EXPANSION OF MUSICAL STYLES, FUNCTION OF TEXTURE, AND PERFORMING TECHNIQUES IN BRIAN LOCK’S SONIC ARCHAEOLOGIES No. 1:
A PERFORMANCE GUIDE

Daniel Pardo, B.M., M.M.

Dissertation Prepared for the Degree of

DOCTOR OF MUSICAL ARTS

UNIVERSITY OF NORTH TEXAS

May 2016

APPROVED:

Mary Karen Clardy, Major Professor
Richard DeRosa, Related Field Professor
Gene Cho, Committee Member
Benjamin Brand, Director of Graduate Studies in Music
Warren Henry, Interim Dean of the College Of Music
Costas Tsatsoulis, Dean of the Robert B. Toulouse School of Graduate Studies

British composer Brian Lock merges the composition styles of Alexander Goehr, Henryk Górecki and Witold Lutoslawski in his innovative works for instrumental sounds and electronics. His most recent work for flute, Sonic Archaeologies No.1, was premiered at the University of North Texas by Mary Karen Clardy, flute; Brian Lock, piano/electric keyboard; and Daniel Pardo, laptop/live mixing. The purpose of this dissertation is to provide flutists with artistic and technical guidance in preparing this work for flute, prerecorded orchestra, interactive electronics and improvisatory accompaniment. Sonic Archaeologies No. 1, a piece in five movements (Black Rain, Psychomania, Kodo, Susperia, and Deep in the Machine), incorporates contemporary techniques to create sounds other than the Western concert flute, with the use of live reinforcement devices such as microphones and time-based audio effects within a D.A.W. (Digital Audio Workstation.) Reggae, Hip-Hop and cinematic styles are juxtaposed within the work, fusing current genres with traditional rhythmic forms like the ones found in a bourrée. As the solo instrument, flute provides more textural than melodic elements, and the performer is required to interact with an unpredictable sonic soundscape as a result of the improvisatory element of the keyboards and computer. The notation of Sonic Archaeologies No.1 invites interpretation blending and altering traditional sounds through microphones and a processed signal flow. The performance guide will address acoustical considerations when the flute sound is being manipulated by dynamic and time-based processors in live performance; the interaction between the flute, electronics and acoustic spaces; the elements of sound production that provide interpretation of contemporary popular styles; and the opportunities for the performer to find, explore and develop artistry beyond the limitations of music notation.
ACKNOWLEDGMENTS

This dissertation is indebted to the generous and limitless guidance of my major professor, Dr. Mary Karen Clardy, who has been at the core of my musical growth during my graduate studies and whose imagination and creativity has propelled many professional opportunities such as this collaboration with film composer Brian Lock.

I would like to thank Brian Lock for inviting me to participate in the premiere of Sonic Archaeologies No. 1, for welcoming the investigation of his work, for making audio materials and scores available, and for the enriching conversations we have had about music composition, technology and contemporary performance practices.

I would also like to thank the members of my committee, Mr. Richard DeRosa and Dr. Gene Cho for their generous support and sound advise throughout my studies at UNT.

This project would not be possible without my family’s encouragement and support, especially my daughter’s, Crystal, who from an early age understands the demands of an academic life.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF MUSICAL EXAMPLES</td>
<td>v</td>
</tr>
<tr>
<td>Chapter</td>
<td></td>
</tr>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>II. ELECTROACOUSIC MUSIC BACKGROUND</td>
<td>3</td>
</tr>
<tr>
<td>a. Brian Lock</td>
<td>7</td>
</tr>
<tr>
<td>III. TECHNICAL GUIDE</td>
<td>9</td>
</tr>
<tr>
<td>a. Enhanced Flute Sound</td>
<td>9</td>
</tr>
<tr>
<td>b. Signal Flow</td>
<td>10</td>
</tr>
<tr>
<td>i. Microphones</td>
<td>10</td>
</tr>
<tr>
<td>ii. Mixers and Audio Interfaces</td>
<td>15</td>
</tr>
<tr>
<td>iii. Preamplifier</td>
<td>16</td>
</tr>
<tr>
<td>iv. Attenuators</td>
<td>16</td>
</tr>
<tr>
<td>v. Frequency Based Attenuators</td>
<td>17</td>
</tr>
<tr>
<td>vi. Dynamic Processors</td>
<td>19</td>
</tr>
<tr>
<td>vii. Time Based Processors</td>
<td>21</td>
</tr>
<tr>
<td>viii. Logic Pro X and Automation</td>
<td>22</td>
</tr>
<tr>
<td>ix. Outputs</td>
<td>23</td>
</tr>
<tr>
<td>c. Practice and Performance Considerations</td>
<td>24</td>
</tr>
<tr>
<td>IV. SONIC ARCHAEOLOGIES NO. 1</td>
<td>26</td>
</tr>
</tbody>
</table>
a. Black Rain .................................................................................................................. 26
b. Psychomania............................................................................................................... 29
c. Kodo ........................................................................................................................... 32
d. Susperia ...................................................................................................................... 37
e. Deep in the Machine ............................................................................................... 38

V. CLOSING REMARKS ............................................................................................. 42

APPENDIX A: INSTRUMENTATION ............................................................................. 43

APPENDIX B: BRIAN LOCK’S GEAR LIST ................................................................. 45

BIBLIOGRAPHY ............................................................................................................. 48
### LIST OF MUSICAL EXAMPLES

<table>
<thead>
<tr>
<th>Example</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1A</td>
<td>Frequency response of human voice singing a G2</td>
<td>11</td>
</tr>
<tr>
<td>3.1B</td>
<td>Frequency response of a concert flute playing G2</td>
<td>11</td>
</tr>
<tr>
<td>4.1</td>
<td><em>Sonic Archaeologies No. 1. Black Rain</em>, flute part, mm. 4-7</td>
<td>27</td>
</tr>
<tr>
<td>4.2</td>
<td><em>Sonic Archaeologies No. 1. Black Rain</em>, flute part, mm. 11-15</td>
<td>28</td>
</tr>
<tr>
<td>4.3</td>
<td><em>Sonic Archaeologies No. 1. Black Rain</em>, flute part, mm. 26-32</td>
<td>29</td>
</tr>
<tr>
<td>4.4</td>
<td><em>Sonic Archaeologies No. 1. Psychomania</em>, score, mm. 54-55</td>
<td>30</td>
</tr>
<tr>
<td>4.5</td>
<td><em>Sonic Archaeologies No. 1. Psychomania</em>, flute part, mm. 57-58</td>
<td>31</td>
</tr>
<tr>
<td>4.6</td>
<td><em>Sonic Archaeologies No. 1. Psychomania</em>, score, mm. 89, 90</td>
<td>31</td>
</tr>
<tr>
<td>4.7</td>
<td><em>Sonic Archaeologies No. 1. Kodo</em>, flute part, mm. 133, 134</td>
<td>33</td>
</tr>
<tr>
<td>4.8</td>
<td>Brian Lock’s <em>Sonata for flute and piano. Vivement</em>, score, mm. 15, 16</td>
<td>33</td>
</tr>
<tr>
<td>4.9</td>
<td><em>Sonic Archaeologies No. 1. Kodo</em>, score, mm. 173-175</td>
<td>35</td>
</tr>
<tr>
<td>4.10</td>
<td><em>Sonic Archaeologies No. 1. Kodo</em>, flute part, mm. 182-185</td>
<td>36</td>
</tr>
<tr>
<td>4.11</td>
<td><em>Sonic Archaeologies No. 1. Kodo</em>, flute part, mm. 188-195</td>
<td>36</td>
</tr>
<tr>
<td>4.12</td>
<td><em>Sonic Archaeologies No. 1. Susperia</em>, score, mm. 200-208</td>
<td>37</td>
</tr>
<tr>
<td>4.13</td>
<td><em>Sonic Archaeologies No. 1. Susperia</em>, score, mm. 209-211</td>
<td>38</td>
</tr>
<tr>
<td>4.14</td>
<td><em>Sonic Archaeologies No. 1. Deep in the Machine</em>, score, mm. 232-7</td>
<td>39</td>
</tr>
<tr>
<td>4.15</td>
<td><em>Sonic Archaeologies No. 1. Deep in the Machine</em>, score, mm. 243-6</td>
<td>40</td>
</tr>
<tr>
<td>4.16</td>
<td><em>Sonic Archaeologies No. 1. Deep in the Machine</em>, flute, mm. 248-57</td>
<td>40</td>
</tr>
<tr>
<td>4.17A</td>
<td><em>Sonic Archaeologies No. 1. Deep in the Machine</em>, flute, mm. 282-5</td>
<td>41</td>
</tr>
<tr>
<td>4.17B</td>
<td><em>Sonic Archaeologies No. 1. Deep in the Machine</em>, suggested flute part variation, mm. 282-5</td>
<td>41</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

