Euphonium and Live Interactive Electronics

A Performers Examination of Three New Works

by

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ABSTRACT

Electro-acoustic compositions throughout the twentieth-century have flourished due to the modern advancements and improvements in technology, including image based interactive software. This project aims to reveal how three composers of different backgrounds utilize the use of euphonium in combination with live interactive electronics. To this date no known works have been composed for this instrumentation.

Advancements in the development of audio software and hardware have helped to improve and rapidly evolve the inclusion of live electronics including the use of performer-triggered events, audio processing, and live electronic decision-making. These technologies can be utilized and explored in various ways. Three composers have been commissioned to each compose a new work focusing on using the timbre of the euphonium in combination with explored electronic sounds, unplanned sounds of nature and the use of the human voice. Each work is performed and examined by the author in order to further explore the electro-acoustic properties of this genre, how they communicate and interact with one another, and how the electronics interact and meld with the sound of the euphonium. Compositional elements in this project include but are not limited to the use of pre-recorded natural and “un-natural” sounds, and the manipulations of both pre-recorded and live sounds through the use of performer triggered events using visual programming languages such as Max/MSP and looping pedals.
For My Mom and Dad
ACKNOWLEDGMENTS

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CHAPTER 1

INTRODUCTION

Purpose of Project

Technology has allowed for the swift development of various compositional techniques and audio software programs for interactive performance. These newly developed programs brought with it an abundance of contemporary compositions containing live interactive electronics. That being said, to this day very few compositions have been written for low brass instruments, primarily the euphonium that contain an interactive electronic component.

The purpose of this project is to provide the established euphonium and electronics repertoire with three newly commissioned works for euphonium and interactive electronics using the graphic programming language, Max. Compositions of this instrumentation haven’t been as widely documented nor established as compositions containing fixed media. The first known work for euphonium and recorded electronics is John Boda’s *Sonatina for Euphonium and Synthesizer* written in 1970. Throughout the rest of the twentieth century and to the present day, euphonium and pre-recorded sounds via the use of fixed media, where audio date is stored on removable media such as magnetic tape, CD, disk or hard drives has been the established method to execute this particular instrumentation.

Works written for live or interactive electronics, which allows the performer to trigger events and make musical decisions has not been thoroughly explored in compositions alongside the brass family, particularly the euphonium. The overall scope of this project is meant to bring about awareness and provide new works to a very limited
set of repertoire for this instrumentation that would blur the lines between the soloist and the accompanist.

**Need of the Study**

“Technological advancements in computers and audio software, and hardware devices in the past three decades have led to the expansion of possibilities for music composition, including works for acoustic instruments and live electronics.”¹ The need for this study comes directly from a performer’s desire for more repertoire that includes pieces using and utilizing the effects of versatile programs for interactive performances such as Max. Overall, an inspiration for this project was a direct reaction to a recital attended completely existing of pieces written for percussion and interactive electronics by Dr. Alexander Wier. The recital in question was based solely on creating new works, as opposed to the need of this study, which is to create an awareness for a contemporary set of repertoire based solely on the combination of the euphonium and interactive electronics. This project will present euphonium players with three new works that propose to expand the core electronic based repertoire for this particular instrumentation. One of the works provided for this study includes the use of percussion in order to further expand the listening audience.

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Limitations of the Study

The limitations of this study include working with another individual in order to produce the final product. This particular study includes a new composition by three separate American composers. Each composer was asked to compose a piece of music for euphonium and interactive electronics. In addition to relying on another individual to complete the final product within a particular time-frame, the project relies on the composer’s own artistic ideas, and software or hardware preferences. In saying this, each composer could choose to compose utilizing a piece of software or hardware that the performer is not completely fluent in operating. Overall, this study contains very few limitations as it stands.

Instrumentation

The initial approach of this project was to create pieces for solo euphonium and interactive electronics. However, after further exploration and thought, the addition of percussion was added to one composition to give the project more depth and to reach a broader audience. Excluding the two works for solo euphonium and interactive electronics, the instrumentation of the work containing percussion, euphonium and interactive electronics was solely left to the composer’s discretion. Each composer was asked to write a piece for euphonium and interactive electronics, where the euphonium player would trigger events that were programmed into Max. The perimeters of the third piece include euphonium with percussion and interactive electronics, where either the euphonium player or the percussionist is to trigger the events through the use of the computer.
Composers

Each of the three composers were selected based upon their differing styles of musical output, as well as their overall experience with visual programming systems. The overall goal when working with each of these composers was to produce three contrasting works that utilized Max. Coming from different backgrounds and studies, each of these composers created drastically different works from one another. Both Grant Jahn and Brett Copeland have prior experience in Max/MSP and other visual programming languages. Grant Jahn created a piece comprised of textural writing. Brett Copeland’s composition focuses on angular and aggressive rhythmic sections. Justin Rito was selected due to his lush, lyrical and accessible melodic writing style for the euphonium.
CHAPTER 2

BACKGROUND AND CONTENT

**Brief Introduction of Electronics**

“Electronic musical instruments” refers to a particular musical instrument whose sound is altered or modified by the use of an electronic median.  

The development of electronic music didn’t become accessible until well after World War II, with three main factors coming to the forefront: “(1) the end of a major war, with the period of artistic and intellectual efforts which followed, (2) the widespread acceptance of the changes in the musical vocabulary as it had developed early in the century and (3) the availability of radio broadcasting equipment, especially magnetic tape recorders.”

The use of technology to influence music as well as musical machines was not a new concept. Music machines and technology traced back to the ancient Greeks, who utilized water pressure to operate a reed organ, thus marking one of the first uses of technology or machines and music to 300 years before the birth of Christ.

The use of machines to enhance the capabilities of acoustic music greatly increased after Thaddeus Cahill’s (1896-1906) “synthesizer” invention, otherwise known as the Telharmonium. A mammoth size contraption, with complex machinery was used to generate extreme levels of electrical currents that was used to operate the attached speaker cones. The invention of the Telharmonium led to a new design of vacuum tubes

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4 Ibid.
5 Ibid., 20.
that ultimately rendered Cahill’s Telharmonium useless. Vacuum tubes created by N.Y.E.M.C (New York Electric Music Company), including the Fleming patent of the radio valve of the diode in 1915 and the triode tube patented by De Forrest was what led to the construction of electric amplifiers, paving the groundwork for a new age of electronic music.

The development of the tape recorder allowed for composers in the 1950’s to experiment and create a new musical instrument, which led to the development of electronic tape music. The use of the tape recorded still allowed for the development of live performances by acoustic instruments, with the addition of electronic sounds; however, it was evident that the tape was increasingly regarded as something that could be seen and function as an instrument. The process of developing the sound on tape took precedence throughout the 1950’s.  

The 1960’s marks the development of the electronic studio. In 1958 Stockhausen stated and described the importance of breaking from traditional music from the twentieth century. The new sounds and technologies that Stockhausen spoke of were being readily utilized in rock, jazz and film soundtracks. Embedding electronic music within popular and contemporary music helped to influence and shape popular music as early as 1967.

The breakthrough of the electronic studio allowed for artistic outlets for composers throughout the world. These newly developed forms of composition allowed for musician-free compositions. Electronic music studios began to shape how both

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7 Ibid.
9 Ibid., 214.
composers and performers perceived musical output. Up until this point in history, in order to achieve the creation of an electro-acoustic composition, composer would need to work directly out of an electronic studio, thus causing a problem with the system’s portability. The development of Max was essential for the further development of electronic music. Software like Max allowed for the portability and accessibility of pieces that until the development Max weren’t able to be disseminated.

Throughout much of the 1970’s the use of the synthesizer as an instrument came to the forefront of electronic music. This particular time-marker brings the genre to the development of electronic music in combination with the euphonium. The first piece written for euphonium and electronics is entitled *Sonatina for Euphonium and Synthesizer* by John Boda. Boda’s piece is a pivotal moment for the euphonium making its way into the contemporary setting. From the 1970’s until present time, marked by the development of Boda’s work, the euphonium has been paired alongside the use of fixed media or otherwise known pre-recorded audio material. The use of fixed media throughout the latter half of the twentieth century was the established format for executing works with an electronic median until the development of the visual programming language Max in the 1980’s.

