An Analytical Overview of Alexandria Smith's *Heart Music for Milford Graves*

by

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When we listen to a sound, where are we listening from? Can sounds be realized through means other than the cerebral faculties? Using rationally as the only mode of perception denies the possibility to understand sounds from an emotional listening model rooted in heart-centeredness. Allowing the mind to maintain authority over feelings is an oppressive means to conform behavior and control the listening guidelines of our consciousness (Freire 2005). The dominance of logical listening has begun to fatigue and new paradigms are emerging that empower a listening model situated in the consciousness of the heart (Lindhard 2020). Composer and theorist Pauline Oliveros argues for a method of listening that is situated more deeply within the human interiority by creating a balance between our objective focus and sensitivity to the broader macro dimensional energies (2005). Premiering in 2023, *Heart Music for Milford Graves* suggests a model of heart-based listening that, according to sound theorist Andra McCartney, encourages a way of "listening to the sound environment as if it were a dear friend or lover" (Siddall and Waterman 2016, 40).

This piece features Alexandria Smith on trumpet and a wearable electronic configuration that translates real-time biofeedback of respiration, heart rate, and galvanic skin response into a sonified experience. Alexandria Smith is a multidisciplinary auralizer that exists within an intersection of performance, scholarly, pedagogical, and techno-centric disciplines. With a methodology rooted in feminist science and technology, Smith theorized, designed and built the wearable electronic device that is featured in *Heart Music for Milford Graves*. Through these technological means, a performance reality of embodied biological data can construct an

interactive procedure which merges the visual and auditory senses into a dynamic phono-optical experience. Currently, Smith is an Assistant Professor of Music Technology at the Georgia Institute of Technology. Joining Smith on modular synthesizer is Daniel Meinecke, a pianist and composer living in New Orleans who teaches at Loyola University New Orleans. Meinecke has curated an artistic identity rooted in groove-based music ranging from trio to large ensemble formats and categorically his endeavors fall within a contemporary lexicon of instrumental domains. Due to the limited availability of information, it is unclear as to exactly what pieces of hardware Meinecke is using during this performance as the program notes simply list modular synth.

With a duration of 18 minutes, this sonic exploration is a demonstration of Smith's biomusic, a technological process involving bodily gestures that are informed by the real-time biological data of the performer, together creating a hybrid coalition of technological devices and human performers. Psychologist Barbara B. Brown describes the biofeedback techno-centric approach as "a mind-machine communications technique" allowing the conscious self to establish dialogue with dimensions of the "inner self" (1974, 4). The systematic framework of the biofeedback musicking of *Heart Music for Milford Graves* originates from the research of musician and theorist Milford Graves. Both the compositional procedure and performative realization of *Heart Music for Milford Graves,* which I will begin to abbreviate as *Heart Music*, are centered in what Graves considers as the common denominator of humanity, the human heartbeat (Graves, n.d.).

Graves believed that music is a universal language with a morphology engendered from cardiological rhythmic mechanics. His collaboration with molecular biologist Carlo Ventura led to a new perspective that the heart speaks at the cellular level and that these cells are dynamic

subjects with agency (Carlo Ventura and Graves, n.d.). This theory is sonically portrayed in *Heart Music* through two primary methods; the first being rhythmic properties that mimic the generally stable but fluctuating autorhythmicity of heart rate known as heart rate variability and the second being high frequency cell-like transformative sounds present throughout (Stauss 2003).

Before addressing the formal components of this piece, I would like to more thoroughly articulate the historical context that *Heart Music* derives its creative origins from. In an interview with The Wire, Graves describes a pivotal moment of inspiration after reading a 1975 article published in *Circulation* journal that argued for echocardiographic observation of pitch frequency in favor of rhythmic output (Licht 2018). Although I cannot know with absolute certainty which exact article Graves is referencing, after investigating the *Circulation* archives I believe it to be an article from the February issue by Chandraratna, Lopez and Cohen (1975). In this research study, they focused on "echocardiography to investigate the temporal relationship of aortic and pulmonary valve closure" and their role in creating discernible frequencies from this mechanical function (Chandraratna, Lopez, and Cohen 1975, 292). Findings from this research suggest a theory that "the second heart sound [aortic valve closure] is caused by decelerations of columns of blood resulting from semilunar valve closure, throwing the cardiohemic system into vibrations" (Chandraratna, Lopez, and Cohen 1975, 295).

Structurally this piece can be divided into 8 primary sections, with a secondary subset emerging within the 4th and 7th section that are intra-lateral contrasts which introduce new auditory objects. The discretion I used to determine changes in form is based on signals that include audible transitional shifts, introduction of novel elements, significant dynamic modifications, and transformation of persistent textures. It progresses through a non-linear form

of helix-like motion, retaining common elements from previous sections while generating new textures without being limited to strictly defined demarcations. Due to the absence of a fixed compositional structure, each section varies in length, dynamic range, and magnitude of activity.