*Sonic Archaeologies No. 1* is the result of collaboration between British film composer Brian Lock and American flutist Mary Karen Clardy. This work for pre-recorded orchestra, electronic sounds and flute was premiered on September 5, 2013 at the University of North Texas by Mary Karen Clardy, flute; Brian Lock, piano/electric keyboard; and Daniel Pardo, laptop/live mixing. *Sonic Archaeologies No. 1* is 13’57” in length, and divided into five movements: *Black Rain, Psychomania, Kodo, Susperia*, and *Deep in the Machine*. Each movement explores different aspects of virtuosity in performers.

*Sonic Archaeologies No.1* is not about the notes but about the sounds of the instrument, what is possible, and how that can be expressive. Being virtuosic and expressive with the sound, not technique.¹

Lock’s interest in virtuosic display goes beyond a nineteenth-century approach based on scalar speed and twentieth century rhythmical asymmetry.

The fourth movement, *Susperia*, looks like a very simple piece of music but it is very difficult to play. It has 2 notes, the bottom C and D, both of which are difficult to play on flute but this is about creating something really beautiful out of actually nothing, which is a different form of virtuosity. You don’t get this that much in contemporary music.²

*Sonic Archaeologies No. 1* demands that the flutist be adept at incorporating contemporary techniques with electronics. This guide provides insight into Brian Lock’s work from a performer’s perspective, creating a reference resource for flutists to understand 1) its construction, 2) various interpretation possibilities, and 3) the interaction between flute and

---

¹ Brian Lock, interview by Daniel Pardo, June 27, 2015.
² Ibid.
electronic signal processors to achieve an artistic vision that interlaces multidimensional sonic aspects.

Electroacoustic music exists in a continuous mode of experimentation and discovery for inventors, composers, and performers. In her 2003 article *Performing Electroacoustic Music: A Wider View on Interactivity*, Elizabeth McNutt challenges the nature of interactivity between performers and machines, and encourages collaboration between composers and performers to facilitate the best possible rendition of a work.³ *Sonic Archaeologies No. 1* was designed with performers in mind as a result of an active collaboration from early stages between the composer and the flutist. This work, designed in Logic Pro X, combines preprogramed drumbeats and synthesizer parts, prerecorded orchestral parts by the Prague Philharmonic, and an array of click tracks with section numbers in the monitor signal to facilitate accuracy on both practice and performance.

The notation of *Sonic Archaeologies No. 1* invites interpretation blending and altering traditional sounds through microphones and a processed signal flow. This performance guide will address acoustical considerations when the flute sound is being manipulated by dynamic and time-based processors in live performance; the interaction between the flute, electronics, and acoustic spaces; the elements of sound production that provide interpretation of contemporary popular styles; and the opportunities for the performer to find, explore, and develop artistry beyond the limitations of music notation.

---

CHAPTER II

ELECTROACOUSTIC MUSIC BACKGROUND

Since 1897, when Thadeus Cahil registered his electrically based sound-generation system known as Dynamophone or Telharmonium,⁴ inventors and composers have looked for ways to expand sonic possibilities beyond the emulation of acoustical instruments. In the case of Cahil’s Dynamophone, it was a 200 ton, 60 feet construction capable of generating pitch sounds through a polyphonic keyboard. Cahil’s idea was to “put the power of a synthetic orchestra in the hands of a single performer.”⁵ Other inventions of the early twentieth century included the Theremin (1924), Ondes Martenot (1928), Dynaphone (1927-28), Trautonium (1930), and Neo-Bechstein piano (1931), from where the electric guitar pick-up vibration capturing system took root.⁶

The invention of these instruments was intertwined with the desire some composers had to deploy from natural sounds audiences had grown accustomed to. Among composers who became interested in this explorative field were Hindemith, Honegger, Koechlin, Milhaud, and Messiaen.⁷ While limited repertoire was produced, some of them, like Messiaen’s Turangalila symphony, featuring the Ondes Martenot, and Hindemith’s Concertino for Trautonium continue to enjoy exposure and programming as virtuosos such as Valerie Hartmann-Claverie (Ondes Martenot), Lydia Kavina (Theremin), and Peter Pichler (Trautonium) maintain the legacy.

In parallel with instruments invention and development, studios were the epicenter of electronic music creation. Accessibility to studios was a privilege only a few composers enjoyed

⁷ Ibid., 5.
due to the limited availability of time and gear. While Varèse considered that the musical alphabet needed to be enriched,⁸ and electronic music would be a feasible vehicle to achieve this purpose, his ventures to enter studios were denied multiple times.⁹ His intent was to conceive music in its perfect state, and reach the listener unadulterated by interpretation.¹⁰

I dream of instruments obedient to my thought and which with their contribution of a whole new world of unsuspected sounds, will lend themselves to the exigencies of my inner rhythm.¹¹

This philosophy of performer-detachment was endorsed by a new generation of composers including the American John Cage. They were interested in the exploration of how noise and sounds could make a sonic composite, which resulted not only in detachment from performers but also audiences.¹² “Groundbreaking works were not written with the audience in mind,”¹³ said the late Milton Babbitt, who advocated total, resolute and voluntary withdrawal from the public world to one of private performance.¹⁴

While experimentation in Electroacoustic music took place in multiple studios between 1940’s and 1960’s, the Radiodiffusion-Télévision Français (RTF) and Norwestdeutscher Rundfunk (NWDR) established two contrasting interests.¹⁵ Led by Pierre Schaeffer,¹⁶ Musique Concrète was rooted in Paris. Their focus was to make music merging natural sounds with electronically produced sounds.¹⁷ Adversely, Robert Beyer, Dr. Wener Meyer-Eppler, and

---

⁹ Ibid., 9-10.
¹⁰ Ibid., 14.
¹⁴ Ibid.
¹⁶ Ibid., 20.
Herbert Eimert pioneered Electronische Musik in Cologne. Their approach was to extend the composition theories of serialism, while researching and experimenting with electronically generated sound sources exclusively.

Experimentation on tape machines gave birth to sound possibilities never heard before. By splicing and replicating parts of tape at different instances with different volumes allowed composers to generate repetitions of content shifted in time that we now know as delay events. Special tape machines with multiple heads and complex routing were designed for the purpose of delay generation. Interest in this kind of sonority first enjoyed popularity in commercial music and experimental studios in America. In New York, Otto Luening used instances of delay to modify the sound of flute in his works *Low Speed* (1952) and *Invention in Twelve Tones* (1952). Similarly, the practice of capturing a sound, splicing the tape and regenerating the recorded material multiple times at the same volume level developed into what we know as sampling and looping.