**Brief Introduction of Max/MSP**

“Max connects objects with virtual patch cords to create interactive sounds, graphics, and custom effects.” ¹⁰ Max is a visual programming language for music and multimedia that was originally created in the mid-1980’s by Mill Puckette while working

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at IRCAM (Institut de Recherche et Coordination Acoustique/Musique – Institute for Research and Coordination in Acoustics/Music). At the time of development, this new “graphical, real-time control environment” allowed composers an outlet for interactive computer/electronic music. The original/commercial version of Max/MSP was known as “Patcher” and later took on the present name after Max Mathews, later refined by David Zicarelli for the Apple Macintosh and officially released in 1988. “The Max environment is predicted on the notion of a patchwork of devices and connections, represented graphically as a matrix of boxes and connecting line.”

Max is part of a larger San Francisco based software company called Cycling ’74. Cycling ’74 utilizes many third party programmers in order to better help in the development and advancement in their products, such as Max and Max/MSP. Max is one of the primary interactive music performance software used worldwide. Some additional examples of interactive music performance software include but are not limited to: Pure Data, Quartz Composer, Open Frameworks and Super Collider.

MSP stands for Max Signal Processing (initials for Millar S. Puckette) and is used as an “add-on” package to be paired with the Max software. MSP allows for the manipulation of digital audio signals that are being produced in real-time by the developed Max patch. Not only does MSP allow for the manipulation of digital signals, MSP allows for the performer of Max patches to see what the composer had intended for the digital patch. Ultimately allowing for the non-verbal communication between the composer and performer.

13 Ibid.
CHAPTER 3

GRANT JAHN - BIOGRAPHICAL AND MUSICAL CONTEXTS

Grant Jahn (b. 1992) is an instrumental electro-acoustic composer originally from Arizona, and is currently based in New Jersey. Jahn is a recent graduate of Arizona State University with a Bachelor of Music Degree focusing in Music Composition. Jahn has explored composing both chamber and solo works, fixed media and works with live interactive electronics. While studying at Arizona State University Jahn studied with Jody Rockmaker, Kotoka Suzuki, Doug Harbin and Rodney Rogers. Notable performers of his works include the Arizona State University Wind Ensemble, the Arizona Repertory Singers, the Herberger String Quartet, Dr. Caitlin Poupard and Dr. Celeste Case-Ruchala (Clarinetist), and the Mosaic saxophone quartet.14

Compositional Style

Grant Jahn’s compositional style is influenced by the minimalist music composers such as Steve Reich, John Adams and Philip Glass. Minimalist compositional techniques make many appearances throughout Jahn’s entire compositional library. He utilizes many of these minimalist techniques, sustained sounds and accessible melodies for both the performer and audience, as well as looped segments of small motives played over an elongated period of time. Many of Jahn’s short melodies used throughout his works slowly shift and transform, leading themselves to mimic the styles of writing by many of the composers that Jahn thinks of highly. Most of Jahn’s works contain these

characteristics, including works for saxophone quartet, string quartet, SATB choir, live/fixed electronics, and film music.\textsuperscript{15}

**Short Synopsis of Grant Jahn’s Composition**

Grant Jahn’s work focuses on a three-part patch that is to be triggered at three particular second-markers labelled in the score. The score is tracked by a second-marker system that allows the performer to see how many sections have passed throughout the length of the piece. Each section of the work is triggered by the use of a midi pedal and utilizes amplified percussion instruments in combination with a high pass filter that allows for the live instruments to produce reverb when being amplified through the speakers.

CHAPTER 4

A PERFORMER'S EXAMINATION OF GRANT JAHN'S “PETRICHOR”

From the composer:

“The word, “petrichor” refers to the pleasant smell following a heavy rain, particularly after a drought or dry-spell. Growing up in the desert in Arizona, I always looked forward to this scent during the monsoon season, the period of time during the summer that the desert sees the most rainfall. It is a pervasive smell that attaches itself to everything outside, from the ground, to the plants, to the air. This piece is a reflection on the peace and calm I experience during a summer storm. The euphonium acts as a harbinger, echoing for more rain to be brought to the earth as it interacts with the percussion. The electronic portion of the work includes a sound file I recorded of a strong summer thunderstorm from my porch as well as altered audio of night sounds that act as a prelude to the storm.”

*Petrichor* is run using an electronic interaction using Max/MSP. Grant’s piece does not contain traditional measure numbers or rehearsal numbers, rather it is based off of the tracking of seconds throughout the piece, which will be marked with a square indicating how many seconds have gone by since the beginning of the piece. The composer designates certain sections that are to be reached at a given “seconds-marker”. Figure 1 below provides an image of a second-marker example that is used throughout the duration of the score.

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Structure

The structure of *Petrichor* is based on motivic ideas that transform throughout the duration of the work. The form of *Petrichor* is in a Slow-Fast-Slow framework, where each repeated section is at the discretion of the performer. The tonality of the work is established with the initial entrance of the vibraphone and later mimicked by the euphonium, creating two layers of motivic ideas that last according to the desire of the performers. Each motivic idea is tonally structured to fit the main entrance, while slowly transforming with the change of the oral cavity shape of the euphonium player.

According to the composer, this work is divided into three large sections. Each section introduces different tempos, characteristics, tonalities, and each contain a mid-section marked by either a tempo change or a shift in tonality. The composer provides clearly marked tempo markings in sections such as the segment in figure 1; however, throughout the work, the composer has added sections of the piece that are more open ended and left to the discretion of the performers.
The beginning section, labeled part one, contains a meditative and pensive character outlining the overall feeling of the work, relating back to the composer’s inspiration for the piece. Part one of *Petrichor* introduces the tonal structure of the piece with rolled chords in the key of D-minor, and later transitions into F-Lydian. Figure 2 is a display of the meditative entrances in the euphonium line, as well as the tonal structure present in the percussion line.

![Figure 2. Grant Jahn: Petrichor, page 1](image)

The material stated above later transitions to a more rhythmic idea that marks a mid-section (B) of part one. The transition of the more rhythmic section also brings with it a change in tonality and the first entrance of the non-pitched percussion instruments. Figure 3 is display showing the entrance of section B of part one.

![Figure 3. Grant Jahn: Petrichor, page 1](image)
With the conclusion of part one, part two takes over with the entrance of the non-pitched percussion instruments. These instruments are used to produce a forward driving rhythm, as well as the next tonal center of the piece. Section B of part one uses the same beginning meditative/pensive motive in the euphonium part while the percussion instruments produce an underlying driving rhythm. The first entrance of peak dynamic contrast presents itself in the middle of section B and diminishes in volume leading into part two.

Part two (labeled C) continues with the underlying non-pitched percussive rhythm, with added accents. This section contains the harmonic content from the beginning, with the rhythmic content from section B of part one. Figure 4 is a display of the transition and entrance into part two, showing the continuation of the driving rhythm and the entrance of the beginning material in the euphonium.

Although short, part two creates a bridge between part two and part three and acts more like a third section of part one, thus being labeled as section C. Section C acts as transition material both motivically and harmonically for the entrance of the part three.
The last section brings the piece back around to the fifth partial of the tonic key, ultimately resolving in the last measure of the piece. Figure 5 is a diagram that contains the transition from section C into the beginning of part three (labeled as section A).

![Figure 5. Grant Jahn: Petricho, page 2](image)

Part three, section A is somewhat similar to the beginning of part one, section B in the way the instruments do not change their role, and the euphonium player continues to produce different oral cavity shapes and sounds that help to change the overall timbre of the piece. This part and section focus on solidifying a solid pitch foundation that ultimately helps to introduce and transition into section B of part three.

