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The Electric Marimba: A Study Of Selected Works For Marimba With Electronic Effect

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THE ELECTRIC MARIMBA: A STUDY OF SELECTED WORKS FOR MARIMBA WITH ELECTRONIC EFFECT

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ABSTRACT

Over the course of the last century, literature for the solo marimba has been greatly expanded by a wide variety of composers to include nearly every contemporary style and genre. One such area of expansion is the use of electronic effect, defined as the augmentation of the acoustic marimba using looping and delay technologies in live performance. This study illuminates the history of electronic effect technology and briefly describes the technological options employed in the genre of marimba with electronic effect. Concepts specific to the genre are also addressed; specifically, the terminology of rhythmic delay and harmonic delay. To introduce these concepts, two works by Australian composer Nigel Westlake are discussed: *Fabian Theory* (1987) and *The Hinchinbrook Riffs* (2003). A brief analysis of these works illustrates the concepts of rhythmic and harmonic delay in action. In addition to these works, two compositions commissioned as a part of this study are also analyzed to show the structural importance of rhythmic and harmonic delay: *chasing the mania* (2015) by Brett William Dietz and *Plasma Trails* (2015) by George Fetner. Finally, the study of two areas of potential growth in the genre – the transcription of music for acoustic guitar and electronic effect, as well as the application of delay and looping technologies to music not originally composed for these technologies – helps to bolster and sustain the genre of marimba with electronic effect for the foreseeable future.

TABLE OF CONTENTS

ACKNOWLEDGEMENTS iii

ABSTRACT iv

LIST OF FIGURES vii

LIST OF MUSICAL EXAMPLES viii

FOREWORD ix

CHAPTER ONE: INTRODUCTION 1

1.1 PURPOSE OF THE STUDY, NEED FOR THE STUDY 2

1.2 REVIEW OF RELATED LITERATURE 3

1.3 METHODOLOGY OF THE STUDY 5

CHAPTER TWO: RESEARCH 9

2.1 A BRIEF HISTORY OF ELECTRONIC EFFECT TECHNOLOGY 10

2.2 EXAMPLES OF EFFECT TECHNOLOGY 18

2.3 THE PRESENT DAY GENRE OF MARIMBA WITH ELECTRONIC EFFECT 21

CHAPTER THREE: THE MUSIC OF NIGEL WESTLAKE
Fabian Theory and *The Hinchinbrook Riffs* 23

3.1 *FABIAN THEORY*: AN INTRODUCTION TO RHYTHMIC AND HARMONIC DELAY 23

3.2 *THE HINCHINBROOK RIFFS*: A COMPARISON ANALYSIS 29

3.3 THEORY OF RHYTHMIC AND HARMONIC DELAY 35

CHAPTER FOUR: COMPOSITION 38

4.1 *CHASING THE MANIA*: BACKGROUND AND ANALYSIS 38

4.2 *Plasma Trails*: Background and Analysis 45

4.3 Techniques of Rehearsal and Performance 53

Chapter Five: Conclusion 56

5.1 The Genre of Acoustic Guitar with Electronic Effect 56

5.2 Music to Which Electronic Effect Technology Can Be Added 58

5.3 Final Thoughts 61

Bibliography 64

Appendix A – Rhythmic and Harmonic Delay Exercises 67

Appendix B – Recital Programs 71

LIST OF FIGURES

Figure 2.1 The Copicat, as used in the late 1950's/early 1960's 17

Figure 2.2 Boss DM-1 Delay Machine 18

Figure 2.3 Max/MSP user interface, featuring a delay patch 20

Figure 4.1 Form of *chasing the mania* 41

Figure 4.2 Max/MSP interface screen for *Plasma Trails* 47

Figure 4.3 Form of delay in *Plasma Trails* 49

Figure 5.2 Max/MSP Patch for *Bloom Suite* 60

LIST OF MUSICAL EXAMPLES

Example 3.1 Selected Delay Types in *Fabian Theory*, m. 1-2 and m. 96 25

Example 3.2 "Doubling" in *Fabian Theory* m. 110-111 26

Example 3.3 *Fabian Theory* m. 34-35 27

Example 3.4 Rising Line with Resultant Pitches from Delay, m. 34-35 28

Example 3.5 Rhythmic Delay from *Fabian Theory* and *The Hinchinbrook Riffs* 30

Example 3.6 Example of triplet resultant rhythm:
The Hinchinbrook Riffs, m. 35-37.....31

Example 3.7 Rhythmic and Harmonic Delay in tandem,
The Hinchinbrook Riffs m. 69-71.....32

Example 3.8 Written out harmonic delay (m. 69-71) from
The Hinchinbrook Riffs 33

Example 4.1 Rhythmic Thickening in *chasing the mania*, m.1-3 and m. 37-39 42

Example 4.2 Rhythmic Delay Rectification, *chasing the mania* m. 50-52.....43

Example 4.3 New Pulse of Rhythmic Delay, *chasing the mania* m. 77-81.....44

Example 4.4 First use of Rhythmic Delay in *Plasma Trails*, m. 14-15 50

Example 4.5 Rhythmic Delay in C section, *Plasma Trails* m. 51-52.....52

Example 4.6 Polyrhythmic delay use, *Plasma Trails* m. 127 53

Example 5.1 Potential for Delay in *Bloom Suite*, m. 1-2 59

FOREWORD

This document is part of the dissertation requirement for the Doctor of Musical Arts Degree in Performance. The major portion of the dissertation consists of four public recitals. Copies of the recital programs are bound at the end of this paper, and recordings of the recitals are on file in the Music Library.

CHAPTER ONE

INTRODUCTION

The marimba is one of the earliest melodic percussion instruments.[1] Though its true location of origin is unknown, the instrument can be traced back to Africa and Asia as early as the 14th century. The marimba is also found in South America, arriving there from Africa in the 16th century. The early marimba served a societal role and was played at weddings, funerals, and other cultural celebrations both large and small. Its usage was secular as well as sacred, though the breadth of its influence was limited to the cultures in which it existed. It is not until the mid-to-late 20th century that the marimba begins to appear on a worldwide scale as a solo instrument.[2]

In the last half-century few instruments have experienced more growth in both performance technique and repertoire. This is due in part to the resourceful nature of the instrument. Possessing an abundance of mallets in many different shapes and sizes, the marimba can be strong and articulate in one piece while chorale-like in another. The marimba also functions well in both solo and ensemble situations, complementing the

[1] Daniel Rager, "The History of the Marimba," Music Faculty Publications, http://engagedscholarship.csuohio.edu/clmusic_facpub/1 (accessed May 27, 2015).

[2] Yi-Chia Chen, "A Catalog of Solo Works for Marimba with Electronics and An Examination and Performance Guide of 'Flux' for Marimba and Electronic Tape by Mei-Fang Lin" (DMA diss., Arizona State University, 2011), http://www.proquest.umi.com (accessed March 12, 2014), i.

sounds of both wind and string instruments with its warm, supple tone. As an acoustic instrument the marimba is well-entrenched in the modern percussion repertoire. Yet there is one area of growth in which music for the marimba has yet to truly embrace – electronic augmentation.

1.1 PURPOSE OF THE STUDY, NEED FOR THE STUDY

The rise of technology in music runs nearly parallel to the growth in popularity of the marimba. From the early 20th century, composers of all backgrounds began to experiment with the use of technology to alter and augment the sound of acoustic instruments. Interestingly, though, the marimba has experienced little growth in this broad area. According to Michael Ptacin, music featuring the solo marimba with electronics (either in the fashion of augmentation or accompaniment) has been a technique of composition for approximately 35 years.[3] In those 35 years much has changed in the world of technology. The technology needed to perform these works has become much more accessible in terms of physical size and financial responsibility, and advancements in the manipulation of that technology have allowed composers to become more sophisticated in their experimentation. Still, very little is known about the use of electronic technology in marimba composition. Even less literature has been composed for the *electric* marimba – that is, music written to augment the acoustic sound of the marimba through the use of electronic effect, defined here as delay and looping technologies. This idea is very similar to the type of effect technologies used by electric guitar players, although the true acoustic sound of the marimba is not lost in the process of augmentation. This genre of marimba with electronic effect represents a concept that

[3] Michael Ptacin, "An Annotated Bibliography of Works for Solo Marimba and Electronics Published from 1978-2012" (DMA diss., University of North Carolina at Greensboro, 2013), http://www.proquest.umi.com (accessed March 12, 2014), 1.

can be both a compositional style as well as a performance technique. Experimentation with each aspect can bring many different musical experiences to the listener as well as the performer.

1.2 REVIEW OF RELATED LITERATURE

Just as there are few compositions for the genre of marimba with electronic effect, there is also very little research regarding the genre. However, a growing body of research into the use of general electronics and the marimba is beginning to emerge. Much of this research has occurred within the last decade, as the popularity of marimba with electronics has risen. In "Rockin' Marimba,"[4] Martha Cipolla delves into the techniques of coupling marimba with "rock" instruments such as the electric guitar, bass, and drumset. Her focus in this brief article is to show that the marimba can be used in a more multimedia setting through the use of amplification and creative instrumentation. Both of these ideas relate directly to this study, as they deal with manipulating the marimba in an electronic setting. However, the article does not feature any investigation into techniques of composition and Cipolla's focus is much broader than simply electronic effects.

Moving away from marimba in popular music, few scholars have chosen to undertake the task of identifying and cataloging music for marimba and electronics. Yi-Chia Chen's 2011 dissertation entitled "A Catalog of Solo Works for Marimba with Electronics and an Examination and Performance Guide of "Flux" for Marimba and Electronic Tape by Mei-Fang Lin"[5] is one example of this task. Although Chen spends a great deal of the dissertation discussing the work of one specific composer, the second

[4] Martha Cipolla, "Rockin' Marimba," *Percussive Notes* 45, no. 2 (April 2007), http://www.pas.org/publications (accessed March 12, 2014).

[5] Yi-Chia Chen, "A Catalog of Solo Works for Marimba."

chapter of the document features an extensive list of music written for the marimba and electronics. This document is extremely useful in this study, as it provides a single location in which many if not all of the works composed for marimba and electronics can be found. The list is organized chronologically, and each work is classified by the type of electronics used (tape, effect, or live electronics). Michael Ptacin delves even further into this approach in his dissertation titled "An Annotated Bibliography of Works for Solo Marimba and Electronics Published from 1978-2012."[6] Ptacin's annotations separate his work from that of Chen in that they help to describe and define the piece more so than just identifying the work, adding another level to its usefulness in this study. Through the broad lenses portrayed above, each of these scholarly efforts helps to create the dimensions for a more refined study of marimba and electronic effects.

Other research has centered on a specific composer or performer that features electronics prominently in his or her music. One such person is percussionist Nathaniel Bartlett. Kurt Gartner discusses Bartlett at length in his article "Nathaniel Bartlett: Modern Marimba3 – Combining Marimba and Computer Generated Sounds."[7] Bartlett's approach to the marimba is similar to this study, as he also values the unique acoustic sound of the marimba in his music. However, Bartlett's approach to the use of electronics is different as he employs mainly computer-generated sounds as accompaniment for his works and performances. His techniques for amplification are

[6] Michael Ptacin, "An Annotated Bibliography of Works for Solo Marimba and Electronics."

[7] Kurt Gartner, "Nathaniel Bartlett: Modern Marimba3 – Combining Marimba and Computer Generated Sounds," *Percussive Notes* 46, no. 2 (April 2008), http://www.pas.org/publications (accessed March 12, 2014).

also very interesting, and may even help to define the parameters for electronic output in performance of marimba music with electronic effect technology.[8]

1.3 METHODOLOGY OF THE STUDY

This study is comprised of five chapters that define and construct the genre of marimba with electronic effect. It is important to note that due to the overwhelming number of potential possibilities in computer-enhanced compositions and performances, this study will focus solely on those that feature electronic effect technologies, previously defined as the use of loop and delay effects manipulated either by pedal (hardware) or through the computer itself (software). The reason for this specificity is to allow the acoustic sound of the marimba to retain its prominence while the electronics assist the instrument in performance. This means that music featuring marimba and CD, tape, electronic sounds, or other electronic contributions is not found in this study, though it is not the author's intent to diminish their importance by their omission. This also includes music composed for other keyboard percussion instruments (such as the xylophone, glockenspiel, and vibraphone) and electronic effect, although the potential for further research into this sub-genre still exists.

The overall structure of the study is centered on two main ideas: *Research* and *Composition*. Research focuses on investigating and illuminating the current use of electronic effect technologies in music composed for marimba. This establishes the techniques associated with this type of composition while also revealing the current repertoire of the genre. Composition offers a more hands-on approach to the genre of marimba with electronic effect through the commissioning of two new works to the

[8] Nathaniel Bartlett, "Sound Space Audio Lab," Nathaniel Bartlett, http://www.nathanielbartlett.com (accessed March 11, 2014).

growing repertoire. Also included in Composition are exercises engineered to help encourage the development of skills needed to perform the music of the genre. Whereas Research defines the genre of marimba with electronic effect, Composition creates musical offerings that elevate the genre to a more visible level amongst percussionists worldwide. With an increase in visibility comes an increase in involvement, especially amongst composers and other performers who may be interested in experimenting with this type of technology. This experimentation further expands and invigorates the genre of marimba with electronic effect.

