Article received on May 24th 2024
Article accepted on June 28th 2024
Original scientific paper
UDC 784.1
78.02
DOI: 10.5937/newso2463057Z

Miloš Zatkalik*
University of Arts in Belgrade
Faculty of Music
Department of Composition

TELEOLOGICAL STRATEGIES OF NON-TONAL MUSIC: THE CASE OF GYÖRGY LIGETI'S *LUX AETERNA*

Art creates the finite in order to restore the infinite.
Gilles Deleuze and Felix Guattari

Abstract: In Ligeti's *Lux aeterna* micropolyphony and the lack of an apparent system of pitch organization comparable to functional tonality seem to preclude goal-directed processes of musical motion. Yet, this article will demonstrate the existence of goals and paths leading toward them on various levels (short-, medium-, and long-term). These teleological procedures include contextually establishing intonational centers as goals; directed linear motion; the completion of twelve-tone aggregates as well as the extension of the completion idea to other parameters. As a final observation, while goal-directed processes span the entire composition, some of them, in conjunction with the text, transcend the work itself, and project goals into infinity.
Keywords: Ligeti, *Lux aeterna,* teleology, completion

* The author's contact details: mzatkali@eunet.rs.

The perfect authentic cadence is the inevitable happy ending of tonal music. This witticism – inspired by Peter Kivy,[1] paraphrased and broadened for my present purpose – sums up neatly a fundamental aspect of music composed within the framework of functional tonality, namely its goal-directedness, with goals of musical motion given a priori and usually known in advance. Conversely, non-tonal music usually defines its goals and goal-reaching procedures contextually, or the sense of directed motion is obliterated. The latter possibility seems more appropriate for Ligeti's music written during the 1960s and in particular the subject of the present article, his a cappella composition *Lux aeterna* for sixteen voices.[2] It is especially appropriate when regarded in light of his own statements about his works being "more object-like than process-like",[3] and, more broadly his views about the untenability of teleological form in post-tonal music.[4] Yet, this same composer has also stated that "musical moments have meaning only in that they point to other moments".[5] This is a sufficient indicator of goal-directedness, at least on local levels, down to point-to-point connections. Another statement by Ligeti, however, suggests that goal-directed processes can be more far-reaching:

> There are specific predominant arrangements of intervals, which determine the course of the music and the development of the form. The complex polyphony… is embodied in a harmonic-musical flow, in which the harmonies… do not change suddenly, but merge into one another; one clearly discernible interval combination is gradually blurred, and from this cloudiness it is possible to discern a new interval combination taking shape.[6]

---

[1] Peter Kivy, *Osmin's Rage*, *Philosophical Reflections on Opera, Drama, and Text*, Ithaca, Cornell University Press, 1999, 289.

[2] It may be of interest here to know the composer's attitude toward this piece: "Like *Apparitions* in 1958, *Lux aeterna* of 1966 is again a cornerstone in my work…With this piece, the mode of composing in 'total chromaticism' has been transcended" (qt. in Constantin Floros, *György Ligeti: Beyond Avant-garde and Postmodernism.* Translated by Ernest Bernhardt-Kabisch, Frankfurt am Main, Peter Lang Publishers, 2014, 103). Music is more overtly modeled from the continuous transformation of what Ligeti terms "intervallic seed crystals" (Peter Edwards, "Convergences and Discord in the Correspondence between Ligeti and Adorno", *Music & Letters*, Vol. 96, No. 2, 2015, 250).

[3] Qt. In Miguel Roig-Francoli, "Harmonic and Formal Processes in Ligeti's Net-Structure Compositions", *Music Theory Spectrum*, Vol. 17, No. 2, 1995, 254.

[4] Edwards, op. cit., 253.

[5] Qt. in Jonathan Bernard, "Inaudible Structures, Audible Music: Ligeti's Problem, and His Solution", *Music Analysis*, Vol. 6, No. 3, 1987, 5.

[6] Qt. in Paul Griffiths, *Modern Music and After*, Oxford, Oxford University Press, 1995, 217.

Arrangements of intervals that determine the course of music and the development of form: this could just as well hold true for any functional tonal piece. It may be the case that in tonal music we encounter less "cloudiness", and have less need for "discerning interval combinations" that are "taking shape". It may also be true that Ligeti's interval combinations are generally less predictable and more context-related than tonal harmonic functions are, but this does not invalidate the underlying idea: the unfolding of a piece of music is a process governed by a set of rules and directed towards certain events that are experienced as goals.

Already Russian musicologist Boris Asaf'ev wrote that "the attention of the perceiving subject is directed towards finding footholds in the flow of music, towards recurring intonational moments (whatever sonic elements they may consist of), and these moments crystallize in the mind".[7] Significantly enough, such a foothold – focal intonation, referential sonority, *ustoy* as he calls it – is not necessarily a tonic, or even a consonance; theoretically, it could be any "arrangement of intervals." It is easy to see how such recurring footholds can be conceived of as contextually created goals. Our listening experience favors such a mode of hearing, involving departure and return, tension and release, predictions, expectations and their fulfillment or frustration. Based on robust empirical evidence, David Huron makes a claim about "statistical learning": as we listen to music we make predictions, and what we tend to predict is the most frequently occurring past event.[8] At the same time, the event we have predicted accurately is a source of pleasure.[9] Consequently, we are highly gratified by those recurring moments that we can accurately predict. Such moments are, therefore, not simply events that are heard more often than some other events: they are heard as goals of musical motion. The "musical event" in Huron's statement may be defined by a number of parameters. It has been repeatedly noted that in Ligeti, and for that matter in many other works from the last several decades, other parameters including timbre, texture or volume may assume the role traditionally performed by pitch. Yet, upon closer examination, it transpires that even in these

[7] Борис Асафьев, *Музыкальная форма как йроцесс*, Ленинград, Государственное музыкальное издательство, 1962/1930, 117–118 (translation M. Z.).

