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Review/Article of Miguel A. Roig-Francoli's article "Harmonic and Formal Processes in Ligeti's Net-Structure Compositions," *Music Theory Spectrum* 17/2 (Fall, 1995), 242-267.

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ABSTRACT: Miguel A. Roig-Francoli's recent article, "Harmonic and Formal Processes in Ligeti's Net-Structure Compositions," *Music Theory Spectrum* 17/2 (Fall, 1995) discusses three compositions by Gyorgy Ligeti that use "net-structures." This review summarizes and critiques several aspects of his article, including his choices of terminology, his analytical procedures, and his views of small- and large-scale form in these pieces.

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[1] In "Harmonic and Formal Processes in Ligeti's Net-Structure Compositions," Miguel Roig-Francoli investigates three of Ligeti's "net-structure" compositions: *Ramifications* (1968-69), the first movement of the *Chamber Concerto* (1969-70), and the fifth movement of the *Second String Quartet* (1968). He begins his article by introducing the concept of "net structures" and identifying their basic characteristics. He divides the net-structure techniques into four categories, each of which is illustrated by close analyses of small-scale harmonic features of sections of the works. He then considers longer-range connections in these movements, which he investigates using reductive techniques. He concludes with a consideration of symmetry and formal balance in the large-scale form of these compositions. In this review, I consider each element of his discussion in turn, providing additional background on some aspects and examining his methodology and his analytical conclusions.

[2] Like Pierre Boulez, Luciano Berio, Karlheinz Stockhausen, and other European composers of the 1960s, Ligeti has often commented publicly on his own works, with some of his remarks recorded in the context of interviews or program notes for performances or recordings. [\[1\]](#) Although a composer's comments on his works should be examined critically (comments may be used to obfuscate rather than enlighten), Ligeti's remarks provide a sense of how he thinks about his compositional processes, and have been useful to analysts who study his works. Ligeti uses a variety of terms to refer to his

positional techniques from the 1960s and 1970s; those most frequently used are "micropolyphony" and "meccanico." Ligeti typically uses micropolyphony and meccanico as "umbrella" terms, referring to a wide range of pieces from the 1960s and early 1970s with specific shared characteristics.

[3] The term "net-structure," which Roig-Francoli selects, is one used in the interviews in a more general sense than meccanico and micropolyphony. Roig-Francoli defines a net-structure as "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" (p. 243). Unlike the terms micropolyphony and meccanico, which Ligeti uses *analytically*, net-structure is not usually mentioned in the context of specific pieces or techniques. Rather, it is consistently used *qualitatively* to refer to a *feeling* Ligeti had about the textures of the pieces--an allusion to a childhood dream where Ligeti was caught in a room full of entangling webs. {2}

[4] Roig-Francoli does not include works such as *Lontano* and *Lux Aeterna* in the "net-structure" group, although Ligeti's own remarks include them along with earlier works like *Apparitions* (the original reference point for the web dream anecdote) and *Atmospheres*. In footnote 5, Roig-Francoli acknowledges this point, but attempts to distinguish these two works by saying that the process is "linear" in one and "harmonic" in the other (p. 243). This is a false distinction--in both cases the changes in harmonies are created by "chromatic fluctuation or intervallic expansion and contraction" as Roig-Francoli confirms later: "The process of constant chromatic transformation, a procedure which Ligeti has used widely both in micropolyphonic and harmonic textures . . ." (p. 246). In the following paragraph, after he has eliminated pieces from Ligeti's broad category of "net-structure," Roig-Francoli does the same with the term "meccanico" (p. 244), a term which Ligeti uses in reference to an anecdote about a story of a widow with a house full of ticking clocks. Ligeti uses this term in a general way, to describe music with a sense of mechanical action that is reminiscent of "malfunctioning machinery." {3} Roig-Francoli interprets Ligeti's comments about meccanico as referring only to single pitch repetitions; yet the context of Ligeti's comments includes a question about the opening of *Continuum* and a description of a piece that he wrote as a schoolboy in which "the left hand plays a mechanical progression of a tritone and the right hand something equally machine-like; two little machines at play" {4}--a passage very similar to the opening of *Continuum* in which repeated patterns of two or more pitches are used in each linear strand.