Part three, section B introduces a motive that was used at the beginning of the work; however, this section utilizes more pitches that help to outline the key. Motivic aspects are also taken from part two, on top of the pitches being played on the vibraphone. Figure 6 is a display of part three, section B, which shows the tonal structure of the vibraphone part in conversation with the euphonium motive that was taken from an earlier section of the piece.
Section B of part three finishes out the remainder of the piece, while both instruments implement motivic ideas and tonality that was present throughout earlier areas of the entire piece. The piece comes to a calm end by the euphonium fading out and the vibraphone producing the last chord of the piece.

**Euphonium Part**

*Petrichor’s* euphonium part is traditionally notated and contains small motives that are developed throughout the work. The beginning of the piece utilizes the euphonium line to outline the first few motives that are supported by the use of rolled chords on the vibraphone. Very few instances of extended techniques are explored throughout the work. The composer chose to utilize the lip bend/valve glissando depending on the experience of the player, as well as the change of the oral cavity shape of the euphonium player. A particular technique the composer utilizes however, is not considered an extended technique among euphonium players is the act of blowing through the horn without producing a pitch, thus allowing for a wind or breathing effect. Figure 7 is an excerpt of the score depicting the composer’s desired oral cavity shape in order to achieve particular sounds from the euphonium. Over the duration of the piece, the euphonium part utilizes three octaves with the addition of a minor third.
The composer uses the euphonium to set up the meditative nature of the beginning by allowing the euphonium to leap a minor ninth, immediately followed by the fall of a half step. This motion happens throughout the majority of part one. Figure 8 is an image of the euphonium line at the beginning of the work, outlining the tonal structure of the piece, as well as the overall meditative characteristic.
**Percussion Part**

The percussion part in *Petrichor* consists of a vibraphone with the motor off and played with rubber and metal mallets, snare drum with the snares disengaged, tam-tam, and bass drum. The composer designates for the percussionist to choose whether or not to amplify the instruments in order to enhance the effects of the overall composition. Each of the specified instruments is assigned to a specific line on the staff according to the composer’s wishes. The Vibraphone is assigned to the top line of the percussion score with the given clef, whereas the non-pitched instruments are left to the bottom staff. According to the composer the non-pitched percussion instruments are arranged as such: Snare drum (top note), tam-tam (middle note) and bass drum (bottom note).

The beginning of the piece utilizes the sustaining quality of the vibraphone by rolling chords with rubber mallets, creating a wash of sound that ultimately produces the tonal support that is needed to enhance the euphonium line. Rolled chords in the vibraphone line help to outline open fourths and fifths, as well as rolled pentatonic chords. These chords, when spelled out, outline a Lydian scale, which makes the opening of this work feel as if there is an absence of a tonal center.

Throughout the introduction of the piece, the percussion part helps to outline the tonality of the overall piece, while the euphonium part sings a meditative melody overtop. This particular action takes place throughout the first section of the piece, labeled A. The beginning section of this piece is measured in forty-four second segments, ending in a roll on the tam-tam, lasting a total of three seconds. The entrance of the more percussive instruments, including the three second tam-tam rolls signaling the next section of the piece, labeled B. The combination of tam-tam and bass drum drive forward
the B section of the piece, speeding up the overall tempo to 120, contrasting the undetermined tempo from the beginning of the work. Section B is labeled to last a total of sixty seconds and contains a metronomic ritardando in the non-pitched percussion instruments leading into the next section of the piece. Figure 9 is an image showing the transition from the more lyrical section to the aggressive rhythmic section at B.

Figure 9. Grant Jahn: Petrichor, page 1

The section of seconds before B comes to a close with vibraphone slowing to nothing, directly followed by the first entrance of non-pitched percussion instruments rolling into the driving section at 135 seconds. Section B provides a rhythmic structure with additional accents that have not been seen prior to this section of the piece. Mallets are added around the 139 second mark, giving this section of the piece a forward driving motion, with the addition of a gradual crescendo leading to the B section around second marker 159 shown in figure 10.
In figure 10 in the percussion part leads directly to the section labeled C. Section C reverts back to the more lyrical demanding style taken from the beginning and maintains the rhythmic structure of section B in the percussion line. The snare drum maintains a constant sixteenth-note pattern that continues through the entirety of this section. The composer has added accents on the larger groupings of sixteenth-notes to provide an underlying rhythm that also syncs up with the electronic counterpart. The driving rhythm in the snare drum comes to a close by a quick diminuendo two seconds before the 300 second marker in the piece.

Driving sixteenth notes in the percussion line continue on for the duration of part three, which is indicated in the score. These constant sixteenth-notes push through to the end of section three and are used as a transition into the A’ section at time marker 5:06 shown in the figure 11.
As indicated in figure 11, the vibraphone is the primary percussion instrument sounding during the A’ section of the piece. At this point in the piece, the percussionist is outlining the same type of harmonic content that was present at the beginning of the piece. The harmonic content is being presented in the form of rolled chords in the vibraphone part being used to support the theme presented in the euphonium line. The vibraphone line at section A’ begins with chords outlining an a-minor chord and continues to descend in pitch until finally reaching an F-major scale at the beginning of the coda section presented in the figure 12.
The vibraphone lands on the determined key of F-Lydiann at the beginning of the coda section, lasting until the end of the piece. This piece’s coda section contains a form of tonal ambiguity in the percussion part, given the fact that both a concert B-flat and concert B-natural are absent at this section of the piece. The vibraphone spells out both a F-major scale and an F-Lydiann scale leading to the end of the piece, leaving out the fourth pitch in each scale. This method of tonal ambiguity is left to the interpretation of the listener and how they hear the vibraphone line ringing in combination with the last chord of the piece.

Electronic Part

Jahn chose to build this piece of music’s electronic counterpart using Max/MSP. The performer’s computer reads the Max patch using a program called Max/MSP. Each of Petrichor’s triggered events takes place using the space bar with an option to control the key stroke with a physical midi pedal to enable a hand-free performance. Unlike most electronic works using a Max patch, this piece is performed with the use of a stopwatch in order to match certain composed events alongside the electronic events being produced.

Petrichor’s electronic counterpart is different in that the sounds being produced throughout the duration of the piece are sounds from nature that have been recorded by the composer and later altered to fit the shape and character of the overall piece of music. Jahn chose to use sounds that he had experienced during the sounds of a Southwest monsoon season, using recorded thunderstorm sounds from the east coast. The very first sounds the listener is going to experience are the relentless sounds of crickets speaking to
one another during the more meditative/pensive sections of the piece. As the piece progresses, the crickets begin to crescendo and the sounds of wind alone with electronic sounds are added in to amplify the intensity of the next section.

This piece of music is marked using second markers that are present throughout the duration of the work. These markers are in direct relation to the electronic part, in that each of the markers is to be matched with a given event. For instance, in between second marker 195 and 200 a massive thunder strike occurs, which signals an intense section of the piece. These second markers in the electronic part allow for the performer to easily follow the score, as well as time out certain pre-recorded events alongside the composed events for the performers.

At second marker 135, Jahn decides to add in sounds of intense wind and small thunder cracks that help to propel the “brimming with intensity” characteristic that he has given this particular section of the piece. Together with the non-pitched percussion added into the mix, the electronic part grows with intensity until second marker 181, where a calm of sound takes place in the electronic part. This calm of sound is immediately followed by a massive crack of thunder, as well as a downpour of rain leading into second marker 200. In the score, second marker 200 is labeled as section C or part two of the overall piece. At this point in the work, the electronic part continues to create a tense atmosphere for the listener; however, it is shortly followed by the sounds of crickets and electronic sounds that help to end out the use of the electronic segment of this piece.

Figure 13 diagram depicts what the performer would encounter when working directly with the Max/MSP patch for Petrichor. Figure 13 below is the image of the Max/MSP patch, the three different sections of the piece are triggered separately, each
indicated by section number, as well as a shutdown option that allows for the performer to start the Max patch over at the beginning during rehearsal times.

Figure 13. Grant Jahn: *Petrichor*, Max patch

The image above shows three major sections of the patch, the top being a button controlling the status of the Max patch labelled “On/Off” alongside three buttons labelled in parts that control each of the three triggered events used throughout the piece. The sext section down the patch contains the levels of each the input audio, reverb, and the high pass filter that help to regulate the audio being received by the patch. The final section in the patch is towards the bottom and contains the second counter, play button, stop/reset switch, and the two channel outputs for the external speakers.