[8] David Huron, *Sweet Anticipation*: *Music and the Psychology of Expectation*, Cambridge, MA, MIT Press, 2006, 138.

[9] Ibid., 164.

situations pitch tends to retain its role of the "most structural parameter".[10] We can, therefore, safely assume that teleology is fundamentally connected (though not limited) to pitch organization.

In light of the above, and particularly in light of the composer's own statements, in Ligeti's music we are justified to search for certain pitch collections that play the pivotal role. If "moments point to other moments", then there is a sense of directed motion. This is basically what Jonathan Kramer meant by linearity when he defined it as a "principle of composition or listening under which events are understood as outgrowths or consequences of earlier events"[11] or when he talked about certain events "being determined in accordance with implications that arise from earlier events of the piece".[12] Moreover, the directed motion may be revealed not only in the immediate proximity, but also on a larger and indeed on the global scale: this is how we read the part of Ligeti's statement where he refers to the "development of form". The form of any musical piece involves connections at a distance, and processes spanning larger portions of music.

What are, then, these important pitch collections that "determine the course of the music"?[13] Obviously and trivially, the composition is rounded with respect to pitch class – the initial F is also the concluding pitch. The fact that the latter is accompanied by a G above is an instance of the aforementioned blurring, which still does not preclude its function as the intonational foothold. Let us also not forget that G is the third pitch introduced in this composition, thus presumably still clearly discernible; in addition, its prominent appearance as the highest pitch in bar 61, sustained through bar 64, initiates the second half of the composition. In this sense it may be "entitled" to partake in the closing function.[14] As the music advances, other tones will

[10] There should be no doubt that Ligeti organized all parameters of his music with the utmost care. For an analyst it would be no less illuminating to study his rhythmic structures, which, in the present composition are based on what he called "elastic talea" (Jan Jarvlepp, "Pitch and Texture Analysis of Ligeti's *Lux aeterna*", *Ex tempore*, Vol. 2, No. 1, 1982, 27).

[11] Jonathan Kramer, *The Time of Music*, New York, Schirmer, 1988, 453.

[12] Ibid., 20.

[13] The ensuing analysis is based on my earlier article, Miloš Zatkalik, "Reconsidering Teleological Aspects of Non-Tonal Music", in: Denis Collins (Ed.), *Music Theory and its Methods: Structures, Challenges, Directions*, Frankfurt am Main, Peter Lang Publishers, 2013, 293–297. Here, it has been amended and significantly expanded.

[14] The difference between the beginning and the end can be viewed from the following

be assigned the roles of temporary or local footholds, such as the prominent A entering in sopranos in bar 24 and sustained through bar 37, with the appearance of the text "luceat eis" (the reader is strongly advised to have a score at hand).[15]

Analytically more pertinent than individual pitches are "specific predominant arrangements of intervals", "interval signals" as they are also called. First, there is the initial three-tone collection, associated with the first statement of the first textual phrase ('Lux aeterna'). It is the 013 set class, and it will reappear with some structural weight as the music progresses. More structural weight is assigned to the set class 025.[16] It will emerge as crucial to the structure of the piece. This collection is sometimes referred to as "the typical Ligeti signal", even if we are cautioned that its general importance in Ligeti's oeuvre should not be overestimated.[17] It performs a significant boundary-creating, hence form-shaping role as can be observed in the following table (Table 1).[18]

perspective: while the finality of returning to the point of origin is intuitively understood, it is not necessarily a return to the *exact* point of origin. The final tonic differs from the initial one (witness Schenkerian *Ursatz*). Outside music, this is well captured by Tzvetan Todorov's narrative formula equilibrium – disequilibrium – equilibrium, where the final equilibrium differs from the initial one.

[15] It is beyond the scope of this paper to discuss to what extent the salience of a given event can be equated with its referentiality, and whether there are sufficient criteria of stability in this music, that could override the effect of salience, as discussed repeatedly by Fred Lerdahl, "Atonal Prolongational Structures", *Contemporary Music Review*, Vol. 4, 1989, 65–87; see also Miloš Zatkalik, Verica Mihajlović, *Prolongacija i strukturni nivoi u posttonalnoj muzici*, Banjaluka, Univerzitet u Banjoj Luci, 2016. For my purpose, it will be sufficient to treat salience as an important criterion in assessing the structural weight of an event.

[16] I use Allen Forte's designations as a convenient way of labeling certain pitch configurations (i.e., 025 is more practical than a "major second plus minor third", or "harmonics number 6, 7 and 8"). In addition, this makes certain meaningful relations between pitch configurations easier to observe, and enables a level of abstraction that can be useful at a certain stage of analysis. Otherwise, it would be preposterous to conduct a thorough set analysis on this piece.

[17] Miguel Roig-Francolí, "Harmonic and Formal Processes in Ligeti's Net-Structure Compositions", *Music Theory Spectrum*, Vol. 17, No. 2, 1995, 250.

[18] Not all authors would agree with this analysis (see, for instance Floros who cites the composer's own division into ten sections. Floros himself divides it into four larger parts, see Constantin Floros, op. cit., 105).

Table 1. Synopsis of Form

Section	I				II				III			
Subsection	I_1		I_2		II_1		II_2		III_1		III_2	
(begin/end)	0	24	24	37	37	61	61	90	90	(101)	(101)	119/127
Pitch/pc	**F→013**	(025)	(A)	013→A	**025**	**025**	**025**	**025**	037	**025**	**025**	**0257→F+G**
Texture	canonic				**non-canonic**	canonic		**non-canonic**	canonic			**non-canonic**

We can divide the piece into three sections, each of which consists of two subsections. There is room for further subdivisions, but they are not vital for this analysis. Transitions between formal divisions are smooth, there are no sharp junctures.

