this intonation are not quarter-tones, but rather deviations of a not precisely determined size, which may reach a maximum of a quarter-tone" (Ligeti 1968:5)

\(^{18}\) As was mentioned previously, it is a F♯ reinforced in four octaves.
The interval sign with which the last section is interrupted evolves becoming a new section in itself. Relatedly to the first movement, this interval sign is the result of juxtaposing two processes without allowing the first one to conclude. Two features confirm this, the first one is the shape that the first section produces [Figure 10] having a B♭ in the first violin and a C in the cello as climatic points. The ascending melody located in bars 11 and 12 also suggests that the process will be contracted again as it was in bar 9 and 10. The second feature is the change in the texture and the abandonment of the timbral transformations between bars 12 and 17.

Figure 10 [harmonic reduction first section second movement]

The second section of this movement is located between the third beat of bar 12 and the first beats of bar 27. From the F♯ that was established in the last interval sign, the cello moves downwards reaching a perfect fifth between the low open strings C and G. Gradually, each of the four instruments start to move upwards chromatically when the higher portion of the register stops. After the sudden crescendo on the viola and the cello in bar 20, the four instruments are brought together in bar 21 continuing with the ascending chromatic movement. The subtle trills in bar 22 are later on transformed in termoli in the subsequent bars (23-25), process that leads to the next sign, ending of this section in bar 27.

Two contrasting materials constitute again the next section. The frantic material appears for first time in the last beat of bar 27 and it is subsequently followed in bar 28 by a timbral canon similar to the one found in the first bars of this movement. This canon uses the same string techniques than the first one but it now gravitates around E♭ and F♯. The gesture with which it starts is a clear allusion to the first bars of the piece (bb. 2-4, 1st mov.): the loud pizzicato followed by a long note. The active material is again introduced in bar 31 interrupting the timbral canon. This material, which is related timber wise to the percussive sound of the pizzicato, leads to the canon again (Third beat b. 32). Although it might seem that the percussive sounds of
bars 31 and 32 have originated another process, it is clear how the subsequent bowed notes of bar 32 are a continuation of the process that began in bar 28.

The juxtaposition of contrasting materials that occurs form this point up until the end of the movement is a result of two procedures. The first one is the fragmentation of the processes contained within this section of the movement (bb. 27-34). This is briefly repeated from bars 33 to 35; however, the contrast is here achieved by register and dynamics rather than timbre and activity. The *subito fortissimo* (ffff) on the violins interrupts the notes that the viola and the cello hold in *pp* and *sul tasto*. In the next bar (34) the violins introduce the register in which the timbral canon continues now organised by pairs of instruments: the first violin with the cello, and the second with the viola. This process continues until bar 39 where another interval sign appears demarking the beginning of the fourth and last section (bb. 39-56).

This new interval sign becomes a process in itself accomplished by the crescendo of the four instruments. In bar 42, a *subito pianissimo* breaks this crescendo and its timbrical change leading to another process where the viola and the cello move apart each other micro-tonally (bb.42-45). Here (b.45), the second procedure of juxtaposed contrasting materials takes place. This time the interruption is achieved by inputting an allusion to the frantic chromatic scale in unison presented in the first movement. Similarly, another reference to the first movement interrupts the long notes in bars 49 and 50. This time the material is related to the chromatic scale in harmonics of the last bars of the first movement (Satory 1999:103). The resemblance continues with the cello holding a C♮ almost until de end of the movement under the *morendo* of the other three instruments. At the end, this movement and the first, in terms of the composer, "are made to rhyme". (Griffiths 1983:71)

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19 First movement: b.49, bb. 51-52 and b. 69
Third Movement

It is due to its clear processes and because it is one of the most characteristic pattern meccanico samples from Ligeti's output, that this movement has been widely discussed. Nevertheless, the question lies in the way in which this motion matches the discourse of the quartet. From the academics that have discussed this movement, Bernard (1994) and Luchese (2011) have produced the most complete studies. Although both approaches deliver insightful conclusions, the movement is considered in isolation missing its connection with the rest of the piece. Hence together with these two approaches it is important to integrate the idea of the movement as part of a larger discourse.

