

The Compositional Techniques and Influences behind Ligeti's 'Atmosphères

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György Ligeti is one of the most prominent and important composers of the twentieth century. Despite his reputation as an avant-garde composer, his music reaches a wide audience⁵⁶. This is partly due to the appearance of his works in the science fiction movie *2001: A Space Odyssey*⁵⁷, one of which is his infamous piece for orchestra, *Atmosphères*. Of all the works by Ligeti that are part of the movie's soundtrack, this is the only one heard in its entirety. Some scholars wonder if an experimental work such as this is serious music or if it can only make sense in the context of a film⁵⁸. However, the ingenuity and radicalness of the compositional techniques employed by Ligeti in *Atmosphères* becomes apparent when it is analyzed in depth. In this paper, I will discuss these techniques as well as various inspirations and influences behind *Atmosphères*. The modern composer was impacted by those before him, particularly the Renaissance composer Johannes Ockeghem. Ligeti also musically represented mathematical concepts in his piece and used them as a basis for formal organization. Through analysis, we will see that Ligeti's compositions are highly sophisticated and do not need to rely on film to be understood.

Some critics, particularly Everett Helm who critiqued *Atmosphères* in 1961 when it premiered, believe that because Ligeti abandons conventions such as motivic development in favour of sustained texture that his music is not serious or challenging for the listener⁵⁹. Yet, that is simply not true and a narrow-minded view of

⁵⁶ John Dewitt Van Der Slice, "An Analysis of Gyorgy Ligeti's 'Atmospheres' (Austria, Hungary)," (DMA thesis University of Illinois at Urbana-Champaign, 1980), iii.

⁵⁷ *Ibid.*, iii.

⁵⁸ *Ibid.*, iii.

⁵⁹ *Ibid.*, 42-43.

Ligeti's works. As we will see below, Ligeti based his piece off of very complex techniques inspired by one of the most serious composers in music history. *Atmosphères* is not challenging if one only considers it in the context of melody or motives. It is, however, extremely radical and sophisticated when its techniques; use of harmony, timbre and individual instruments; and formal organization are studied.

György Ligeti lived in Hungary and studied at the Conservatory in Kolozsvár from 1941 to 1949⁶⁰. During this time, there was a lot of artistic control and Ligeti was not aware of the musical advances happening in the West⁶¹. Bartók and some Stravinsky were the extent of his musical knowledge during the start of his career⁶². Yet, Ligeti yearned to write more complex, seemingly shapeless music⁶³. As a result of his situation, he produced the folk-based songs that were in demand at the time while composing more experimental works “for his desk drawer”⁶⁴. In 1956, when the restraints on artists were loosened, Ligeti left Budapest where he was living and settled in Cologne, Germany⁶⁵. Here, he reinvented himself as a “radical contemporary composer”⁶⁶. He was able to learn what his contemporaries were working on⁶⁷, and was introduced to post-Webern techniques and electronic music, the latter two greatly influenced *Atmosphères*, composed in 1961⁶⁸.

The progression in music history towards music that is concerned more with sound than melody manifests itself in *Atmosphères*. The nineteenth and beginning of the twentieth centuries saw a growing fascination with the concept of sound, including innovations to the manufacturing of instruments which allowed composers to explore the

⁶⁰ Paul Griffiths, “Ligeti, György (Sándor),” *Grove Music Online*, accessed November 12, 2013, *Oxford Music Online*.

⁶¹ Ibid.

⁶² Ibid.

⁶³ Ibid.

⁶⁴ Griffiths, “Ligeti, Gyorgy.”

⁶⁵ Ibid.

⁶⁶ Michael D. Searby, *Ligeti's Stylistic Crisis: Transformation in His Musical Style 1974-1985*, (Lanham: Scarecrow Press, Inc., 2010), 4.

⁶⁷ Griffiths, “Ligeti, Gyorgy.”

⁶⁸ Van Der Slice, “Analysis of ‘Atmospheres,’” 8.

various sounds these new technologies could produce⁶⁹. The progression from Berlioz to Mahler to Debussy to Webern saw timbre and sound being treated more and more radically⁷⁰. The concept of *Klangfarbenmelodie* placed timbre on the same level of importance as pitch and its duration⁷¹. As composers were more enthralled with pitch and timbre, melody and harmony faded in importance. Ligeti's *Atmosphères* focuses on timbre and textures with little to no concern for conventional melody, harmony or rhythm⁷². It is important to note that though these elements are not the centre of his composition, they do play a crucial role in producing the dense sounds.