[5] As Roig-Francoli notes, however, "Ligeti's use of technical terms descriptive of his music is not always consistent" (p. 244). In order to avoid terminological confusion, previous analysts have found it useful to coin terms of their own for groups of Ligeti's compositions, using specific techniques rather than attempting to use one of his terms. In my own work, I use the term *microcanon* (invented as a subcategory of *micropolyphony*) to designate textures formed from a pitch succession set canonically in many voices at short time intervals, and *pattern-meccanico* (a subcategory of *meccanico*) for textures in which several linear strands, each constructed from small groups of pitches repeated mechanically, are overlaid to create a contrapuntal texture. {5} Compositions using microcanonic techniques include *Lux aeterna* (1966), *Lontano* (1967), and the ninth movement of the *Ten Pieces for Wind Quintet* (1968). Works with one or more passages of pattern-meccanico textures include *Continuum* (1968), *Coulee* (1969), and the fifth movement of the *Second String Quartet*. Later works, such as *Ramifications*, the *Chamber Concerto*, the "Selbstportrait" movement of *Three Pieces for Two Pianos* (1976), and the *Drei Phantasien nach Friedrich Holderlin* (1982) combine microcanon with pattern-meccanico in various ways.

[6] After his introductory comments, Roig-Francoli's attention turns to the analysis of "harmonic processes" in Ligeti's net-structures. While Roig-Francoli is careful to try to distance himself from previous analysts of Ligeti's music, his analytical approach is built on foundations provided by other writers. Most of the analytical comments are directed toward *Ramifications*, one of several works in which Ligeti combines pattern-meccanico techniques with microcanon (illustrated in Roig-Francoli's Ex. 1).

[7] Roig-Francoli begins his analysis of *Ramifications* by partitioning each instrument's flowing melodic line of pitches with brief durations into small repeated units, or patterns. He does not state the criteria he uses for partitioning, but seems to be following the segmentation procedures established by previous analysts for pattern-meccanico textures. Analytical procedures for

segmentation in twentieth-century music typically draw on discontinuities in one or more aspects of the musical texture--rests, abrupt changes of range, separation of melodic strands, durations markedly longer or shorter than those proceeding or following, and changes in timbre or articulation. Repetition of a sequence of pitches or durations can also be used for partitioning. In Ligeti's pattern-meccanico compositions, long rests (more than the notated beat unit), abrupt changes of range, markedly longer or shorter durations, and noticeable variation in articulation or timbre are rare, but the formation of the texture by weaving of individual instrumental parts is typical, making the initial partition the separation of individual instrumental parts. Unlike *Continuum*, which has continuously flowing lines, the instrumental lines in *Ramifications* (and other later works like the "Selbstportrait" movement of *Three Pieces for Two Pianos*) do include brief rests, but their duration is generally less than the notated beat unit and they do not interrupt the continuous flow of the lines. The criteria for partitioning this type of texture depends on recognition of repeated melodic units or patterns. Each unit is a series of ascending (or descending) steps or skips, which is separated from its repetitions by a skip from the highest to lowest (or lowest to highest) boundary pitches of the pattern (the largest skips in the melodic line). Roig-Francoli's segments fit these criteria.