Most conspicuously, boundaries between sections are marked by changes in texture from canonic to non-canonic. Yet, with Ligeti, the structurally important events regularly include the parameter of pitch. The majority of the boundaries between sections or subsections are marked by the collection 025. The 013 collection, already singled out for its structural significance, also plays some boundary-defining role, whereas the significance of the minor triad (037) will be discussed at a later stage. Again in Ligeti's words,

> The interval signals were neither tonal nor atonal yet somehow, with their purity and clarity, they constituted points of rest, they afforded the possibility of operating with alternate tension and resolution. The point was simply to provide moments of clarity at important formal junctures, in contrast to the more or less dense, blurry polyphony that reigned in between these moments (qt. in Bernard).[19]

Goals are thus rather clearly projected both in pitch and in texture. What I have said so far may not have been very illuminating. Ligeti's interval signals are well known, not least from the composer himself. What I find analytically exciting is to observe how the 025 set is established and how it gradually gains prominence. Its rise to power, as it were.

The first statement of this set is in bars 6–8, notes F–E-flat–A-flat in first sopranos (since the texture is canonic, it will be imitated by other voices). At that point, its significance and future role is far from obvious; it is in no way highlighted and it even cuts across the normal segmentation of the text. It becomes more meaningful when it reappears at bars 13–14, corresponding for the first time to a complete word ("aeterna"). Even this instance does not

[19] Qt. in Jonathan Bernard, "Ligeti's Restoration of Interval and Its Significance for His Later Works", *Music Theory Spectrum*, Vol. 21, No. 1, 1999, 2–3.

yet reveal the true significance of this collection: we understand it only in retrospect. The segment in which the 025 set is inaugurated as a structural collection comprises bars 22–24 when it closes the first subsection, just before the very prominent A, which also marks the entrance of another textual phrase ("luceat eis").

That it plays a major structural role becomes clear at the beginning of the second section, bar 37, with three basses singing F-sharp–A–B, this time simultaneously. Henceforward, the collection returns frequently, both horizontally and vertically; it becomes the "recurring intonational moment" towards which "the attention of the perceiving subject is directed", and which "crystallizes in the mind", according to the Asaf'ev's definition of *ustoy* quoted above. Most importantly, the boundary-defining role is subsequently confirmed by its appearance at another major structural junction in bars 87–90 (end of section II), where it is most clearly verticalized, in two "incarnations": as E–G–A and E–F-sharp–A. Moreover, after it has performed the boundary-creating role between the two subsections of section II – also the mid-point of the piece – it is entrusted to the altos as their sole pitch content for the next no less than eighteen bars. The overall sound is heavily permeated with this collection.

Bar 94 introduces B5 as the melodic climax of the piece, and shortly afterwards, in bar 101, enters D as the lowest extreme. This conspicuous point of maximal registral expansion also has an "added bonus" of the 025 set class, both vertically (F-sharp–A–B in sopranos and tenors), and horizontally (A–B–F-sharp, prefigured by these same pitches in bar 37, and B–F-sharp–G-sharp as two interlocking sets with the same prime form in altos). If we add the B–D in the bases, we obtain another 025 set sharing the tone A with the previously indicated one; furthermore, if we abandon the tone A to the A–B–D set, then the A-flat in the altos completes the 025 with F-sharp and B.

The last sonority before the concluding dyad F-G reads D–F–G–C. Its prime form is 0257, which again can be constructed out of two interlocking 025 sets (C-D-F + D-F-G). As we can see, of the two common tones in that case, one is F (predictably?). Furthermore, if we consider pitches A (24–37 end signal, unison) – G (61; member of 025 but the tone itself is dominating in the outer voices) – E (83; unison), we again obtain the same set, which demonstrates its larger-scale organizing power (summed up in the simultaneous E–G–A in basses, b87).

Therefore, not only does the 025 set constitute a contextual goal that once established we expect to recur, and are gratified when we hear it, in a

manner not unlike the tonic in tonal music: the very promotion of this collection, the establishing of its structural primacy proves to be a goal-directed process. We can read it as a narrative of how an almost arbitrary group of notes is promoted into the central sonority of the composition.

But Ligeti has some other goal-reaching resources in store. One of the well-rehearsed strategies that enable non-tonal music to project goals is the completion of the twelve-tone aggregate. Edgard Varèse utilizes it, and so does Anton Webern in his pre-serial phase; it has been discovered in Olivier Messiaen, George Crumb and many more, and it can even be shown to play some role in tonal music. As far as Ligeti is concerned, we could take the first of his Ten Pieces for Wind Quintet as a textbook example. By bar seven, the composer has introduced eleven pitch classes; the last one, C-sharp is deferred until bar 16. Accordingly, its appearance is expected as an important event, and as an important event it is treated.[20] *Lux aeterna* may not be the most illustrative example, yet we will miss some important aspects if we overlook the use Ligeti makes of the possibilities offered by the full 12-tone aggregate as opposed to 9-, 10-tone or 11-tone collections. An instance of this is contrasting the II_2 subsection containing all twelve pitch classes with other (sub)sections with fewer pcs, thus contributing to the global shaping of the piece. Another possibility he explores is withholding certain notes which might plausibly be expected, and which are to be supplied later. One of his procedures is "stopping short" of the full aggregate completion: the penultimate pitch is given prominence while the last one is rendered inconspicuous or its appearance is postponed. Thus, section I employs ten pcs. The "completing-but-one" B occurs within the sonority that opens section II: in other words, it is involved in boundary-creation. It is shortly followed by the completing D. The completing tone is not really salient, although it gains some weight by being introduced as the last vestiges of the previous section ("Domine" sung by three basses) die out. The sections overlap and it is precisely with this D that the overlapping segment ends. A similar procedure repeats in II_1: a 10-pitch collection, with the full completion deferred until the next subsection is already underway. In such cases, aggregate completion plays a connecting role between sections or subsections, a procedure previously identified in Ligeti's *Ten Pieces* (Morrison 1985).