Each chapter of the study involves the ideas of Research and Composition as a structure to help understand the genre of marimba with electronic effect. This chapter (Chapter One) serves as the introduction, containing an explanation of the purpose of the study, the need for the study, the limitations of the study, the related literature, and the methodology of the study. Chapter Two begins the Research portion of the study, featuring a brief discussion of the timbral aspects of the marimba and how the use of electronic effect technologies can augment the acoustic sound of the instrument. This chapter also includes the short list of compositions that populate the current genre of marimba with electronic effect as a background for the discussion of future compositions. Knowledge of the technology needed to execute the music of the genre of marimba with electronic effect is a must. Chapter Two satisfies this need with a simple discussion of the technology involved in the genre. This includes the use of different types of pedals, as well as a basic knowledge of the software options that can be used to manipulate effect technologies. Chapter Three closes the area of Research, featuring the analysis of two pieces of music from composer Nigel Westlake, *Fabian Theory* and *The Hinchinbrook*

Riffs, composed for the marimba with electronic effect. These works represent two types of compositions for the genre of marimba with electronic effect, which are defined in this study as *rhythmic* and *harmonic*. These terms refer to the manner in which the composer uses delay effects in the work. Rhythmic delay prioritizes the rhythm created by the delay effect, while harmonic delay often features more vertical, harmony-like structures created by the delay effect. Both rhythmic and harmonic delay can be found within the confines of a single piece, though often a single type of delay defines the majority of the composition. Characteristics of both types of delay can be found in each of Westlake's works, and their inclusion provides evidence that can help analyze and classify other works in the genre of marimba music with electronic effect.

Chapter Four comprises the Composition portion of the study. The chapter begins with a methodological approach to creating music for the genre of marimba with electronic effect through a brief analysis of the works commissioned for this study: *chasing the mania* by Brett William Dietz, and *Plasma Trails* by George Fetner. Each composer represents a unique approach to the music of this young genre. Brett William Dietz is a percussionist whose compositions often feature complex rhythmic interactions. Though he has experience composing with electronics, this is his first work for marimba and delay. George Fetner is a guitarist with a considerable amount of experience in the use of delay and looping effects. As a guitarist, his music is more melody-driven, though his use of less common meters such as 5/16 and 7/16 does create interesting rhythmic features. Their compositions for this study are based on a given set of simple instructions: the piece should be for solo marimba, between five and eight minutes in length, and it must feature delay and/or loop effect technologies. The choice of

technology is left to the composer, as is the overall structure of the composition. Chapter Four also includes a short discussion on developing the technique necessary to play the music of the genre of marimba with electronic effect. An appendix at the end of the study contains technical exercises created expressly to address these concepts, as well as suggestions for further technical development.

Chapter Five serves as a conclusion to the study and illustrates two potential future applications for the genre of marimba with electronic effect. The first application involves the transcription of music for acoustic guitar with electronic effect. The previous analysis of Nigel Westlake's music in Chapter Three exposed concepts that can be found in music for both the marimba and the guitar, as well as the timbral similarities inherent in the two instruments. In fact, *The Hinchinbrook Riffs* is a transcription from one of Westlake's original guitar works, and the musical content and effect technologies experience little change when migrated from the guitar to the marimba.[9] The transcription of music composed for the acoustic guitar with electronic effect has the potential to bolster the small yet significant collection of works composed for marimba with electronic effect. The second application is far rarer. It deals exclusively with music composed for marimba that does not already contain any electronic augmentation, but to which electronic effect technology can be added. One excellent example of this is Elliot Cole's *Bloom Suite*, movement I. This section of Chapter Five shows how to apply electronic effect technology to *Bloom Suite*, which creates a unique cross-genre musical composition. It also illustrates the impressive flexibility of the genre of marimba with electronic effect in both experimentation and, ultimately, realization.

[9] Nigel Westlake, "The Music of Nigel Westlake," Rimshot Music, http://www.rimshot.com.au (accessed March 12, 2014).

CHAPTER TWO

RESEARCH

In the right performance space, the marimba can be an instrument of great sensitivity. Nuances in both timbre and weight can be expressed through careful selection of mallets, proper technique, and even physical deftness. Unlike wind and string instruments, however, the marimba is very limited in its options for note length. Except in the case of a roll,[10] the duration of a note on the marimba is limited to the overall resonance of the bar after it is struck. This is usually very brief, and variables such as the type of wood the bars are made of as well as the environment the marimba is in have only a small effect on that length. Interestingly, though, it could be argued that this nature lends well to the application of electronic effect, as both delay and looping technology can be clearly articulated through the music without distorting the acoustic sound of the instrument.

There are two paths by which the composer/performer can use electronic effect in music. These paths can most easily be seen in the use of delay, though the following definitions also apply to looping as well. Analog delay is the simplest type of delay, but also offers a very narrow field of control over the length of delay. In analog delay the sound signal is converted onto magnetic tape, which is fed through the effect device

[10] A roll in percussion can be defined as the method of employing rapid single strokes to achieve as close to a sustained sound as possible.

unprocessed. This results in a sound that contains imperfections and is often described as being "warm and fuzzy."[11] This type of delay is most commonly associated with the "slap-back" guitar sound of 1950's rock-and-roll music. Digital delay offers a greater range of possibilities for manipulation and experimentation as well as a very clear and crisp sound quality. Digital delay begins as analog, and as the sound travels through the delay device part of the signal is converted from analog into digital, sampled at the higher digital bit rate, and then blended and converted back into the analog sound to create a cleaner overall sound quality. More discussion on the principles of both analog and digital delay will come later in this chapter, but it is important to note here that each type of delay requires some form of technology to create the desired effect. Through this technology the composer/performer can create, manipulate, and ultimately innovate the music they produce. And while the genre of marimba with electronic effect is very young, its roots may have been planted nearly 150 years before its first note.

2.1 A BRIEF HISTORY OF ELECTRONIC EFFECT TECHNOLOGY

The writings and ideas of Ada Byron (Lady Lovelace) are some of the first mentions of computer music, though nothing like a computer existed in her time.[12] In 1843 she published a translation of an article describing the Analytical Engine, a calculating machine first conceived by Charles Babbage. This article, entitled "The Sketch of the Analytical Engine," contained not only her translation of the original article but also notes and musings of Lovelace's own concepts and feelings regarding the

[11] guitarplayer.com, "What's the Big Deal About Analog Delay Pedals?," New Bay Media, http://www.guitarplayer.com/guitar-player-101/1025/whats-the-big-deal-about-analog-delay-pedals/47925 (accessed December 18, 2015).

[12] Nick Collins and Julio d'Escrivan, ed., *The Cambridge Companion to Electronic Music* (Cambridge: Cambridge University Press, 2009), 12.

workings of the machine. Andrew Hugill, writing in the Cambridge Companion to Electronic Music, describes Lovelace's ideas in this way:

> Her writings, although scientifically and technically grounded, display the same tendency to Romantic vision as those of her own father, the poet Lord Byron.[13]

And truthfully, her approach was nothing short of revolutionary. Lovelace postulated that the machine, whose original intent was mathematical, could be used for many other things, including the composition of music.

> Again, it might act upon other things besides number, were objects found whose mutual fundamental relations could be expressed by those of the abstract science of operations, and which should be also susceptible of adaptations to the action of the operating notation and mechanism of the engine. Supposing, for instance, that the fundamental relations of pitched sounds in the science of harmony and of musical composition were susceptible of such expression and adaptations, the engine might compose elaborate and scientific pieces of music of any degree of complexity or extent.[14]

This passage above seems to describe something akin to our modern computer: a device with seemingly boundless potential. Add to this the fact that Lovelace addresses the musical implications of such a device, and its importance to the idea of electronic music is that of a spark that starts a fire. While the Analytical Engine was never fully realized, Lovelace's ideas stoked the growing fire of possibility that existed in music during the time of the Industrial Revolution.

By the turn of the 20th century, electronic instruments began to appear with greater regularity in popular music. These instruments heralded the coming of a new

[13] Ibid., 12.
[14] Fourmilab, "The Sketch of the Analytical Engine," https://www.fourmilab.ch/babbage/sketch.html (accessed January 6, 2016).

approach to music, most evident in the writings of the Futurists. In his 1913 manifesto *L'arte del rumori* (The Art of Noises), Luigi Russolo attempted to categorize all types of sounds, including those often identified as noise. It is interesting to note that within Russolo's categorization of sounds he devoted an entire family of noises to those obtained by the use of percussion instruments, and it is this manifesto that is often regarded as the beginning of the modern percussion ensemble.[15] He even developed his own instrument to create his noises mechanically, which he called the *intonarumori*. Twenty-four years after Russolo, the percussionist and composer John Cage penned a famous lecture, which he stated in part his belief that:

> …THE USE OF NOISE…TO MAKE MUSIC…WILL CONTINUE AND INCREASE UNTIL WE REACH A MUSIC PRODUCED THROUGH THE AID OF ELECTRICAL INSTRUMENTS…[16]

The final part of this sentence is the most important for the genre of marimba with electronic effect; not that electronic instruments[17] would replace acoustic musical instruments, but that the electronics would become even more of a factor in the creation of new types of music. This idea is in many ways just as revolutionary as that of Ada Lovelace, and though it appears in an era where the technology to achieve such a goal is much more a reality than a dream, the importance of Cage's feelings as a prominent composer of the day cannot be overstated. It would not be long before looping and delay, the fundamental tenets of the genre of electronic effect, would come into being.

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[15] Larry Vanlandingham, "The Percussion Ensemble: 1930-1945," *Percussionist* 9, no. 3 (Spring 1972).

[16] John Cage, *Silence: lectures and writings* (Middletown, CT: Wesleyan University Press, 1961), 3.

[17] The term instrument here is used to describe an object or objects that act upon music, not the musical instruments themselves.

While the first uses of looping and delay would not occur until well into the 20th century, the birth of these effects can be traced back into the 19th century with the creation of two very important tools for recording. The end of the 19th century saw great advancement in the art of recording through the work of visionaries like Thomas Edison and Alexander Graham Bell. Their early inventions of the Phonograph and the Graphophone pioneered the use of wax and tin foil cylinders as recording and playback devices. In 1895 a German immigrant named Emile Berliner debuted a new type of recording medium – in his "Gramophone," the recording was done on a flat zinc disc as opposed to the much larger wax cylinders of the day.[18] The first uses of looping in music were achieved through the use of similar disc technology, and in fact composers such as Paul Hindemith (*Trickaufnahmen*, composed in 1930)[19] and John Cage (*Imaginary Landscape No. 1*, composed in 1939) used turntables and gramophones to achieve variable speed loops as early as the 1930s. Interest in turntable applications can even be traced to composers such as Darius Milhaud and Pierre Boulez. Robin Maconie, in her book "Avant Garde: An American Odyssey from Gertrude Stein to Pierre Boulez," even suggests that Milhaud brought the idea of sound looping with him to America in the 1940s.[20]

[18] The History of Sound Recording, "First Phonographs and Graphophones, and then Gramophones," http://www.recording-history.org/HTML/phono_technology4.php, (accessed January 5, 2016).

[19] Erica Jill Schienberg, "Music and the Technological Imagination in the Weimar Republic: Media, Machines, and the New Objectivity." (PhD diss, UCLA, 2007), http://www.proquest.umi.com (accessed March 28, 2016), 1.

[20] Robin Maconie, *Avant Garde: An American Odyssey from Gertrude Stein to Pierre Boulez* (Lanham: The Scarecrow Press, 2012), 155.

In 1928 another German man by the name of Fritz Fleumer would alter the world of music forever by inventing magnetic tape recording.[21] This idea was not uniquely Fleumer's – in fact, in 1888 Oberlin Smith, an American engineer, published an article in the journal Electrical World entitled "Some Possible Forms of Phonograph."[22] In the article Smith describes a mechanism through which "…a cord, string, thread, ribbon, chain, or wire, made wholly or partly of hardened steel…"[23] would travel and become magnetized.

> When in operation with the undulatory current from the telephone passing through the helix, the cord becomes, so to speak, a series of short magnets grouped into alternate swellings and attenuations of magnetism…The cord therefore contains a perfect record of the sound, far more delicate than the indentations in the tin-foil of the mechanical phonograph.[24]

Oberlin's "tape", and subsequently that of Fleumer as well, was delicate but produced recordings of very high quality. By the middle of the 20th century composers began to experiment with tape, first as a medium to accompany music with sounds, and later as a device to alter the perception of the music itself. It is in this environment that the prolific future of looping and delay effect technology in Western musical culture is conceived.

"In the 1960s tape – the essential tool of studio-based music from Stockhausen to the Standells – was reinvented as a performance instrument."[25] These are the words of Nicolas Collins, used to describe the first use of tape in live performance of Western

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[21] Collins and d'Escrivan, ed., *The Cambridge Companion*, 15.

[22] Oberlin Smith, "Some Possible Forms of Phonograph," *The Electrical World* (September 8, 1888), http://oberlinsmith.org/Library/Library-PDFs/The%20Electrical%20World%208%20Sep%201888.pdf (Accessed December 18, 2015).

[23] Ibid.

[24] Ibid.

[25] Collins and d'Escrivan, ed., *The Cambridge Companion*, 43.

music. The distinction of the first work to use tape in live performance can be applied to Mauricio Kagel's *Transicion II*, composed in 1959 for piano, percussion, and two tape recorders.[26] One of the tape decks contained pre-recorded music, recorded by the pianist and percussionist prior to the performance, to be played back during the live performance. The second tape deck recorded the live performance, and then was manipulated (by cutting and splicing) to create loops of the live performance that were then played back. The person(s) in control of the tape decks acted as a performer in the work, as they contributed to the live performance through the manipulation of the recorded material.