The overall dynamic arc of the piece has a slow building onset that leads into a rapid series of undulations before a short period of stabilization that suddenly dissolves into a moment of respite. After this respite, the piece retains an elongated phase of intense dynamics that slightly decreases before building into a climax which transitions into a quiet resolution. The lowest amplitude point occurs at 6:29 and the dynamic climax occurs at 9:22. In *Arcana X*, Smith describes the physical components of her biofeedback devices; a wearable respiration sensor attached to the ribcage accumulating breath data, a pulse sensor placed on the chest underneath the wearable accumulating heart data and two electrodes placed on the right shoulder which measure galvanic skin response (Zorn 2021, 278). Smith continues with a comprehensive overview of her system:

> The sensors transform voltage readings that come from my body into discrete analog signals that get parsed into audio and visual applications. The data is read by an Arduino, an open-source microcontroller that I program using the C programming language, and can be sent to software such as Ableton Live/Max for Live, Max MSP, Pure Data, OpenFrameworks, projecting mapping software, etc. via a direct serial connection, serial to MIDI bridge, and open sound control. All of the data streams collected by the discrete sensing look, feel and sound very different. (278)

Now, let us listen to an excerpt from the piece starting at the 6:22 mark which introduces Section 4. This portion illustrates many of the key sonorities that encapsulate the essence of this piece; the overall conceptual bedrock of the heart rate pulse tones, Smith's digitally interactive processing of the trumpet alongside live acoustic performance, the metaphoric portrayal of cellular activity, novel element introduction, and the entrance and exit of a subset.

In order to correlate *Heart Music's* sonorities to the cardiology research of Graves, I analyzed specific data parameters related to time-based procedures and the underlying tempo-like pulse. In this graphic, the yellow points represent onset detection of the various attacks and the red curve represents time values measured as a consistent tempo potential to demarcate an assumed metric rate. Notice the subtle fluctuation of the numeric tempo value and paired groupings of the onset plots. This fluctuation of tempo represents how heart rate variability correlates to minute stimuli response as a demonstration of healthy heart function.

Dysmorphologist Conny van Ravenswaaji-Arts et al. point out that "because of continuous changes in the sympathetic-parasympathetic balance, the sinus rhythm exhibits fluctuations around the heart rate mean. Frequent small adjustments in heart rate are made by cardiovascular control mechanisms" (1993, 436). Without the asymmetrical rhythmic pulse of heart rate variability, individuals are at high risk of affective disorders that compromise the ability to maintain homeostasis (Mulcahy et al. 2019). During a lecture for The Guelph Jazz Festival Colloquium, Graves asks the question, "Why in the conservatories are they still trying to teach us to play with *bar line*, *bar line*, *measure*, *even*, *even*?" in order to challenge the biologically misaligned metrical dogmas that are so commonly upheld in academic institutions (2009, 46:53). This critique brings into question the potential dangers of one of the most commonly demanded tools of institutional music learning, the metronome.

As an instrument, the metronome has historically been a required essential of music school pedagogy, but if this tool directly opposes the naturalness of our biological rhythms, what kind of unnoticed bodily harm has this been causing? If in the core of formal music learning we have practices that reflect states of not only illness but those of life-threatening conditions, how has this negatively impacted generations of students? By reconsidering the doctrinal authority

which has been placed upon the rhythmic training of metronome use, new possibilities of health-centered musical practices can arise that align more inherently to our biological functions.

The secondary element of focus that I would like to address is the sound of metaphoric cellular representation that occurs throughout *Heart Music*. A live performance collaboration between Graves and Ventura led to research findings that demonstrated the expression of nanomechanical vibratory signatures within stem cells resulting in unique microvibrations output of acoustic resonances (Carlo Ventura and Graves, n.d.). This process of cell melody creation is thought to be a response to extracorporeal pressure wave stimuli that become processed within the cell nucleus (C Ventura et al. 2017). Furthermore, intracellular oscillatory features extend as far as the genetic level of DNA where resonant frequencies are occurring within the kilohertz, megahertz, gigahertz, and terahertz frequency ranges (Cosic, Cosic, and Lazar 2015).

Within Section 6 of *Heart Music,* this melodic cellular operation is signified through high frequency glissando synth textures rising and falling throughout the phonographic space that reduce in decay over a relatively condensed temporal unfolding. What comes to mind during this particular auditory series is a Subotnick-esque tonal signaling that commands the foreground while trumpet flurries assume an infra-supportive role. A distinguishing component of this section is that live trumpet performance concludes for the remainder of the piece and Smith's performative procedures will concentrate solely on manipulating an amassed sample bank of material from the previous trumpet activities. The top half of this image displays an adaptive spectrogram plug-in beginning at the 13:40 mark which exhibits a major activity point of spectral density with frequencies extending into and beyond the discernible range of human hearing. In the bottom half of this image, a colorized harmonic spectrum plot reveals a densely populated overtone continuum with harmonic partials approaching a centesimal value range. Now we will

listen to how this particular region corresponds as a musical rendering to the aforementioned peculiarities of cellular melodies.