Both authors agree on the formal design of the movement describing it as ternary (A-B-A'). There is also a consensus on the gesture that articulates the music; both coincide that this is the role of the snap pizzicati in the cello (bb. 12 and 34) and in the viola (b. 37). This is also a reinstatement of a key gesture, since the quartet starts with it and it is used to articulate and introduced the percussive sounds of the second section of the second movement. Similarly, the rapid bowed scales that mark the beginning of the second part of the present movement (b. 30) are linked to comparable gestures of previous movements.

Whilst Bernard suggests that this movement cannot be harmonically "associated with canonic structures" (1994:243), Luchese suggests that here most of the sections are arranged following a four-part rhythmic canon. The analysis proposed by the latter incorporates the harmonic procedures that the former describes. Additionally, it uses mathematical procedures to analyse this movement. In first place, Luchese demonstrates how "the duration of the sections seem to be modelled on golden section proportions"(2011:38). As evidence, the author portrays how the positive golden section of the complete movement is located approximately on the juncture between sections A (b. 1- first beat b. 30) and B (second beat b. 30- first beat b. 37). Likewise, by combining the length of B and A', Luchese identifies that the beginning of A'

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20 The two outer sections are characterised by the mechanic pizzicato on repeated pitches. Conversely, the use of bowed notes and a more hectic material constitute the middle section (Luchese 2011:1).
(second beat b. 37) matches the negative golden section of the combined segment (2011:38).

The first section is subdivided into two, one first process that unfolds until bar 12 and a second one that ends in bar 30. The first process starts with a registral space of a major second played by pairs of instruments: the first violin and the viola playing a B♭5, the second violin and the cello an A♮5. This interval gest progressively expanded, though, in contrast with the first movement, it is not filled by a chromatic figuration and its expansion is not stepwise materialised. The snap pizzicato in the cello (B♭3, b. 12) interrupts the process just when it has reach a distance of 14 semitones in the last beats of bar 11 and 7 semitones in the first beat of bar 12. Figure 11 shows how this section is rhythmically configured as a four-part canon.21

Figure 11 [similar to the one presented by Luchese (2011:42)]

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<tr>
<th></th>
<th>b.3</th>
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<tr>
<td>Violin 1</td>
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<td>10</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Violin 2</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>9</td>
<td>10</td>
<td>11</td>
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<tr>
<td>Viola</td>
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<td>4</td>
<td>6</td>
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<td>11</td>
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<tr>
<td>Cello</td>
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<td>9</td>
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</table>

After the snap pizzicato of the cello, the following subsection starts two octaves below with the instruments again arranged by pairs. A minor second forms each pair whilst the two pairs are at a distance of a major second. The rhythmic acceleration of this process exceeds the first one reaching a beat subdivision of 16. It starts out of phase and by canons it reaches the rhythmic unison in bar 25. Harmonically, the minor seconds of the beginning are expanded to 30 semitones in bar 19 and are subsequently contracted to almost a major second in bar 21, emulating the interval of the beginning of the movement. Figure 12 displays the harmonic processes contained in this section. As a summary, Luchese also indicates up until here "the boundaries of the registral space reveals a fascinating symmetrical profile" (2011:40).

21 Regarding this, Luchese (2011:42) indicates that "the effect here is four strands that gradually move out of phase. Once the notes played by the cello reach the speed resulting from twelve subdivisions, the parts begin a very rapid but systematic deceleration, although no longer in imitative fashion"
Following the bowed rapid scales in bar 30, the second section begins with a contrasting timbre. As explained by Luchese (2011:43), each of the instruments play a different permutation of the chromatic scale and, similar to a dodecaphonic behaviour, this permutation is only repeated until the first one has gone throughout the twelve tones. These rows are arranged as displayed in Figure 13.