While *Transicion II* offers an example of early tape looping effect technology, at this time delay effects were achieved in much the same way. Two separate reel-to-reel tape decks were placed at a calculated distance from one another. One deck recorded live sound, while the other played the sound back. The time of the delay corresponded to the distance between the tape decks and the speed of the tape itself. This concept could be used to create "realtime counterpoint from live performance,"[27] though this approach did not offer a considerable amount of control over the sound of the delay. For example, *I of IV*, composed by Pauline Oliveros in 1966, uses tape delay to create very thick textures of music through the repetition of tones. Terry Riley also applies this technique to his piece *Poppy Nogood and the Phantom Band* (1969), although his piece sounds remarkably different than that of Oliveros. In *Poppy Nogood*, Riley's construction of the delay as well as his chosen melodies creates a unique accompaniment-like product. As the delay repeats, it acts as a countermelody (or counterharmony) to the acoustic playing that

[26] Peter Manning, *Electronic and Computer Music* (Oxford: Oxford University Press, 2004), 157.
[27] Collins and d'Escrivan, ed., *The Cambridge Companion*, 44.

follows. Collins describes this use of delay as "canonical," in direct contrast to that of Oliveros' accumulation of sound.

At the same time as Kagel, Oliveros, and Riley, the popular music of the 1950s and 1960s was experimenting with electronic effect in its own way. As the electric guitar grew in popularity during the 1950s, performers began to search for new ways to change and enhance their sound. Terms such as "phasing" and "flanging" became extremely popular, and they both refer to the creation of small time delay effects. Musicians manipulated these delays to change the way their sound was heard after it travelled through an amplification device; through these effects certain frequencies would be either amplified or cancelled out altogether, resulting in a much different "electric" sound than that of an acoustic guitar.[28] As experimentation continued, devices were created to allow musicians maximum manipulation of electronic effects. One of these was a device known as The Copicat,[29] and it still can be found in use today.

[28] Manning, *Electronic and Computer* Music, 170.
[29] Ibid., 169.

1961 Watkins Copicat
© 2010 Reg Goodwin, http://www.watkinsguitars.co.uk

Figure 2.1 The Copicat, as used in the late 1950s/early 1960s.

The Copicat, created by Charlie Watkins of Watkins Electric Music, was marketed as an analog echo device. It contained between three and five tape playback heads (seen in the above image against the long tape arc), and could create irregular patterns of delays. Technology such as the Copicat and other similar devices allowed musicians to more easily experiment with delay, looping, echo, and reverberation. The Beatles used tape loops on their album *Revolver* (1967), specifically in "I'm Only Sleeping" and "Tomorrow Never Knows." Brian Eno, in his solo piece *Discreet Music* (1975), uses both echo and delay in a style similar to that of Steve Reich.[30] These are just two of many examples of musicians experimenting with technology, and expanding the limitations of how music and electronics could communicate with each other.

[30] Ibid., 173.

2.2 EXAMPLES OF EFFECT TECHNOLOGY

By the end of the 1970s composers and musicians alike were moving away from analog effects and into the realm of digital electronics. Digital effect technology offered the musician a consolidated approach to using electronic effects. Through digital signal processing the effect functions that were before offered by multiple units could be combined into one device, and the potential for refined manipulation of these effects was much greater. While the list of digital devices that offer delay and looping technologies is too numerous for inclusion here, the reference of a few specific types of electronics may offer the reader avenues for exploration. These devices can be classified into two categories: pedals and software.

The DM-1 Delay Machine
© Roland Corporation

Figure 2.2 Boss DM-1 Delay Machine.

The most common pedal used for digital delay is manufactured by Boss. Boss, a division of the Roland Corporation, began making effects pedals in the late 1970s.[31] The first delay unit created by Boss was the DM-1 Delay Machine, available for purchase beginning in 1978. The DM-1 featured delay times of up to 500 milliseconds, although determining the precise speed of the delay was difficult given the lack of delay time information on the pedal itself. Beginning in 1983, the DD series of delay pedals created the first "stompbox" delay[32] which offered much more control over the delay time than previous models. Later models of delay pedals include an even more refined approach to controlling the delay (down to the precise number of milliseconds via a digital readout screen), as well as new technologies that allow musicians to reimagine the sounds of original analog and tape delay. The Boss DD-7 pedal even includes up to 40 seconds of looping effect recording, though the process to create the loop requires the manipulation of multiple knobs and can be cumbersome in performance.

The software category, however, eliminates the cumbersome nature of pedals and combines the possibilities of electronic effects into one simple to use package. The best example of this is the Max/MSP software, developed and maintained by Cycling '74. The software exists in two parts. Max, created in the mid 1980s by Miller Puckette, is a visual programming language for the creation of music and other media. It can interface with synthesizers and other electronic instruments through the use of MIDI. MSP (Max

[31] BOSS US, "Echoes In Time: The History of Boss Delay Pedals," Roland Corporation, http://www.bossus.com/blog/2015/11/11/echoes-in-time-the-history-of-boss-delay-pedals/ (accessed January 4, 2016).

[32] The term "stompbox" refers to a device, such as a pedal, that can be manipulated by the use of the foot to achieve some type of effect. The use of the term in electronic music culture may stem from the more common folk stompbox – a small wooden box musicians would "stomp" on to create rhythmic accompaniment.

Signal Processing), on the other hand, allows users to create/manipulate digital audio in real-time. An example of the user interface for the software can be seen in figure 2.3.

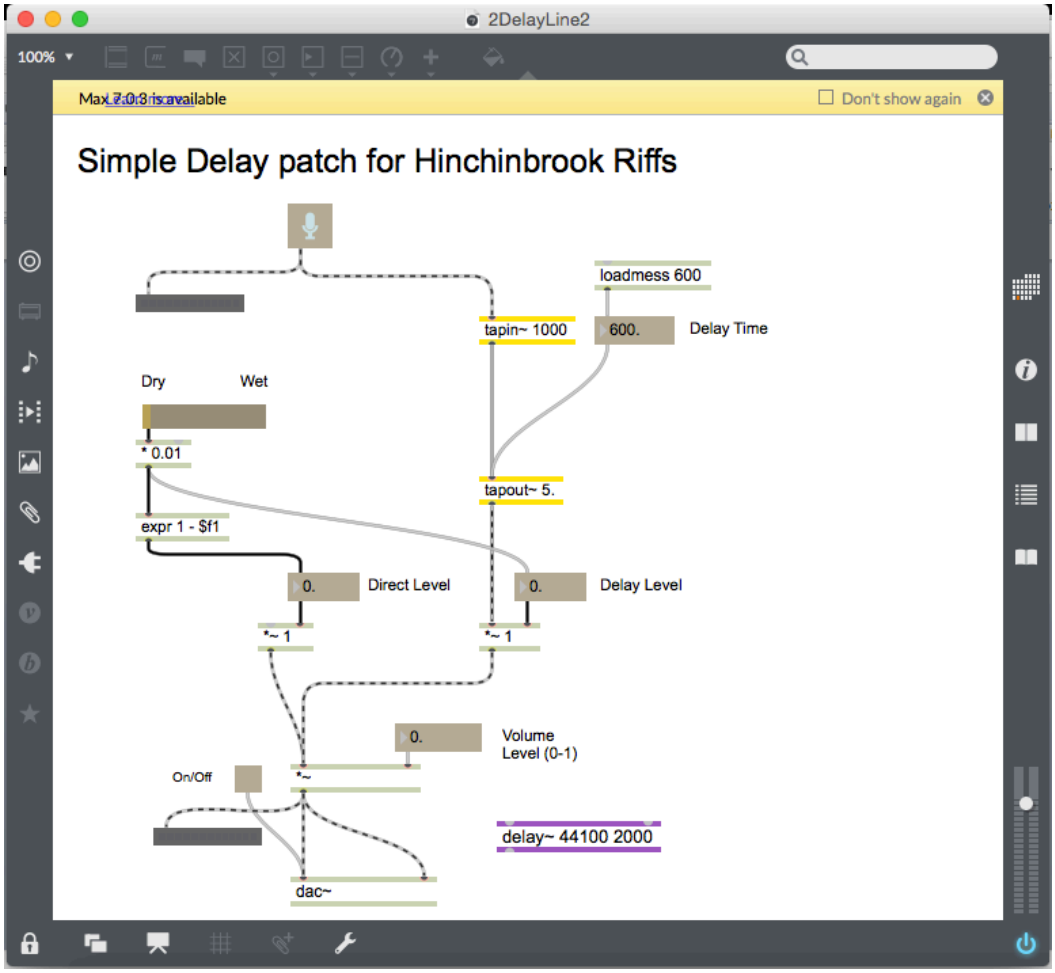


Figure 2.3 Max/MSP user interface, featuring a delay patch.

The Max/MSP interface is built around a large, empty box. This box is then filled with buttons, patch lines, and other devices to create whatever the musician desires. In this case, the patch is constructed to create a delay effect, and the elements that make up the patch allow the performer to adjust the volume, length, and aural saturation of the delay.

More so than pedals, the software allows the performer to have ultimate control over the effects themselves. With Max/MSP, the performer is physically creating the digital environment in which the effect is created. Further manipulation of the software is possible, and more information on the many uses of the Max/MSP software can be found in their immense library of documentation, which is a part of the software and is available to all users.

2.3 THE PRESENT DAY GENRE OF MARIMBA WITH ELECTRONIC EFFECT

The use of electronic effect technology in music composed for marimba begins in the 1980s and extends through to today. Table 2.1 shows the very brief list of compositions for marimba and electronic effect.

Table 2.1 Compositions for Marimba with Electronic Effect.

Compositions for the Genre of Marimba with Electronic Effect

Composition/Composer	**Effects Used**
Fabian Theory (1987) – Nigel Westlake	delay and loop
Mirrors of Emptiness (2008) – Grigory Smirnov	delay
Hinchinbrook Riffs (2009) – Nigel Westlake	delay (single)
chasing the Mania (2014) – Brett Dietz	delay
Plasma Trails (2015) – George Fetner	delay and loop

The first three works, composed over a twenty-year span, represent very different uses of electronic effect in composition. Both *Fabian Theory* and *The Hinchinbrook Riffs* will be discussed in more detail in Chapter 3, but they each contain unique applications of delay effect technology in marimba music. Smirnov's *Mirrors of Emptiness* is a lengthy study

on how the use of delay can alter how we hear certain rhythms and passages of music, not in a dissimilar way to the early minimalist tape-delay works of Riley, Oliveros, and others. The final two works are composed as part of this study, in an attempt to both develop the genre and also explore the possibilities of marimba and electronic effect.

Through this brief history of electronic effect technology and their predecessors, a background for the use of electronic effect in marimba music can begin to be seen. From the simplest of tape delays to the most complicated software, the possibilities of electronic effect allow the performer to achieve new ways of hearing sound with or without augmentation of the original acoustic sound. This control is the basis for the genre of marimba with electronic effect, and that same control may allow for its use for many years to come.

CHAPTER THREE

THE MUSIC OF NIGEL WESTLAKE:

FABIAN THEORY AND *THE HINCHINBROOK RIFFS*

Australian composer Nigel Westlake is responsible for nearly two-thirds of the current repertoire for the genre of marimba and electronic effect. His two pieces, *Fabian Theory* and *The Hinchinbrook Riffs*, represent two distinct methods of achieving electronic effect, and their result is just as unique in performance. Yet a comparison study of these two works yields an unusual amount of similarities, and in a few cases these similarities come to represent tropes of composition. An analysis of these tropes will serve as an analytical guide, to be ascribed then to the analysis of two compositions commissioned for this project – *chasing the mania* by Brett William Dietz and *Plasma Trails* by George Fetner.

3.1 *FABIAN THEORY*: AN INTRODUCTION TO RHYTHMIC AND HARMONIC DELAY

Fabian Theory, completed in September 1987, represents the first composition for marimba and electronic effect. The work was revised in 2003, and partial evidence for this revision may be found on the second page of the work. The preface includes information, provided by Westlake, written in response to the "…many emails from percussionists all over the world requesting details of how to manage the technology

associated with the piece."[33] The work features the use of both delay and looping effects, with delay as the predominant effect, as it is in use for over two-thirds of the work. Westlake achieves these effects through the use of a Roland SDE series digital delay unit, a "rack-based" hardware component. That is, it was intended to be included in a tower system along with other tools for electronic manipulation. The SDE series is still available for use, however the product is no longer manufactured by Roland and the cost of obtaining one online is prohibitively expensive due to its scarcity. In this case, the management of technology that Westlake speaks of is likely a reference to figuring out how to create the delay and loop effects without the use of the original delay device. Westlake's delay indication is very specific. He defines the delay time as 566 milliseconds, and he advises the performer to adhere strictly to the given tempos. The reason for these indications is very simple, in that by playing the written rhythms at the prescribed tempi the performer creates specific rhythmic patterns in the interplay between the acoustic sound and the delay output. These "resultant patterns," as they are described in Jeremy Barnett's article "Understanding the Use of Digital Delay in Westlake's 'Fabian Theory'"[34] become more complex as the piece (and the tempos) advance. The resultant patterns are not only effected by tempo changes, however. They can also change as the time signature changes. This information is crucial in discovering the first important trope of delay composition, one that I have defined as *rhythmic delay*.

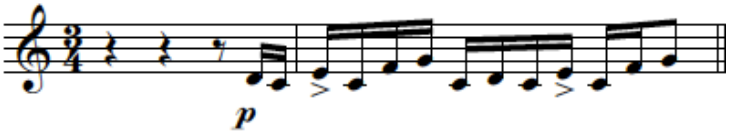
Rhythmic delay is expressed as the use of delay effect technology to create a rhythm whose aural result is a distinctly different rhythm than that of what is notated in

[33] Nigel Westlake, *Fabian Theory*, (Australia: Rimshot Music, 2003), 1.