In the 50s and 60s, collaborations between RCA, Princeton, and Columbia universities saw advances in analogue synthesizer design such as the vacuum tube based RCA Mark II Electronic Music Synthesizer, and multitracking recording into tape, which greatly expanded sonic possibilities by allowing separate sonic events to be recorded simultaneously, and then

---

19 Ibid.
22 Ibid., 162.
23 Ibid., 163.
24 Ibid., 165.
25 Ibid., 176.
26 Ibid., 183.
resynchronized and overdubbed multiple times. Just as Milton Babbitt was able to take advantage of the Columbia-Princeton studio to work on his serial compositions, composers became household names for leading studios in key locations. Examples of these associations are Schaeffer and Boulez in Paris, Meyer-Epplerin in Bonn, Eimert in Cologne, Berio and Madena in Milan, and Hugh Le Caine in Ottawa.

Robert Moog contributed to the advancement of analogue synthesis with his design of solid-state synthesizer modules in the 60s. This voltage-controlled instrument became the most sought after instrument in electronic music during the next two decades. It also championed the inclusion of a four-part envelope generator or ADSR, which allows control of attack, decay, sustain and release characteristics of the output signal.

Multiple directions in technology development and proprietary communication protocols devised by Korg, Yamaha, Roland, Oberheim and Kawai resulted in a commercial demand for a universal communication protocol. The establishment of MIDI (Musical Instrument Digital Interface) took place in the early 80s, at the same time as analogue synthesis became increasingly computerized. IRCAM (Institut de Recherche et Coordination Acoustique/Musique) was key to advancement in digital synthesis and recording. As the MIDI protocol was being developed, Boulez’s work at IRCAM produced repertoire for computer such as Répons (1981). In late 80’s

---

28 Ibid., 183.
31 Ibid., 245.
32 Ibid., 258.
33 Ibid., 258.
34 Ibid., 289.
IRCAM released Miller Puckett’s first version of Max, a graphical programing language for music applications, which has seen multiple revisions and releases over the next few decades.

Computers, as an inevitable path for electroacoustic music, have provided exponential expansion on the fields of sound generation, hardware emulation, and recording environments. They have also made decades of research and technological development accessible to the general public through pieces of software such as virtual instruments, music notation programs, Digital Audio Workstations (DAW), and software samplers, to name a few.

Brian Lock’s Sonic Archaeologies No. 1 is a work that takes advantage of modern technology to access the full spectrum of audio technology research described in these pages: MIDI communication, multiple instances of synthesis with envelop manipulation, looping, time based effects such as delays, and reverbs, multi-track recording (Prague Symphony Orchestra,) and synchronized playback and audio manipulation for live performance. Aside from fusing musical elements from diverse origins into one work, Lock brings an archeology of electroacoustic practices and technology into this innovating piece for flute.

a. Brian Lock

British composer Brian Lock (b. 1967,) combines influences from Alexander Goehr (University of Cambridge), Henryk Mikolaj Gorecki and Witold Lutoslawski (Chopin Academy of Music) in his musical output. These diverse compositional approaches in philosophy and craft create a significant impact in Lock’s music for both cinema and art music compositions.

The influence of Alexander Goehr in everything I did was the philosophical background of the music; what actually was the intention and idea of the composition. So in a general sense, what was really behind the notes, what was driving it, what were you trying to do and how does that fit within the context of contemporary, intellectual thought about

36 Ibid., 310-11.
music and culture. In contrast, The Polish school is concerned with sound, color, and texture. Polish music is based on the idea of sonority and how sound manifests itself. Gorecki and Lutoslawski’s influence on what I was doing was to make everything very clear and expressive.37

Brian Lock’s erudite electroacoustic pieces have been commissioned and premiered by international figures such as Susan Milan (Royal College of Music), Mark van de Wiel (Royal Academy of Music), and Mary Karen Clardy (College of Music, University of North Texas).38

His large orchestral scores are used by leading art-house directors worldwide from The Land Girls for the UK’s David Leland, to all the classical music and arrangements in Jane Campion’s The Portrait of a Lady, to Philippe de Brocca’s Vipère au Poing and for Polish directors Mariusz Treliński and Jan Jakub Kolski.39

Aside from his work for BBC, CBS, Virgin Classics, Decca and Silva Screen, Lock is a fellow of The Royal Society of Arts, Higher Education Academy, and holds a position as Senior Lecturer in Composition and Music Technology at Royal Holloway, University of London.40

---

37 Brian Lock, interview by Daniel Pardo, June 27, 2015.
CHAPTER III
TECHNICAL GUIDE

The purpose of this chapter is to provide flutists with a basic understanding of the technical requirements and procedures needed to support the artistic demands of Sonic Archaeologies No. 1. Lock invites flutists to explore the sonic possibilities of their instrument beyond traditional and contemporary sound production.

Sonic Archaeologies No. 1 is not about the notes but about the sounds of the instrument, what is possible, how that can be expressive on its own and when it’s enhanced with audio effects.41

Technical suggestions provided in this guide are based on research and knowledge gathered during 15 years of experience as audio engineer for recording and sound reinforcement environments in the U.S. Military Band Program, and as studio owner. My academic background in music production includes the completion of the U.S. Armed Forces Sound Reinforcement Course (Distinguished Honor Graduate), and a Master Certificate in Music Production from Berklee College of Music (Summa Cum Laude). Additionally, I provided sound reinforcement for the premiere of Sonic Archaeologies No. 1.

a. Enhanced Flute Sound

Interacting with live reinforcement devices such as microphones and signal processors requires flutists to adapt to new acoustical environments. Traditionally, flutists learn projection through technique that produces interaction with surrounding surfaces such as walls, floor, and ceiling. This approach is challenged by the use of microphones in close position since they capture the signal just a few inches from the source. At this point, electric amplification

---

41 Brian Lock, interview by Daniel Pardo, June 27, 2015.
enhances, transforms and delivers the audio signal to the audience, so flutists must focus sound so it appears clean and clear where the microphone’s diaphragm is placed. Interacting with microphones and signal processors allows flutists not only to reach the hall with less physical effort but provides access to a more intimate soundscape and modern techniques such as whistle tones, key clicks, pizzicato, Aeolian sounds, etc. The increased volume with the aid of a microphone brings the performance to the audience with an enhanced musical spectrum of tone, phrase, and technical effects.

b. Signal Flow

Signal flow refers to the path run by an audio signal, in this case the flute, starting from the microphone, and ending with speakers directed to the audience and musicians. The following overview of signal flow is not meant to be an all-inclusive description of electronic components and methods but an exclusive reference of basic concepts and practices that will help flutists prepare Sonic Archaeologies No. 1.

i. Microphones

Microphones, in all methods of transduction, convert sound waves traveling through air into electrical signals. Each microphone has a defined frequency range of reception. Since the flute possesses similar sound properties as the human voice, most microphones designed for singing applications will work well for flutists (Example 3.1). Because they are at the beginning of the signal path and capture the natural sound of the flute, choosing the right microphone is perhaps the most important factor of the technical setup.

---

Example 3.1A: Frequency response of human voice singing a G2.

Example 3.1B: Frequency response of a G2 played in a concert flute.
Due to constant development in audio technology there is no standard operation or specific gear that solves all situations of electroacoustic music so a deeper understanding of the kinds of microphones and methods of transduction is necessary to make gear choices for either live performance or recording. Microphones can be divided by their method of transduction, design, or polar pattern.

By method of transduction, dynamic and condenser microphones are common choices to be used by flutists in electroacoustic music. Dynamic microphones work well in live performance since they pick up signals close to the diaphragm and reject the ones out of their polar pattern, thus minimizing chances of feedback. Sound quality in dynamic microphones is less detailed than condensers, but sufficient for electronic manipulation in a live setting. Condenser microphones are typically found in recording environments where detail quality is at a premium. They also work well in a live performance situation where monitoring and Front of the House conditions provide minimum feedback scenarios. A third but less common kind is ribbon microphones.43 Ribbons have excellent sonic characteristics with warmth and gentle high frequency response, but tend to be more fragile than dynamic and condenser microphones, so they are rarely used in live performance. Their traditional top-end prices also make them an infrequent choice for applications outside of professional recording studios.