In the rhythmic domain, the composer arranges the instruments again by pairs: the first violin with the viola and the second violin with the cello. Each pair presents a rhythmic canon with the first pair using demisemiquavers and the second semiquaver triplets. "After the instruments complete their statements, they begin restating their permutations, although not in entirely the second time"(Luchese 2011:43). In bar 33, the canon stops as if the aforementioned bars were compressed. The fortissimo *pizzicati* in bar 34 interrupt this giving way to B's second subsection (bb. 34-36), where, by mean of a different display of pizzicato techniques, each instrument play a "collective permutation of a set of chromatic pitches"[Figure 14] (Luchese 2011:44).

![Figure 12: harmonic processes first part of the third movement]

![Figure 13: rows per instrument]

| Violin 1 | G | C | E | B | C♯ | D | B♭ | G♭ | A | A♯ | F | E♯ |
| Violin 2 | F | B | C♯ | G♯ | G | E | A | D♯ | D | F♯ | C | B♯ |
| Viola   | D | F♯ | C | F | E♯ | B | A♯ | E | B♭ | G | C♯ | A |
| Cello   | E♯ | A♯ | A | B♭ | G♭ | D♯ | G | F | C | B | D | E |

![Figure 14: taken from Luchese (2011: 44)]

A (cello) - Bb (cello) - B (viola) - C (violin 1) - Ab (violin 2) - C# (cello) - D/Eb (viola) – E (violin 2) - F#(violin 1) - F(cello) - G (violin 2)
The snap pizzicato of the viola in bar 37 demarks the ending of section B and generates the beginning of the last section of the movement: A' (bb. 37-47). According to Luchese, this section:

"Resists segmentation or division [...]. What begins as a thick texture and somewhat wide registral space narrows to the smallest space possible: converge on a single pitch"(2011:44)

This single pitch is F♯5 and has been carefully chosen as it is the last pitch that the cello holds and the end of the second movement. Moreover, the significance of this note is reaffirmed by its use in several crucial points of the fifth movement, as it will be further on described.

**Fourth movement**

Contrary to the third and fifth movements of the quartet, the fourth has not been object of previous analysis. This is partially due to the uniqueness of its language, (Steinitz 2003:173) but also as it is difficult to compare to other Ligeti's pieces. Griffiths states that this movement "is very fast and very threatening" and that in it "everything that has happened before is pressed together"(1983:71). As another observation, Toop indicates that the composer compares the movement to a "dwarf start in which 'the same mass that is contained in our Sun is compressed into a millionth part of its volume"(1993:133)

This comparison suggests that the movement works as a certain kind of recapitulation, however, the uniqueness in its material presents a contrasting role rather than a resemblance to what has been materialised in the piece up until this point. However, there are specific behaviours that may suggest a summation in its material, such as the gestures comprehended in bars 19, 23 to 25, 28 to 31 and 33 to 36, that are comparable to the passive material recurrent in the first two movements. Similarly, the material of bars 37 to 40 may be perceived as a resemblance to the active material recurrent throughout the first movement.
If understood as a recap, it can be proposed that this movement corresponds to the notion of interruption. Notwithstanding, this "confrontation of opposites" (Steinitz 2003:171) is here presented differently. The stasis in this movement acts as a residue of intense aggressive gestures rather than being the result of juxtaposed processes with equal hierarchy. Examples of this can be found throughout the movement, specifically with the effect obtained when some instruments are subtracted from the attack in bars 3, 7 and 10; or by sudden dynamic changes such as the one in bar 19. Here, the soft notes can be perceived as residue or resonance, these gestures are reiterated in bars 23, 24 and 33.