[20] Apart from its emphatic presentation (general unison, *fff* dynamics, abrupt change of register), it is located near the point of the golden section. We are somehow aware that the music flow is directed toward this climactic point.

I would like, however, to offer an alternative view of the D at the beginning of II as the completing pitch. If we agree that, notwithstanding its above indicated connecting role, we experience it as rather inconspicuous, may we assume that the "legitimate completion" is deferred as far as bar 102? Namely, the D in the basses is given prominence as the lowest note in the entire piece, and a special structural role, since it both initiates the last subsection, and participates in the closing 0257 tetrachord (i.e., it is one of the two last remaining notes before the texture is reduced to the F–G dyad). We find another instance of a postponed or ambiguous aggregate completion in section II_1: again a 10-pitch collection; the two missing pitches are G and F. One of them – F – is at first presented quite inconspicuously, then regained in bar 72 where it is the lowest tone, and sustained as such for the next seven bars. However, this is still not the structurally most important completion (would it be too early for that kind of "tonic arrival", if we treat F as the focal intonation?). The structurally important completion, including both F and G is "saved" for the very end. All this suggests that aggregate completion does play a role in large-scale formal process.

As I have argued elsewhere,[21] the completion process need not be restricted to pitch classes. We can generalize it to other entities. As the music unfolds, the entities are introduced, and the goal is reached when all individual entities from the given "family of entities" are exhausted: all pitch classes (from the 12-tone collection or a subset thereof, or a subset of any other collection considered in some way significant or referential), all intervals/interval classes, all possible transpositions of a given scale, all possible permutations of the given set of any elements, and more. Not only are discrete elements involved. When the magnitude of a certain parameter changes continually, then exploring its full range, reaching the extremes, is also seen as a kind of completion. Registral completion – reaching the outermost bounds of the available tone space – can serve goal-projecting and goal-attaining purposes. Note that register is treated as distinct from discrete pitches, which allows for a degree of flexibility: registral completion does not necessarily predict the exact pitches that will serve as registral limits.

Such a process accounts for the peak tone B in bar 94. This tone is reminiscent of the A from bars 24–37, not least because of the same syllable "lu". Taking a step further, I intend to show that it is in a way implied by it. Let us examine the implications of this A. When it appears, it opens up a new register, indicating the possibility that registral considerations must thencefor-

[21] M. Zatkalik, op. cit.

ward be taken into account, and it is emphasized both texturally and textually. Most importantly, it is the highest tone yet, and will remain so for a long time. But would the listener expect the absolute melodic climax after less than a third of the composition has elapsed? I presume that most listeners will feel entitled to a note higher than A later in the piece. Reaching the absolute climax is thus projected as one of the goals. As I have already indicated, it does not imply what exactly that note will be; yet, given that the A already practically reaches the limits of the soprano register, would there be a wide choice of pitches available? The viable candidates are few, and among them the A–B progression is a better candidate since it reflects a number of other relations. It is presented vertically, between the lowest and highest notes, exactly when the melody reaches its highest point in bar 94; it is perhaps foreshadowed by the quasi-legato transition from A to B between tenors and basses in bar 37, with the striking timbral effect of the falsetto basses. This in turn foreshadows the major second (transposed by major second), F-G that concludes the composition. There is yet another implication of the A–B progression that will be mentioned towards the end of this paper. For the time being, we can conclude that the expansion of musical space, reaching its highest and lowest extremes, can be experienced as a goal-directed process.

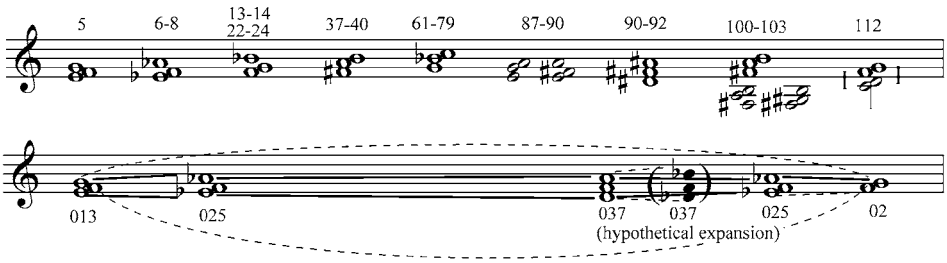
Another aspect of Ligeti's compositional procedures germane to my topic is voice-leading. Michael Hicks points out that Ligeti's interval signals, especially those that "provide moments of clarity", to recall Ligeti's statement, may be "blurred by *filling*, a process wherein new pitches are inserted into the existing intervals; by *accretion*, in which new pitches are attached to the outside of existing intervals; or by *shifting*, in which one or more of their elements ascend or descend".[22] Furthermore, expanding and contracting tone collections by stepwise motion of the outer notes is of particular importance, and even a cursory look at the score should make it clear. Other scholars have also noticed "wedge contours" as "a mainstay of Ligeti's music".[23] These pro-

[22] Michael Hicks, "Interval and Form in Ligeti's *Continuum* and *Coulée*", *Perspectives of New Music,* Vol. 31, No. 1, 1993, 174. There are obvious connections with "parsimonious voice leading" (Richard Cohn, "Neo-Riemannian Operations, Parsimonious Trichords, and Their 'Tonnetz' Representations", *Journal of Music Theory*, Vol. 41, No. 1, 1997, 1–66.), or Schoenberg's "law of the shortest way" (Arnold Schoenberg, *Theory of Harmony*, translated by Roy Carter, Berkeley and Los Angeles, University of California Press, 1983/1911, 39).