By functional design, the most practical possibilities for the flutist are within hand-held, stand-mounting, lavalier, and headsets. While hand-held microphones are designed for mobility, flutists are obliged to use them on stands. They come as dynamic or condenser and tend to be affordable, so a multiple array of this type of microphones is simple to acquire. Known as stand-mounting, this kind of conventional condenser microphone is commonly found in recording

environments. The reason for a different category is that they are either built with delicate components such as tubes, or designed to be paired with a shock mount to reduce input of vibrations transferred by the stand. They offer excellent sonic quality and are easily found in higher educational institutions so they represent a viable option. With these two kinds of microphones, *Sonic Archaeologies No. 1* requires at least a two-microphone setup, one by the flutist’s stand and another one inside the piano’s chamber. The drawback to this approach is the amount of gear necessary for the operation. By employing more microphones, there is a need for more microphone stands, microphone cables, and inputs on the mixer or audio interface, which constitutes more work during setup, a more complex technical configuration, and in general, a larger margin of error.

Lavalier and headset microphones offer more flexibility than the former options. Lavalier microphones are mostly small condenser microphones with excellent frequency response for voice and flute. They can be wired or wireless and attach to the performer’s shirt or coat. By doing so, they maintain a constant distance from the flute so the flutist is less restricted to fixed positions, as is the case with microphones on stands. They come in different polar pick-up patterns but best suited for the flutist is omnidirectional, as it minimizes the proximity effect and resonance transmitted by the body in comparison with cardioid and hyper cardioid microphones. Similarly, headsets offer excellent frequency response at a fixed distance to the source, but face the lip plate of the flute, providing a more direct and less atmospheric version of sound. Both lavalier and headset microphones are an advantage for performance of *Sonic Archaeologies No. 1*, as the flutist can move freely around the front music stand as well as when it is indicated to play harmonic trills into the piano’s harp. Aside from eliminating the need for

---

microphone stands and allowing distance control from the audio source, these two types of microphones prove more adequate than pick-up microphones attached to the flute, since Lock’s work requires the use of both concert and alto flutes.

Mostly found in commercial stages, attached pick-up microphones offer the same advantages as lavalier and headset, but depending on the method of attachment, the flutist will need one microphone in each flute, which is pricey for the flutist, uncommonly owned by sound companies or educational institutions, and cumbersome if they are not wireless, due to the necessary movement on stage. Finally, since there is no pause between movements of Sonic Archaeologies No. 1, it is not recommended to add any logistical procedures aside from switching flutes between movements.

By polar pattern, microphones can be commonly classified as Cardioid, Hyper-Cardioid, Figure 8, and Omnidirectional. As indicated by their name, Cardioid and Hyper-Cardioid microphones have pick-up patterns that resemble a heart shape. When using these types of microphones on a stand, they must be placed aiming at the flutist’s mouth at least 6 inches away, in a declining 45-degree angle. Since they do not pick up signals outside of range depicted by their shape, the flutist must remain at a fixed position while performing. Figure 8 microphones capture signals both in the front and back of the microphone and its application is aimed at choirs or ensembles where multiple sources surround the microphone. For practical purposes, flutists do not benefit from this type of polar pattern when playing Sonic Archaeologies No. 1. Omnidirectional microphones capture signals in a 360-degree angle, and their best application is on lavalier microphones, as they are not facing the flute directly. This type of polar pattern also helps reduce the proximity effect. In a nutshell, the most convenient microphones to be used in
Sonic Archaeologies No. 1 based on mobility, ease of use and limited accessories needed are 1) condenser Cardioid or Hyper-Cardioid headset or 2) Omnidirectional lavalier microphone.

Another reason to choose a headset or lavalier microphone over microphones on stands is the necessity to bring motion integration to the performance. Remaining at a fixed position, slaved to the technology at hand, prevents the performer from adding elements physical engagement, which affects the way the audience receives the performance. Audience reactions are part of the grand counterpoint established by the concert experience.

It’s not interesting to watch someone playing a laptop. You need to engage people visually, and this peace should have a lot going on from the flutist. The electronic part is very so it can react to it. Also, there could be a cameraman to enhance the experience. The audiovisual counterpoint can help the audience get the narrative. 45

ii. Mixers and Audio Interfaces

A mixer is a device where all incoming audio signals combine into one. Analog and digital mixers are designed with component order in mind. This means that from the location of the preamplifier, the visual layout of devices functions in subsequent order. A standard order of these devices is: Preamplifier, monitor sends, equalizer, panoramic pot, fader, and master mix. Audio interfaces behave in similar ways as analogue and digital mixers but handle audio through computer software, where same principles apply. While flutists performing Sonic Archaeologies No. 1 cannot manipulate a mixer in the live setting, understanding the way these components work can help performance preparation and communication between musicians and engineers. If working without an engineer or solely with Logic Pro X, then understanding of routing and parameter behavior in some of the audio processors is necessary.

45 Brian Lock, interview by Daniel Pardo, June 27, 2015.
iii. Preamplifier

The function of the preamplifier is to bring low-level signals, such as flute or voice, from -70 dBu to -50 dBu, into acceptable volume levels between -20 dBu to +4 dBu, to be compatible with mixers, sound cards or audio interfaces. This crucial stage establishes what will be considered 100% of the signal for later processors, so changes to this parameter affect all following devices in the chain. Depending on the kind and brand of the mixer or audio interface, certain functions may also be available at the preamplifier stage: **phantom power**, a boost of 48v necessary for condenser microphones to work; **Invert phase**, a device that switches positive peaks in the signal with negative and vice versa to prevent phase cancellation between two signals with close to identical information; and **Pad**, an attenuator of 10 to 20 dB that is rarely needed when amplifying an acoustical flute due to its low natural volume. After these selections have been set during sound check, it is best to leave them unchanged during performance as all proportions of reverb, delay, sends will also be affected. The following processors provide technical and artistic possibilities: attenuators, dynamic processors and time based processors.

iv. Attenuators

Attenuators use the level set by the preamplifier and treat it as nominal unaltered gain. Their function, as the name describes it, is to attenuate signals for specific needs. For instance, the fader on a mixer attenuates the signal, found at 100% when set at 0 dB, or nominal level, lowering the perceived volume to accommodate audio content within the complexity of sources being mixed. Values above nominal gain amplify the signal along with any electrical noise and

---

47 Ibid., 130.
48 Ibid., 278.
49 Ibid., 152.
50 Ibid., 325.
low-level distortion generated by electrical gear up to that point in the chain. Thus the principle of existence for this device is to attenuate as a primary function even though they all include head room for instances where extra amplification is required. Another kind of attenuator is the panoramic potentiometer or pan,\(^51\) which places signals in the sonic panorama from left to right by attenuating the signal at the opposite selected side, distributing the signal into a stereo position. Pan settings can either be fixed at a set position or shifted during performance to add movement within sound sources. The latter practice requires either an engineer with instructions or a channel with written automation in Logic Pro X.

v. Frequency Based Attenuators

Aside from faders and pan pots, equalizers are used to accommodate the flute, or any audio signal, in a vertical axis and also serve creative purposes when specific frequency-based effects are programmed. Equalizers are frequency dependent attenuators\(^52\) that instead of altering the perceived volume of the signal as a whole, take on a defined section of the frequency spectrum and either attenuate it or enhance it, leaving the rest of the signal’s volume unaltered. Originally, the transmission of voice through long cables, in the telephone industry, experienced signal loss at only certain frequency ranges. To compensate for such loss, frequency specific amplifiers were used to boost and ‘equalize’ the signal.\(^53\) These devices are particularly useful to reduce unwanted frequencies or noise within frequencies from the flute signal. For instance, A/C noise, piano pedal noise, and some electrical and wind noises reside at frequencies below 100 Hz. While those noises are not exclusive to that frequency range, they all have that portion of the spectra in common and since the flute does not have much acoustical content in that register, an


\(^{52}\) Ibid., 244.