Figure 13 shows the performer to be in complete control of the input and output of the program, as well as the ability to determine which sounds are coming out of each channel and the volume immediately associated with each channel. The composer has
given the performer a stop/reset button in the Max patch for easy rehearsal, as well as a high pass filter level in order to allow for the appropriate sound coming from the speakers for both the audience and the performer.

**Potential Performance Issues and Suggestions**

Throughout the duration of this piece there are few possible performance issues. Due to the composer’s choice of a time marker system, this could prove to be a possible performance issue, in that each section dependent on a specific time marker will be at the discretion and timing of the performer. The use of an additional stop watch will help to ensure that each performer will clearly be able to see each time marker and easily follow the score. Bearing this in mind, each performer’s part must be clearly marked with additional half-way second markers to ensure that each larger designated second-marker is made at the correct time.

It is highly encouraged for each performer to go through measure each of the notated repeated sections to determine the length (in seconds) of each stave. The length of each stave needs to be pre-determined to ensure that each second marker is met in coordination with the electronic part. Excluding the use of the electronic part, each section needs to be timed out amongst each of the performers, meaning that the percussionist’s gestural figures need to match up with the euphonium’s more lyrical gestures to allow for the harmonic content to solidify before the entrance of the lyrical line. These sections must be rehearsed alongside a stop watch but excluding the use of the electronic part, to ensure the precise timing of each event.
CHAPTER 5
JUSTIN RITO - BIOGRAPHICAL AND MUSICAL CONTEXTS

Justin Rito (b. 1986) is a Michigan based composer and performer, beginning his musical journey as a classical pianist, collaborator and performer. Rito explored many creative outlets branching out into modern popular music and contemporary works. He is the founder of the East Lansing, Michigan based concert series entitled, “Unwind”, which focuses on contemporary music that is performed for the general public. While living in East Lansing, Michigan, Rito served as the musical coordinator for a music series at the Broad Art Museum entitled, “Sonic Salon Series”. Such performances would utilize the museum space to create a unique aural and visual experience to the audience.17

Rito has served as an adjunct instructor of music at Michigan State University and Alma College, focusing on composition, music theory and performance. He is currently working on his Doctorate of Musical Arts degree in Composition at Michigan State University, and holds a Bachelor of Music Education from Alma College, Master of Music in Music Composition from Central Michigan University and a Master of Arts degree in Music Theory from the University of Western Ontario. Rito’s teachers include, David Gillingham, Jay Batzner, Ricardo Lorenz and David Maslanka.18

Compositional Style

Rito’s compositional style and output ranges from solo works with accompaniment to small chamber works containing various instrumentation, and has

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18 Ibid.
recently begun exploring the dynamic field of electro-acoustic compositions. His particular style is highly immersed in the classical and contemporary pop genres. Rito use of dense tone colors and textures, large lyrical melodies, thick textures and underlying rock inspired grooves lend itself well to dramatic and colorful compositions. Overall, Rito’s compositional style can be defined as being dense expressionistic music.19

**Short Synapsis of Justin Rito’s Composition**

Justin Rito’s composition relies on the looping of live recorded euphonium lines produced by the performer. Once a set of loops has been established and is set to repeat until triggered, the performer is given a line to play over the set of recorded loops. The composer provides dotted lines to indicate what sections are to be looped, as well as numbers within circles to indicate where and when the midi pedal is to trigger the next event. Every section within the dotted lines is to be recorded and performed at a consistent tempo indicated at the beginning of the score in order for the piece to align correctly at the end.

CHAPTER 6

A PERFORMER’S EXAMINATION OF JUSTIN RITO’S “ZERO CIRCLE”

Zero Circle is a new work for euphonium and interactive electronics by composer and teacher, Justin Rito. The title for Zero Circle was derived and inspired from a poem written by Jalāl as-Dīn Muhammad Rūmī, a Persian Sunni Muslim poet in the early 1200’s. Below is a translation of the poem used as a foundation for Zero Circle:

Be helpless, dumbfounded,  
Unable to say yes or no  
Then a stretcher will come from grace  
To gather us up

We are too dull-eyed to see that beauty  
If we say we can, we’re lying  
If we say No, we don’t see it  
That No will behead us  
And shut tight our window onto spirit

So let us rather not be sure of anything,  
Besides ourselves, and only that, so  
Miraculous beings come running to help  
Crazed, lying in a zero circle, mute

We shall be saying finally,  
With tremendous eloquence, Lead us  
When we have totally surrendered to that beauty,  
We shall be a mighty kindness

According to the composer, “This poem speaks to me as a moving call for humility. Whether read religiously or not, the idea of humility in our daily lives, though, we might see some fantastic changes in the way our world operates. I wanted to capture that humility and the radiance it can have for others with Zero Circle, which is comprised of a few simple recorded loops by one performer who then performs some accompanying

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The idea of humility in relation to the poem used as inspiration for this piece is evident when looking at the style in which this piece is composed. Rito chooses to use a looping system that relies on the performer to trigger events that are produced by the performer themselves.

**Structure**

*Zero Circle* is a through-composed work that focuses on simplicity in texture and timbre. Ultimately the piece comes full circle and never strays too far from the home key of C-minor and E-flat major. The beginning of *Zero Circle* relies on the constant droning of E-flat in the solo euphonium line. The droning of the E-flat is recorded and triggered to loop by the performer, which is the model for the overall piece. This particular piece blends together the use of electronics with the sound of solo euphonium. This combination blurs the line between the electro-acoustic median and the sounds of an acoustic euphonium.

The overall structure of the piece has been broken down into five major sections with six interludes in between each of the major sections. The introduction of *Zero Circle* contains both the first and second recorded loops as well as the first interlude, which is defined by the empty space provided by the composer to allow the loops to settle and create a rhythm. Figure 14 is an image of the introduction of *Zero Circle*.

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After the introduction and first interlude is section A and contains most of the main melody played by the solo euphonium performer. Underneath the solo line of the live euphonium part are two recorded loops (present in figure 14) that were established during interlude one. Included in the A section is a simple melody that is accompanied by the recorded loops in the key of C-minor. Figure 15 is an image of what the euphonium soloist will see when performing this section of the piece.

Section A not only contains the first instance of the main melody in C-minor, A contains two interludes that allows both of the recorded loops to establish once the melody has ended. Figure 16 is an image of interlude three, as well as the next entrance
of the melody in the relative major of E-flat major. One should note that the tonal center has been defined by author of this document and was not specified by the composer.

This section of the piece is centered around the key of E-flat, whereas the beginning was centered around C-minor. Unlike the beginning of this piece, the latter half of section A expands out to a high A-flat and immediately descends to a low G, setting up the transition into section B.

Section B in Zero Circle contains both the recorded first and second look; however, it also contains a flowing melody that wasn’t present in section A. At this point in the piece, Rito utilizes the key of E-flat and is constantly centered around the fifth and third in the key of E-flat. The melody in section B expands out to a high A-flat providing the climax of the piece and immediately descends down to the same low E-flat that was sounding at the beginning of the piece. Section B also contains the fourth interlude that includes the recorded loop one and two. Figure 17 is an image of the beginning of section B including the climax of the work.
Interlude number four concludes with the introduction of section A’, which is a small recap back to the first melody that the solo euphonium had played in section A. This section is shorter in comparison to the sections prior to; however, section A’ contains interlude five which contains the first instance of a loop fading out and is no longer present in the background of the piece. During interlude five, the composer programed the Max patch to slowly fade out loop two, while loop one continues on to the next section. Figure 18 is an image of both section A’ and interlude five.
The conclusion of interlude five and the gradual fade of loop two leads directly into section C, which is metrically aligned with loop one from the beginning of the piece. At the beginning of this next section marks the recoding of loop three, as well as the looping of the actual content. Loop three contains the same pitches as loop two; however, the duration of notes is different in order to fit into 7/4 time along with loop one. Section C contains the main melody from section B in the key of E-flat; however, the composer specifies that this section needs to be played as if it were a memory. Throughout the entirety of this section, the loops present are constantly shifting between the initial key of C-minor into its relative major until the very end of section C. Figure 19 is an image showing the recorded loop three, as well as the trigger that sets the material to continuously play.
Figure 19. Justin Rito: *Zero Circle*, page 5