[23] Eric Drott, "Lines, Masses, Micropolyphony: Ligeti's *Kyrie* and the 'Crisis of the Figure'", *Perspectives of New Music*, Vol. 49, No. 1, 2011, 21.

cesses provide direction to linear motion. As a goal-projecting strategy, it may appear to be of purely local ("microteleological") significance, relevant only for point-to-point connections; however, I am tempted to draw some more far-reaching conclusions about the expansion-contraction mechanisms over long spans, to demonstrate the existence of long-term linearity, which could perhaps qualify as the background structure of this composition, although what I am not trying to construct should not be confused with Schenkerian *Ursatz*.

Example 1. Background structure



The familiar 013 trichord from the beginning expands into even more familiar 025 and further into 037, the minor triad from the beginning of section III (Example 1). It now contracts back to 025 (before ending up as a 02 dyad). This would then be the deepest structural layer, the "genetic code" of the composition, as it were. The example further shows how the indicated set classes are transposed (i.e., D to D-sharp) which I explain as displacements, by various interval classes, closer to the surface. It is as though the forces generated through the course of music bend the trajectory and displace certain events from their proper positions, cause them to veer off course. It is important to note that the beginning and end are not displaced. Why does this process of expansion stop exactly at the minor triad? Perhaps because the possibilities of gaining new sonorities through expansion are exhausted; a further expansion would yield another minor triad, the sonority that would merely be another transposition. If such an interpretation seems viable, this would be an instance of a completional process supporting directed linearity in the background.

Yet another aspect with teleological implications – and the principal addition to my 2013 analysis – needs to be discussed. Let us reconsider the D appearing in tenors in bar 41, indicated earlier as the completing tone of the chromatic total. As the F-sharp–A–B trichord from the previous section ex-

pires, this D enters into a four-tone subset of the whole-tone collection, together with C, E and F-sharp in other three tenors. The moment in itself may seem too brief to be anything but incidental; yet, it is not the only instance when the whole-tone collection is hinted at. Upon closer scrutiny, we can observe a slight prevalence of the pitches F-sharp, E, D and C in 39–41; the same could be said of the pitches A-flat, B-flat, C and D, bars 56–61. Possibly, there is also a significant whole-tone relation spanning the entire composition, from the initial F to A and B as melodic peaks, including G in bars 61–64 (local melodic peak, located at a formal juncture, and sustained for a considerable stretch of time), to the concluding F–G dyad. It is rather tempting, then, to include a low extreme. D-sharp – already identified as part of a boundary-creating minor triad – is also, if not the lowest pitch in the entire piece, then the lowest note up to that point, and very conveniently adding a fifth pitch to the whole-tone collection. According to the completion model, the remaining D-flat/C-sharp is implied. This, however, does not happen, in the sense that this pitch is never highlighted in an analytically meaningful way. Instead, the lowest extreme is D, reached via the descending chromatic trichord E–D-sharp–D: indeed a tetrachord, if we count the octave transfer of F–E, bars 71–85. If there are any expectations concerning the whole-tone scale, they are dispelled by the pronounced chromaticism in the lowest voices.

This long-range juxtaposition of whole-toneness and chromaticism invites us to search for other principles of pitch organization. When a whole-tone subset is complemented with a semitone, this produces a subset of the acoustic scale, or Scriabin's "mystical chord". Furthermore, when in bars 8–11 we hear the progression A-flat–D-flat–E-flat–F we may think of the pentatonic scale, which is even completed with B-flat in bar 12 ("unfortunately", only after an intervening G-flat). This G-flat, in its turn, suggests a diatonic scale, and considering the subsequent B-flat–A–B-flat–C–B-flat that can easily be perceived as a closing melodic formula, we can identify the scale precisely as B-flat minor.[24] The structural 025 is a subset of both. Ligeti seems to explore various possibilities of pitch organization, but he does not seem "enthusiastic" about any of them. None is projected to any appreciable degree; none of them produces a decisive perceptual effect. The listener is more likely to hear dense cluster-like sonorities with occasional points of clarity, "neither tonal nor atonal".

[24] No analyst has gone as far as to assert the existence of functional tonality, but Jarvlepp, op. cit., 27 for instance, talks about "quasi dominant 7th chords".

In what ways is this pertinent to our present concerns? I will implore the readers' patience while I make a theoretical detour. There are non-tonal compositions that rely on external, a priori defined systems of pitch organization. The a priori status of these systems is relative in the sense that – unlike, say, Mozart or Brahms to whom functional tonality was the only option – post-tonal composers could choose from a range of possibilities, such as the octatonic scale, some other mode, or dodecaphonic series etc. for one particular composition. Claude Debussy in his prelude *Voiles* consistently uses first the whole-tone scale, then the pentatonic one, whereas the contrast between the two serves as a principle tool for the shaping of the global form. *Eine kleine Trauermusik* by the Serbian composer Milan Mihajlović is centered on C, its referential sonority derived from the harmonic series; various transpositions of the octatonic scale are used in lieu of modulation, and at the point of crisis, octatonicism is pitted against tonality. Once such systems are established, they generate certain expectations on the part of the listener. Such compositions reveal from the outset their organizing principles, and comply with Asaf'ev's statement "The immediate goal of each first moment of intoning is to draw the listener into the sphere of the musical setting based on the system of sound relations specific to a given epoch and social context."[25] Music, however, often creates ambiguities in order to clarify them; contradictions to be united; music creates tension in order to release it.[26] Over the last hundred years, there have been many compositions in which organizational principles are less clear and by no means unequivocal. Contrary to Asaf'ev's proposition, the listener is not drawn into a recognizable system of sound relations. The goal toward which the musical motion is propelled is to clarify the initial ambiguity. Instead of the dominant function, it is ambiguity or uncertainty that generates tension. The goal is reached and tension released at the point (or a segment of the composition) at which one of the principles ultimately prevails.[27] In *Lux aeterna*, the rules governing the course of music are obfuscated. The composer gives us misleading clues, lays false scents. As we catch

[25] Asaf'ev, op. cit., 63.