Atmosphères is arguably Ligeti's most famous work in his entire *œuvre*⁷³. Upon first listening, the piece does not appear to have much substance, sounding like a large mass of sound devoid of melody and conventional harmony. Yet, that is exactly the effect Ligeti intended to produce. He was interested in creating such dense sonorities that the "individual interwoven instrumental voices are absorbed into the general texture and lose their identity"⁷⁴. This work, for large orchestra without percussion instruments, can be considered as the next stage in music that seeks to emancipate dissonance⁷⁵. Once pitches lose the distinction of dissonant and consonant, it would follow that they be freed from any definition. Ligeti creates his dense, chromatic sound clouds in two ways and both are surprisingly simple. The static sonorities are produced when each member of the orchestra is playing a single note or specific interval. The opening cluster in *Atmosphères* has the strings playing individual notes while the brass and woodwinds play intervals ranging from a major

⁶⁹ Van Der Slice, "Analysis of 'Atmospheres,'" 1.

⁷⁰ *Ibid.*, 1.

⁷¹ *Ibid.*, 1.

⁷² Searby, *Ligeti's Stylistic Crisis*, 6.

⁷³ Brian J. Lefresne, "Applications of Chaos Theory and Fractal Geometry in the Music of Gyorgy Ligeti," (MA thesis University of Ottawa, 2005), 100.

⁷⁴ Joseph Auner, *Music in the Twentieth and Twenty-First Centuries*, (New York: W.W. Norton & Company, Inc., 2013), 238.

⁷⁵ Van Der Slice, "Analysis of 'Atmospheres,'" 2.

second to a perfect fifth⁷⁶. Ligeti uses basic music principals to create something complex. Furthermore, the layering of diatonically unrelated pitches and intervals result in a heavily chromatic sound cluster and the inability to distinguish its individual parts⁷⁷. The employment of this technique is simply one example of many that demonstrate the sophistication of Ligeti's music.

Another way in which Ligeti creates his dense sonorities is through a technique he called "micropolyphony." This technique is a variation of a canon: each voice is playing the same set of ordered pitches, yet to a separate rhythmic pattern⁷⁸. It can be thought of as stretching the musical line horizontally by varying rates instead of using imitation. In *Atmosphères*, particularly at rehearsal letter C, the rhythmic patterns played by different voices increase from a quarter note to a twenty-tuplets at varying rates⁷⁹. The resulting rhythmic complexity is astounding and makes it impossible for a conductor to cue everyone⁸⁰. Ligeti's technique was partly inspired by layering used in electronic music⁸¹. In fact, *Atmosphères* has its origins in another work called *Pièce électronique No. 3*⁸². In this composition, Ligeti was interested in creating sound masses by layering sound waves that were resonating at various frequencies⁸³. He abandoned this work though because he realized acoustic instruments would be more effective in creating a sustained texture within which "composite sounds would emerge and recede like shadows"⁸⁴. Although micropolyphony produces a more

⁷⁶ Lefresne, "Applications of Chaos Theory," 102.

⁷⁷ Ibid., 102.

⁷⁸ Searby, *Ligeti's Stylistic Crisis*, 5.

⁷⁹ Lefresne, "Applications of Chaos Theory," 102.

⁸⁰ Zachary Lewis, "Close Up: Ligeti's "Atmospheres" a work of shimmering, groundbreaking complexity," Cleveland OH Local News, published February 26, 2012, [http://www.cleveland.com/musicdance/index.ssf/2012/02/close_](http://www.cleveland.com/musicdance/index.ssf/2012/02/close_up_ligeti_atmospheres_a.html)

⁸⁰[up_ligeti_atmospheres_a.html](http://www.cleveland.com/musicdance/index.ssf/2012/02/close_up_ligeti_atmospheres_a.html).

⁸¹ Carson Kievman, "Ockeghem and Ligeti: The Music of Transcendence," (PhD Princeton University, 2003), 15.

⁸² Lefresne, "Applications of Chaos Theory," 101.

⁸³ Lefresne, "Applications of Chaos Theory," 102.