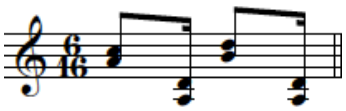
[34] Jeremy Barnett, "Understanding the Use of Digital Delay in Westlake's 'Fabian Theory'," *Percussive Notes* 51, no. 1 (Jan. 2013): 66-68.

the music. Rhythmic delay is used throughout *Fabian Theory*, and to a lesser extent in *The Hinchinbrook Riffs*. At its core, the interaction between the acoustic sound of the marimba and the electronic output of the delay offers the composer intriguing opportunities for experimentation. Example 3.1 shows two separate elements of *Fabian Theory*. The first excerpt represents the first two measures of the piece, while the second is an excerpt from measure 96.

Example 3.1 Selected Delay Types in *Fabian Theory*, m. 1-2 and m. 96.



Fabian Theory – m. 1-2

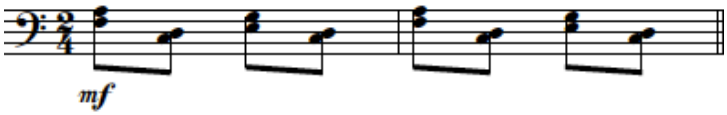


Fabian Theory – m. 96

In the opening of the piece the delay functions much like an echo. It sounds precisely in time with the notes played, and continues as it fades away in the second measure. Measure 96, however, acts differently in spite of the fact that it is played at precisely the

same tempo as the first measure. The rhythm of the 6/16 passage forces the resultant pattern into an output of triplets, even as the speed of the 16th notes stays the same. This is an example of rhythmic delay, as in this excerpt Westlake is using the written rhythm and the delay to create an unexpected result for the listener. Rhythmic delay can also manifest itself in the form of tempo "doubling," as seen in example 3.2.

Example 3.2 "Doubling" in *Fabian Theory* m. 110-111.



Fabian Theory by Nigel Westlake

The eighth notes written here in m. 110-111 do not sound like eighth notes when played with the delay and at the given tempo (quarter note = 134). In actuality, they sound twice as fast as the written rhythm. Barnett explains this effect:

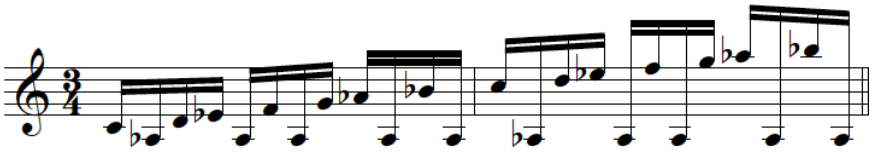
> Playing eighth notes at 134 bpm with our delay results in a constant flow of sixteenths in our new tempo because each note now waits five sixteenths before it comes through the delay. Five sixteenths will place this next sounding of the note on an off beat sixteenth (an "e" or "a"), in between the eighth notes that are being played on the marimba.[35]

[35] Ibid., 67.

This result is not arrived at by accident. Westlake is using the interplay between the delay and the written rhythm to create a unique rhythmic structure, a use of the rhythmic delay.

The second type of delay composition – *harmonic delay* – is much rarer in music composed for the genre of marimba with electronic effect. This may be due to the fact that once the instrument is struck and the pitches are captured by the microphones, there is very little opportunity to affect the pitch output. Therefore, a quick harmonic rhythm may result in unintentionally dissonant pitch material when applied to the delay. Nigel Westlake utilizes this type of delay on multiple occasions, but none is as pleasing as passage found in measure 34 and 35 of *Fabian Theory*.

Example 3.3 *Fabian Theory* m. 34-35.

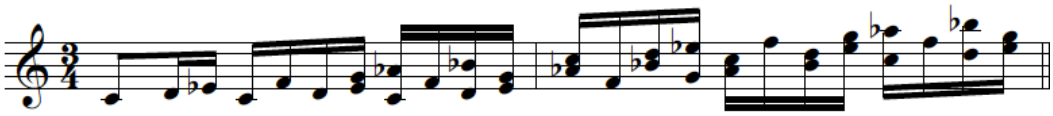


Fabian Theory by Nigel Westlake

As Westlake leads up to the first significant time signature change of the piece, he creates a rising line that features the pitches generally assigned to the Eb major/C minor scales. This intervallic relationship of a sixth (Eb-C) can also be seen in two notes that begin the ascension (C-Ab), and help to create a sense of openness in the sound of the scoring.

That openness is reinforced by the reaction of the delay on the rising line. As the pitches are played, the delay effect creates a repeat that occurs every four notes. Example 3.4 shows how the rising line when played with the delay combines to create new harmonies.

Example 3.4 Rising Line with Resultant Pitches from Delay, m. 34-35.



As the delay interacts with the struck pitches of the marimba, new combinations of pitches are created, and a pattern of intervallic relationships at the third and the sixth appears. The delay also changes the intrigue of the passage. From measure 34 to 35 the pitch content without the delay is simply the same pattern of notes transposed up one octave. The second measure immediately becomes more interesting when the delay is applied, adding the interval of a third to the downbeat and upbeat pulse of beat 1 in measure 45. This brief example illustrates the principle of harmonic delay, defined as the use of delay effect technology to create harmonic functions based on the interaction of the delay and the acoustic melody. Unfortunately, this example also represents one of the only moments of harmonic delay in *Fabian Theory*. Although there are other measures in the piece that feature subtle harmonic interplay, no section is as uniquely composed as to feature this interaction as measure 34-35.

3.2 *THE HINCHINBROOK RIFFS*: A COMPARISON ANALYSIS

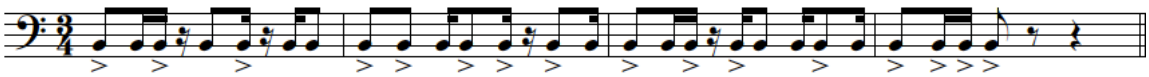
Westlake's second work for the genre of marimba with electronic effect, *The Hinchinbrook Riffs*, was not originally composed for the marimba. In fact, the piece was written first for guitar and effect in 2003, and then directly transcribed by the composer for the marimba in 2009. This presents a few interesting observations. Firstly, the ease of transcription from guitar to marimba offers an opportunity for further exploration into whether other works for guitar and delay could be applied to the marimba. Secondly, the timbral similarities of the guitar and the marimba highlight the concept that percussive sounds are much easier to manipulate in the world of electronic effect than those of instruments with more sustain, an idea first proposed and discussed in Chapter 2. These concepts will be addressed more thoroughly in Chapter 5 as a means for extending research into the genre of marimba with electronic effect.

The Hinchinbrook Riffs approaches the use of delay technology in a different manner than that of *Fabian Theory*. The first difference is in the delay time itself, which is set at 600 milliseconds with the tempo of the quarter note = 100. Though the tempos of both are similar, the change in delay time "speeds up" the sound of the output. The second difference is the length of the delay, which Westlake indicates should only occur once (one repeat). This is very different from the echo effect of the opening measures of *Fabian Theory*, and may be a result of advancements in technology that arrived in the first decade of the 21st century. Westlake also pays more attention to the audience's listening environment in *The Hinchinbrook Riffs*, instructing the performer in the program notes to "…pan the live signal to the left side & the delayed signal to the right side (or vice versa) – the object being to obtain maximum separation between "live" and

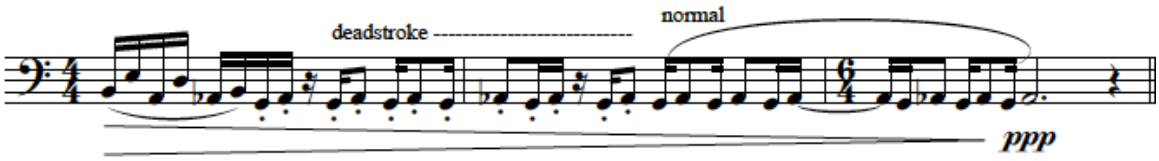
"delayed" signals."[36] This new distinction is important to the genre of marimba with electronic effect. In Westlake's intentions here, the value of the sound of the marimba is equally paramount with that of the electronics. The interactions of rhythmic and harmonic delay in this piece cannot occur without equal representation between the acoustic and electronic media, therefore the presence of this statement in the preface helps to add validity to the notion of these concepts as compositional intent.

Rhythmic delay occurs in *The Hinchinbrook Riffs* in similar ways to that of *Fabian Theory*. Example 3.5 shows excerpts from both works that feature similar written rhythms, resulting in similar output when applied to the delay.

Example 3.5 Rhythmic Delay from *Fabian Theory* and *The Hinchinbrook Riffs*.



m. 17-20, *Fabian Theory*



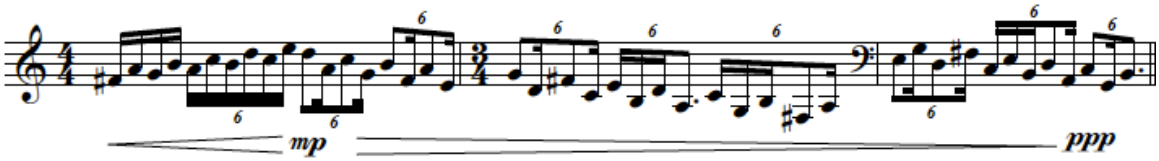
m. 161-163, *The Hinchinbrook Riffs*

[36] Nigel Westlake, *The Hinchinbrook Riffs*, (Australia: Rimshot Music, 2009), 1.

The resultant output of these rhythms in both pieces is that of continual 16th notes. In *Fabian Theory*, the accents create a separate rhythm above the continual 16th notes (adding intrigue), while in *The Hinchinbrook Riffs* the dead-stroke technique offers rhythmic clarity to the constant 16th notes. These two excerpts also share space within the rhythm, an important distinction that will be discussed later in this chapter as a clue for unlocking the presence of rhythmic delay.

Another appearance of rhythmic delay can be found in measure 35-37 of *The Hinchinbrook Riffs*. In this excerpt, a similar approach as in *Fabian Theory* to coaxing triplets out of the resultant rhythm is achieved by Westlake, this time without changing the time signature.

Example 3.6 Example of triplet resultant rhythm: *The Hinchinbrook Riffs*, m. 35-37.



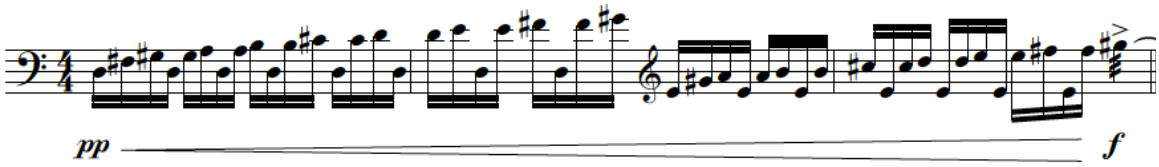
The Hinchinbrook Riffs by Nigel Westlake

In *Fabian Theory* Westlake manipulates the delay to create triplets through the use of space in rhythm and a change in meter (see m. 96 from example 3.1). In *The Hinchinbrook Riffs*, however, Westlake embeds the content for the output of triplets

within the structure of a triplet. The presence of the eighth-sixteenth note rhythm (which can also be found in *Fabian Theory*) and the "triple-beat" feel show the identity of the rhythmic delay, and confirm the importance of this structure in the music of Westlake as well as the genre of marimba with electronic effect.

Harmonic delay appears in *The Hinchinbrook Riffs* as well, though in this piece it is featured far more than that of *Fabian Theory*. Example 3.7 shows the beginning of one of these sections, found near the midpoint of the piece. The presence of rhythmic delay in these three measures creates the most unique passage found in either piece, as this excerpt includes evidence of harmonic delay as well.

Example 3.7 Rhythmic and harmonic delay in tandem, *The Hinchinbrook Riffs* m. 69-71.

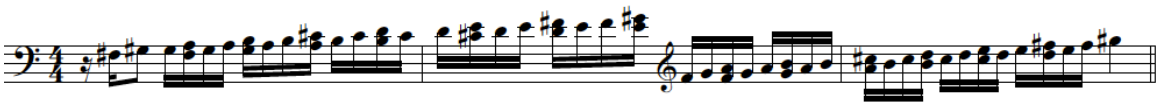


The Hinchinbrook Riffs by Nigel Westlake

The repetition of the pitches D and E create a syncopation that can be discerned without the delay; a 3/16 feel within the 4/4 time signature. This rhythmic pattern is built to compound in the delay and can be extrapolated from the repeated pitches in this excerpt,

revealing the presence of rhythmic delay. These pitches are also repeated in the music as well as the delay, hence Westlake's suggestion of balancing the acoustic and electric sound output. Without this balance the repeated syncopation could result in chaos for the listener. With respect to harmonic delay, the pitch content in this excerpt is much more stabilized and easier to identify than its counterpart in *Fabian Theory*. For example, in this excerpt the pitches used are part of the A Major scale. The first measure of the excerpt begins with the pitches D and F#, establishing a key area in D Major, while the pitches of E and G# in the second measure establish an E Major key area. E is an important pitch in this work, as it is the first and last pitch that we hear, therefore it is not unusual that one of the most interesting harmonic moments of the piece occurs around E. As in *Fabian Theory*, the struck pitches repeat one quarter note after they are played. Yet unlike *Fabian Theory*, they repeat only once. Example 3.8 shows the result of the written harmonic delay. In a similar fashion to example 3.4, the repeated "pedals" have been omitted to show only the harmonic motion.