[26] The reason for this, as offered by the psychology of the unconscious, is related to the need for the mastering of tensions in early infancy, but we cannot pursue this line in the present article.

[27] I demonstrate how this works in Dmitri Shostakovich, Alexander Scriabin, and Serbian composer Miloje Milojević in Miloš Zatkalik, "Obfuscation and Clarification: Reflections on Post-tonal Teleology", *Principles of Music Composing*, XVII, 2017, 16–23.

glimpses of pentatonicism or whole-toneness or diatonicism etc., we expect to hear any of them established or completed. More importantly, as we are hearing occasional clashes between different principles, and receiving contradicting information, we may cease to expect a definite continuation, but all the more we expect a clarification. This, however, we are denied: some goals are never attained.

At the beginning of this article post-tonal teleology was presented as a binary choice: contextual goals (and means for their achievement) vs. obliterated sense of directed motion. In other words: either teleological or non-teleological. If for a while longer we abide by this oversimplified model, have we settled this issue for this composition? Up to now, I hope I have demonstrated how "moments point to other moments". Moments in the proximate neighborhood, or further away, or across very large portions of the composition. I have also indicated the logic that makes these latter moments true points of arrival. Admittedly, there is no consistent syntax that would steer the music towards precisely these specific moments, but there is little doubt about the teleological nature of a number of processes we have noted in *Lux aeterna*. By way of a shortest possible summary, these processes include:

- centricity, with intonational centers and referential collections as contextually established goals;
- the very process of promoting these collections, rendered as goal-directed;
- aggregate completion, both locally and globally;
- the completion process in other domains (register, texture);
- directed linear motion, again both locally and globally;
- creating ambiguities, hence expectations of their clarification;
- finally, progressive-recessive tendencies in Wallace Berry's terms (Berry 1987), the ending, generally deemed recessive,[28] is in this case as recessive as it could conceivably be.

This makes a solid case for goal-orientedness in *Lux aeterna*. We can, furthermore, situate this piece within a broader framework of teleological considerations. In my 2013 article, I proposed a number of teleological conditions (reproduced here in a slightly modified form). In order for a musical composition to be goal-oriented, at least some of the following conditions must be fulfilled:

[28] Wallace Berry, *Structural Functions in Music*, Mineola, Dover, 1987.

1. music is conceived of as motion; a flow; a process;
2. events occurring before the end of the composition imply continuation;
3. the direction of that continuation is relatively predictable;
4. not only the immediate continuation, but also more distant, long-term goals are relatively predictable;
5. once attained, the goal is recognized as such;
6. patterns of tension and release are experienced; in this connection, the release of tension and dissipation of energy are characteristic of concluding processes.

These conditions are strongly interrelated, interdependent and largely validate each other. The condition 1 is the easiest one to grasp intuitively, even if extremely difficult to define. Condition 2, if it is not to be taken in a trivial sense (we can always imagine some kind of continuation, and the earlier the stage of the composition, the more assured we are that some continuation will follow), tends to relate ultimately to condition 6, since the feeling of tension is something that indisputably raises the expectation of continuation. Condition 3 heavily depends on the musical language employed, or rather on the listener's familiarity with it; at the same time, inertia, i.e. expectation that once a pattern has been established the course of music will continue in that pattern [29] also plays a significant role. Familiarity with, or the ability to recognize a musical language largely influences conditions 4 and 5, whereas condition 4 is particularly sensitive to the listeners' capacity for retaining past events.

All this deserves further elaboration, but that is beyond the scope of this article. Our immediate concern is to assess *Lux aeterna* against these conditions. In what ways the piece fulfill conditions 1 and 6, I believe, is self-evident. Condition 4 generally tends to exert the least immediate influence on the listener, we can, therefore, easily relegate it to these inaudible structures that Bernard discusses in his 1987 article.[30] Most of our analytical data, however, seem to corroborate the existence of these long-range processes. Recalling Huron's statistical learning, we can ascribe a certain level of predictability and recognizability to goals, which amounts to the fulfillment of conditions 3, 4 and 5. On the whole, *Lux* fares well against these teleological conditions.

[29] Steve Larson, *Forces in Music*, Bloomington, Indiana University Press, 2012, 22.

[30] These procedures if not heard as such, still yield specific audible results. A different set of procedures would have been heard differently. In Ligeti's words: "polyphony is written, harmony is heard".

Two additional moments now invite attention. First, the above formulations such as "at least some of the conditions" and "to a certain level". It is obvious that we need to switch from the binary mode to a more nuanced scale. Goal-orientedness is a matter of degree; the strength of the impetus, of propulsion toward the goal can be graded; there are varying probabilities of goal prediction and goal recognition. With teleology, as with most other aspects of music, it is not "either/or" but "to what extent". Of course, I am not suggesting that we can or ought to quantify these values. A kind of relative, primarily intuitive but rationally explicable scale will suffice.