Figure 20 contains both the “memory” section, interlude six, as well as an additional recorded loop, labeled as loop four. At this point in the score most of the loops are beginning to fade out, including the initial loop one. Marked in red in figure 20 below shows that the newly recorded loop four is to continue on while loop one fades into the beginning of the coda section.
The coda section is rather short in comparison to prior sections of the piece. This section contains no motivic content other than the supportive harmonic texture that was present from the beginning of the piece. From the beginning of the coda, Rito mentions that loops one, three and four all return to finish off the shape of the piece. While all three loops are playing through, the euphonium plays a single pitch and brings the piece back to the original key of C-minor. The piece ends with all of the loops fading out in the distance while the euphonium continues to play. With the loop ending, the tonal structure of the piece becomes ambiguous, due to the lack of additional pitches to define the key, much like the entire piece. Figure 21 is an image marking the coda as well as the triggers that are used trigger each looped section.

![Figure 21. Justin Rito: Zero Circle, page 5](image)

Each looped section of the piece is clearly marked with a number within a circle, stating when an action is meant to be triggered by the performer. Figure 22 is an example of what the performer will see when they come to a section that is meant to interact/loop with the computer. Each section within a dotted bracket is meant to be performed at a constant speed and recorded using the Max/MSP patch provided by the composer.
The performer is to trigger circle one with the key stroke of the space button or a midi pedal. Once triggered, the computer will begin to record the section immediately following the triggered patch. In the image above, notice the cue labeled 2. Once circle 2 has been triggered, the first loop recorded is programmed to continue looping until told to otherwise with an additional key stroke. After each triggered event the composer has provided time afterwards for the loop to establish and create a rhythm. Figure 23 is an image depicting cue 2 as well as the space provided after the cue to allow for the loop to continue.
Once the first recorded segment has been looped and allowed to play through for five to ten seconds, the performer it motioned to trigger the third section labeled with a 3 in a circle. The third section/trigger is programmed to record the second section of music that the euphonium is to play. Hence, recording loop number two. Figure 24 is an image showing the third trigger that is made to record the second loop of the piece. All of which is included in a dotted bracket.

![Figure 24](image.png)

Figure 24. Justin Rito: *Zero Circle*, page 1

Once again, the composer has provided time after the recorded loop to settle; however, unlike the first recorded loop, loop two is meant to be recorded over top of loop one. The section of time (labeled “interlude one”) after the recorded loop two allows for a rhythm to be created with the recorded loop one in 7/4 time and the recorded loop two which is in 6/4 time. Due to the difference in time signatures, loop one will repeat a total of six times over top of loop two before returning to the original loop. Rito clarifies that the two loops will be offset from one another and there are to continue to play underneath the music that is taking place.

The recorded/looped euphonium part in the beginning creates a rhythm offset by the use of different time signatures. The baseline is set up by the euphonium line from the beginning in 7/4 time and is looped after it is repeated twice. Following the second repetition, the section is looped until triggered to do otherwise. The third trigger is
programed for the computer to record the supporting line played by the euphonium, while the first two measures are repeated underneath the recording of the third loop. Once all parts have been recorded, the fourth loop takes place, which signals the computer to play in unison all of the parts that had been recorded. While each of the loops play through, the main melody is presented by the the live euphonium player overtop of the recorded sections.

**Euphonium Part**

The euphonium part in *Zero Circle* contains all of the harmonic and tonal content that is used throughout the entirety of the work. The euphonium is recorded overtop of itself and looped as the source of accompaniment and pulse. The euphonium states the primary pitch of E-flat that is droned throughout the work. Once the principle pitch has been established and recorded via the use of Max/MSP, the entrance of the second motive is introduced (labeled loop 2). Figure 25 is a diagram depicting the looping cycle Rito uses in the euphonium part.

![Euphonium Part Diagram](image)

**Figure 25. Justin Rito: Zero Circle, page 1**
Once these two loops have been established, Rito suggests short interludes for the looped sections to settle, forming a sort of rhythm due to each section being performed in different time signatures. The conclusion of the first interlude presents the euphonium soloist with a simple melody that is played over the two recorded looped sections. The euphonium begins its melody in the original key of C-minor and later transitions into its relative minor towards the end of section A. Section A concludes and sets up the entrance of section B in the key of E-flat major. During this section the euphonium sings a melody that sets up the climax of the piece as well as utilizing a moving eighth-note sections that help to drive the piece forward. Figure 26 is an image of the driving forward euphonium line in section B.

![Euphonium Line](image)

Figure 26. Justin Rito: Zero Circle, page 3

The moving euphonium line comes to a close at the end of section B on the initial pitch of E-flat. Once the euphonium sounds come to a close, interlude four transitions the piece into section A’. Section A’ in the euphonium line, brings the piece back around to the melody that the euphonium played at the beginning of the piece. The ending of section A’ excludes the use of the solo euphonium line, setting the end of the piece to represent a more “memory-like” setting.
The transition of interlude five into section C excludes the solo euphonium line until loop one starts over again. Once loop one begins it cycle, the euphonium comes back in to play alongside loop one. During this time, the euphonium line is being recorded and looped to match loop one. Once recorded, loop three is triggered to continuously play while the solo euphonium line plays in octaves with the recorded loops. At this point, the live euphonium brings back the main melody that was first heard in section B. However, the euphonium player is instructed to play this section as if it were a memory, slowly bringing the end of the piece to a quiet close. Figure 27 is an image of the euphonium melody that was instructed to be played with a preferred feeling by the composer.

Figure 27. Justin Rito: Zero Circle, page 5

While closing in on the coda, the euphonium line begins to drone on concert E-flat throughout the remainder of the piece. While the loops continue to fade out, the live euphonium continues to drone on a E-flat until the euphonium is the final sounding element of the piece. Figure 28 is an image showing the fading loops alongside the drone of the euphonium line.
Max Patch

Unlike most interactive based compositions, *Zero Circle* is a basic looking system that once activated will continue to play/loop through until the performance commands the program to do otherwise. *Zero Circle* utilizes Max and is run using Max/MSP or what is commonly referred to as Max Runtime. Figure 29 is a diagram that depicts what the performer would encounter when working directly with the Max/MSP patch for *Zero Circle*.
The introduction of *Zero Circle* begins with the first triggered event/loop. The electronic part is immediately ordered to be triggered two measures after the initial activation. Cue two is used as a trigger to loop the first two measures that were being recorded with the trigger of cue one. Rito chose to place the first four cues back to back in order to create an overlapping of rhythms that the solo euphonium uses as a harmonic cushion. Below is an image of the first four cues of *Zero Circle*, as well as the composer’s instruction as to what is taking place during each cue.
For the majority of the piece, the four loops above play out while the euphonium part is instructed to play above. The next triggered event doesn’t take place until the fifth interlude. This cue is instructed to cause the second recorded loop to fade out while allowing the first loop to continue on to the next section. Below is an image showing the fifth cue, as well as the instructions by the composer.

Immediately following the fifth cue is the sixth triggered event, which is mean to record the third loop over top of the first loop that was recorded from measure one of the piece. Cue six is instructed to record loop three, while cue seven takes the recorded loop three and instructs it to play until the next triggered event. Below is image of cue six and seven, indicating the recording and looping of loop three.
Both loop one and three is instructed to continue to play until the eighth cue, which triggers the recording of loop four while loop three gradually fades out. Once the triggering of cue nine takes place, the recorded loop four plays on repeat while loop one continues to fade away. Below is an image showing the eighth and ninth cue.