Example 3.8 Written out harmonic delay (m. 69-71) from *The Hinchinbrook Riffs*.



The single repeat of the delay creates a steady rhythm of ascending dyads at the interval of a third, moving diatonically through the A Major scale. In the first measure and a half

of the excerpt, the presence of the repeated D gives the harmonic implication of a IV chord which moves to a V chord with the arrival of the repeated E in measure 70. The sustained pitch of G# in the final beat of measure 71 can add weight to this pitch argument if the repeated E is factored in, as it would then represent the final dyad of the passage as well as a clear indication of an E major key area. This harmonic delay functions rhythmically as well. If the repeated D and E are factored into the example, and the pitches other than the dyads are removed, the resultant rhythm looks similar to that found in measure 161-163, shown in example 3.5. It is possible, therefore, to read this passage as both an example of rhythmic delay and harmonic delay.

Another excellent example of harmonic delay begins in measure 72. It is by far the most significant use of harmonic delay, lasting for nearly 28 measures. In his dissertation on the percussion music of Nigel Westlake, Kevin Estes describes this passage in an interesting way: "Creating a depth of polyphony, Westlake creates two recurring patterns in the mid-range, one that varies slightly and one that remains constant."[37] Just as in previous examples, the constant (or repetitive) pattern is not as useful in determining the type of delay. However, Westlake uses the pattern that varies to create harmony for the pitches in the constant pattern, setting up a melody and accompaniment relationship. This harmonic delay may be more of an echo than the previous excerpt, but its presence as a musical structure it is no less of an attempt to infuse harmony into the process of the delay. The pattern changes every four measures, creating a four-bar phrase structure that lasts for twenty measures and ends in a

[37] Kevin Estes, "Solo and Chamber Percussion Works by Nigel Westlake: An Examination of Fabian Theory, The Hinchinbrook Riffs, The Invisible Men, Kalabash, Malachite Glass, Moving Air, Omphalo Centric Lecture and Penguin Circus" (DMA diss., Ohio State University, 2014), http://www.proquest.umi.com (Accessed January 5, 2016), 115.

prolongation centered on A major. Not only is this passage pleasing to listen to, it is also one of the most musically rich and substantive sections in the entire piece.

3.3 THEORY OF RHYTHMIC AND HARMONIC DELAY

With both rhythmic and harmonic delay identified in the music of Nigel Westlake, a theory of use for each of these delay types can be presented. This theory consists of methods of identification, as well as opportunities for use. In the case of rhythmic delay, there are two simple methods for discovery within a composition. The first and most obvious method of identification is a tempo change, as most changes in tempo will result in rhythmic delay. In the case of *Fabian Theory*, each change in tempo within the piece coincides with the use of rhythmic delay. It is important to note, however, that a change in tempo is not a requirement for rhythmic delay. This is most clearly illustrated in *The Hinchinbrook Riffs*, as there are no tempo changes in the piece whatsoever. The second method, and often the most likely indicator of rhythmic delay, is the manipulation of space within the music. This is articulated by space within the rhythm, which can be affected by both even and uneven patterns of rhythmic composition. For example, patterns of equally spaced repeated notes often do not result in different output rhythms, as in the case of measure 1-2 of *Fabian Theory*. When that pattern is broken and space is introduced, as in the eighth-sixteenth rhythm found in measure 96 of *Fabian Theory*, the delay pattern results in an offset rhythm. Staying in *Fabian Theory*, measure 110-111 features equally spaced notes, but the distance between those notes is much greater than that of measure 1, and even though the tempo is faster the change is not proportionate to that of the first measure. Therefore, with the presence

of more space between each sounding note the concept of rhythmic delay can be achieved.

Harmonic delay, due to its rarity of use, can often be difficult to locate. In most cases the simplest method of identification is aural and not theoretical. There are, however, a couple of ways to discern the presence of harmonic delay by simply looking at the score. The first method of identification involves the use of scalar motion, often over a sustained period of time (at least two measures), that moves toward a cadential gesture in the music. The scale pattern often does not move unfettered towards the cadence. Instead, its movement can be broken by repeated notes (see example 3.3) as well as a sequential-type gestures (see example 3.7). This broken motion allows the pitches of the acoustic and delayed sound to "line up" and create vertical harmonies. The second method is much more ambiguous, and therefore is often not as reliable as an identification tool. In certain cases, extended periods of repeated musical gestures can contain the necessary techniques for creating harmonic delay. In these phrases, the repeated gestures are only occasionally changed and these changes are very minimal and occur at regular intervals. This is best expressed from measure 72-99 in *The Hinchinbrook Riffs*. The harmony of this section relies on the four-bar phrasing that is present, as well as its relationship with the upper voicing. Kevin Estes discusses this relationship in these terms: "Small pitch changes create subtle chord changes allowing for the audience to experience a seamless ostinato with altering harmonic colors."[38] Again, as this is the only instance in either *Fabian Theory* or *The Hinchinbrook Riffs* that uses this type of compositional layering, it is not the most reliable method for discerning the

[38] Ibid., 115.

use of harmonic delay. However, it represents an important use of texture that can often show an understated harmonic process at work, especially when viewed without the assistance of the delay. In any case, these methods of identification for both rhythmic and harmonic delay are important in illuminating the technique of composition for the genre of marimba with electronic effect.

CHAPTER FOUR

COMPOSITION

With terminology in hand, a more thorough study of the genre of marimba with electronic effect can begin by featuring two works commissioned for this study. These two works show evidence of both rhythmic and harmonic delay, though they approach the concept of composing with delay in very different ways. Composers Brett William Dietz and George Fetner represent two unique styles of composition, and their manipulation of both the delay and the marimba itself provides the performer and the listener alike with an intriguing challenge when confronting their works. Understanding the composers themselves is crucial to understanding their compositions; therefore, a brief biographical sketch of each composer will help set the stage for an analysis of their works.

4.1 *CHASING THE MANIA*: BACKGROUND AND ANALYSIS

Brett William Dietz is the Associate Professor of Percussion at Louisiana State University, a position he has held since 2003. In the interest of full disclosure, he is also the author's former teacher, though that fact alone did not determine his inclusion in this project. Dietz received his doctorate from the Northwestern University School of Music, studying percussion and composition with Michael Burritt and Jay Alan Yim, respectively. He also recognizes Stanley Leonard and David Stock as mentors; Stanley

Leonard represents a unique comparison to Dietz, as both are percussionists as well as composers. Not only a percussionist, Dietz is also an active and well-respected composer across multiple mediums. He has composed for orchestra, wind ensemble, and other chamber ensembles. He has also composed an opera, and his works for percussion (both solo and ensemble) are performed worldwide to great critical acclaim. He is also a fierce supporter of electronic music, and has composed multiple pieces that include some form of electronics. In spite of this background, however, this is his first composition using electronic effect.

Brett William Dietz's *chasing the mania* was the first piece commissioned for this project. Completed in January 2015, it is roughly 9 minutes in total length and features four mallet marimba with delay throughout. There are very few instructions for the performer, though Dietz is slightly specific about the audio equipment to be used. He advises that the piece be performed "…using two microphones, monitor, delay pedal, and amplification system,"[39] though he does not specify the type of microphone or monitor/audio system to be used. The delay pedal is an interesting inclusion, as the performer does not manipulate the delay at any point in the composition (except to turn it on). Given the openness of the other directives, one can conclude that any method of creating delay (be it pedal or software) is applicable in this piece. Another interesting feature of this work involves the delay itself, which Dietz indicates should be set at the tempo of the dotted quarter note at 90-98 beats per minute. Other indications about the delay can be gleaned from a reference recording, created with MIDI sounds. In the recording, the delay has a decay rate of roughly one measure. This means that the music

[39] Brett Dietz, *chasing the mania*, (Baton Rouge, LA: Cat Crisis Publications, 2015), 1.

captured in the delay can still be faintly heard as the new acoustic material is struck. Also evident in the recording is the relationship of the musical tempo and the delay tempo as it relates to the rhythm which receives the beat. In this case, the delay is structured off of the dotted eighth note, while the tempo itself is defined by the quarter note in 4/4 time. This difference in primary beat is important, and represents the first instance of the use of rhythmic delay in the piece. Had both tempi referenced the same derivation of the beat, the rhythms would have aligned perfectly one beat after the marimba is played. By placing the delay at the dotted quarter note, Dietz creates an eighth note of space between the rhythms of the acoustic sound and the electronic delay. As referenced in the previous chapter, this space provides an opportunity for rhythmic delay, as the acoustic and delayed rhythms thwart the expectation of the composed rhythm and create new rhythms as a result.

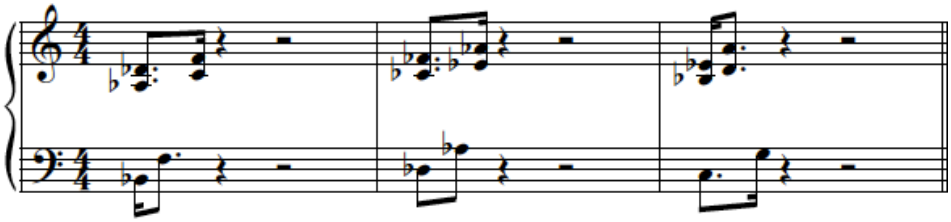
The piece can be divided into three primary sections, with nearly each section conveniently illuminated by rehearsal marks. The A section of the piece begins at the very beginning of the piece and is 51 measures in length. The B section starts at measure 52 and lasts until measure 78. Measures 79-93 act as a bridge from the material of the B section to the final section of the piece. The bridge section contains the pitch content of the B section placed in the rhythmic structure of the A section. The final section, identified here as A' for its rhythmic similarity to the opening A section, begins at measure 94 and finishes at measures 119, the end of the piece. Figure 4.1 shows the formal structure in a visual representation.

Figure 4.1 Form of *chasing the mania*.

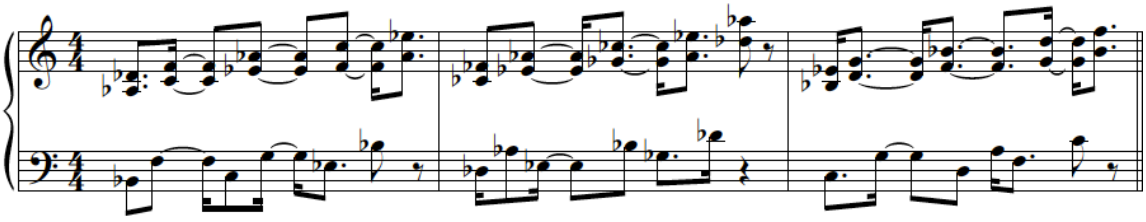
The musical content of each section helps to delineate it from the surrounding sections while also creating a rhythmic structure for the shape of the entire piece. The A section begins sparsely with one beat of written music per measure. The pitch content of the section is represented by contrasting patterns of intervallic relationships. The pitches composed in bass clef (individual notes, to be played by the left hand of the marimbist) are separated by the interval of a perfect fifth, while the double stops[40] composed in treble clef (to be played by the right hand) are a perfect fourth, the first separated from the next at the interval of a major third. These intervallic structures continue for 15 measures, at which point the scoring thickens rhythmically. In fact, the entire process of the A section is devoted to this thickening, as the rhythms move from single beats to an entire measure. This process is shown in example 4.1, with excerpts from the beginning and end of the A section.

[40] The term double stops refers to the technique of playing two notes at the same time.

Example 4.1 – Rhythmic Thickening in *chasing the mania*, m.1-3 and m. 37-39.



m.1-3



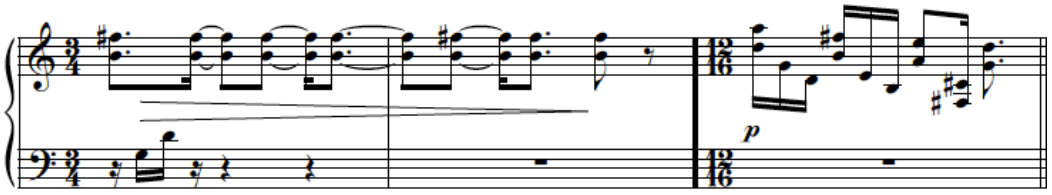
m. 37-39

The pitch content of each of these two passages is similar, though measures 37-39 represent the full rhythmic realization of the opening statement. By developing the rhythm to its full potential, Dietz is "composing out" the concept of rhythmic delay. In this case he is not only developing the rhythm itself, he is also creating a cacophonous texture of rhythms with the delay.

By the time the piece reaches measure 37 the rhythm of the delay has created a pulse based on the 16th note. Due to the arrangement of the delay at the dotted quarter note, this pulse causes the resultant rhythm to feel much like a 12/16 time signature and

puts it at odds with the written time signature of 4/4. Still, in spite of the pulse difference, each meter shares a common factor in the subdivision of the beat into four specific groupings, though the underlying beat is slightly different. Dietz's use of rhythmic delay accentuates this relationship, and he rectifies the pulse relationship at the beginning of the B section, shown alongside the close of the A section in example 4.2.

Example 4.2 Rhythmic Delay Rectification, *chasing the mania* m. 50-52.

