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Spectral Processes in the Music of Alvin Lucier

ABSTRACT

Listeners often associate the music of Alvin Lucier with the practice of experimental music due to his unorthodox means of creation. By viewing his work in this way, whether consciously or subconsciously, his music is often treated as aleatoric. This classification ignores the compositional stimulus that fuels the creation of his music is ignored. Each of Lucier's compositions is driven by the exploitation of one facet — or phenomenon — of sound. When considering multiple pieces by Lucier, it becomes clear that Lucier is exposing multiple sound phenomena; because each piece typically deals with only one phenomenon, it seems that he is taking an atomic approach to exploring sonic possibilities: the spectral atom. A closer look at his *Twonings* reveals a clashing of temperaments similar to Georg Friedrich Haas' *In Vain*. A spectral analysis of *Nothing is Real (Strawberry Fields)* reveals the metamorphic effect of using an otherwise non-musical object to filter a sound, mimicking the process used by Gérard Grisey in his piece *Modulations*. Lastly, a dissection into humans' perception of time exposes process in Lucier's *Silver Streetcar for the Orchestra*. Creating correlations to the compositions and writings of known spectralists facilitates a recontextualization of Alvin Lucier's works into the realm of spectralism. The thread that ties composers of the spectral aesthetic together is the transformation of sound over time; this same thread stitches the foundation for Alvin Lucier's music. This recontextualization opens a door to subsequent analyses that would have never been considered without the spark of spectral ideologies.

1. INTRODUCTION

Alvin Lucier has produced over 100 works that redefine the border between sound and music. These pieces frequently reveal sonic phenomena that affect the listener in new ways. However, even with a plethora of works that engage listeners in unique ways, Alvin Lucier's music has been paid little attention. Perhaps the reason his music has not received proper consideration is because it features experimental or minimalist practices of generating music — for example, sondols in *Vespers*, electroencephalography in *Music for Solo Performer*, and galvanic skin response sensors in *Clocker*. As minimalist or experimental as his pieces are, the resultant composition consistently adheres to the aesthetics of spectral composers, which Joshua Fineberg calls 'the principles of spectralism'. In this same article, Fineberg claims that spectral composers view music 'as a special case of the general phenomenon of sound'; moreover, these composers 'consider music to ultimately *be* sound' (Fineberg 2000, 2–3). Alvin Lucier actively reflects these ideologies in his music, however, on a much smaller level: in the form of spectral atoms. A spectral atom is a combination of up to three exploited musical ideas in the realm of acoustics, psychoacoustics, and vibrating media that, together, form a unique and solidified spectral idea. I define these as spectral atoms due to the fact that his pieces generally focus on one phenomenon in their entirety, with few exceptions. Moreover, these spectral atoms often combine with other atoms to form larger spectral works by composers such as Georg Friedrich Haas and Gérard Grisey.

Using three of Alvin Lucier's works, *Twonings* (2006), *Nothing is Real (Strawberry Fields)* (1990), and *Silver Streetcar for the Orchestra* (1998) as case studies, I will examine the information provided by Lucier to uncover these spectral atoms. In each case, there is a direct correlation between how Lucier and spectral composers use acoustic phenomena to both realize and use each spectral atom. To support this claim, I compare my findings in Lucier's works to standard spectral works such as *In Vain* (2000) by Georg Friedrich Haas, and both *Partiels* (1975) and *Modulations* (1976–1977) by Gérard Grisey in search for their implementation of spectral atoms.

2. TWONINGS

Twonings, for cello and piano, features unison long tones to exploit the dichotomy of just intonation and equal temperament. To achieve the exploitation between the two tuning systems, Lucier asks the cellist to play using only natural harmonics which clash throughout the piece with the equal tempered pitches of the piano and cause audible beating between the instruments. I determined the exact rate of beating for each pitch of the piece by first calculating the frequencies for the overtones of the cello strings and then calculating the difference between the cello and piano frequencies.[1] This revealed the exact rate of beating for each pitch of the piece. Though the amount of beating does not adhere to a strict pattern, it does, in fact, follow a system. The system, localized to each section of the piece — delineated by fermatas in the score — consists of patterns between the choice of cello string and which partial the cellist is asked to play.