\(^{53}\) Ibid.
equalizer can clean up the signal without lowering the volume of the remaining audio. Most audio mixers have a High Pass Filter function by the preamplifier gain stage that, when engaged, allows frequencies above a certain threshold, normally fixed at 75 or 80 Hz to pass through. This function should be engaged on flute signal channels except when the flutist executes key-taps, beat boxing, Aeolian sounds on an alto or bass flute, and enhancement of those frequencies is desired. Another specific cleaning function of the equalizer is to attenuate air noise from flute sound production or from an enhanced frequency range as a default response on specific microphones. This unwanted property of sound is mostly found between 5 and 8 KHz, where human voices may exaggerate the 's' sound. Each microphone has a specific frequency response just as each flutist differs in sound quality from one another, so compensation for these characteristics can take place by using an equalizer effectively.

Equalizers can be found at several stages within the signal path so a deeper understanding of these devices is in order. There are two main kinds of equalizers: graphic and parametric. Graphic equalizers allow you to choose a specific frequency and either raise or lower it without affecting the very next frequency available. Parametric equalizers allow you to find a center frequency and alter it while also affecting neighboring frequencies. The amount of frequencies affected is regulated by the bandwidth parameter, also known as $Q$. A small $Q$ value implies that a very small region of frequencies is affected (narrow bandwidth), while higher values take more neighboring frequencies (wide bandwidth). Generally, two filters are encountered within a parametric equalizer, a high-pass and a low-pass filter. As their names suggest, the former allows content above a set frequency threshold to move on to the next stage in the signal flow, while the latter filters frequencies higher than a specific threshold. This is also useful because depending on the musical content traveling through the system, some types of electrical noise find a home
in frequencies around 13-15 KHz and this can be taken care of by a low-pass filter. Best use for an equalizer in Sonic Archaeologies No. 1 will be to prevent unwanted noises and clean up the flute’s signal. This means that the gain parameters of an equalizer will decrease in value depending on the flute’s interaction with the microphone and acoustic characteristics of the venue.

vi. Dynamic Processors

Dynamic processors automate aspects of volume control. Their reaction time to audio signals can be almost immediate and very precise. The most useful dynamic processors for flutists preparing for performance of electroacoustic music are gates, compressors and limiters.

Gates are used to suspend the incoming audio signal until the sound pressure level reaches a threshold. This is useful to minimize foreign signals, mainly from monitors, to reenter the signal path and create a feedback loop. Since Lock’s work is designed for practice and performance wearing headphones, there is no need for a gate in the performance of this piece.

Most of the dynamic control should be done with a compressor. Compressors may be found in the mixer, as outboard gear, or as an insert in Logic X. The most important parameters are the threshold, attack, ratio, release, and gain. The threshold, measured in dBs, determines the point where the signal’s volume will be affected. The ratio establishes how many dBs will pass through the threshold. For example, a ratio of 2:1 means that for every 2 dB that go above the threshold, only one will pass. Similarly, a threshold of 5:1 would only let 1 dB pass when the incoming signal is 5 dBs higher than the threshold. The attack time is measured in seconds or fractions of a second, and determines how soon the compression ratio will be applied to the

---

signal. Release, also measured in time, determines how smoothly the compressor will return to inactivity. The parameters explained so far are in control of reducing the dynamic range of the audio signal. The last parameter is called gain. Its purpose is to raise the audio content, now less contrasting, to a higher level so the low dynamic content can be more easily heard, and peaks or saturation in the audio signal do not cause distortion. Compressor values cannot be predicted as many factors can vary acoustical circumstances such as the type of room, objects in the room, gain stage of the microphone, etc. That said, the ideal settings for flute compression in electroacoustic music, and in this case *Sonic Archaeologies No.1*, will be the ones that accomplish the reduction of dynamic range without being perceived by the audience. In practical terms, ratios of 5:1 and above with a low threshold will tend to affect the dynamic content drastically, resulting in a dull performance and this could alter the effectiveness of the flutist and the performance in general. Attack and release times will also work best on flute if they are smooth, which means not very short settings are preferred. Flutist will benefit from having enough time for sound check and start with the threshold raised to its highest setting, a ratio of 3:1, and lower the threshold while playing to determine its most natural setting.

Limiters for performance of acoustical instruments are best used for technical safety than for artistic reasons. A limiter is a compressor with a ratio of infinity to 1, meaning no audio will pass through the threshold. This can be useful to prevent the flute sound from sound distortion. To achieve this safety practice, the threshold parameter should be raised to its highest setting and then moved down 0.2 or 0.3 dBs. By doing so, only signals that are about to overload the system will be stopped by the limiter and no overloading will occur.
vii. Time Based Processors

Time based processors are devices that alter the incoming signal giving the impression of being at a larger space (reverberation), repetitions of sound at different volume levels (delay), or altering clones of primary signals by adjusting pitch or spectra (phaser, harmonizer). For the purpose of Sonic Archaeologies No. 1, reverb (short for reverberation,) and delay, are the most useful devices.

Reverb units simulate acoustical properties of different types of spaces by generating artificial reflections and blending them together. To take advantage of this effect, a copy of the flute channel must be sent to a separate channel that has the device on it. The dry, unaffected, flute channel mixes with the signal from the reverb channel to produce the desired combination. Reverbs come with a variety of parameters such as time, decay, feedback, room size, etc. While it is helpful to get familiar with how each parameter affects sound, reverb units, in software and hardware versions, offer presets that easily accommodate the needs of a flutist. Some of these presets appear under the names: Room 1, Room 2, Hall, Cathedral, Arena, Film-score, etc. Experimentation with these presets is the most productive way to understand the way flute behaves on each of them, and to develop an artistic taste for when to apply them. When using presets, the key parameter to consider is the send from the flute channel. The more signal is sent to the reverb channel the wetter, affected, it becomes, so the flutist should load a preset and experiment with the amount of signal that is sent to it and play along with the background tracks of Sonic Archaeologies No 1 to hear how it all works in context. Volume and send levels are always relative, so setting up reverb levels without the context of all other sounds playing may

---

56 Ibid., 266-267.
57 Ibid., 278.
prove ineffective. Adjustment of these settings should be expected to happen at all stages of preparation and performance, not only because acoustical conditions change from place to place, but because adjustments to the reverberation send can provide variety and excitement to performance.

Delay units generate repetitions of the audio content being sent to its channel. The routing of delay units should be the same as reverb units. A delay unit should be inserted into a separate track and the flute signal can be sent to it to taste. Depending on the intention with the effect, there are a couple of parameters in a delay unit that need attention. Rate determines how often repetitions of an event will be reproduced and Feedback sets the amount of repetitions per event. While skilled engineers can adjust these parameters to taste, using delay effects from Logic X allows synchrony of the rate parameter with the tempo of the metronome in the timeline. In this case, only the amount of repetitions and the amount of affected signal need to be adjusted. The musical implications of these parameters are of great importance in Sonic Archaeologies No. 1. Black Rain and Susperia feature the flute with textural content that benefits from large amounts of delay at specific points as explained in chapter 4. These instances can be indicated for the engineer to execute in real-time or can be programed in advance in Logic Pro X for more precision and control.

viii. Logic Pro X and Automation

Logic Pro X is a Digital Audio Workstation that offers multi-track recording, virtual instruments, samplers, effect emulators, and music notation.58 Sonic Archaeologies No. 1 is written for orchestra, electronic sounds, and flute. When an orchestra is not available, Brian Lock’s Logic Pro X session includes the prerecorded orchestra tracks by the Prague

---

Philharmonic. The session also includes prerecorded electronic samples, tracks with virtual instruments to be played from a MIDI keyboard, metronome with bar-count track, and a flute track for real-time manipulation of sound if desired. This real-time manipulation can add artistic value to a performance if automation lanes have been written.