The final two triggered events occur in the coda of *Zero Circle* and both serve the purpose of allowing the fading of all loops, as well as allowing all of the recorded loops to play out while slowing diminishing in dynamic. The last image provided displays the last two cues in *Zero Circle*, as well as the composer’s instruction as to what is occurring after the activation of each event.
Potential Performance Issues and Suggestions

Some of the possible performance issues throughout pieces merely relate to the performers internal sense of time in relation to the use of the pedal triggered events. Pedals will come with a short delay at the initial depression of the pedal. Due to the installed delay, the performers timing will be offset from the developed electronic counterpart. Electronic triggering pedals have an option to alter the response time that will allow the performer to trigger the events according to their own time. Allowing for the events to be triggered in the timeframe that is needed to perform Zero Circle. Zero Circle contains a performance issue that isn’t directly related to the electronic median being used. This issue is directly correlated to the intonation of the individual performer that is being looped. Each loop that is created builds upon the next creating offset chordal entrances that the performer then plays the written melody on top of. Overall, Zero Circle has very few performance issues.
CHAPTER 7

BRETT COPELAND - BIOGRAPHICAL AND MUSICAL CONTEXTS

Brett Copeland (b. 1992) is prolific composer of both acoustic and electro-acoustic genres based out of Rochester, New York. Copeland currently holds a teaching assistantship at The Eastman School of Music where he is a Doctoral student in tuba performance and literature. In addition to his studies in tuba performance, Copeland is a member and teaching assistant of the Eastman Audio Research studio. He holds a Master of Music degree in Tuba Performance and Electro-acoustic Composition from the University of South Florida and a Bachelor of Arts in Music Technology from the University of Northern Iowa.23 Many of Copeland’s works have been performed across the United States, collaborating with dancers, engineers and visual artists.

Through his studies, Copeland has collaborated with dancers, engineers, visual artists and has provided musical compositions for visual art installations and events. Copeland’s works have been featured as part of the Vox Nous Fifteen Minutes of Fame Series and the Electrobrass Conference in 2016. He has also been a major contributor to the Dugal Dance Project, an event for the International Human Rights Arts Festival.

Copeland’s primary teachers include Jay Hunsberger, Dr. Baljinder, Dr. Jeffrey Funderburk and Sandy Nordahl.

Compositional Style

Copeland is primarily a composer of electronic and electro-acoustic music but often combines with acoustic instruments. He has much experience in writing music for a

commercial purpose, video games, music for mobile applications and traditional concert
music. His composition, “Charmer” is for solo guitar and was piece selected to be
performed by Rodrigo Baggio being part of a series called Vox Nous Fifteen Minutes of
Fame. Copeland draws most of his compositional inspiration from R&B, avant-garde and
pop music.24

**Short Synopsis of Brett Copeland’s Composition**

Brett Copeland’s composition includes both live interaction and fixed media. Each event is triggered using either a midi pedal or the spacebar of a computer. The piece allows the live euphonium to play overtop of the pre-recorded audio sounds throughout the introduction. Throughout the piece, Copeland adds in the use of live alterations of the solo euphonium. Copeland’s piece ends with the electronic patch playing through, while altering the live euphonium line until the conclusion of the piece.

CHAPTER 8
A PERFORMER’S EXAMINATION OF BRETT COPELAND’S “WARRIOR”

According to Copeland: Warrior is a single-movement work broken up into several contrasting sections. There are two main melodic ideas that occur throughout the piece: one lyrical and one rhythmic and aggressive. These ideas are in constant battle throughout the piece and are present in both the euphonium and the electronics. The electronics serve as both accompaniment and another performer. Some sections of the piece are recorded and then manipulated by the electronics and played back as new material. The sounds heard in the electronics are synthesizers, pre-recorded tuba sounds, and live-processed euphonium. This piece is performed using Max/MSP.”

Structure

Warrior is a ten-minute work for solo euphonium and interactive electronics. The overall structure of the work is slow-fast-slow, where the slower beginning section fights with the faster middle section, creating the war-like atmosphere taken from the title of the work. Warrior contains a short introduction that is based off of a second-marker notated in the score. Copeland added a second-marker to allow for the performer to easily follow score during “freely” timed sections. The computer begins the piece with bass drones that are meant to set up the overarching atmosphere for the work. The solo euphonium line acts as a lone voice producing crying musical lines that help to offset the distortion in the electronic synthesizer. The introduction of Warrior comes to a close after the final entrance of distorted bass drones sound, cuing the euphonium to enter on an extended

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technique later mentioned in this document. To complete the introduction section, the
euphonium sound on a concert G, leading to the key of the next section of the piece.
Figure 35 is an image of the introduction of Warrior including highlighted second-
markers.

Figure 35. Brett Copeland: Warrior, page 1

Warrior’s second section is significantly longer in duration than the introduction.
This section begins with a timed entrance of computer generated synthesizer chords that
are used as an accompaniment device for the solo euphonium to introduce the full
chorale-like melody used throughout the duration of the work. Section A of this piece is
the first and only instance of the solo versus accompaniment roll mentioned in the
purpose statement of this document, as well as the use of a particular spelled out tonal
center. Copeland chose to use a simple melody outlining the key of E-flat major while the
synthesizer plays supporting chords under the euphonium line. Figure 36 shows the first
eight measures of section A, as well as the highlighted second-markers provided in the
score.
Section A of *Warrior* not only provides the solo euphonium with a chorale-like lyrical line, it presents the listener with the first larger section intentionally marked as “freely” by the composer. The first “freely” section of this piece of music utilizes live recorded euphonium sounds taken from areas earlier in the work. A tempo is suggested by the composer; however, Copeland has allowed for an artist’s freedom, in that the next triggered event is at the discretion of the performer. During the first “freely” section, the euphonium is presenting material that was first notated in the introduction of piece. This material transforms into the more aggressive material in transition number one. Figure 37 is an image displaying the “freely” section as well as a highlighted marker showing the composers instruction of this section at the discretion of the performer.
Transitional material immediately follows the “freely” portion of section A. The transitional material continues to stay in the tonic key of E-flat major; however, throughout the duration, the material quickly shifts to the key of B-flat minor. This section of the piece is angular in comparison to the lyrical stated at the beginning of the work. Copeland utilized the angular and more aggressive nature of compound time signatures such 5/8 and 7/8, allowing for the eighth-note to come to the point of focus, as opposed to the quarter-note. The thirteen-measure transition material contains the first set of repeated accents throughout the entire work. These accents allow for a shift throughout each compound meter. The last three measures of the transitional material begins with the triggering of an event in the provided Max patch, as well as a quick accelerando into section B of the piece. Figure 38 is an image showing the transitional material with highlighted sections bring to attention the triggered event in sync with the quick accelerando.

Figure 38. Brett Copeland: Warrior, page 2

Section B of Warrior begins in measure fifty with the suggested tempo of quarter-note equals 108. The suggested tempo by the composer is provided so that the euphonium and an electronic hit sync towards the end of the B section. The material provided in
section B is aggressive in nature and distant in tonality. Section B is pitched in the key of B-flat minor and explores the B-flat Lydian scale by adding the raised fourth in the key of B-flat. This section in particular is where the composer chose to present both the aggressive B section material and the more lyrical chorale content from the introduction and section A. Notated in the live euphonium part is the more aggressive material, while the Max patch provides aspects of pre-recorded tuba sounds in a more chorale-like characteristic. These contrasting characteristics in the piece communicate throughout the duration of section B. Figure 39 is an image showing the first twelve measures providing the aggressive notation and tonality, as well as the short motives that expand throughout the remainder of the piece.

Figure 39. Brett Copeland: *Warrior*, page 2

Smaller climactic moments occur throughout section B and the transition into section A’. This section utilizes driving rhythms and mixed meter with the use of accent marks placed on the larger beats of each section, providing the performer and listener with steady pulse of where the music is heading. Copeland transitions between groups of four and three in order to reach the final climactic moment in the last measure of section
B. Figure 40 is an image showing the four measures preceding the final climactic moment of the piece, as well as the final distorted bass synthesizer entrance.