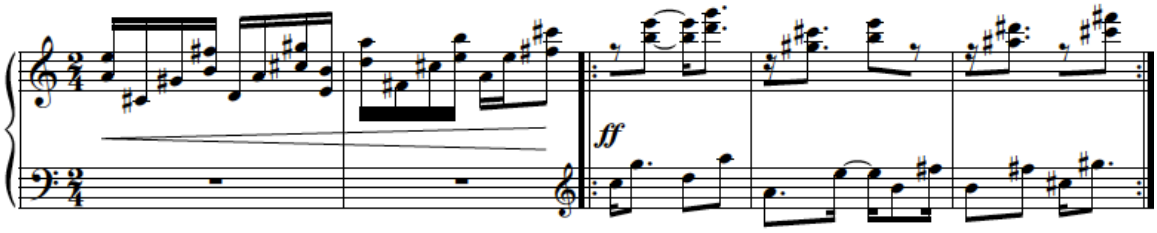


chasing the mania by Brett William Dietz

In what is arguably the clearest use of rhythmic delay in the piece, Dietz shifts the time signature from 4/4 to 3/4 and adjusts the texture of the piece to elide rhythmically with the new time signature of 12/16. The listener hears little difference between the rhythm played in the first two measures and the rhythm of the 3rd measure, as the steady stream of 16th notes continues in the tempo of the delay. Conceptually, it is easy to infer that the rhythmic relationship of the entire A section is based on the pulse juxtaposition of 3 over 4. In fact, this idea of polyrhythmic relationships is a mainstay in the musical compositions of Dietz. Unlike his other compositions, however, Dietz does not have to use complex polyrhythmic notation to achieve his ultimate goal.

Dietz continues the pulse grouping of three throughout the B section. The close of the B section provides the listener and the performer with a unique use of rhythmic delay to create a pulse of 3, this time in a new time signature.

Example 4.3 New Pulse of Rhythmic Delay, *chasing the mania* m. 77-81.



chasing the mania by Brett William Dietz

Whereas the A section established a 4 over 3 pulse relationship at the 16th note, and the B section accentuated the 3 beat pulse at the same 16th note, Dietz throws us the proverbial curveball in the bridge by changing the underlying rhythm of the pulse without changing the beat that it resides in. The listener still hears rhythms that, when processed and repeated by the delay, appear to be governed by a three beat pulse. Yet the new underlying rhythm is now the eighth note, and the rhythms of the bridge sound more like 6/8 than 2/4. This is especially clever on the part of Dietz, as the musical content in the bridge is also a juxtaposition of previous ideas: in this case, the rhythms of the A section and the musical content of the B section. The bridge leads to the A' section, which uses

similar rhythms and intervallic relationships as the A section right up to the very last measure. The piece ends much as it began, with a very open structure of one beat of written music per measure.

Through the analysis of *chasing the mania*, it is clear that the motivating factor in the construction of the piece appears to be based on the interaction of the written music and the delayed music to create new rhythmic values, defined as rhythmic delay. There are a few moments of harmonic delay in the piece, though their appearance seems more to be a result of the rhythmic interaction and less of a specific construct. More often the texture of the piece limits the ability of the delay to act in a harmonic manner. This is especially evident in the B section, where the rhythmic textures are too thick and the pitch content too close together to create a melody-countermelody interaction. Though the piece lacks a true use of harmonic delay, the use of rhythmic delay truly defines the overall structure of the piece.

4.2 *PLASMA TRAILS*: BACKGROUND AND ANALYSIS

Whereas *chasing the mania* was the first composition by Brett Dietz using electronic effect, the second work commissioned for this project features a composer with a litany of experience using delay, albeit with a different instrumentation. George Fetner received his bachelors and masters degrees in composition from The University of South Carolina, studying with noted composers Jesse Jones, John Fitz Rogers, and Reginald Bain. His compositions feature many different types of ensembles: from orchestra and wind ensemble to, in the composer's own words, flash mob and rock band. Many of Fetner's works contain elements of electronic accompaniment, and he is a regular

contributor to xMuse, the University of South Carolina's Experimental Music Studio. As a performer, Fetner is an active guitarist in the Columbia, SC music scene. His music is featured on multiple critically acclaimed albums, with much of the music containing electronic effect as a medium of performance. It is both his compositional and performance experience with delay technology as well as his close working relationship with the Max/MSP software that feature in his inclusion in this project.

Plasma Trails was composed in Fall 2015 and features the marimba with many different types of delay effects. The composer terms the accompaniment as "computer-generated sound,"[41] though in reality the computer is merely processing the sound of the acoustic marimba. This processing is done through the Max/MSP software, featuring a very unique interface. This is shown in figure 4.2.

[41] George Fetner, *Plasma Trails*, (Columbia, SC: Osprey Key Publications, 2015), 1.

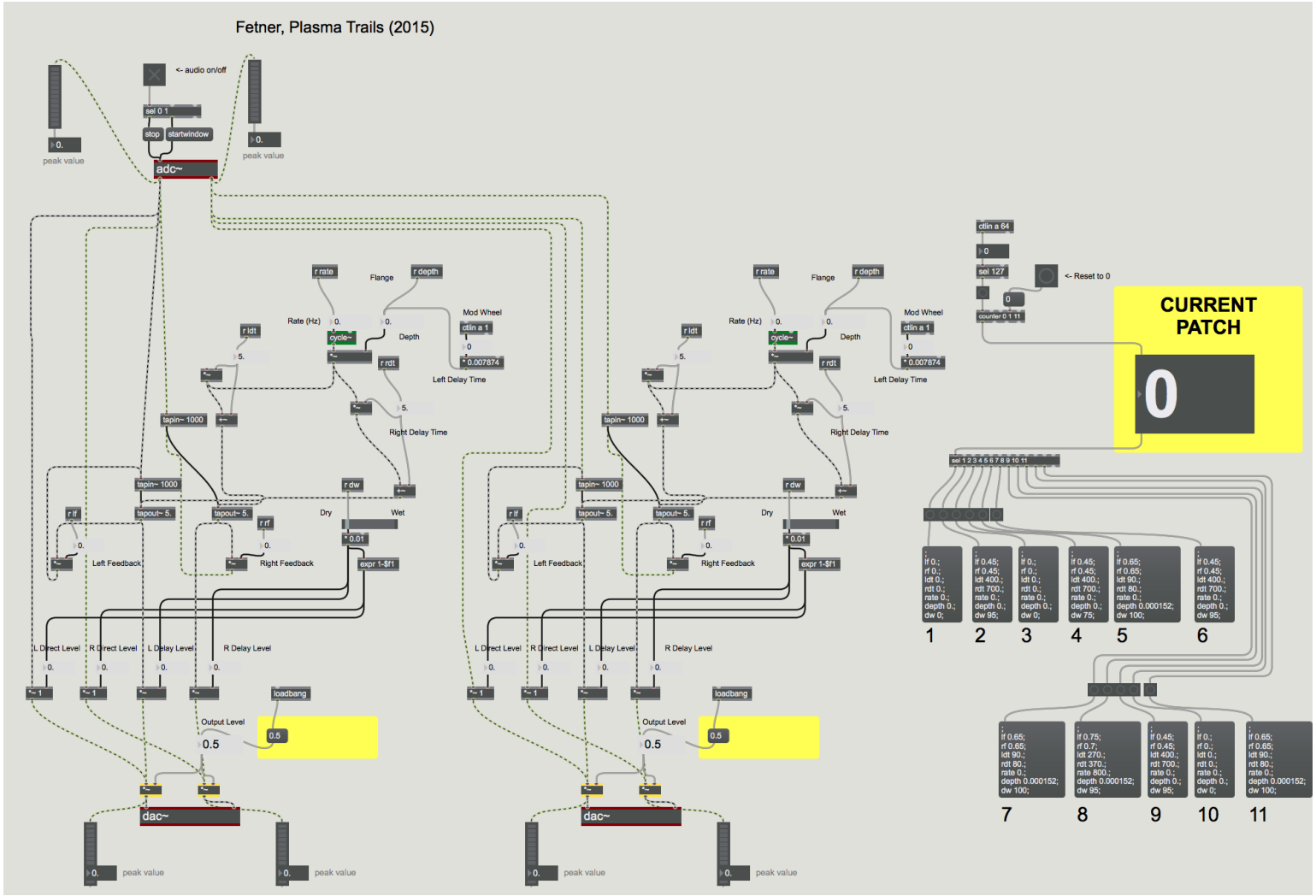


Figure 4.2 Max/MSP interface screen for *Plasma Trails*.

Even without prior knowledge of the software, a few functions stick out. First, there are 11 specific patches that are used for the piece (seen on the right side of figure 4.2). These patches are specified in the work by their corresponding number, and the software is manipulated to change each patch via the use of a foot pedal. Each patch has its own preset function, meaning that the performer merely has to turn on the software and activate the initial patch within the program to begin the performance of the piece. This is important, as many percussionists may be unfamiliar with the workings of Max/MSP and therefore may seek to avoid music that requires them to create the software themselves. Within the software, only 8 of the 11 patches have preset delay functions. Those 8 patches are represented by 3 unique types of delay, with the repeats of these delays functioning almost as a formal structure. The remaining three patches have no delay setting at all. The functions to the left side of the figure are the "nuts and bolts" of the operation: the long rectangular bars at the top and bottom of the screen allow the performer to monitor the input and output of the program, while the myriad of boxes and buttons perform the processes necessary to create the delay sound of each patch.

Outside of the software, there are no performance suggestions for the percussionist. One of the first questions the percussionist must answer pertains to the number of mallets to use. The primary texture of this piece is horizontal, possibly to avoid the clashing harmonies often associated with vertical pitch structures and delayed sound. There are only three instances in the piece where the performer is required to play more than one note at the same time, and in both cases only two notes are composed. However, the speed of the piece may dictate to the performer the necessity for four mallets, only to ease the technique needed to play these passages. As with any work for

marimba, mallet choice is also an important factor in performance. Fetner's work is exceptionally descriptive dynamically and the majority of the piece resides in the upper tessitura of the instrument. A mallet with a heavy core and a softer outer wrap gives the piece the articulation it requires while allowing the marimbist to play over all octaves of the instrument. Finally, while there are no suggestions made in regards to audio equipment, it can be inferred that a similar setup to that of *chasing the mania* would be preferable. That setup should include 2 microphones, placed at the upper and lower range of the marimba, with an output speaker system and an internal monitor (accessible via earpiece) or external monitor. The most important hardware difference between *chasing the mania* and *Plasma Trails* involves the use of the Max/MSP software, which must be routed through an audio interface. Options for this include products by Focusrite (including the Scarlett and Saffire series), as well as the Presonus One-Box system.

Using the changes in delay as a guide, a formal structure for *Plasma Trails* can be realized. Figure 4.3 shows this "delay" form, including the measure numbers that correspond with the notated delay changes.

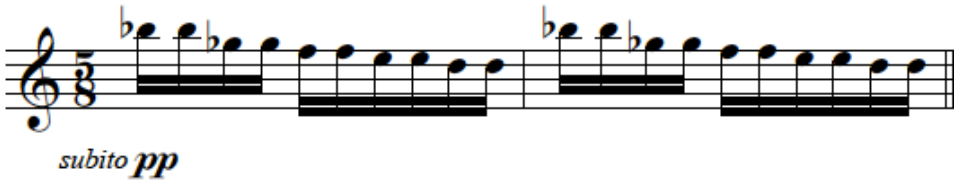
A -----	B ---	A -----	B -------	C --------	B ----------	C -------	D --------	B ----	A ---	C ----	A	
m. # 1	14	19	29	49	70	108	124	156	162	179	196	

Figure 4.3 Form of delay in *Plasma Trails*.

There are two important points regarding the "delay" form. First, the identifying letter of each section corresponds to the type of delay used. As there are only three types of delay in the piece, the letters B, C, and D show those effects within the form. The A section represents the measures where there is no delay present. Second, the measure numbers included in the above figure represent the first measure of the new section. Looking at this in particular, a sectional "crescendo" can be seen. As the performer moves towards the middle of the piece, the size of the sections increase. Then, after the entrance of the D section, the piece experiences a sectional "decrescendo" to the end. While this "delay" form is a simple method of divining the overall structure of the piece, it is not the only formal structure present in the piece. There is a "musical" form based on the written pitches and rhythms, though in almost all cases this form shares a close relationship with the "delay" form.

There are a few important uses of rhythmic and harmonic delay in *Plasma Trails*. The first such use occurs in measure 14 when the first delay patch is engaged.

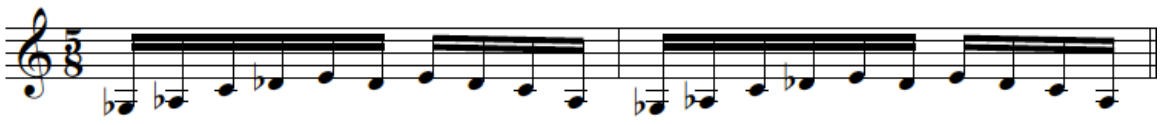
Example 4.4 First use of Rhythmic Delay in *Plasma Trails*, m. 14-15.



This section, defined as the first B section of the piece, is composed in 5/8 featuring a steady, descending line of 16th notes. When the delay is applied, however, the pulse of the section changes from the 8th note to the 16th note. The resultant rhythm is that of a 5/16 measure, and this rhythmic delay continues until the delay is removed 6 measures later. The feel of the 5/16 pulse also fits rhythmically into the entire section, even in spite of two time signature changes (3/4 and 4/8), as two 5/8 measures can be superimposed over the 3/4 and 4/8 measures to continue the 5/16 pulse. Elements of harmonic delay can also be applied to this example. Here the 5/16 pulse of the delay forces the return of the acoustic material 5 notes after each is struck. This timing allows intervallic relationships to form at the fourth and third (perfect fourth, as well as major and minor thirds). The pattern of two repeated notes does not line up, though. This creates a pitch juxtaposition where the delayed notes repeat and the acoustic notes descend. After the first measure of this section this effect is difficult to hear as the pitch content of the measures makes the rhythms more chaotic. Though not as recognizable as the examples from Westlake, these relationships serve in part to accentuate the rhythmic delay throughout the section.