Automation refers to the programming of parameter changes in a timeline. For instance, changes to the amount of flute signal going to the delay track can be preprogramed so they only happen when indicated. This means that flutists can design parameter changes while practicing in order to achieve more controlled versions of their interpretation, which can add more interest to the sonic richness of Lock’s Work. Automation cannot provide absolute results in *Sonic Archaeologies No. 1* due to the improvisatory factor of electronics triggered by the keyboard but can establish the basis of a crafted point of departure.

ix. Outputs

The final stage of the signal path is the output. *Sonic Archaeologies No 1* requires two different kinds of outputs. One is the main output, which carries the audio signal that the audience listens to, and the other is the monitor output, which carries the same audio content plus a reference track. The reference track contains metronome sounds and bar-counts so the performers can start movements in perfect synchrony and ensure all musical events are happening at the right time. This monitor signal must be used through headphones. Although any kind of headphones can be used to perform *Sonic Archaeologies No. 1*, it is recommended to use professional headphones as they provide detailed sound quality and flat frequency response.
c. Practice and Performance Considerations

According to Brian Lock, electroacoustic and contemporary music can be problematic for performers because notation tends to be far from intuitive. Playing with background tracks can also be very stressful unless the performer has a way to know with certainty where he/she is at any given time. To alleviate these situations, Lock designed practice tracks and notated the whole work in a clear way, leaving much room for interpretation and creativity.

Practice tracks for *Sonic Archaeologies No. 1* include 1) MIDI mockup of the electronic parts, 2) MIDI mockup with MIDI orchestra, 3) Full MIDI mockup with metronome, 4) Full MIDI mockup with metronome and bar count, 5) Full MIDI mockup with MIDI flute, and 6) Reference of full version of mixed electronics with live orchestra.

To take advantage of these practice references, the flutist should alternate isolated practice with playing along with tracks. While performance will benefit from the use of metronome and bar count, it will be helpful to practice *Sonic Archaeologies No. 1* without the bar count to get familiar with the depth of sonic layers that comprise this work. Critical listening of the full version with live orchestra while following the score will provide a richer understanding of the complexity of textures, as many of the electronic elements are not notated.

Initially, practicing with loudspeakers can help to learn the electronic program, as this activity does not lead towards hearing exhaustion. Once the flutist has command of technical materials and familiarity with the interactive elements, he/she should include practice with the full electronic setup, to become comfortable playing into a microphone and wearing headphones.

The next step is to record practice runs into Logic Pro X. These recordings not only provide invaluable feedback to the flutist in terms of rhythm accuracy, tone quality and

---

59 Brian Lock, interview by Daniel Pardo, June 27, 2015.
60 Ibid.
intonation, but can also be used to test effects manipulation in Logic Pro X. Annotations of important findings directly on the score can give technical and artistic perspective throughout the preparation process. These annotations extend to values of physical parameters such as the gain setting at the preamplifier. Such information can be very useful when doing sound check in the performance venue. Recording into Logic Pro X while in sound check allows the flutist to step out off the stage and listen from the audience location. This will allow the flutist to make informed decisions about all settings.

A musical/technical aspect that must be included into the preparation of this piece is the fact that some segments of musical content must be played into the piano’s harp. This implies that music must be either memorized, or that an additional music stand with a modified score must be setup for this purpose.

Flexibility is key in the realm of electroacoustic music, especially when improvisation is one of the components. When preparing the performance of Sonic Archaeologies No. 1, flutists should have multiple versions of how to interpret Lock’s work.

The element of improvisation in the keyboard, and the nature of interaction with electronics can make this piece sound about 30% different each time. Every performance of Sonic Archaeologies No. 1 should be fresh and innovating for the musicians and the audience.61

61 Brian Lock, interview by Daniel Pardo, June 27, 2015.
CHAPTER IV

SONIC ARCHAEOLOGIES NO. 1

In Sonic Archaeologies No. 1, Lock invites the performer to create authenticity and a personal voice through performance instead of micromanaging interpretation through a preconceived plan. An orchestral score is available, however the composer provides prerecorded orchestral tracks for practice and/or performance where access to a live orchestra is impractical or unavailable. Sonic Archaeologies No. 1 is divided into five movements: Black Rain, Psychomania, Kodo, Susperia, and Deep in the Machine. All movements are connected through a continuous timeline in the background tracks, which include several measures on metronome-only signal to facilitate adjustment to new tempos and accurate entrances in contrasting styles.

a. Black Rain

The opening movement of this work has a fixed time of 3’26”.

After a bar of count off through the monitor system, Black Rain starts with two bars of electronic drumbeats (not notated,) at a tempo of 60 BPM, shifting through the horizontal plane with active sixteenth-note repetitions generated by a delay unit. These rhythmic figures are electronically manipulated and shifted in pitch and timbre. The flute starts on measure three with a three-bar phrase that can be deconstructed as a collection of two-beat cells covering a range of a major second, which is developed by means of inversion, augmentation, transposition, and voice exchange (Example 4.1.). The first pitch is a G2 on the downbeat of measure four moving down to F2 in the last sixteenth-note of beat two passing through F#2. Beats three and four present an inversion of these notes, preserving the rhythm but one octave lower. Bar five utilizes the same motive transposed a fifth below. The third repetition, beats three and four of measure five, escape the
predictable pattern, presenting the major second D1-E1. Measure six shows the interval D1-E1 rhythmically augmented to a full bar with a voice exchange E1-D3. The glissandi on every other beat is replaced on measure six by a rising line of 32nd-notes joining E1-D3 together.

Example 4.1: Sonic Archaeologies No. 1. Black Rain, flute part, mm 4-7

This initial phrase presents a variety of technical and artistic possibilities for the flutist. Embedded in it are the character and essence from where the interpretation of the whole work can be found. First, in a traditional sense, a melodic line with vibrato and connection between registers may portray a version of classical phrasing. A more cinematic approach may include the exaggeration of gestures in glissandi and variation in vibrato frequency and fluctuation of centered pitch. This exotic approach may resemble ethnic flutes in style and sound quality. A third possibility would be to take the two-beat cell construction into further account. In this version, a conscious disconnection of melodic segments through disrupted air flow every two beats and added sforzandos at the beginning of every cell, can produce a clear version based on motivic development, giving the impression of a house of mirrors, where the identity of the phrase is the result of sonic events that happen in a variety of spaces and temporal appearances reflecting and mirroring prior events.

Brian Lock describes the intervallic construction based on two-beat units as the basis of his bird sounds. Furthermore, the presence of contemporary techniques such as flutter tongue and glissandi is meant to imitate the diversity of sounds found in nature:

---

62 Brian Lock, interview by Daniel Pardo, June 27, 2015.
Flutter tongue and glissandi throughout the piece are meant to be lyrical. The contemporary glissando sticks out, but I’m trying to make them expressive through a skilled performer. They are not decorative or random contemporary elements. They are here for expression and drama, imitating bird sounds.\(^{63}\)

To enhance this idea of an archeology of sounds built with birdcalls instead of traditional phrasing, flutists can resort to electronic enhancements. Gestures made with time-based processors such as delays and reverbs add to the sonic counterpoint by blending the flute in a similar fashion as the affected samples in the prerecorded tracts, creating atmospheric illusions and depicting a tridimensional scene. Fluctuations in reverberation, shifts in panoramic position (at the beginning of each rhythmic cell), and triggering of a ping-pong delay (such as beat four of measure six through the downbeat of bar seven), can be automated in the Logic Pro X flute track, or notated for a skilled audio engineer.