Another general remark that is worth considering is what Ligeti states about the chord construction of this movement. He states that:

"There are not connections among the chords. Rather cumulative thinking is involved. There is little that is rational here. [...] However, to determine this after the fact, to say where this happened and which notes are involved, is difficult. A great deal depends on string technique, on the notes that are possible to reach in multiple-stop playing"(Satory 1990:106)

According to this, it is crucial to consider the idiomatic writing as a salient feature in for the chord construction. The following figure [Figure 15] displays two passages of the movement where this is noticeable:

Figure 15 [sections of the quartet with chromatic chords built from open strings]

bb. 11-16
Around the open strings the composer builds chromatic chords enabling practical positions for the performers. Additionally, it adds to each chord the inherent resonance of the open strings. This reinforces the character and performance instructions given in the score\textsuperscript{22}. This practical positions together with the use of open strings also represent ease in the overall performance of the movement. In both samples the chords are written in fast tempi requiring rhythmic accuracy. For this reason, each chord is not only practically written in isolation, but also in context. This enables each performer to make small changes in the position to achieve longer passages.

Similarly to the third movement, the present one can be segmented in three parts: A (bb 1-36), B (37-55) and A' (bb. 56-63). Although the gestures that articulate the form here differ with the interval signs of the first two movements and the pizzicati of the third, some of them are comparable. This is the case of the material located in bar 19 and between bars 28 and 36, where the form is articulated by mean of dynamic contrast, harmonic configuration and evident antagonistic passivity. The first section is hence subdivided into two by this material, and, as it is portrayed in Figure 16, this chord is arranged in the same way that the one used in bars 18 and 70 of the first movement: a major second with a minor third underneath.

\textsuperscript{22} In the score it is instructed that: “This movement is to be played with exaggerated haste, as though crazy and (except for a few \textit{pp} passages) with the utmost force.” (Ligeti 1968:21)
The next material that is comparable to an interval sign is located between bars 33 and 36. Although it seems that it acts as a resonance of the last harsh chords, it is essentially a result of a simple additive process. This kind of material appears for a first time in bar 19 dividing this section in two. The second time it is twice longer (bb. 23 and 24). The third time it is interrupted by the rapid figurations played by the cello and the viola. Finally, the four instruments complement the chord in bar 33 lasting 4 bars and demarking the end of section A.

Section B is characterised by the sudden rapid figurations that appear in bar 37. The four instruments play this gesture and it is subsequently juxtaposed to the rough chords of section A. These hasty figurations are a clear allusion to the ones used throughout the first movement and that are salient in the fifth. However and in accordance to the character of this movement, these are not as rhythmically sophisticated as their predecessors. They are only arranged by alternating demisemiquavers and semiquaver triplets and by pairing the instruments: the first violin with the viola and the second violin with the cello. The rhythmic and instrumental assemblage allows a note-to-note relationship that unfolds chromatically filling a registral space no higher than a fifth. It is worth noticing that this passage does not present a registral movement, therefore, whilst a harmonic goal is not perceived, the chords are recognised as a mere juxtaposition that is not interrupting any process.

This section ends with a gesture that is a focal point for the entire quartet. In bars 49 and 50 the ensemble plays for first and only time what can be considered an interval sign in the loudest possible dynamic (fffff). This interval sign is arranged in the register in two minor seconds spread widely in the register: A♮7-G♯7; and B♭2-C♮3. This sign develops for seven bars (b. 49-55), the loud dynamic is suddenly changed by
pianissimo in bar 55, reinforced by a change in the playing technique. There is also a direct relationship between harmony and dynamics. The loud chords are formed by minor seconds whilst the subsequent soft ones are configured in their majority by major seconds and minor thirds.

Comparable again to the third movement, the last section of the fourth (bb. 56-63) is shorter and resists segmentation. Its material is associated with the chromatic chords used throughout the movement, though this time these are not all formed by multiple stops. Generally, it can be suggested that the compression that Ligeti suggests about this movement is a verticalisation of the chromatic scale that has been developed horizontally in the first three movements. This has been achieved together with the idiomatic approach of the strings, that reinforce the idea of something active that has been pressed together therefore producing constant and harsh tension.