The pun's title makes clear that the main spectral atom of the piece is the phenomenon of beating. This atom's generative importance is supported by its application in larger spectral works. For example, Grisey's *Partiels* uses the difference tone between a dyad to realize subsequent rhythmic constructions. At rehearsal mark 15, two clarinets are sustaining a dyad of 134.7 and 146.8 hertz. The closeness of these two tones causes the sound to pulse, an effect also exploited in *Twonings*. The rate of the pulse is equal to the absolute value of the difference between the two frequencies. In this case, the difference between the two frequencies equals 12.1 hertz, or pulses per second. In this excerpt, the wooden drum, introduced just after

[1] The formula $f_x=(f \bullet x)$ — where f represents the fundamental frequency in hertz, x represents the partial number, and f_x represents the frequency of partial x — was used to calculate the overtones of the cello strings. The piano frequencies were based off of the 'Table of Equally Tempered Scale A = 440' from Alfred Howe's book *Scientific Piano Tuning and Servicing* (Howe 1963, 30).

the dyad, appears at a rhythm of seventeen in the space of two, or in this given tempo, 12.5 attacks per second. In comparison to the 12.1 hertz difference tone, it is a near exact match, especially considering the representation in musical notation (Grisey 1976–1977). This pattern — a dyad followed by a notated realization of its rate of beating — continues as the main generative tool of this section of the piece.

Lucier's organization of the pitch content in *Twonings* correlates to a process found in Georg Friedrich Haas's piece *In Vain*, for chamber orchestra. *In Vain*'s pitch material is generated from fundamentals native to the equal tempered scale. The fundamental pitch descends chromatically through this equal tempered system while the overtone content slides upwards into the overtones of the next, lower, fundamental (Hasegawa 2015, 16–18). The last section of *Twonings* models Haas's system of stepwise motion within the established tuning system. In this section, the pitch content ascends through the overtone series of each of the cello strings by step while the fundamental ascends by string from the lowest string up to the highest string. For instance, starting on partial 6 of string IV, the instruments continue upwards by partial to partial 12. Once the instruments reach partial 12, the pitch content shifts upwards to the overtone series of string III. At this point, the pitch content returns to partial 6 where the process repeats until the piece concludes on partial 12 of string I.

3. NOTHING IS REAL (STRAWBERRY FIELDS)

Nothing is Real (Strawberry Fields), for piano, amplified teapot, tape recorder, and miniature sound system, reflects a different facet of spectral aesthetics. The piece follows a simple two-part form where the pianist first records the gestures provided in the score in real time and then plays the recording through a small speaker located inside a teapot. Though the notated music contains no reference to spectral techniques, the teapot performs the filtering technique — or as I propose, the filtering atom — often utilized by spectral composers.

Lucier's teapot applies three different forms of filtering: teapot with closed lid, teapot with no lid, and the transition between closed lid and no lid. To cycle through these different sonorities, Lucier indicates in the score that the lid 'will roughly follow the contour of the resonance tone melodies' (Lucier 1990). The resonance tone melodies are pitches that emerge through the transition between an open lid and a closed lid. The result is a succession of emphasized overtones within the piano sound. Because the sound being filtered is often a complex sound — in this case, a mostly diatonic cluster as opposed to a single pitch — the lid brings into focus each fundamental of the pitches within the cluster as the lid transitions (see Fig. 1).

To analyze this filtering atom, a spectrogram analysis was conducted to compare the second pitch performed by the piano in both the acoustic and closed teapot settings. This comparison showed a diminishing of the first overtone, an almost complete elimination of the third overtone, and an emphasis of the fifth overtone of the piano once the sound passes through the teapot with the lid closed.

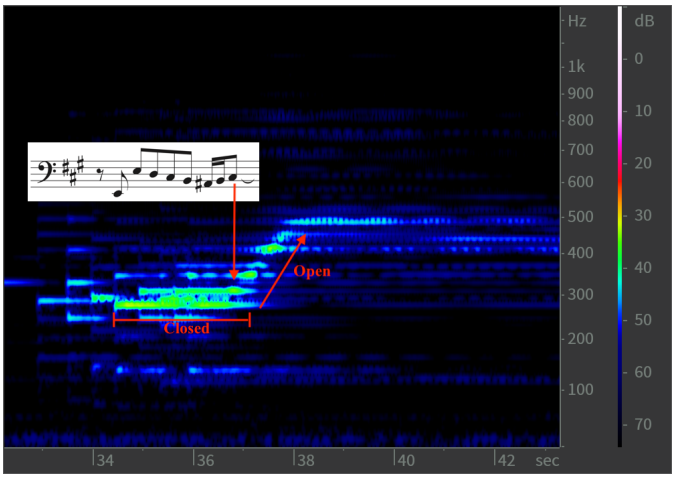

Fig. 1. Spectrogram analysis of a resonance tone melody.