The final section of *Warrior* is designated as A’ and begins the final “freely” section of the work along with penultimate triggered event. This section utilizes the lyrical euphonium line along with the triggered long tones and drones in the electronic part. Section A’ does not consist of a suggested tempo if quarter-note equals 50; however, section A’ also contains an “at liberation” instruction by the composer. *Warrior* ends with the soloist playing a chorale-like melody taken from section A. The soloist triggers the final event of the patch, triggered to fade the electronics while the euphonium sustains the final pitch of the piece. Figure 41 is an image showing section A’ along with highlighted triggered sections.
Euphonium Part

Throughout the duration of this piece the euphonium is used as both a solo voice and as a source of accompaniment for the electronic part. Copeland utilizes various extended techniques for the euphonium including, breathing through the horn while depressing the valves half way, multi-vibrato, half-valve flutter tongue, and trills. *Warrior* begins with the sound of the electronic part with the solo euphonium breathing through the instrument while depressing the valves half way. This technique allows for the air passing through the horn to be more audible for the audience. The use of this technique by the composer is meant to create stress and angst while the electronics set up the atmosphere for the remainder of the piece. Figure 42 is an image depicting the composers use of both multi-vibrato and the technique of breathing through the horn utilized throughout the piece.
The remaining extended techniques used throughout *Warrior* are both the half-valve flutter and the whole-step trill. Both of these techniques are used as penultimate effects before the piece continues to the next section. Figure 43 is an image showing the composers use of the half-valve flutter, as well as the section that immediately follows.

Figure 44 is an image showing the first entrance of an elongated trill, ultimately used to create intensity for the section immediately following the written trill, as well as another instance of the composer’s use of the flutter-tongue technique.
Throughout the extent of the introduction of *Warrior* the solo euphonium line is used as a form of chant over top of the bass droning synthesizer. The use of the chant-like lines create a sort of contrast with the electronic part. As mention above, the use of flutter-tonguing is used to create tension right before the first entrance of section A. The euphonium part throughout the introduction outlines the harmonic content that is used throughout the duration of the piece. Figure 45 is an image of the introduction showing the beginning chant-like calls used in the euphonium line.
Immediately following the conclusion of the introduction in the metered entrance of section A. The electronic part creates a sort of accompanied line while the solo euphonium sings over top of the synthesizer accompaniment. The melody provided by the euphonium is lyrical in nature and contains eighth-note motives that are later transformed into triplets and sixteenth-notes. Figure 46 is an image provided highlighted sections indicating the notes that slowly transform throughout the duration of the chorale in section A.

![Figure 46. Brett Copeland: Warrior, page 1](image)

The chorale-like section indicated above continues throughout the duration of the first half of section A. While the main chorale theme transforms, the euphonium line in combination with the electronic accompaniment transforms into the piece’s first “freely” section. The composer chose to use a “freely” section to allow the solo euphonium a chance to act as the soloist while the computer records what the euphonium chooses to play. Throughout the “freely” section, the solo euphonium is instructed to play “at liberty”, while also exploring outside of the initial key of E-flat major. Figure 47 is an
image showing the first nine measures of the first “freely” section as indicated by the composer.

![Image showing the first nine measures of the first “freely” section as indicated by the composer.](image)

**Figure 47. Brett Copeland: Warrior, page 1**

Copeland chose to implement the use of a transition section in between section A and B that utilizes the harmonic content from the beginning of the piece, as well as the rhythmic content from the section that immediately follows the transition. The solo euphonium presents the first instance of the aggressive material present in both the transition and section B. The transition material present in the euphonium line contains accents and heavy articulations that help to transform the lyrical beginning into the aggressive and dominant B section. Figure 48 is an image showing the rhythmic transformation the solo euphonium line provides while staying in the tonic key of E-flat major until the euphonium begins to accelerando into section B.
Figure 48. Brett Copeland: *Warrior*, page 2

The solo euphonium line helps to provide the framework for the piece to accelerate into section B by the use of the repetitive figure shown above. The euphonium provides the initial melody heard in the introduction of section B. While the euphonium plays the driving rhythms throughout section B, pre-recorded tuba and human voice sounds play over top of the solo euphonium, providing a complete contrast to the rhythmic and aggressive euphonium line. At this point in the piece, the line between soloist and accompanist has been blurred by the composer’s use of the intertwined melody in both the euphonium and electronic line, as well as the use of both the lyrical chorale-like melody in combination with the aggressive melody. The aggressive melody in combination with the electronic chorale occurs until the climactic point of the piece, right before transitioning into the final section of the piece. Figure 49 is an image showing the euphonium line throughout the first half of section B.
The euphonium line brings section B to a close with a climactic hit alongside the electronic part. The euphonium is instructed to decrescendo into the first figure in section A’. The euphonium line is used as a harmonic and rhythmic transition into the final section of the piece. Section A’ is an elongated version of the latter half of section A. Copeland utilizes the sound of the euphonium to bring the chaos that had ensued from the prior section to a calm by allowing the solo euphonium to play at the performer’s liberty. This section is without a defined tempo despite the suggested tempo mention at the beginning of the final section. Figure 50 is an image showing the lyrical euphonium line while the electronics slowly fade out underneath the solo line.
Electronic Part

Warrior’s electronic patch was written using Max and utilizes pre-recorded tuba sounds, synthesizers effects and live-recorded euphonium sounds produced by the performer. Provided on the score are cue numbers (ascending) for the performer, that are to be triggered when reached. In addition to each triggered event, the composer provided second-markers that allow for the performer to easily track certain sections of the piece. The tracking of each section allows for the performer to accurately time out each triggered event. Provided in figure 51 below is an image of the electronic interface that is visible to the performer, or the person running the electronic median. Per instructed by the composer, the performer is allowed to have another person run/operate the Max patch to allow for ease of performance. Within the interface are three sections: a description of triggered events, triggering method (labeled spacebar), as well as specific levels that allow for the performer to control the gain and output of each speaker being used to perform this piece.
As seen in Figure 51, the patch provides three level markers showing in stripped green that allow for the performer to control the levels of input and output of the overall patch. Located in light grey and off to the lower right hand corner are buttons that indicate what the patch is triggering while the piece is playing through. The composer provides three blank buttons that are to be checked off at the beginning of the piece that are in direct correlation with the input and output levels. The last button on the patch that the performer needs to be aware of is the trigger button, labelled “spacebar”. This button can be pressed in order to trigger the next even in the patch sequence, or the performer can push the physical spacebar on the computer to trigger the next event.

The introduction of this piece begins with the performer triggering the first event of the piece. The electronics being triggered are computer generated synthesizer sounds
that help to create the atmosphere for the beginning of *Warrior*. At this point in the work, the electronics are marked by the provided second-marker on the score. While the electronics produce distorted drones in the background, the soloist is notated to quietly perform a chant-like melody over the provided computer generated synthesizer chords. Figure 52 is an image showing the notated computer line throughout the introduction of *Warrior*.

![Figure 52. Brett Copeland: Warrior, page 1](image)

The conclusion of *Warrior*’s introduction brings with it the first metered entrance of the electronic part. Throughout the duration of the metered section in A, the electronics act as the harmonic and rhythmic meter for the euphonium. Once four measures have sounded in the electronic at section A, the performer is requested to trigger the next patch trigger, this trigger is labelled with the number two inside of a circle. At this point in the piece the electronic part simply plays out until measure twenty-seven, where the next triggered event takes place. Figure 53 is an image showing the electronic part (synthesizer) at section A along with the beginning of the second triggered event.

![Figure 53. Brett Copeland: Warrior, page 1](image)
Several measures before the beginning of the transition section, the electronics begin to fade out and allow for the first marked “freely” section. At this point in the piece, the electronics are utilized as a form of recording and playback software that plays throughout the duration of trigger three, which takes place in measure twenty-eight. The electronics produce live recorded sounds as well as bell-tone sounds while the euphonium plays a lyrical solo line over the recorded sounds. The “lyrical” section of the piece transforms right into the transitional material before section B. Throughout the duration of the transition material, the electronic part seems to be absent, allowing for the euphonium to provide the transition into the fourth patch triggered event in measure forty-seven.