Heart Music invites us to investigate a supportive infrastructure that has been largely ignored within the broader musical discourse; the cellular agents that constitute, organize, and animate our biological selves. Biologist Phillip Ball states that, "what goes on *inside* an agent is influenced but not fully determined by what happens *outside*. Cells are not just bags of inert molecules until some signal arrives at the cell surface to prompt them into action; those molecules are constantly interacting and reacting to maintain the cell's integrity, and external signals just nudge that activity" (2023, 13). As agents situated within our internal ecology, cells may exhibit more agency than previously assumed and examining their presence in the envelope of the human "sonosphere" may lead to new perceptual modalities and musical paradigms (Cox and Warner 2017, 154).

Smith foregrounds a non-hierarchical relation to the processes of the unconscious that guide her bioartistry and explains how "instead of grasping for control, I dance with my unconscious and embrace the inevitable limits of autonomy. This practice is an acknowledgement of the multiplicity of my being, and the complexity of liberation" (Zorn 2021, 279). This dancing, or interplay, between internal voices of the body and the externalized voice of the performer is a transformative reimagining of theorist Roland Barthes' concept of the musical grain (2009). Our bodies are a complex system full of latent peculiarities waiting to be discovered through aberrant curiosities such as those facilitated by Smith and Meinecke. *Heart Music for Milford Graves* is a movement towards discovering the undiscovered possibilities that rest beneath the threshold of our conscious mind.

References

Ball, Phillip. 2023. *Organisms as Agents of Evolution*. John Templeton Foundation. https://www.templeton.org/wp-content/uploads/2023/06/Biological-Agency_1_FINAL_2.pdf.(Ball 2023)

Barthes, Roland. 2009. *The Grain of the Voice: Interviews 1962-1980*. Northwestern University Press ed. Evanston, Ill: Northwestern University Press.

Brown, Barbara B. 1974. *New Mind, New Body: Bio-Feedback: New Directions For The Mind*. New York: Harper & Row.

Chandraratna, Premindra, Jose Lopez, and Lawrence Cohen. 1975. "Echocardiographic Observations on The Mechanism of Production of The Second Heart Sound." *Circulation* 51 (2): 292–96. https://doi.org/10.1161/01.CIR.51.2.292.

Cosic, Irena, Drasko Cosic, and Katarina Lazar. 2015. "Is It Possible to Predict Electromagnetic Resonances in Proteins, DNA and RNA?" *EPJ Nonlinear Biomedical Physics* 3 (1): 5. https://doi.org/10.1140/epjnbp/s40366-015-0020-6.

Cox, Christoph, and Daniel Warner, eds. 2017. *Audio Culture: Readings in Modern Music*. Revised edition. New York: Bloomsbury Academic.(Cox and Warner 2017)

Freire, Paulo. 2005. *Pedagogy of the Oppressed*. 30th anniversary ed. New York: Continuum.

Graves, Milford, dir. 2009. *Tono Rhythymology and Biocosmology: New Paradigms for Creating a Unified All-Pervasive Music*. The Guelph Jazz Festival Colloquium. http://www.improvcommunity.ca/sites/improvcommunity.ca/files/research_collection/25/Graves_Keynote_full.mp4.

———. n.d. "Research." Heart Music. Accessed April 18, 2024. https://www.milfordgraves.com/pageab.

Licht, Alan. 2018. "Listen To Your Heart." *The Wire*, March 2018.

Lindhard, Tina. 2020. "Intuition: A Heart-Based Epistemology." *Diálogo* 7, (November):181–94. https://doi.org/10.18638/dialogo.2020.7.1.16.

Mulcahy, James S., Dennis EO Larsson, Sarah N. Garfinkel, and Hugo D. Critchley. 2019. "Heart Rate Variability as a Biomarker in Health and Affective Disorders: A Perspective on Neuroimaging Studies." *NeuroImage* 202 (November). https://doi.org/10.1016/j.neuroimage.2019.116072.

Oliveros, Pauline. 2005. *Deep Listening: A Composer's Sound Practice*. New York, NY: iUniverse.

Ravenswaaij-Arts, Conny van, Louis A. A. Kollee, Jeroen C. W. Hopman, Gerard B. A. Stoelinga, and Herman P. van Geijn. 1993. "Heart Rate Variability." *Annals of Internal Medicine* 118 (6): 436–47. https://doi.org/10.7326/0003-4819-118-6-199303150-00008.

Siddall, Gillian H., and Ellen Waterman. 2016. *Negotiated Moments: Improvisation, Sound, and Subjectivity*. Improvisation, Community, and Social Practice. Durham, NC: Duke University Press.

Stauss, Harald M. 2003. “Heart Rate Variability.” *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology* 285 (5): R927–31. https://doi.org/10.1152/ajpregu.00452.2003.

Ventura, C, D Gullà, M Graves, A Bergonzoni, R Tassinari, and C Cavallini. 2017. “Cell Melodies: When Sound Speaks to Stem Cells.”

Ventura, Carlo, and Milford Graves. n.d. “Heart Sound Melody and Stem Cell Reprogramming.” https://static1.squarespace.com/static/5bbae881d74562ac18fdfcc6/t/5bf2471f1ae6cf7a695f6490/1542604576125/Carlo-Milford+Collaboration.pdf.

Zorn, John, ed. 2021. *Arcana X: Musicians on Music*. Arcana, X. New York: Hips Road.