It is precisely this information — the data gathered from the analysis of the piano through the different teapot lid combinations — that a composer such as Grisey would use as a compositional tool. For example, in *Modulations*, Grisey used four different mutes and analysed their filtering effects on the trombone's E_2. He then progresses through the spectra of the four different mutes, ordering from the most harmonic to most inharmonic (Rose 1996, 16–20). Lucier takes this idea of Grisey's and breaks it down to its atomic level. He makes the entire piece about one conceptual mute instead of interpolating between multiple mutes. In this case, however, the mute happens to double as a teapot.

4. SILVER STREETCAR FOR THE ORCHESTRA

Silver Streetcar for the Orchestra, for amplified solo triangle, also presents a spectral atom using a slightly different form of filtering — physical dampening. Lucier asks the player to strike a triangle at a rate of 320 beats per minute for no more than 20 minutes. The player simultaneously mutes the triangle with the thumb and forefinger of their free hand. The player is asked to manipulate five different performance parameters (muting location, muting pressure, striking location, striking strength, and tempo) while striking the triangle, and only one parameter is manipulated at a time. Throughout the piece, the player transitions seamlessly between the five parameters slowly enough to create an imperceptible process of change. Lucier specifies that 'as soon as the acoustic response of these conditions — an altered parameter — is established, the player begins gradually altering the same or another variable until a new response is heard' (Lucier 1998). What this does, much as in *Nothing is Real (Strawberry Fields)*, is to allow the triangle to resonate in different ways, resulting in an imperceptible, ever-shifting progression of overtone harmonies. The spectral atom of this piece consists of the gradual shifting between these different overtone harmonies.

Silver Streetcar for the Orchestra owes its success to the rhythmic simplicity of the work, its rhythmic regularity presents the listener with little to process. Gérard Grisey classifies this rhythmic content as 'maximally predictable' in his article 'Tempus ex Machina: A Composer's Reflections on Musical

Time' (Grisey 1987, 244–7). Since Lucier presents the audience with a consistent musical event to process — in this case a repetitive metallic transient — the listeners are able to adapt to the striking subsequently phasing it out of their immediate consciousness (Moore 2013, 50–1). After the adaptation takes effect, the listeners are exposed to a multitude of shimmering overtones emerging from the folded metal bar. As Grisey beautifully states in the same article, this periodicity provides 'a redundancy helpful to our powers of comprehension' (Grisey 1987, 247).

Lucier's choice of having the triangle amplified deserves attention; more specifically, does it matter if a performance is amplified or not? By amplifying the triangle, the piece is subjected to an increased presence of the performance space. In other words, the amplification increases the level of reverberation present to the listeners. Because of its rhythmic uniformity, *Silver Streetcar for the Orchestra* is perfect for testing the perception of time with the presence of reverberation. In a recent focus group experiment, I tested the hypothesis that the presence of reverberation causes a listener's perception of time to be faster than if there were no reverberation present. This hypothesis is grounded in the idea that the decay from the reverberation connects more sonic events thus providing more musical interest. I presented the participants with two instances of the same recording: a 5:34 excerpt of Lucier's *Silver Streetcar for the Orchestra* recorded in an anechoic chamber. The first excerpt featured zero reverberation, and the second had reverberation with a 6.2 second decay added. Out of 34 participants, 52% supported my hypothesis with claims of 'the first excerpt was at least three times as long' or 'the second excerpt was a lot shorter'. Forty-six percent of the participants either did not hear a change in length between the excerpts or were not cognizant of their lengths while listening. Finally, 2% of the participants disagreed and thought that the dry excerpt was longer. Additional comments were made such as that the perceived pitch of the triangle in the reverberant recording was lower, or that the speed of the triangle attacks was faster in the same reverberant excerpt. I plan to develop an experiment to further test this hypothesis and to test the perception of pitch and tempo with the presence of reverberation; this new study will have a larger participant pool.