[8] After partitioning, Roig-Francoli then examines the patterns. One innovative aspect of his analysis of the opening patterns of *Ramifications* (in Example 2a) is the emphasis on the inclusion of various partitions of the pitch interval [4] in the melodic strands. [6] Rather than explaining the metamorphosis of the patterns by focusing on voice-leading in the compound melody--maintenance of common tones, voice leading by step, and additions of tones--he examines the outer interval span and the inner filling of that span as an approach to the same type of information. However, in examining details of his analysis of this example, several problems emerge. First, Roig-Francoli states that the "group cardinality . . . is symmetrical, creating the pattern 2-3-4-5-4-3-2" (p. 246). However, the sequence of patterns in its entirety is 2-2-3-4-3-3-4-4-4-5-4-4-4-3-3-3-2, which is not symmetrical. He gives no justification for selecting from the full sequence the individual patterns that makes the 2-3-4-5-4-3-2 symmetry. Although the cardinality of the patterns does, in general, expand from 2 pitches to 5 pitches and contract back to 2, it is not as symmetrical as he makes it seem. Second, in this same paragraph, he states that "the piece begins with the pitches A4-G4, connected at m. 2 by the passing Ab4 . . ." (p. 246). What he does not mention is that the initial A4-G4 is followed by A4-G#4 prior to the pattern with A4-Ab4-G4. By what criteria is the Ab4 passing? The spelling of the Ab/G# here does not provide useful information--it simply follows the convention of spelling a pitch as a sharp when it goes up to the next pitch and as a flat when it goes down. These questions can be clarified by examining the progression of patterns with regard to pattern shifts. In this light, the G4 (and the Bb4) are "added pitches" appended to the continuing "common tones" A4 and Ab(G#)4. (Roig-Francoli also emphasizes the symmetrical nature of the chromatic clusters here--but chromatic pitch clusters are always symmetrical!) Without the ability to eliminate the Ab4 as "passing" there is no real point to be made.

[9] In order to classify various types of net-structures in Ex. 2 and those that follow, Roig-Francoli introduces four types of net-structures: 1) "chromatic fluctuation of . . . short melodic patterns," 2) "chromatic transformation of harmonic cells," 3) "chromatic transformation of triadic units" and 4) "progressive change in dynamics, timbre, or rhythm" (p. 246). However, his examples show that the first three of his categories actually involve the same compositional procedure: step-wise voice-leading (usually involving half-steps) that achieves gradual transformations in the harmonic content of the music. In regard to his first two categories, the example he cites for his Category 2 (his Ex. 3) has a microstructure of rapidly reiterated short melodic patterns just like his example for Category 1 (his Ex. 2). The "melodic patterns" are the source of the harmonies involved in the "chromatic transformation of harmonic cells." The only difference in the two is the size of the pitch intervals involved in the patterns: Roig-Francoli limits Category 1 to patterns spanning no more than [6] with no more than [4] between adjacent pitches. Although he does not explain the reasons for these limitations on Category 1 (nor does he explain the lack of specificity regarding acceptable intervals for Categories 2 or 3), it is possible that Roig-Francoli makes the distinction because the patterns with larger intervals between successive pitches are more like "traditional" harmonic arpeggiations. However, there is fluidity between the harmonic dimension and the melodic dimension in many of Ligeti's compositions, and the boundaries between perception of melody and harmony were elements that Ligeti was exploring in his compositions at the time these

pieces were written. {7}

[10] In his analysis of Ex. 3, Roig-Francoli represents his partitioning of the patterns in a "pitch reduction" graph, in which the pitches of each pattern are "stacked" in harmonies. As in the previous example, his interest lies in the partitioning of the outer span into pitch intervals rather than the voice-leading from one pattern to the next. Drawing on Bernard's theory of trichordal relationships, {8} Roig-Francoli isolates several trichords related by *infolding* and *unfolding* ([2][6], [2][8], [6][8], and [8][10]) that he considers significant in the "middleground" structure of this passage (p. 248-249). His criteria for significance are "main points of structural articulation": beginnings and endings of points of "textural transformation," "relatively stable sonorities," harmonies that initiate or close "processes of chromatic expansion or contraction," and "intervallic and spatial symmetrical designs" (p. 248). Roig-Francoli defines "textural transformation" as "progressive changes of patterns or figuration in all instruments" (p. 248, note 18)--in other words, a textural transformation is a passage with frequent pattern shifts or a rapid "harmonic rhythm."

[11] A comparison of his reduction with the score reveals some inconsistencies. Some of the trichords he selects for his "middleground reduction" are highlighted in the musical context--for example, [2][6] as the end of an expansion in Group 2, m. 20 and [8][10] as a resting point in Group 1, mm.21-22. Others occur in the midst of an ongoing process: the "textural transformation" identified by Roig-Francoli in measures 20-21 does not stop at the [6][8] in Group 1 which he selects, but continues uninterrupted to [10][8]; likewise the [2][6]s in Group 2, mm.22 and 23, and the [6][8] in Group 2, m.24. He does not show the eventual goal of the textural transformation in Group 2 in his example--the rapid pattern shifts continue unabated until a reiterated pattern E4-B4-G5 in m.25, a span of [7][8]. {9} In addition, trichords [8][11], [9][10], and [7][8] are significant in this passage as ending and resting points (Roig-Francoli recognizes them as significant in his Ex. 3b), yet are not accounted for in the trichordal constellation that he discusses.