**Fifth movement**

Similar to the third movement, the fifth one has been object of previous investigation. Two authors have delivered analysis of it, but again, the movement has been considered in isolation ignoring its role in the discourse of the entire quartet. On the one hand, Roig-Francolí (1995) considers the movement as a composition characterised by net-structures. On the other hand, Clendinning (1989:225) approaches the movement as a pattern-meccanico composition. Regardless the conceptual discrepancy that is solved by Roig-Francolí, both authors submit revealing conclusions coinciding in first place with the formal design of the

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23 It changes from ordinary playing with lots of bow changes per note to little bow changes in natural and artificial harmonics.
25 “A net-structure is a continuous web of finely-woven lines or repeated patterns in a constant interactive process of transformation of one or more parameters, such as pitch, rhythm, texture, dynamics or timbre. [...] Harmonic transformation in net-structures results from systematic processes of chromatic fluctuation or intervallic expansion and contraction” (Roig-Francolí 1995: 243)
26 Roig-Francolí (1995: 244) stated that: “Ligeti's use of technical terms descriptive of his music is not always consistent, we may note that the composer employs the term 'meccanico' to refer to a type of texture totally different from his harmonic pattern-transformation webs. Ligeti's characteristic 'meccanico' passages or movements feature the quick mechanical reiteration of only one pitch per instrument (as opposed to a melodic or harmonic reiteration) with *staccatissimo* or *pizzicato* markings.” This is confirmed by the terminology used by the composer in *Ligeti in Conversation* (Eulenburg 1983), 16-17, 107-108 and 135.
movement: one first section comprised between bars 1 to 19, a middle one between bars 20 to 56, and the last section between bars 56 to 81.

Aside the middle-section's chromatic arrangement of pitches, this movement is, characterised by the consonant sonority that the minor thirds introduce in the first bars. Clendinning suggests (1989:223) that the first signal harmony appears in the figuration of bar 12. However, contrarily to Clendinning's point, the first signal harmony appears in bar 18. It might be possible to consider the chord built from open strings\(^{27}\) in bar 12 as an interval sign due to its harmonic configuration. Nonetheless, this chord does not interrupt any processes but rather softens the "change from descending scalar patterns to arpeggiations" (Clendinning 1989:223). The material of bars 18 and 19, conversely, presents a clear articulation that behaves similarly to the other interval signs found throughout the quartet, although in here, the sign appears as a result of a complete process. Furthermore, it is build by several minor seconds contrasting harmonically with the rest of the first section.

The next gesture that suggests a formal articulation is the minor-second trill over a G\(^3\) that the four instruments reach just before bar 37. Although both Clendinning and Roig-Francolí neglect this point as significant, it is worth identifying some features that give this bars (37-44) a crucial role within the movement. In first place, this trill is the clear aim of a process.\(^{28}\) In second place, it also operates as the origin of a new process that unfolds chromatically and timbrically until bar 40.\(^{29}\) Thirdly, the material located from bars 41 to the first beat of 44 presents a resemblance to the material with which the first and second movement end. Furthermore, the material that appears hereon is extremely contrasting to any previous one. Consequently and for the time being the present movement can be divided in four sections rather than the three initially proposed, these are: first section between bb. 1-29, second section located in bb. 20-44, third section between bb. 44-56, and the fourth one in bb. 56-81.

The next formal division suggested by Clendinning takes place in bar 56. The author states that in "b. 55, scalar passages give way to frantic, disjointed fragments of

\(^{27}\) C\(^3\) [viola] - G\(^3\) [violin 2] - A\(^3\) [cello] - A\(^4\) [violin 1]

\(^{28}\) This process begins in bar 20 and it is materialised in bar 34.