Triggered event four is immediately followed by the sound of a bell in the electronic part, which immediately transitions into section B of the piece. Section B of Warrior contains the majority of the electronic conversations between the computer and the solo euphonium. This section in comparison to the introduction and section A contain pre-recorded human voice, pre-recorded and digitally altered tuba sounds, and white noise throughout the section’s entirety. The climax of the piece occurs in section B with a distorted bass drone in the Max patch, the same drone that opens the entire piece. Figure 54 is an image showing the use of the electronics component in the climax of Warrior.
Once the completion of Warrior’s climax in measure eighty-five occurs, section A’ takes place, the electronic part immediately thins in texture, drops in character and dynamic. The fifth triggered event in section A’ is marked as “freely”. The electronic part contains various long tones, drones, and bells that continuously fade out until the completion of the piece with the activation of the sixth trigger. The electronics act as a tonal blanket for the performer to comfortably perform above the electronics. Section A’ winds down in character and and dynamic as the electronics are triggered to completely fade out. Figure 55 is an image showing the electronics final triggered event.

Figure 55. Brett Copeland: Warrior, page 3

Potential Performance Issues and Suggestions

Potential performance issues are very limited within the context of Warrior. The use of electronics in this composition are used to enhance the effect that the composer is trying to rely onto the audience. Events are marked with clear event circles and each
event is triggered by the performer. Not only are the events clearly marked but the composer provides an understandable time frame for when each event is to be triggered in order to move smoothly into the next section of the piece. Copeland provides second-markers for the performer to use as a tracking device while the patch moves through each event. This added sense of flexibility allows for the piece to evolve at the preferred rate of the performer.

*Warrior* does contain a timing issue when triggering each event. The triggered sound files when not played in time will not line up with the written euphonium part. When following the concise instructions provided by the composer, a performer will likely find the piece to be easily navigated and performed. Other than the basic timing of the electronic counterpart with the live euphonium, there seem to be little, if no performance issues when it comes to operating and interacting with the computer program.
CHAPTER 9

CONCLUSION

Since the early works such as John Boda’s *Sonatina for Euphonium and Synthesizer* the exploration electronics and technology has been used to advance the way performers perceive, interpret and perform contemporary music. The visual-based music programming language has made it more accessible for both the composer and performer. Max/MSP has allowed for each of the pieces mentioned above to flourish and become a physical product. Since the creation of the first piece for euphonium and electronics had been established in 1970, possibilities for music using electronics has expanded to allow for such pieces as Justin Rito’s *Zero Circle*, Brett Copeland’s *Warrior* and Grant Jahn’s *Petrichor*.

It is the authors hope and intention that throughout these three compositions, the project has demonstrated the use of innovative technologies, methods of composition and performance, and allowed for this genre to be more openly explored in the future.
REFERENCES


APPENDIX A

LIVE RECORDINGS OF GRANT JAHN’S “PETRICHOR,” JUSTIN RITO’S “ZERO CIRCLE,” AND BRETT COPELAND’S “WARRIOR”

[See Attached Files]
APPENDIX B

LIST OF KNOWN WORKS FOR EUPHONIUM AND FIXED MEDIA
- *Echanges* – Vinko Globokar (1975)
- *Alter Ego* – George Heussenstamm (1978)
- *Dream Sequence* – Merlin Patterson (1981)
- *Differentia* – Aris Carastathis (1987)
- *Night Song* – Neal Corwell (1989)
- *Odyssey* – Neal Corwell (1990)
- *Distant Images* – Neal Corwell (1992)
- *Meditation* – Neal Corwell (1992)
- *Aboriginal Voices* – Neal Corwell (1994)
- *Simyeh* – Neal Corwell (1994)
- *Solvejg’s Song Fantasy* – Edvard Grieg (1994)
- *Black Moon Rising* – Neal Corwell (1997)
- *Heart of the Wolf* – Neal Corwell (1998)
- *2AM* – Neal Corwell (1998)
- *Quiet Mountain* – Neal Corwell (2000)
- *Breathing Room and Breathing Room: Radiators* – D. Edwards David (2001)
- *Dandy Noodles* – Neal Corwell (2001)
- *Let There Be Funk for Tuba or Euphonium with Digital Playback* – D. Edwards David (2001)
- *Floating Dreams for Euphonium and CD* – Peter Meechan (2008)
- *Hummingbrrd* – Steven Bryant (2012)
- *Nightwalker for Euphonium and Backing Track* – Kit Turnbull (2013)
- *Soldier’s Lullaby for Euphonium and Electronics* – Alex Mitchell (2013)
- *A Night Devoid of Stars for Euphonium and Digital Playback* – Peter Meehan (2014)
- *Basic Research 1 for Euphonium and Fixed Electronics* – Jake East (2014)
- *Susurrations for Euphonium & Electronics* – David Thornton (2014)
- *Yatsar for Euphonium and Electronics* – Jason Post (2014)
- *Disquiet for Euphonium and Fixed Media* – Matt Murchison (2016)
- *Terminal Intelligence for Euphonium and Fixed Media* – Matt Murchison (2017)
APPENDIX C

LETTERS OF PERMISSION
April 9, 2017

Dear Brett Copeland,

I am completing a Doctoral Research Project at Arizona State University entitled “Euphonium and Interactive Electronics: A Performers Examination of Three New Works for Euphonium and Electronics,” I am seeking permission to include excerpts from your piece “Warrior” in my research paper. Score excerpts from “Warrior” will be included in chapter eight.

The request of permission extends to future revisions of my research paper, including the prospective publication of the document by UMI. These rights will not restrict the publication of the material by you or others authorized by you. The signing of this letter confirms that you own the copyright to the material in question.

If these terms meet your approval, please sign below where indicated. Thank you.

Sincerely,

Danielle Duron-VanTuinen

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

Brett Copeland

Date: 4-10-2017
April 9, 2017

Dear Justin Rito,

I am completing a Doctoral Research Project at Arizona State University entitled “Euphonium and Interactive Electronics: A Performers Examination of Three New Works for Euphonium and Electronics,” I am seeking permission to include excerpts from your piece “Zero Circle” in my research paper. Score excerpts from “Zero Circle” will be included in chapter Six.

The request of permission extends to future revisions of my research paper, including the prospective publication of the document by UMI. These rights will not restrict the publication of the material by you or others authorized by you. The signing of this letter confirms that you own the copyright to the material in question.

If these terms meet your approval, please sign below where indicated. Thank you.

Sincerely,

[Signature]

Danielle Duron-VanTummen

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

[Signature]

Justin Rito

Date: April 9, 2017
April 9, 2017

Dear Grant Jahn,

I am completing a Doctoral Research Project at Arizona State University entitled “Euphonium and Interactive Electronics: A Performers Examination of Three New Works for Euphonium and Electronics,” I am seeking permission to include excerpts from your piece “Petrichor” in my research paper. Score excerpts from “Petrichor” will be included in chapter four.

The request of permission extends to future revisions of my research paper, including the prospective publication of the document by UMI. These rights will not restrict the publication of the material by you or others authorized by you. The signing of this letter confirms that you own the copyright to the material in question.

If these terms meet your approval, please sign below where indicated. Thank you.

Sincerely,

Danielle Duron-VanTuinen

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

Grant Jahn

Date: 4/9/17

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BIOGRAPHICAL STATEMENT

Danielle VanTuinen is a low brass performer, music educator, and arranger based in Phoenix, AZ. She currently serves as a Graduate Teaching Assistant in Tuba and Euphonium at Arizona State University, where she is the tuba/euphonium instructor of the Brass Methods courses and private lessons instructor. In addition to her appointment at Arizona State University, Ms. VanTuinen is the low brass instructor with the Phoenix Youth Symphony, a nationally-recognized program for elementary, middle and high school musicians. She is also a founding member of the Moreau|VanTuinen Duo, a contemporary percussion/euphonium duo aimed at education and the commission of new works. Danielle is currently working towards a Doctorate of Musical Arts degree in Music Performance from Arizona State University, and holds a Master of Music degree in Music Performance from Arizona State University and a Bachelor of Music degree in Music Performance from Central Michigan University.