⁸⁴ Lefresne, "Applications of Chaos Theory," 102.

rhythmically active cluster than before, when the instruments are holding notes, the effect is virtually the same: a chromatic, impenetrable, interwoven mass of sound.

Ligeti's micropolyphony was also inspired by the canons and polyphony employed by Renaissance composers, particularly Palestrina and Ockeghem⁸⁵. His technique is essentially an atonal version of their canons⁸⁶. Ligeti familiarized himself with these composers while he was teaching counterpoint at the Franz Liszt Academy in the years before he left Budapest⁸⁷. He has spoken too of his admiration of Ockeghem⁸⁸. Not surprising, it was when he was teaching counterpoint that his interest in building something from nothing, or from basic musical elements such as a single pitch, began to flourish⁸⁹. In fact, the music of the twentieth century is closer to that of the fifteenth century than any other era in Western classical music history⁹⁰. In the case of Ockeghem and Ligeti, they both created music based on a sophisticated, imperceptible framework whose contrapuntal progressions are indistinguishable⁹¹. Furthermore, Ockeghem avoided conventional means of closure such as cadences in order to create a free flowing, endless line of music spread evenly over each voice⁹². This could be a description of *Atmosphères*, which has a constant texture against which the various sonorities of the orchestra ebb and flow seamlessly. This continuous progression of sound clusters, which are difficult to differentiate unlike the clear sections of sonata form, for example, inhibits the listener to perceive change in time⁹³, which adds to the free floating characteristic of *Atmosphères*.

Ligeti's technique of micropolyphony elevates the piece's complexity because the rhythms become so intricate, as mentioned

⁸⁵ Searby, *Ligeti's Stylistic Crisis*, 5.

⁸⁶ *Ibid.*, 6.

⁸⁷ *Ibid.*, 5.

⁸⁸ Kievman, "Ockeghem and Ligeti," 1.

⁸⁹ Van Der Slice, "Analysis of 'Atmospheres,'" 7.

⁹⁰ Kievman, "Ockeghem and Ligeti," iii.

⁹¹ *Ibid.*, iii.

⁹² Kievman, "Ockeghem and Ligeti," 2-3.

⁹³ Van Der Slice, "Analysis of 'Atmospheres,'" 39.

above⁹⁴. Harmony is revolutionized by the employment of this technique as well. The sonorities that come out of all the layering are unlike anything that can be analyzed by conventional harmonies. Yet there are still ties to conventional sonorous schemes. Ligeti organizes the work by three main sonorities: chromatic, pentatonic and diatonic⁹⁵. The main focus of *Atmosphères* is on timbre, texture and sonority⁹⁶. The way in which Ligeti treats the orchestra to bring out the dense clusters of sound revolutionizes the way we think of music⁹⁷. One critic wrote, “instead of clear and transparent, *Atmosphères* strives to be hazy and indefinite, a vast, intricate blur where every musician plays a distinct role but few individuals can actually be heard”⁹⁸. What Ligeti desires for each player is laid out in great detail with very specific dynamics, rhythmic markings and even playing techniques⁹⁹. He even differentiates between the members of each instrumental section of the orchestra, requiring fourteen separate lines for both the first and second violins, ten for both viola and cello and eight for double-bass¹⁰⁰. The importance placed on each individual member of the orchestra in *Atmosphères* is like the next step in the progression from Wagner’s treatment of the orchestra and Webern’s *Klangfarbenmelodie*.

The formal structure of *Atmosphères* is one of the most sophisticated aspects of the piece, largely because it is inspired by mathematics. Many composers base their works off of some form of extra-musical medium, most often other arts such as literature or paintings. Ligeti, however, found inspiration from the sciences and mathematics¹⁰¹. While *Atmosphères* is not normally thought of as having connections to mathematics, particularly fractal geometry and chaos

⁹⁴ Lewis, “Close Up.”

⁹⁵ Van Der Slice, “Analysis of Atmospheres,” 16.

⁹⁶ Searby, *Ligeti’s Stylistic Crisis*, 6.

⁹⁷ Lewis, “Close Up.”

⁹⁸ Ibid.

⁹⁹ Van Der Slice, “Analysis of ‘Atmospheres,’” 30-31.

¹⁰⁰ Lewis, “Close Up.”