[12] Roig-Francoli delays consideration of his third type of net-structure (chromatic transformation of triadic units) to pages 257 and 258, and then only mentions it briefly. This "short shrift" is appropriate since Ligeti does not prioritize "triadic units" but treats harmonies with three pitches as one of the possible types of "harmonic cells." Roig-Francoli's use of the term "triadic" is questionable here in any case--these are trichords made from stacks of [7]s, [8]s, and [9]s (perfect fifths and major and minor sixths), but they have no tonal implications, are not derived from chords stacked in thirds in this context, and are in no way functional. {10} Although Roig-Francoli's division of Ligeti's voice-leading techniques into the first three categories is problematic, the step-wise (but not always "chromatic") voice-leading that he observes in each of these examples is typical of Ligeti's style in the late 1960s.

[13] The fourth type of Roig-Francoli's net-structures, "progressive change in dynamics, timbre, or rhythm," is certainly an interesting aspect of Ligeti's music. Unfortunately, Roig-Francoli does not deal with these elements in any detail; he provides only a brief surface description of "rhythmic layers" and changes in prevailing durations in two passages from *Ramifications* to illustrate this "category" (pp.250-252, 257-258). The examination of non-pitch elements can be a complex process, due to changes in the prevailing duration in various instrumental parts, harmonic rhythm (the rate of change in the pitch content of patterns), alignment of starting points of patterns (pattern interaction), dynamics, or timbre. Additionally, these elements can interact, supporting--or contradicting--the shaping of a section by range, pitch content, or other factors. One approach to the interaction of pitch and non-pitch elements is to separate out each contributor and consider its effect in the sound of the piece. But this solution does not capture the full richness of the interaction. This aspect of Ligeti's compositions warrants further investigation.

[14] In addition to *Ramifications*, Roig-Francoli locates "net-structures" in the first movement of Ligeti's *Chamber Concerto* (pp. 252, 262-263) and the fifth movement of his *Second String Quartet* (pp. 252-253, 256-257). His comments on the details of these two pieces add little to the work of previous analysts, aside from the emphasis on harmonic stacks and registral and associational links between specific pitches. Roig-Francoli's representation of the harmonies of the closing section of the first movement of the *Chamber Concerto* in Ex. 5 suffers from a lack of precision in the

distinction between pitch and pitch class, and a lack of specification of his segmentation criteria. Since the final section incorporates octave doublings of the canon in six octaves, Roig-Francoli's Ex. 5 is mislabeled: those are not "pitch reductions" or "pitch collections" as he states in his text, but pitch-class collections. [\[11\]](#) Unlike the canon melodies of *Ramifications*, the canonic line here is not divided into recurring patterns. It is unclear how Roig-Francoli arrives at the scalar segments shown in his Ex. 5: they are not patterns or segments of the canon melody. Presumably, they derive from temporal segments, but they only roughly correspond to the pitch-class content within the segments I examined. The harmonic process *is* one of "subtraction and addition of single pitches" (p. 252); however, close inspection of the canon melody and harmonies it creates in this section reveals that the process is not as orderly as is indicated in his example. In his discussion of this example, Roig-Francoli is interested in the "alternation of symmetrical and asymmetrical states" (p. 252). As previously noted, chromatic pitch collections are always symmetrical--therefore the symmetry in the first three segments that he shows is trivial. The alternation between symmetry and asymmetry is a natural by-product of a gradual, one-pitch-at-a-time expansion outward of chromatic clusters around a "hollow" center. That type of expansion is most logically constructed by moving one side out a little, compensating by expanding out the other side, then repeating the process. This type of systematically expanding wedge is common in others of Ligeti's compositions, including the "Christe" settings from the "Kyrie" of the *Requiem*. Like this example, the *Requiem* does not expand with a regular alternation, while the ninth movement of the *Ten Pieces for Wind Quintet* does.