\(^{29}\) Violin 1, 2 and viola move chromatically upwards at different rates whilst the cello has a descending movement, first of a major second and then a minor second.
arpeggiations”. Consequently, even without an evident formal articulation in bar 56 the last section of the movement starts here (Clendinning 1989:225). Whereas Clendinning’s point is acceptable, it is crucial to understand this dividing point as a result of a process rather than two juxtaposed sections. The first gesture indicating that one section has finished appears in bar 53 with the loud scalar fragments played in rhythmic unison by the four instruments. Apart of being an allusion to gestures of other movements, the subsequent material is clearly contrasting. From thereon, what Clendinning identifies as "scalar passages", are really fragmented arpeggations that become progressively complemented until reach a complete figuration in bar 56.

The process continues until bar 58 where the four instruments reach 8 subdivisions per beat and the long notes in the cello and the viola are subsequently introduced. This progressive acceleration starts in bar 54; therefore, it is difficult to accept Clendinning’s idea of a formal division in bar 56. Moreover, it is clear how the intervallic arrangement of the figuration is contracted from sixths in bar 56 to thirds in bar 58. Consequently, this movement starts in bar 58 and the section comprehended from bars 54 to 57 works as an independent 'transition' between the third section (bb. 44-56) and the fourth one (bb. 58-81). This 'transition' can be also understood as a remnant of the fortissimo in bar 53, and it could be associated to behaviours found in the fourth movement.

The last section of the movement ends with the running scales in rhythmic unison. This time, these scales are organised combining minor and major seconds. This closing section also enables a retrospective approach to the materials used in this movement. In first place it is obvious how this movement opens and closes "with the same D♯-F♯ vibration" (Griffiths 1983:72). Furthermore, the aforementioned scales the material with which Ligeti builds the section located between bars 45 to 53. Similarly, the long notes that the cello and the viola play in the last section are closely related, harmonically and timbrically, to the open strings introduced in bar 12. The fifth movement is, together with its almost obvious sense of recapitulation, the release of the energy that was compressed in the fourth movement. In other words, it gives "the impression of something self-contained and distant, as if the quartet had become

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30 As indicating on the score by Ligeti, they should "disappear suddenly, as though into nothingness" (Ligeti 1968:31).
very physical and near in its fourth movement and then withdrawn." (Griffiths 1983:73)

**Conclusion**

Although each of the movements does present a different development of the chromatic scale, the discourse is organised in such a way that the complete quartet is perceived as a complete work. The material throughout the movements, though in contrasting motions, is presented enabling linearity. Together with this, there are gestures that, due to their particularity, are used as a way to achieve unity and a cyclical sense balancing the dissimilar character of the movements. Furthermore, it can be concluded that these gestures have their own developmental processes appearing with different profiles depending on the motion of the movement in which they emerge. One example of this is the chromatic scale in harmonics at the end of the first and second movements. Even more recurrent are the running scales in rhythmic unison that appear for first time in the first movement and are constantly transformed during the work. Another case is the pizzicato with which the piece starts and that is presented with different roles in all the movements.

The analysis of the complete work shows that it is crucial to not reduce the approach to the location of interval signs as isolated phenomena. Inversely, the formal articulation responds to the motion characteristic of each movement. This relationship between specific processes builds the formal arrangement within each movement; in some cases the interval signs are a result of juxtapositions. In other cases, they are a result of longer processes cohabitating and affecting different registral segments. Finally, it is worth stating that, as suggested by Roig-Francoli and Jonathan Kramer, this music presents a "nondirected linearity" in which goals are:

"Unpredictably defined as they happen, rather than having been explicitly established by either such contextual means as previous reiteration or emphasis, or by a priory references to 'neotonal' procedures" (Kramer 1988, cited in Roig-Francoli 1995:254)

This idea confirms the notions of interruption and juxtaposition as the main notions articulating the material throughout the piece. Moreover, this reinforces the relationship between stasis and activity as salient characteristic of the piece.
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