The C section provides the next use of rhythmic delay. In fact, the B and C sections share a few important aspects related to both the acoustic and delayed structures. For example, they both feature 16th notes in a 5/8 time signature. Unlike the B section, however, the effect of the delay is more specific.

Example 4.5 Rhythmic Delay in C section, *Plasma Trails* m. 51-52.

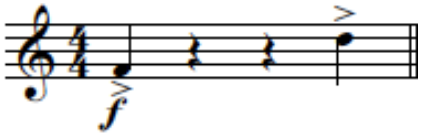


Plasma Trails by George Fetner

When the delay is applied to the above pitches, the resultant rhythm created features 32nd notes perfectly placed between the acoustic pitches. Though not the same rhythm, the presence of two repeated pitches in this section recalls the repeated descending pitches of the B section. The use of this delay exists nearly three times as long as the previous delayed section, conceding to the B section delay 21 measures after it begins.

The final section of note in *Plasma Trails* is the most unique of the entire piece. It also represents a different approach to rhythmic delay. In the D section (beginning at m. 124), the texture of the piece opens up considerably. The tempo slows down dramatically, and some measures feature only one pitch while others have no pitch content whatsoever. Yet, there is still music filling the entire section. Example 4.6 shows a sample of one such measure.

Example 4.6 Polyrhythmic delay use, *Plasma Trails* m. 127.



Plasma Trails by George Fetner

While the written material in this measure is represented by two quarter notes, the delay takes the attack of each single note and creates a polyrhythmic texture of 3 over 2 that fills the space between each note. In essence, the delay creates the entire rhythmic structure of this section, giving length to the relatively short articulation of the marimba without applying the typical convention of the roll. The rhythmic delay is also embellished by subtle changes to the sound envelope that occur as the delay subsides. These changes do not obscure the acoustic sound of the marimba, though they have the effect of narrowing the focus of the sound as the delay fades. This D section leads into the final two sections of the piece, which feature rhythms and harmonic elements from earlier in the work as the piece draws to its conclusion.

4.3 TECHNIQUES OF REHEARSAL AND PERFORMANCE

While *chasing the mania* and *Plasma Trails* approach the use and manipulation of delay in very different ways, the presence of the concepts of rhythmic and harmonic delay in each work show their connection to the tenets of the genre. Understanding this terminology has impacts for composers and performers alike. For composers, rhythmic

and harmonic delay serve as fundamental structures that are crucial to the identity of music composed with electronic effect. In the case of the performer, knowledge of the location of these concepts can help to improve the quality and style of the musical experience. While methods for discovering the location of both rhythmic and harmonic delay have already been addressed, the technique for performing these types of delay requires more clarification. Both *chasing the mania* and *Plasma Trails* can be used to serve this purpose.

First, the percussionist should not feel the need to apply the delay in the early stages of practice. For example, in the A section of *chasing the mania*, the compounding rhythms would be all but unplayable if the delay is applied too early in the learning process. In this case, as in most other cases regarding rhythmic delay, priority should be placed on learning the precise placement of the written rhythms before including the delay in the learning environment. As soon as the written rhythms are learned and the delay is applied, the percussionist should pay careful attention to the rhythmic interaction of the acoustic sound and the delayed output. For instance, the rhythmic delay used in the C section of *Plasma Trails* requires the performer to play at a precise tempo, keeping exact space between the struck pitches to create 32^{nd} notes through the delay. Simply playing the correct tempo is not enough to apply this concept of rhythmic delay: the performer must work diligently and carefully to balance the acoustic sound and the delayed sound, especially in places where the dynamic changes. This idea of precision is crucial in harmonic delay as well, as the motion of the written rhythm must be placed precisely to create structures of the delayed harmony. Finally, the performer must be aware of the delay at all times, almost in the same way a chamber musician is aware of

other musicians in an ensemble. Take, for instance, the excerpts found in examples 4.2 and 4.4. In *chasing the mania* (example 4.2), the rhythm of the first two measures is closely related to that of the final measure of the example, while in *Plasma Trails* (example 4.4) the delayed pattern creates a repeat every 5 16^{th} notes. There may be some adjustment necessary by the performer to align each these rhythmic structures as they are created, in a similar way to the alignment of musicians as they interact in an ensemble. Here, however, there is only one performer, so ideas regarding interpretation should be very easy to ratify.

These approaches to rehearsing the music of the genre of marimba with electronic effect are by no means the only methods available to the percussionist, but they represent the most fundamental ideas of the genre. Exercises highlighting these concepts have been included as part of this study and can be found in the appendix at the conclusion of the document. The author encourages each performer to apply the concepts of rhythmic and harmonic delay in their own exercises, as experimentation with the use of delay can be just as advantageous as musical practice itself!

CHAPTER FIVE

CONCLUSION

The potential of the genre of marimba with electronic effect seems limitless. With constant advancements in technology, as well as the need for musicians to push the envelope of what is performable and "composeable", the possibilities are very wide-ranging. Two of these possibilities present applications with potential not only for the future but also in the present. The first applies to music composed for guitar with electronic effect, while the second applies music not originally composed for electronic effect but with the ability to be adapted for effect technology.

5.1 THE GENRE OF ACOUSTIC GUITAR WITH ELECTRONIC EFFECT

The acoustic guitar offers a wonderful analog for the marimba. Their resonant potential is similar, their timbres are equally warm and articulate, and the guitarist and marimbist often share the same maximum number of simultaneous striking elements – four fingers to four mallets. Already in this document we have seen a piece originally composed for guitar and delay transcribed for the marimba (*The Hinchinbrook Riffs*), and there exists the potential for other applications of this cross-instrumental collaboration. One such work is by American composer Ingram Marshall, entitled *Soe-pa*. Composed in 1999 for Benjamin Verdery, *Soe-pa* (which means "patience" in

Tibetan) is inspired by the melodies of Bach.[42] The piece is composed in three movements totaling just under 15 minutes in length: the first movement features heavy chordal structures alongside arpeggiated eighth note passages, each ornamented by a delay set to repeat every quarter note at a tempo between 120 and 125 beats per minute. Marshall uses the concept of harmonic delay to great effect in both the chordal and arpeggiated structures. The delay effect allows Marshall to expand the pitch content of the chordal structures, while in the arpeggiated passages the delayed sound acts as a countermelody (not unlike the use of harmonic delay in *The Hinchinbrook Riffs*). The second movement of the work uses looping effects to develop an ensemble texture that allows the guitarist to become both the soloist and the accompanist in an environment similar to that of a chamber ensemble. The final movement begins with a lilting, dance-like melody accompanied by a delay which repeats every three eighth notes. This calmer melody quickly dissolves into a much faster exploration of rhythmic delay. Not unlike the triplet rhythms created by the delay in both of Nigel Westlake's works as well as that of Brett Dietz, Marshall uses space to create an unexpected resultant rhythm that moves the work to its ultimate conclusion.

Musically and compositionally, this piece appears to be a perfect opportunity for transcription to the genre of marimba with electronic effect. Logistically, however, this process may be more difficult to imagine: the work is only available in rental form, making the cost of transcribing the work potentially unmanageable. Other notable works with the potential for transcription from guitar to marimba are included in table 5.1. In

[42] GAMI/Simonds, "Minimalist Music for Guitar Plus," GAMI/Simonds, LLC, http://www.gamisimonds.com/news/2014/4/10/minimalist-music-for-guitar-plus.html (accessed January 28, 2016).

many cases the music for these works is only available in guitar tablature, though if a transcription is desired the author suggests contact with the composer as a means of attempting to begin the process.

Table 5.1 Sample Works Listing for Guitar with Electronic Effect.

A Sample of Works for Acoustic Guitar with Electronic Effect

Composer	**Title**	**Publisher**	**Available Format**
Ewan Dobson	*Time 2*	CandyRat Records	PDF/Tab
Nicky Hind	*Crossings*	Listen to the Wind	PDF/Sheet Music
Nicky Hind	*Ripples*	Listen to the Wind	PDF/Sheet Music

5.2 MUSIC TO WHICH ELECTRONIC EFFECT TECHNOLOGY CAN BE ADDED

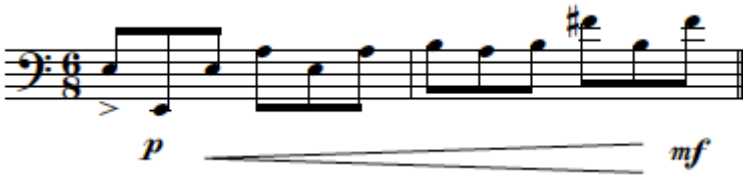
The second area with possibilities for development in the genre of marimba with electronic effect includes music that does not feature delay or looping effect technology at all. How can a work not originally composed for delay or looping effects possibly be "retrofitted" to use these effects in performance? The answer is as complex as the piece itself and can most easily be seen in a contemporary work by composer Elliot Cole entitled *Bloom Suite*. Originally composed for solo guitar in 2014, the work has undergone several ensemble transformations in its short life. These include arrangements for solo marimba, trio (adding cello and clarinet), and even an arrangement for full orchestra. Cole suggests that more arrangements can be created simply by contacting him directly. This flexibility lends credence to the limitless nature of applications for the piece. The suite is composed in four movements, and while the first three movements are

unique, the final movement shares material from the previous three. The first movement is the only section of the work that is applicable for this project. The identity of the piece provides a clue to how the first movement can be adapted for delay.

> I actually composed the piece in a highly "digital" way. I wrote myself a midi composition environment in SuperCollider that lets me create a "garden" of "blooms" – ordered clusters of pitches, which in this case comprise the deep dotted-quarter-level melodic line of the first movement – and then animate them with different patterns. First movement spins it out thus: 121 212 323 434...[43]

Composing using SuperCollider[44] does not guarantee the application of delay, though in this case the "spinning" that Cole describes does generate the appropriate environment. A sample of the score, shown here in example 5.1, shows why this is so.

Example 5.1 Potential for Delay in *Bloom Suite*, m. 1-2.



Bloom Suite, Mvt. I by Elliot Cole

The pitch changes in this excerpt, found on beats one and four of each measure, represent the first iterations of the dotted quarter pattern that Cole describes. It is also interesting to

[43] Elliot Cole, email message to author, November 15, 2015.
[44] SuperCollider is a programming language developed by James McCartney in 1996. The free software is designed for audio synthesis and algoryhthmic composition.

note that this dotted quarter note concept can be described at a larger level, as each pitch is repeated as an eighth note a total of three times. This pattern of repetition is what allows the piece to be transcribed into a delay environment. In fact, there are only a handful of pitches in the entire movement (one can be seen in the second 8th note of figure 5.2) that do not repeat in their original pitch location.

Max/MSP presents the most viable option for reengineering the first movement of *Bloom Suite* into a delay environment. The prototype patch for creating this environment is shown in figure 5.2.

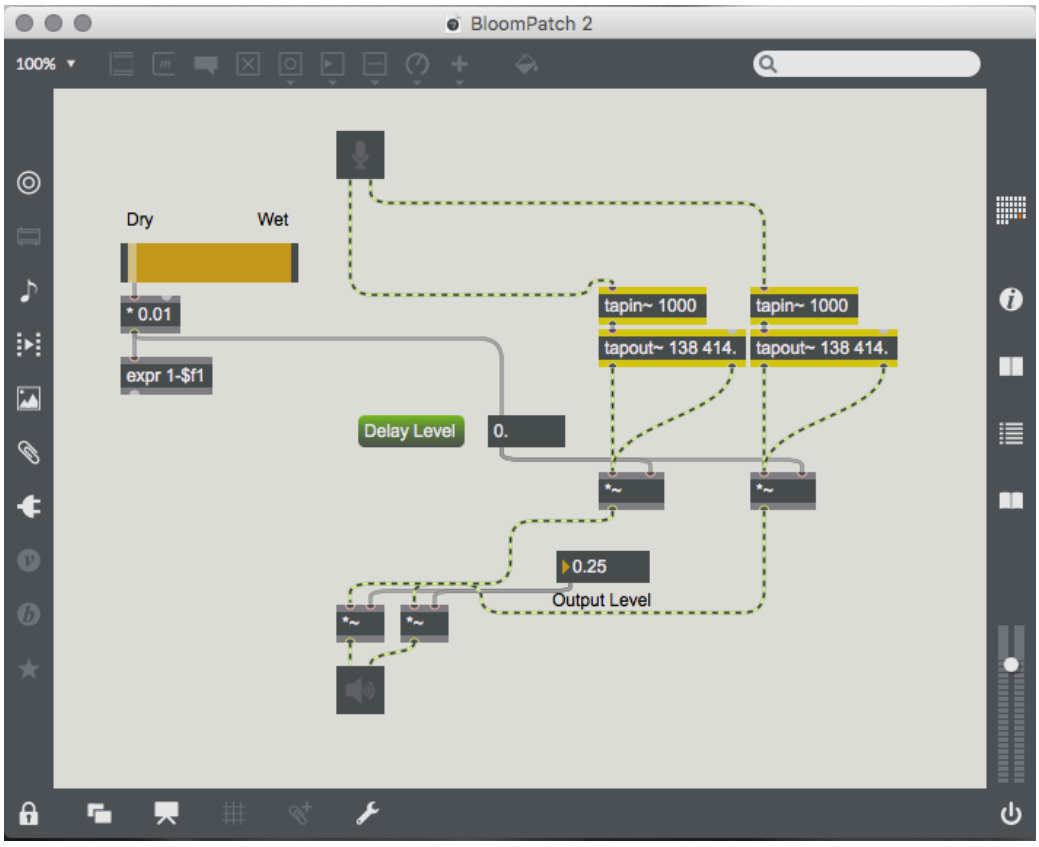


Figure 5.2 Max/MSP Patch for *Bloom Suite*.