[15] The most significant contribution of this article is the discussion of possible types of longer-range harmonic structures in Ligeti's music (pp. 253-257). Roig-Francoli confronts Ligeti's assertion that his musical forms are non-teleological and "object-like" (rather than "process-like"). He argues persuasively that Ligeti's music *is* teleological, with forward-directed linear motion created by extended harmonic processes with step-wise voice-leading between contextually-established local harmonic goals. He observes that the concept of prolongation is problematic in compositions like Ligeti's that do not exhibit the characteristics of tonal function and voice-leading, pitch organization using centricity, or other large-scale means of predicting specific goals for linear motion. In Ex. 6b, Roig-Francoli introduces a "long-range pitch reduction," a type of "middleground sketch" which he states "displays the voice-leading connections between major points of formal articulation" (p. 253). His graph is not intended to imply prolongation or directed motion, but instead to display associational links between specific pitches and intervals.

[16] As with other systems of reductional analysis, such as Schenkerian reductions, the parsing and interpretation of foreground events are crucial to middleground decisions. Details of Roig-Francoli's graph are difficult to evaluate since the presentation of this graph is not supported by detailed analysis of each of the sections represented in the longer-range graph. For the most part, his comments (and his graph) parallel the observations made by previous analysts who provide a more detailed foreground analysis. [\[12\]](#) Roig-Francoli's graph provides a means for highlighting specific pitches and locations in the piece--and this is difficult to accomplish with detail-rich range graphs (plots of pitches sounding over time). Unfortunately, the task of comparing his comments with his graph (and with the score) is made more difficult by his use of square-bracket notation to indicate both the size of intervals in semitones and the reduction of compound intervals.

[17] In the concluding section of this article, entitled "Formal Processes," Roig-Francoli lists four main types of form that he asserts Ligeti "identifies among his compositions" (p. 260). This is a case in point about the dangers of extracting information from interviews without careful consideration of the context. In Roig-Francoli's presentation, these formal categories seem to be definitive and clear-cut. However, the context from which they were extracted is a wandering, informal, and internally-contradictory conversation from Ligeti's relatively early (1971) "self-interview"--hardly the type of text from which one derives indisputable categories. [\[13\]](#) (Ligeti is uninclined in "interviewing himself" to insist he clarify points that are vague or unclear).

[18] After identifying the net-structure compositions as among Ligeti's "balanced, static forms," Roig-Francoli lists the factors that he intends to use to identify formal and sectional divisions: "harmonic, intervallic, and spatial processes"; "rhythmic processes"; "textural changes"; "formal articulation"; and "auxiliary factors . . . such as instrumentation and dynamics" (p. 260). From

examining Figures 2 and 3, it seems that formal balance and golden section calculations have influenced his choices. For example, a comparison of Roig-Francoli's discussion of the formal outline of *Ramifications* with Figure 2 and the score, reveals that his *comments* acknowledge elisions, overlapping processes, the precise locations of events, and the continuous nature of each main section, but his *chart* glosses over those "messy details" to present a parallelism between sections and a correspondence of events to golden section proportions that is more tenuous in the music than it appears on the chart (p. 260-262). Roig-Francoli's chart of the subdivisions of the second large section in the *Chamber Concerto* suffers from the same flaw (pp. 262-263). The precision of golden section calculations in that work is further disturbed by the presence of varying measure lengths and tempi and by unmeasured cadenza-like passages. Comparing Roig-Francoli's calculations to those made by approximating the length of time that each measure would last in seconds indicates that some of his locations may be "off" by as much as two measures.