Accordingly, as much as we have strived to demonstrate teleological processes, a number of analytical observations can be made to undermine these processes. The sixteen densely packed voices of Ligeti's canon stifle each other and no meaningful melodic development is perceived. Likewise, consistently applied polyrhythmic divisions 3:4:5 preclude the formation of recognizable rhythmic patterns. Nor is there a clock ticking in the form of accents, metric or structural. The entrance of canonic voices is virtually imperceptible, so not even these constitute discernible events. Sound mass is produced, entailing a sense of stasis. Key structural events (interval signals) issue gradually out of the mass. My analysis has demonstrated how they emerge, their – as I have called it – rise to power, which apparently renders them predictable. Yet, I acknowledged the lack of syntax that would steer the flow of music toward these events. They do perform the function comparable to that of the tonal cadence, but they are rather like attractors in a self-organizing thermodynamic system.[31] Having made all these analytical observations, it would be safe to say that there are clearly forces at work in this piece that serve to project goals and guide music toward them, but they are counterbalanced by tendencies to arrest the motion, frustrate expectations, thwart progress, blur the perspective. Instead of an evolution toward a certain outcome (either known a priori or projected within the piece), we have a "continuous self-vibrating region of intensities"[32] instead of a process with a beginning, a culmination and an end – a plateau.

[31] Attractors are relatively stable states to which the system tends to evolve, and which determine the evolution and guide processes toward definite outcomes regardless of their initial states. I elaborate this idea in Miloš Zatkalik, "Musical Teleology between Newton, Prigogine and Deleuze (with Spinoza Becoming Musical)", *Principles of Music Composing*, XX, 2021, 11–22.

[32] Gilles Deleuze, Felix Guattari, *A Thousand Plateaus,* translated by Brian Massumi, Minneapolis, London, University of Minnesota Press, 1987/1980, 2.

The second of the two above mentioned moments is no less intriguing. To what degree music is goal-oriented is not, or not only inherent in music itself. Orientation towards a goal is not, or not only something that exists *in* music as its intrinsic property: it is also a mode of listening. Even a tonal piece could be listened to with "non-teleological ears". We can put it this way. Composers apply certain techniques or procedures. They do it consciously or unconsciously; they generally (but not always) have a specific result in mind; sometimes they can have a specific audience in mind. They cannot, however, specify the exact reaction of the listeners, including whether or not the listener will anticipate and recognize goals.[33]

The reason why I set such store by teleological listening has something to do with the fact that the mode of thinking in Western civilization is pervaded by teleology: we tend to listen in terms of beginnings and ends, expectations and fulfillments.[34] It is part of our listening strategies, indeed of our culture. And since we have already mentioned linearity, let us be reminded that our very language is linear.[35] Ultimately, as we have seen, we cannot accurately predict, even less prescribe, whether or not or to what extent a listener will expect and recognize goals or will prefer instead to hear "a single present stretched out into an enormous duration, a potentially infinite 'now'",[36] "frozen eternity".[37] The infinite, the eternal: that is precisely what *Lux aeterna* is about. Let us be reminded of the difference between the "clear" F at the beginning and the "blurred" F-G at the end. This seems contrary to the conventional wisdom that the end ought to be more stable than the beginning. But this is valid only insofar as we require the end to be final and definitive. Here, the blurring of the end is tantamount to precluding its finality, creating conditions for its projection into eternity. If the composition ad-

[33] This relation between compositional procedures and listeners' experience could be called "structural coupling" after Chilean biologists Maturana and Varela (Humberto Maturana, Francisco Varela, *Autopoiesis and Cognition: The Realization of the Living,* Dordrecht and Boston, G. Redial Publishing Company, 1980/1972). They developed this concept expressly for the biological domain, but some thinkers – notably Niklas Luhmann – applied it in the social sciences.

[34] Kramer, op. cit., 20.

[35] Note also Susanne Langer's pertinent observations on the linearity of language (Susanne Langer, *Philosophy in a New Key*, New York, The New American Library, 1958, 77).

[36] Kramer, op. cit., 55.

[37] Ibid., 7.

mits any goals, they are not of this world, transcendent, and projected into eternity. This makes us see teleological procedures in a new light. What most powerfully propels the music toward goals is inaudible, hidden from our perception. Part of God's larger design, inscrutable to men? We should probably call it *ἔσχατος*, rather than *τέλος*. One needs to be a believer to think of the last judgment and resurrection, but one does not need to share Christian beliefs in order to ask about the ultimate destiny and perhaps to recognize its audible shape in Ligeti's *Lux aeterna*.

Works Cited

Асафьев, Борис В. [Asaf'ev, B.V.]: *Музыкальная форма как ūроцесс* [Musical Form as a Process]. Ленинград: Государственное музыкальное издательство [Leningrad: State Music Publishing], 1962/1930.

Bernard, Jonathan: "Inaudible Structures, Audible Music: Ligeti's Problem, and His Solution", *Music Analysis*, Vol. 6, No. 3, 1987, 207–236.

Bernard, Jonathan: "Voice Leading as a Spatial Function in the Music of Ligeti", *Music Analysis*, Vol. 13, No. 2/3, 1994, 227–253.

Bernard, Jonathan: "Ligeti's Restoration of Interval and Its Significance for His Later Works", *Music Theory Spectrum,* Vol. 21, No. 1, 1999, 1–32.

Berry, Wallace: *Structural Functions in Music*. Mineola: Dover, 1987.

Cohn, Richard: "Neo-Riemannian Operations, Parsimonious Trichords, and Their 'Tonnetz' Representations", *Journal of Music Theory*, Vol. 41, No. 1, 1997, 1–66.