**Example 4.2:** *Sonic Archaeologies No. 1. Black Rain*, flute part, mm. 11-15

The second flute entrance occurs on measure 11, restating rhythmical figures from the initial cell (quarter, dotted sixteenth, thirty-second), although the intervallic range is enlarged to a descending fourth (Example 4.2.) A transposed version of this cell is found on beat one of measure twelve, down a fourth. The new element in this phrase is the *flutter tongue* marking on the first eight-note of the triplet figures in measure thirteen. This contrast between duple and triplet figures with the addition of the extended technique are in accordance with Lock’s inclusion of bird sounds into the archaeology.

\(^{63}\) Brian Lock, interview by Daniel Pardo, June 27, 2015.
Example 4.3: *Sonic Archaeologies No. 1. Black Rain*, flute part, mm. 26-32

Measure 27 introduces trilled harmonic glissandi on the flute to be played following the directions of the arrows (Example 4.3). Lock specifies that these trilled segments must be played into the piano’s harp so the harmonics merge with the piano’s resonance, thus making acoustical layering prior to electronic manipulation. To achieve this, the pianist improvises sustained chords to determine what notes will resonate along with the sounds produced by the fluctuating flute part. The piano is not meant to produce its natural sound but only open certain strings for resonance. On stage, the flutist will turn his/her back to the audience and enter the piano resonance chamber as much as possible. This is one of the clear instances where the flutist is called to improvise, not in terms of notes but in terms of color and intensity. Amp variations in volume and vibrato along with irregular oscillations of pitch may bring interest into the activity of this deceivingly simple part. Additionally, larger instances of reverb and delay will also enhance the programmatic illusion.

b. Psychomania

The cueing track begins the new tempo of quarter note set at 72 BPM on measure fifty-one. Measures 51-53 are designed for musicians to internalize the new tempo but the audience does not hear this audio signal. The flute and prerecorded electronic parts begin *Psychomania* on measure fifty-four.
Psychomania features the flute in an unconventional soloist role, one of texture playing. Lock places sextuplets in the flute part against 4/4 meter Reggae figures in the keyboard and drumbeat parts (Example 4.4). This textural material takes away any expectation of stylistic blending within the parameters of popular music, but rather challenges the audio program with a most contrasting rhythmic juxtaposition. This rhythmical treatment reassures us of the fundamental idea of Sonic Archaeologies No. 1 not fitting into defined styles, but creating a collection of musical elements that, while not meant to fit together within established stylistic vocabulary, find a way to blend in a more comprehensive, holistic aesthetic.

The idea struck me one day: why keep all these things apart? Instead of, like cooking, making something with it together, like Chinese-Polish food. We are changing constantly, merging and advancing, so why continue to keep things isolated? This is a way to glue the elements together.\(^{64}\)

Measures 54-56 will blend best by playing light and smooth sextuplets with slight accents on beats one and three to meet the transient attacks from drumbeats. Rhythm must be stable to

\(^{64}\) Brian Lock, interview by Daniel Pardo, June 27, 2015.
not draw attention to the line and allow the reverse relationship where the prerecorded material features the melody and the live performer subverts to an accompanying role. Measures 57-58 (Example 4.5) deal with bird sonorities, so the exaggeration of dynamics when playing trills is paramount. Trills throughout the piece are not bound to traditional execution where the performer strives for evenness. Bird sounds may happen evenly and unevenly in the canvas of life, so *Psychomania* may benefit from an improvisatory approach to trills.

Example 4.5: *Sonic Archaeologies No. 1. Psychomania*, flute part, mm. 57-58

Example 4.6: *Sonic Archaeologies No. 1. Psychomania*, score, mm. 89, 90

Example 4.6 shows the flute playing an interval of a minor second on measure eighty-nine and a major second on measure ninety. At the same time, violin 1 repeats the textural
material introduced by the flute on measure fifty-four. In the violin, the arpeggios are within the range of a minor ninth, which can be understood as a minor second in a voice exchange. This treatment reiterates the interval of a second as the fundamental fabric of *Psychomania*. Example 4.6 also shows patterns in the vibraphone that at times go in contrary motion compared with the violin and viola, and a cello line that adds rhythmic textural complexity. Some of these textures are not easily audible in the tracks but it is crucial for flutists to be aware of the many layers present in this movement so the performance can emphasize blending instead of contrast.

Drumbeats come on and off during *Psychomania* allowing the repetitive material to be altered spontaneously in reaction to the varying accompanying layers.

c. Kodo

The third movement, *Kodo*, fuses elements of linear virtuosity with exciting electronic programming at a tempo of 130 BPM. This time, Lock offers the flute its traditional scalar quality with sixteenth-note sextuplets, advancing with chromatic sections, and emphasizing intervals of seconds at certain points. Example 4.7 illustrates the chromatic passage starting on the downbeat of measure 133, breaking the pattern on beat three, to repeat the pitches D₃-C♯₂ three times before continuing with the ascending line.
Example 4.7: Sonic Archaeologies No. 1. Kodo, flute part, mm. 133, 134

Example 4.8: Brian Lock’s Sonata for flute and piano. Vivement, score, measures 15, 16

Another interesting aspect of this movement is its relationship with Brian Lock’s Sonata for Flute and Piano, movement I, Vivement. Example 4.7 shows the sextuplet chromatic figures going into sixteenth-note broken arpeggios on measure 135. Similarly, example 4.8 shows a sextuplet chromatic run into thirty-second note angular arpeggios on the flute part, followed by echoes in the piano part. These occurrences represent Lock’s technical vocabulary of flute virtuosity. In terms of phrasing, aside from isolated rhythmic events, those sixteenth-note angular figures on Kodo’s measures 135-136, have a voice leading that goes from the repeated Eb3 on

---

beats two and four resolving to D3 on beats two and four of measure 137. Instead of breathing often during rests, the performer can present this voice leading by breathing every four bars if possible.

When practicing *Kodo*, attention must be given to full rhythmic accuracy, latching each beat with the drumbeats on the recording. Prerecorded orchestral parts also have sixteenth-note patterns to develop momentum as they exchange instrumentation. Example 4.9 shows the full orchestra score on measures 173-175. Here, sixteenth note patterns go back and forth from bass clarinet and violin I, to trombone II and bass trombone. While in full rhythmic exchange that may give the impression of unison lines, there are small deviations in the melodic content of each line. For instance, measure 173 shows a somewhat similar line between the bass clarinet and violin I, but with different pitch classes.

This partition and distribution of melodic material between voices now becomes co-dependent on the pre-recorded performance of the piece. Unlike traditional preparation for performance based on rhythmic accuracy according to the score, Brian Lock’s work challenges the flutist to adapt the notated part to the nuances of performance by the Prague Philharmonic. The performer must then ensure full understanding of the score and its performance, to properly align sonorities, textures and rhythmic entrances. Furthermore, *Sonic Archaeologies No. 1.*’s prerecorded tracks also suggest a playing style of articulations, character, and intensity that can guide the flutist for a smooth blend with the ensemble, particularly in fully orchestrated movements such as *Kodo.*
Example 4.9: *Sonic Archaeologies No. 1. Kodo*, score, mm. 173-175
While pursuing new textures and idiomatic approaches for the flute, Brian Lock also includes traditional elements into *Kodo*. There are two more elements that contrast previews phrases. The first one is found on measure 182 on the flute part (Example 4.10.) The rapid octave jumps with flutter tongue indications for the lower octave are best achieved when using French flutter tongue. This technique is associated with the vibration of the uvula instead of the tip of the tongue against the roof of the mouth. Generally, the later works best on higher registers while the former allows the shape of the embouchure to remain still, thus allowing rhythmic accuracy and smoothness of phrase. The second new element is seen on example 4.11. In a traditional sense, this is the only melodic phrase played by the flute in *Sonic Archaeologies No. 1*. These ephemeras eight bars present the flute in its most lyric register propelling a sumptuous melody.