[19] This is not to imply that sectional balance (including golden section proportions at the level of the entire movement) is absent in Ligeti's music. Roig-Francoli's locations of the golden section proportions at the level of the entire movement are more convincing than his smaller-scale ones, and, as he notes, other analysts have located golden section proportions overarching entire movements (p. 264, note 45). *Lux aeterna* provides further evidence that proportional balance is important to Ligeti. At the end of the third section, Ligeti has notated seven measures of rests, the precise meaning of which is not explained in the score. When Ligeti was asked about them, he replied they "depend on proportions of the durations of the piece."^[14] The addition of this "silent coda" changes the total number of measures from 119 to 126, a difference which affects the calculation of the golden section (similarly to the silent measures at the end of *Ramifications*), but neither calculation of the golden section corresponds to a significant structural point in the piece. One explanation of the additional measures is the creation of a large-scale symmetry in the length of sections: from the beginning to the end of each canonic section, the three sections are 37, 50, and 37 measures long (including the seven silent measures), with each pair of the canonic sections separated by one complete measure without canon. These may be the proportions that Ligeti had in mind when he added the seven measures.

[20] In summary, this article provides an introduction to *Ramifications*, the first movement of the *Chamber Concerto*, and the fifth movement of the *Second String Quartet*--three of Ligeti's compositions written shortly after *Lux aeterna*, *Lontano*, and *Continuum* that have not received as much attention in the analytical literature. Roig-Francoli makes some interesting observations about these pieces, but his analysis would benefit from a clearer statement of the criteria he used for partitioning, delineating categories, and selecting significant harmonies. More attention to analytical details would also strengthen his arguments. In prioritizing harmonies that fit trichordal constellations and in his search for symmetries, golden sections, and sectional parallelisms, Roig-Francoli seems willing to overlook elisions or other continuities in the musical surface, canonic processes and voice-leading details, and the exact content or locations of events in his desire for regularity and order. He should heed Ligeti's remarks that he quotes (p. 265): "I detest both absolute geometrical precision and total openness. I want a certain order, but an order slightly disorganized . . . I love irregularities" and "prima la musica, dopo la regola."

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1. The most significant sources for the works considered in this article are cited in Roig-Francoli's footnote 1, p. 242.

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2. The most complete versions of the dream of webs are in Ligeti's article "Zustände, Ereignisse, Wandlungen," *Melos* 34 (1967): 165-169, translated by Jonathan Bernard as "States, Events, Transformations" in *Perspectives of New Music* 31/1 (Winter 1993), 164-265 and in a footnote to an interview by Peter Varnai translated in *Ligeti in Conversation*, 25 (with comments on the dream on preceding and following pages).

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3. *Ligeti in Conversation*, 16-17 and 21-23.

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4. *Ibid.*, 16.

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5. Jane Piper Clendinning, "Contrapuntal Techniques in the Music of Gyorgy Ligeti" (Ph.D. dissertation, Yale University, 1989); "The Pattern-Meccanico Compositions of Gyorgy Ligeti," *Perspectives of New Music* 31/1 (Winter 1993), 192-234; "Structural Factors in the Microcanonic Compositions of Gyorgy Ligeti" in *Concert Music, Rock, and Jazz Since 1945*, ed. Elizabeth West Marvin and Richard Hermann (Rochester: University of Rochester Press, 1995), 229-256.

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6. I will use the convention (established by Jonathan Bernard in his *The Music of Edgard Varese* (New Haven: Yale University Press, 1987)) of using integers in square brackets to represent pitch intervals measured in semitones.

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7. As Ligeti says in *Ligeti in Conversation*, 86: "polyphony is written; but harmony is heard."

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8. Bernard, *Varese*, 74-76.

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9. There is an error in graph 3b--the final sonority should be D4-C#5-A5, as shown in graph 3a, making a [8][11].

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10. See Roig-Francoli's own discussion of the lack of "tonality" and related issues in Ligeti's music on pages 253-256.

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11. His earlier examples so labeled *are* actually "pitch reductions" because all instrumental parts are playing within the same limited range.

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12. See Clendinning, "Contrapuntal Techniques," Vol. I, 221-229, and Vol. II, 120-126.

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13. *Ligeti in Conversation*, 134-135. Ligeti categorizes some of these same works differently in

other interviews.

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14. Jan Jarvlepp, "Pitch and Texture Analysis of Ligeti's *Lux aeterna*," *ex tempore* 2/1 (1982), 26. Jarvlepp observes that the silent measures are not present on commercial recordings of *Lux aeterna* and would be covered in a live performance by the audience's applause.

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