Deleuze, Gilles; Felix Guattari: *A Thousand Plateaus*. Translated by Brian Massumi. Minneapolis, London: University of Minnesota Press, 1987/1980.

Drott, Eric: "Lines, Masses, Micropolyphony: Ligeti's *Kyrie* and the 'Crisis of the Figure'", *Perspectives of New Music*, Vol. 49, No. 1, 2011, 4–46.

Edwards, Peter: "Convergences and Discord in the Correspondence between Ligeti and Adorno", *Music & Letters*, Vol. 96, No. 2, 2015, 228–258.

Floros, Constantin: *György Ligeti: Beyond Avant-garde and Postmodernism.* Translated by Ernest Bernhardt-Kabisch. Frankfurt am Main: Peter Lang Publishers, 2014.

Griffiths, Paul: *Modern Music and After*. Oxford: Oxford University Press, 1995.

Hicks, Michael: "Interval and Form in Ligeti's *Continuum* and *Coulée*", *Perspectives of New Music*, Vol. 31, No. 1, 1993, 172–190.

Huron, David: *Sweet Anticipation: Music and the Psychology of Expectation.* Cambridge, MA: MIT Press, 2006.

Jarvlepp, Jan: "Pitch and Texture Analysis of Ligeti's *Lux aeterna*", *Ex tempore*, Vol. 2, No. 1, 1982, 16–32.

Kramer, Jonathan: *The Time of Music*. New York: Schirmer, 1988.

Kivy, Peter: *Osmin's Rage*: *Philosophical Reflections on Opera, Drama, and Text.* Ithaca: Cornell University Press, 1999.

Langer, Suzanne: *Philosophy in a New Key*. New York: The New American Library, 1958.

Larson, Steve: *Forces in Music.* Bloomington: Indiana University Press, 2012.

Lerdahl, Fred: *Tonal Pitch Space.* Oxford and New York: Oxford University Press, 2001.

Maturana, Humberto; Varela, Francisco: *Autopoiesis and Cognition: The Realization of the Living*. Dordrecht and Boston: G. Reidel Publishing Company, 1980/1972.

Morrison, Charles D.: "Stepwise Continuity as a Structural Determinant in György Ligeti's Ten Pieces for Wind Quintet", *Perspectives of New Music*, Vol. 24, No. 1, 1985, 158–182.

Roig-Francolí, Miguel A.: "Harmonic and Formal Processes in Ligeti's Net-Structure Compositions", *Music Theory Spectrum*, Vol. 17, No. 2, 1995, 242–267.

Schoenberg, Arnold: *Theory of Harmony.* Translated by Roy Carter. Berkeley and Los Angeles: University of California Press, 1983/1911.

Zatkalik, Miloš: "Reconsidering Teleological Aspects of Non-Tonal Music," in: Denis Collins (Ed.), *Music Theory and its Methods: Structures, Challenges, Directions*. Frankfurt am Main: Peter Lang Publishers, 2013, 265–300.

Zatkalik, Miloš: "Obfuscation and Clarification: Reflections on Post-tonal Teleology", *Principles of Music Composing*, XVII, 2017, 16–23.

Zatkalik, Miloš: "Musical Teleology between Newton, Prigogine and Deleuze (with Spinoza Becoming Musical)", *Principles of Music Composing*, XX, 2021, 11–22.

Zatkalik, Miloš; Verica Mihajlović: *Prolongacija i strukturni nivoi u posttonalnoj muzici* [Prolongation and Structural Layers in Post-Tonal Music]. Banja Luka: Univerzitet u Banjoj Luci, Akademija umjetnosti, 2016.

Summary

Music composed within the framework of functional tonality is generally conceived as goal-directed, with goals of musical motion given a priori and usually known in advance. Conversely, non-tonal music defines its goals and goal-reaching procedures contextually, or the sense of directed motion is obliterated. The latter possibility seems more appropriate for Ligeti's works composed in the 1960s, particularly in light of his own statement about his works being "more object-like than process-like". Yet, this same composer has also stated that "musical moments have meaning only in that they point to other moments", this suggesting that, after all, we are justified in searching for some forms of goal-directed processes in his music. The present paper examines various procedures whereby Ligeti projects goals (short-, medium-, and long-term) in his composition *Lux aeterna* for sixteen voices; steers the flow of music toward them, and reaches (or sometimes undermines) them. These procedures can be classified as (1) centricity, with intonational centers as contextually established goals; (2) the very process of promoting these centers is rendered as goal-directed; (3) aggregate

completion, both locally and globally; (4) the completion process in other domains; (5) directed linear motion, again both locally and globally; (6) registral and textural processes; (7) patterns of tension and release. Of special interest will be the procedure (4), which in my earlier publications I have defined as an extension and generalization of the (well-rehearsed) aggregate-completion. The goal is defined as the exhaustion of all entities within a given "family of entities", i.e. all pitch classes belonging to the given scale, all possible transpositions of a given collection, all intervals/interval classes etc. I have demonstrated such completion processes in several works by Lutoslawski, Messiaen, Shostakovich etc. By "goal" we can mean: a) a point in time, the reaching of a single note or chord; b) a more extensive musical entity: if the goal is the return of a previously stated theme, then the whole theme can be conceived of as a goal; c) a goal can be defined in a more abstract sense: to restore balance, to attain a certain state, to clarify initial ambiguity.

Three additional observations are made. There are clearly forces at work in this piece that serve to project goals and guide music toward them, but they are counterbalanced by tendencies to arrest the motion, frustrate expectations, and thwart progress. The second one is a warning that teleology does not exist solely through musical parameters: it is also a way of hearing music. According to the third one, while goal-directed processes span the entire composition, some of them, in conjunction with the text, transcend the work itself, and project goals into infinity.