¹⁰¹ Lefresne, “Applications of Chaos Theory,” 1.

theory like some of his other compositions¹⁰², placing it in such a context helps us better understand the piece overall¹⁰³.

In the score, *Atmosphères* is divided into twenty two rehearsal letters, starting with X, then going alphabetically from A to U¹⁰⁴. Within the individual sections, marked by the rehearsal letters, there are instances of inspiration from mathematical concepts such as elements of chaos theory, which is very basically the study of systems whose outcomes are extremely sensitive to their initial conditions. At rehearsal letter E, the music appears to be ascending and descending from a specific pitch¹⁰⁵. This section in the score is a visual representation of a bifurcation tree¹⁰⁶: a point that splits in two, with each new point dividing into two and so on. Another instance of this idea is in rehearsal letter H, in which all the strings are playing and the focus slowly narrows to two pitches¹⁰⁷. In this case, the music could be viewed as a reverse bifurcation tree¹⁰⁸. Before the compositions of *Atmosphères*, Ligeti was interested in mathematical concepts as well as building something from nothing¹⁰⁹. Further proof that this piece contains bifurcation trees is found in the sketches for the work. On one of the pages for *Atmosphères* at the Sacher Foundation in Basel, Ligeti wrote out a musical representation of a bifurcation tree: he starts with a single note, D above middle C, and each measure is a diverging of the notes until almost five octaves are spanned across the treble and bass clefs¹¹⁰.

Ligeti did not limit his use of mathematical concepts to pitches. Each section is its own cluster of sound, with some being very similar to the ones before or preceding it and others quite different. The piece looks and sounds as if it is following a specific path, but sections with

¹⁰² Ibid., 101.

¹⁰³ Ibid., 111.

¹⁰⁴ Van Der Slice, "Analysis of 'Atmospheres,'" 38.

¹⁰⁵ Lefresne, "Applications of Chaos Theory," 103.

¹⁰⁶ Ibid., 103.

¹⁰⁷ Lefresne, "Applications of Chaos Theory," 103.

¹⁰⁸ Ibid., 104.

¹⁰⁹ Ibid., 106.

¹¹⁰ Ibid., 110.

unrelated musical material interrupt that flow¹¹¹. The disruptive sections cause the music to alter its trajectory and go in a new direction¹¹². It appears that Ligeti was composing the overarching sections of *Atmosphères* in the form of a bifurcation tree¹¹³. The large scale form of the piece can also be viewed as a sine wave, if considered by pitch and range¹¹⁴. A sine wave starts from a point, increases then decreases and continues to oscillate in that manner. *Atmosphères* begins by encompassing a wide ranges of pitches, then a narrow range and back to wide again¹¹⁵. Also, the second half of the work focuses on register or, more specifically, sounds oscillating between high and low registers¹¹⁶. Even though there are fairly convincing instances of Ligeti's employment of elements of chaos theory in his composition, he did not use a formula¹¹⁷. That being said, analyzing *Atmosphères* in mathematical terms instead of musical ones helps us to better understand the overall scheme of the work¹¹⁸. For example, unrelated sections of music that seem to disrupt the flow of the piece are actually part of large scale patterns¹¹⁹. Ligeti was interested in redefining structure by creating music that is not dependant on melody, harmony, or motivic development¹²⁰. Using mathematical elements allows him to write free-flowing, non-linear music and focus on sonority.

As we have seen, the inspirations for *Atmosphères* are many and diverse. The compositional techniques he employed, specifically micropolyphony, are radical and highly sophisticated. The canons and counterpoint of Renaissance composers, such as Ockeghem, influenced the complex relationships between voices in Ligeti's music. The

¹¹¹ Ibid., 107.

¹¹² Ibid., 107.

¹¹³ Ibid., 107.

¹¹⁴ Ibid., 101.

¹¹⁵ Ibid., 101.

¹¹⁶ Lefresne, "Applications of Chaos Theory," 101.

¹¹⁷ Ibid., 107.

¹¹⁸ Ibid., 111.

¹¹⁹ Ibid., 111.

¹²⁰ Van Der Slice, "Analysis of 'Atmospheres,'" 43.

Hungarian artist also found compositional techniques and a basis for formal structure from mathematical concepts. All of these elements allow Ligeti to create a new structure for his music that focuses on dense, intricate, chromatic sound clusters never heard before.

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