Example 4.10: *Sonic Archaeologies No 1. Kodo*, flute part, mm. 182-185

Example 4.11: *Sonic Archaeologies No 1. Kodo*, flute part, mm. 188-195
d. Susperia

The fourth movement of Sonic Archaeologies No. 1, Susperia, is deceivingly the most technically and musically challenging. Lock demands virtuosity by performing a whole movement with only two notes, C1 and D1 in alto flute. These two notes are the lowest ones in the instrument. To produce consistent sound, full of phrase, requires flutists’ full concentration and control of physical conditions (Example 4.12.)

The virtuosic climax of the piece is not found on the rapid patterns, but actually on the delicate melody played on the alto flute on the fourth movement, with that pianissimo C, which is in a very vulnerable register. It takes absolute mastery of the instrument to make a phrase full of beauty, and that is true virtuosity.  

Example 4.12: Sonic Archaeologies No. 1. Susperia, score, mm. 200-208

---

66 Brian Lock, interview by Daniel Pardo, June 27, 2015.
This movement invites expressive gestures through acoustical and electronic manipulation of the phrase. The tempo is set at 60 BPM and the accompanying textures are delicate and open. Shifts in physical depth are expected through increase instances of reverberation and delays. Delayed repetitions of quarter-note values can be effective to enhance expressiveness. This movement can also take advantage dynamic processors in the audio chain. A lower threshold setting and higher ratio on the compressor will help the low volume produced by the flute in its lowest register to be more present in the mix without overloading the signal when the harmonic glissandi are indicated (Example 4.13.) These glissandi indications are to be played with the harmonic series that takes root on C1 and D1.

Example 4.13: *Sonic Archaeologies No. 1. Susperia*, score, mm. 209-211

![Example notation]

e. Deep in the Machine

The fifth movement of the work presents a full orchestration with linear sequences that appear heavy and energetic as the flute joins the whole string section in unison. Deep in the Machine is marked at 120 BPM.

The flute offers a lot of variety. It can be brutal, harsh mechanical, even militaristic, but we don’t hear that in classical context as much. I thought this was another way to develop the archeology, which in the fifth movement, is about intense repetition of notes in a hard, mechanical and exciting. Those textures are directly linked to the third movement of the flute sonata, which is really aggressive and verging on unplayable.  

Adding to the complications of the movement, phrases in Deep in the Machine are constructed with unexpected shifts in pitch changes (Example 4.15.) When practicing these complex runs, flutists must be attentive to how the repeated notes change at weak subdivisions of beats instead of strong pulses.

---

67 Brian Lock, interview by Daniel Pardo, June 27, 2015.
Example 4.15: *Sonic Archaeologies No. 1. Deep in the Machine*, score, measures 243-6

Flute linear content repeats on measure 252 with the indication *Hip-hop beat* (Example 4.16.)

The composer purposely omits further indications, leaving it up to the flutist to interpret.

Electronic music can be rigid due to its fixed timeline. If every event is notated and dictated, then the performer can lose interest and the audience perceives that. Notation can encourage freedom and artistry and those are the improvisatory elements that the flutist can bring to the table. The electronic part is designed so the keyboardist can react to the way the flutist presents the content.68

The open notation in Deep in the Machine invites flutists to explore variations in sound production and explore other contemporary techniques such as overblowing tones, adding key clicks, etc. The main sources of reference for style are the rhythmic samples present in the backing tracks, which dictate color, intensity and rhythmic accents.


68 Brian Lock, interview by Daniel Pardo, June 27, 2015.


The final possibility of variation and improvisation is presented with the repeated sixteenth-note figures on measures 282-285 (Examples 4.17A-B.) While playing the written octave placements can ensure excitement and drama to the line, the composer welcomes variations in octave placement or sound production techniques. Example 4.17B presents a variation of octave placement to suggest one of the countless possibilities of execution. The diamond heads used in C1, indicate overblowing to enhance drama, but this is to be done at the discretion of flutists as they culminate the performance of this enigmatic and somewhat unpredictable work.
 CHAPTER V  
CLOSING REMARKS

Brian Lock’s *Sonic Archaeologies No. 1* for flute, orchestra and electronics challenges flutists to stretch boundaries of sound and technical virtuosity, and to unveil an artistic voice capable of expressing complex moods through sound color despite range limitations or note choice. Lock’s work combines compositional traditions from Eastern and Western Europe with technological interaction, making a unique contribution to the flute repertoire. The lack of melodic material in the solo part in exchange for textural devices, demands the flutist to think in a non-linear capacity, thus raising awareness and sensitivity for the collection of sounds found in the electronic and background parts. Brian Lock’s use of contemporary sound techniques to depict bird sounds expands the flute vocabulary with fresh ideas, and his use of clear and yet open notation invites individual expression.

*Sonic Archaeologies No. 1* can serve a grand purpose as an educational resource. It can serve as a first hand tool to develop knowledge and experience interacting with electronics. Its practical use of a Digital Audio Workstation environment allows access to audio processors such as compressors, reverb delays, etc., that can become part of an artist’s signature sound. The way Brian Lock has designed practice tracks with MIDI mockups, metronome channels with section counting, transition measures between movements, prerecorded orchestral tracks, and simple notation procedures, encourages successful preparation of this innovative work and paves the way for a clear methodology of how to execute modern electroacoustic works for flute.
APPENDIX A

INSTRUMENTATION
The following instrumentation is included in the full score. In the absence of an ensemble, *Sonic Archaeologies No. 1* can be performed with the prerecorded orchestral tracks by the Prague Philharmonic.

**Instrumentation**

- Clarinet in Bb (doubling Bass Clarinet in Bb)
- Bassoon (doubling Contrabassoon)
- 2 Horns in F
- 2 Trombones
- Bass Trombone
- Timpani
- Percussion (2 players): Tambourine, suspended cymbal, bass drum, and vibraphone.
- Harp
- Piano (for resonance only)
- Flute solo (doubling Alto Flute)
- Laptop computer (1 player)
- Violin 1
- Violin 2
- Viola
- Violoncello
- Double bass
- Electronics
APPENDIX B

BRIAN LOCK’S GEAR LIST
Composer Brian Lock requested the following gear for the premier of *Sonic Archaeologies No. 1* on September 5, 2013 at the University of North Texas.

Provided by Brian Lock:

- 2 Hebden Sound Microphones
- 4 Beyer Microphone Suspension Clips
- 1 Stereo T Bar
- 2 Mic Leads
- 1 Apple Macbook Pro Laptop
- 1 Apple Macbook Pro Laptop Power Supply Unit
- 1 Mbox pro
- 1 Mbox pro Power Supply lead
- 2 Firewire Cables 800-400
- 1 MIDI Cable
- 2 USB Cables
- 1 Mouse and Mat
- 2 G Drive External Hard Drive + Leads
- 2 Beyer Dynamic DT250 Headphones
- 1 Samson Headphone Amplifier + PSU
- 1 Stereo Jack to Male XLR
- 1 Stereo Jack to Female XLR
- 1 Music Score and Flute part
- 1 Plug board and UK to US adaptor
To be provided by the performance venue:

1 Table for laptop and Mbox

1 Stereo Input to House PA System or speaker set-up

3 Beyer Microphone Boom Stand (Flute, Piano, Brian)

6 Mic Leads XLR

2 MIDI Cables

1 Stereo Jack to Jack Lead (6 meters)

3 Music Stands

1 Electric mains extension lead

1 Gaffa tape

1 Grand piano

1 MIDI keyboard at least 4 octaves

1 Chair

1 Piano stool

2 Headphone extension leads

1 Table lamp
BIBLIOGRAPHY

Articles


Books


**Dissertations**


Interview

Lock, Brian. Interview by Daniel Pardo, June 27, 2015.

Music Scores


Websites