There are two reasons for using Max/MSP instead of a delay pedal. First, the specificity of the repeat length requires careful attention. It is important in translation that the struck pitch repeat only two times, and while delay pedals can accomplish this feat it is very difficult to manipulate the pedal to achieve the desired output. Second, the sound output of the delay should incur as little dissolution as possible. Just as an echo fades with each repeat, the typical pedal delay fades away at a rate that can be adjusted for each specific performance. In Max/MSP, however, this fading is less noticeable. This allows for the rhythmic authenticity of *Bloom Suite* to remain as close to intact as possible. Once the software is managed, the translated performance of *Bloom Suite* results in a simpler technical experience for the performer without sacrificing the original rhythmic and melodic intent of the composer. In fact, the delay works to accentuate the dotted quarter note relationships found both at the surface level of the work and at the deeper, more embedded eighth note repetition level. In this way the delay helps to more truly divine the purpose of the composition for the listener and the performer alike.

5.3 FINAL THOUGHTS

Compositions for acoustic guitar with delay and compositions not originally composed for delay but to which delay can be applied are not the only opportunities for development in the genre of marimba with electronic effect. Some percussionists have already tapped into the possibilities of working with electronic effect, especially in live performance. Composer/performer Payton MacDonald is a great example of this concept. His project/album "Super Marimba" features his own compositions for marimba (both through-composed and improvised) using delay and looping effects. Most

of his compositions are solo ideas, though he has adapted some to be played with a chamber ensemble. MacDonald discusses the concept of his project thusly:

> The solo pieces tend to be firmly rooted in the American minimalist tradition, especially Terry Riley…Minimalism was a meaningful fresh start because it reintroduced the notion of ritual into the concert experience, and ritual is a profoundly important part of the human experience, and challenging rituals are something that is lacking in our times.[45]

This concept of ritual can also be found in MacDonald's musical influences, especially in Hindustani music. Compositions for tabla as well as mridangam, mainstays in the instrumentation of Hindustani music, are also present in MacDonald's output. Though most of MacDonald's works for marimba with electronic effect are unpublished and many are not even "composed out", the concept of improvisation and experimentation using the potential of delay and loop effect technology provides a glimpse into the future of the genre of marimba with electronic effect. Electronic effect technology can be convincingly used in live performance to create an accompaniment environment, allowing the marimbist to perform as soloist over their own chamber ensemble. Elements of this can be found in current compositions for the genre, such as the looping section in *Fabian Theory*. In a similar way to a jazz soloist, the marimbist may be able to "comp" and solo at the same time when using electronic effects, providing the performer with a myriad number of options for creating music in a live setting.

The future of the genre of marimba with electronic effect is bright and filled with potential. The "electric" marimba has a stable foothold in the current musical culture, and the available possibilities in the technology associated with the genre makes the

[45] Payton MacDonald, "Super Marimba," http://www.paytonmacdonald.com/SuperMarimba.htm (accessed January 26, 2016).

marimba more versatile. Additionally, the manner in which this type of electronic augmentation is achieved is relatively simple to teach and execute. More importantly, this genre adds a new layer of resourcefulness to the marimba by creating sounds and performance environments that cannot be achieved in acoustic performance alone. As a result, this technology opens up the marimba to new composers and compositional styles. It is this author's hope that more percussionists will discover the possibilities of the genre, and that this environment of exploration and experimentation will continue to grow and develop the genre of marimba with electronic effect. With the genre of marimba with electronic effect a true technological future for the marimba can be achieved without sacrificing its inherent acoustic sound and originality. This allows the marimba to remain a relevant instrument in the world of solo and chamber ensemble performance for many years to come.

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APPENDIX A: RHYTHMIC AND HARMONIC DELAY EXERCISES

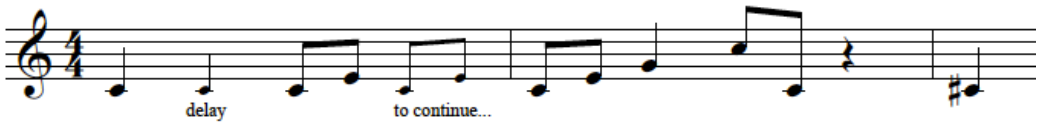
Note: The purpose of these simple exercises is to help the performer develop the skills necessary to play the music of the genre of marimba with electronic effect. The given instructions for each exercise can be modified to the performer's needs. Each exercise is applicable with both pedal and software technology, as all timing is in both milliseconds and beats per minute.

RHYTHMIC DELAY EXERCISES:

Exercise #1 – Play in all 12 major keys

Delay Time: 800ms, 600ms, 400ms

Tempo: Quarter Note = 66, 84, 116

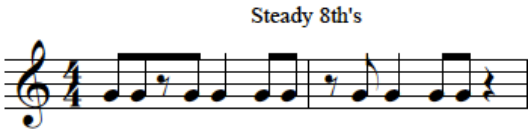


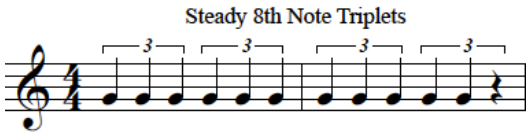
…continue in all 12 Major Keys…

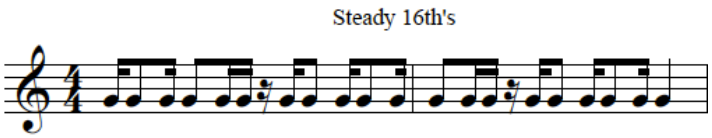
Exercise #2 – Play on a single pitch, one excerpt after the other or separately

Delay Time: 800ms, 600ms, 400ms

Tempo: Quarter Note = 66, 84, 116





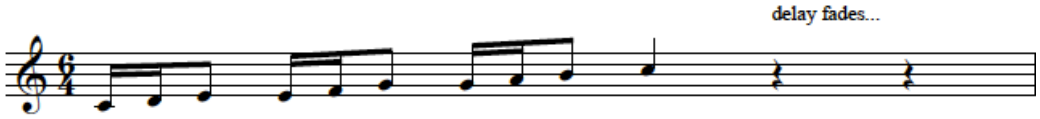


HARMONIC DELAY EXERCISES:

Exercise #1 – Play in all 12 major keys

Delay Time: 600ms

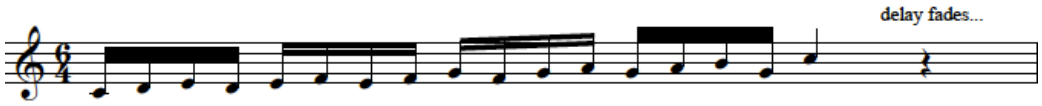
Tempo: Quarter Note = 84



Exercise #2 – Play in all 12 major keys

Delay Time: 800ms, 600ms, 400ms

Tempo: Quarter Note = 66, 84, 116



COMBINED (RHYTHMIC AND HARMONIC) DELAY EXERCISES:

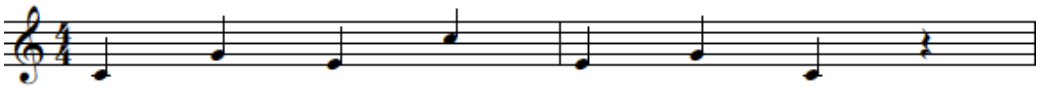
Exercise #1 – Play in all 12 major keys, with either two or four mallets

NOTE: if using four mallets, use sticking pattern 1 3 2 4 2 3 1

Delay Time: 600ms

Tempo: Quarter Note = 128

Expected Output: Steady 8th notes after beat 1



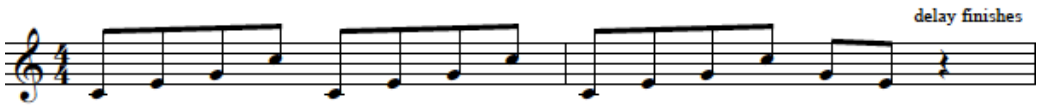
Exercise #2 – Play in all 12 major keys, with either two or four mallets

NOTE: if using four mallets, use sticking pattern 1 2 3 4, with 3 2 for the last two notes

Delay Time: 600ms

Tempo: Quarter Note = 105

Expected Output: Steady 16th notes after beat



APPENDIX B: RECITAL PROGRAMS

UNIVERSITY OF
SOUTH CAROLINA
School of Music

BRETT B. LANDRY, ***percussion***
in
CANDIDACY RECITAL

Friday, March 1, 2013
7:30 PM • Recital Hall

From Nine French-American Rudimental Solos II IV V	Joseph Tompkins
Velocities	Joseph Schwantner
Prime Ordinals	Jim Casella
From Eight Pieces for Four Timpani March Canaries	Elliott Carter
The Apocryphal Still Life	Christopher Deane
From Rebonds *b.*	Iannis Xenakis

Mr. Landry is a student of Dr. Scott Herring.
This recital is given in fulfillment of the requirements for admission to candidacy for the Doctor of Musical Arts degree in Performance.

UNIVERSITY OF
SOUTH CAROLINA
School of Music

BRETT B. LANDRY, ***percussion***
in
GRADUATE RECITAL

Cory Fica, ***percussion***

Monday, January 27, 2014
6:00PM . Recital Hall

A Minute of News (1990) — Eugene Novotney (b. 1960)

From My Little Island (1988) — Robert Aldridge (b. 1954)
- Theme
- Tango
- Hymn
- Dance of Passion

Composed Improvisation for Snare Drum (1987) — John Cage (1912-1992)

Clair de Lune (1905) — Claude Debussy (1862-1918)
arr. Steven Musumeche

Fabian Theory (1991) — Nigel Westlake (b. 1958)

8 on 3 and 9 on 2 (2007) — Robert Marino (b. 1982)
Cory Fica, *percussion*

Mr. Landry is a student of Scott Herring.
This recital is presented in partial fulfillment of the requirements for the Doctor of Musical Arts degree in Performance.

UNIVERSITY OF
SOUTH CAROLINA
School of Music

SONG E. KIM, *piano*
BRETT LANDRY, *percussion*
JASON TERRY, *piano*
in
GRADUATE CHAMBER RECITAL

Monday, April 28, 2014
4:15 PM • Recital Hall

Estaciones Porteñas — Astor Piazzolla (1921-1992)
II. Otoño Porteño
IV. Invierno Porteño

Song E. Kim, *piano*

Der Hirt auf dem Felsen — Franz Schubert (1797-1828)

Angela Yoon, *soprano*
Peter Geldrich, *clarinet*
Jason Terry, *piano*

2+1 — Ivan Trevino (b. 1983)

Cory Fica, *percussion*
Brett Landry, *percussion*

Music for a Summer Evening — George Crumb (b. 1920)
I. Nocturnal Sounds (The Awakening)
II. Wanderer-Fantasy
III. The Advent
(including *Hymn for the Nativity of the Star-Child)*
IV. Myth
V. Music for the Starry Night

Song E Kim, *piano*
Jason Terry, *piano*
Brett Landry, *percussion*
Ben Tomlinson, *percussion*

Ms. Kim & Mr. Terry are students of Dr. Joseph Rackers.
Mr. Landry is a student of Dr. Scott Herring.
This recital is given in partial fulfillment of the requirements for the Doctor of Musical Arts degree in Performance.

UNIVERSITY OF
SOUTH CAROLINA
School of Music

BRETT B. LANDRY, ***percussion***
in
GRADUATE RECITAL

Wednesday, February 18, 2015
6:00PM . Recital Hall

Anvil Chorus — David Lang (b. 1957)

Strange Dreams — Nathan Daughtrey (b. 1975)
- Unheard Music
- Ballerina Mom
- Mermaid Song
- Pools of Light

Sheldon Johnson, *soprano saxophone*

Etude in Ab Major (Op. 6, No. 2) — Clair Omar Musser (1901-1998)

Homage to Max — Rande Sanderbeck
- I
- II
- III
- IV
- V

Mudra — Bob Becker (b. 1947)

Connor Bain, Andrew Lasseter,
Austin Martin, Joseph Spearman, *percussion*

Mr. Landry is a student of Scott Herring.
This recital is given in partial fulfillment of the requirements for the Doctor of Musical Arts degree in Performance.

UNIVERSITY OF
SOUTH CAROLINA
School of Music

presents

BRETT B. LANDRY, ***percussion***
in
GRADUATE RECITAL

Music for the Electric Marimba –
The genre of marimba with electronic effect

Monday, April 18, 2016
6:00 PM . Johnson Hall

Bloom Suite (2014) — Elliot Cole
I. — adapted for digital delay by Brett Landry

Mirrors of Emptiness (2008) — Grigory Smirnov

The Hinchinbrook Riffs (2009) — Nigel Westlake

Vertical River (2005) — Blake Tyson
Bailey Seabury, *vibraphone*

Chasing the Mania (2015) — Brett Dietz
World Premiere

Plasma Trails (2015) — George Fetner
World Premiere

Mr. Landry is a student of Dr. Scott Herring.
This recital is given in fulfillment of the requirements
for the Doctor of Musical Arts degree in Performance