This rhythmic redundancy creates the outlet for the spectral atom to come to aesthetic fruition. A spectrogram analysis of any recording of this piece reveals the myriad of surprising frequencies that materialize from the instrument. Fig. 2 displays a spectrogram of my performance of *Silver Streetcar for the Orchestra* in an anechoic chamber at the University of Louisville. Because adaptation is present — due to the repetitive attacks — the changing spectra and emergence of new overtones become even more prominent because of our ears' excitement for change.

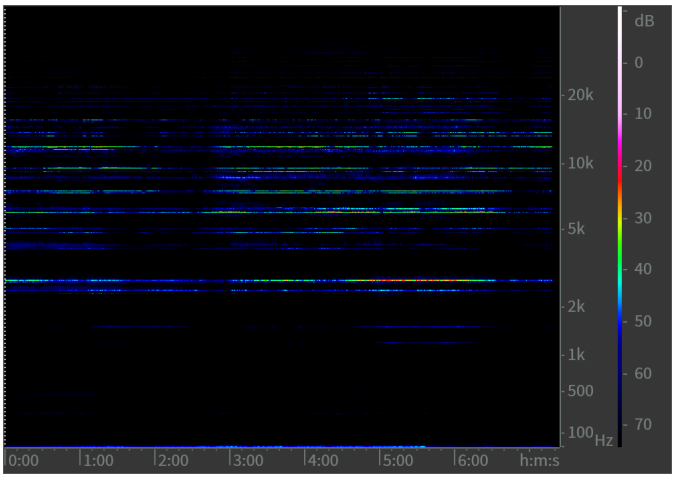

Fig. 2. Spectrogram of *Silver Streetcar for the Orchestra*.

The idea of gradually changing spectra is a familiar concept to the composers of the spectral school. For example, the process of using mutes to filter the spectra in Grisey's *Modulations* is the same process used in *Silver Streetcar for the Orchestra*. Furthermore, Grisey uses this same atom in *Partiels* where, in the first section, he transforms the initial harmonic harmony to an inharmonic harmony gradually through each repetition of the spectrum (Féron 2010, 85).

5. CONCLUSION

The idea of the spectral atom can be found in other pieces in Lucier's output as well. For example, *I Am Sitting in a Room* (1970), for voice and electromagnetic tape, reveals the acoustic properties of a specific room. Much like *Silver Streetcar for the Orchestra*, *I Am Sitting in a Room* operates through repetition; however, instead of repeated attacks of a percussion instrument, a recording of the human voice is played and recorded into the room repeatedly until the sonic characteristics of the space emerge. *Still and Moving Lines of Silence in Families of Hyperbolas* (1973–1974) focuses on the phenomenon of acoustic beating; similarly to *Twonings*, closely-tuned sine waves in conjunction with physical instruments create a sound that is perceived to move throughout the listening space. *Music for Sonorous Vessels* (1991) amplifies the resonance within various objects caused by the resonance of the piano. Like *Nothing is Real (Strawberry Fields)*, the concepts of filtering and resonance are exploited as the main musical idea.

Let us return to the title of the paper: *Spectral Processes in the Music of Alvin Lucier*. The title implies that there are processes in Alvin Lucier's music that coincide with those that are used by spectralists. In fact, these analyses show that Lucier's music possesses similar — if not identical — qualities to those that spectral composers value. But I would like to take this title one step further. Though these intentions are present in the music of Alvin Lucier, we find each work of his *as a whole* to be a spectral process: that is, his music functions *as* a particular spectral process, not *because* of spectral processes. Herein lies the spectral atom. In theory, Lucier's pieces could be seen as spectral ideas literally in the sense that someone wishing to write a canonic spectral work could sketch out a piece by combining the atoms found in his music. Perhaps spectralism could even be re-categorized with various subsets of spectral ideas.

For example, Lucier's *Nothing is Real (Strawberry Fields)* can be recategorized as spectral minimalism because of the minimal amount of alterations present to achieve the spectral atom. Furthermore, *Twonings* can be classified as spectral experimentalism because of the meandering nature of the overtone patterns. Therefore, Lucier's minimalist and experimental labels are not inaccurate but rather too vague. The analyses featured in this article will be used to expand the notion of spectral atoms to other composers who practice composing with sound as the generative idea. In turn, I believe the discovery of these spectral atoms aid in the analysis of other, larger, spectral works while also expanding the genre of spectralism as a whole.

KEYWORDS

Spectral atom, Alvin Lucier, spectralism, Gérard Grisey, Georg Friedrich Haas.

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