Multiplicity as Tone Colour:

Becoming Electronic Music Pedagogy

by

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Abstract

In recent years, Information Computer Technologies have advanced significantly and are now more widely available to the average person. This has led to an emerging generation that is not only consuming media content, but also creating it. They are both producers and consumers, or, 'prosumers' (Waldron, 2013). The media that these prosumers create is made possible by Information Computer Technologies on personal computers, smartphones, tablets, and software applications.

Currently, traditional music education is comprised of students learning and performing prescribed music, in which they are expected to accurately replicate the music piece. This has led to a suppression of creativity in secondary music education as students are typically not afforded the opportunity to generate their own original, expressive compositions. Recent technological advances have now made digital audio recording accessible to the average user, and it can be utilized in order to compose one's own original, creative works. I will propose that Information Computer Technologies that include recording and editing software applications, Digital Audio Workstations, virtual instruments, and social media can be used in secondary music education programs in order for students to express creative ideas through their own original compositions as a form of 'creative problem solving' (Assey, 1999, as referenced in Nielsen, L. D., 2013; Crawford, 2010; Southcott & Crawford, 2011; Crawford, 2013; Kuzmich & Dammers, 2013; Order, 2015). Herein, I will be referring to music-based Information Computer Technologies as 'Digital Audio Technologies' (DAT) when referencing hardware and software applicable to creating, distributing, and listening to digital audio (Supper, 2015; Gomes, 2016; Shashank, Karthik & Preethi, 2016), and will refer to 'Information Computer Technologies' when referencing the technologies in a broader sense not limited solely to audio

production/consumption, or when the research has referred to it as such. The purpose of this thesis is to challenge Digital Audio Technologies in a philosophical and audio/visual thought experiment so as to allow the capacities of these tools to afford new creative realities for the user, and not just to be used in a prescriptive way that would yield predictable results.

I will be using the theories of Attali (1985) and Giroux (2010; 2016) to discuss the current state of music education, and how its structure is rooted in control and power, leading to "a pedagogy of repression" (Giroux, 2016, p.355). This control denies students a creative and expressive voice. Then, I will explore a thought experiment comprised of two parts in order to conceptualize a way to break the mould of traditional music education. Firstly, I will use Deleuze & Guattari's (1987) theory of the rhizome—in which growth happens in multiple lateral offshoots—as the basis of the philosophical portion of the thought experiment. The rhizome will be utilized in order to reimagine a new reality in which students can generate their own compositions, leading away from the top-down methods of traditional music education. Secondly, in the audio/visual portion of the thought experiment, I have created audio/visual supplements that challenge the conventions of recording software and Digital Audio Workstations. This audio/visual experiment will be utilized in order to allow for creative offshoots as a "line of flight" (Deleuze & Guattari, 1987, p.9), so as to not merely integrate music technology into an already top-down way of educating.

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CHAPTER ONE

INTRODUCTION

Within the last decade, the technological advances in audio recording software, virtual instruments, and computer processing have allowed for the average person to write, produce, and record their own music. Not only are these tools becoming increasingly powerful, but they have been made available to the masses on personal computers, tablets, and smartphones (sometimes even bundled with the hardware at no additional cost). In 2006, after having played in various bands for a number of years, I had a desire to compose and record new music, and to do so differently than following the typical conventions of the rock bands I had previously been in. I was listening to more electronic music and desired to write and record in this direction, seeking to follow in the steps of artist like Ulrich Schnauss, Boards of Canada, and M83. I purchased a laptop computer from Apple's then-new MacBook line, and began to explore various software programs related to recording, sequencing, and synthesis. Much of my early learning about sequencing and sound design was done on the software program Reason, thanks to its intuitive operation and skeuomorphic[1] layout of virtual synthesizers, drum machines, sequencers, and effects. This started me off in creating my own tracks and songs, but not without difficulty when trying to comprehend the various functionalities and principles of the way in which the hardware—that Reason was virtually modeled after—operated. Although the recording technology I had been using then was very much in line with what is currently available (albeit simpler, slower, and with less features), this was at a time when current learning resources like

[1] "Skeuomorphism is a term most often used in graphical user interface design to describe interface objects that mimic their real-world counterparts in how they appear and/or how the user can interact with them" (Interaction Design Foundation, n.d.)

YouTube were in their infancy. And, as a result, learning these tools meant me doing so on my own, or maybe with the help of a friend.

In my time as a teacher, I have met students that have begun composing their own music using recording software. Yet, it was not taught to them in school, rather something they engaged in at home on their own. I began to see parallels in the work and learning they were doing, and with what I had been teaching myself years earlier. This posited the question: what technological affordances do these students currently have (both in and out of school) at a young age compared to the technologies made available to me when I was trying to learn to compose electronic music as an adult? Although learning resources like music forums existed long before the YouTube era, those websites—although holding a wealth of information—lacked what sites like YouTube are currently able to *do*. What has changed in the last decade is how users are interacting online. Cayari (2011) notes how YouTube allows users to learn and grow, somewhat through trial and error. Users post videos of themselves performing a song, get feedback (good and bad), and make adjustments. Their skills increase, as do their proficiencies in the music and the technology (p.6). This platform paired with powerful recording software that is both affordable and accessible allows for the user to create and consume content, all while interacting with a vast audience of fellow users that are both producers and consumers, or, 'prosumers' (Waldron, 2013).

An evolution in computer technologies has allowed for new realities to emerge. Crawford (2013) points out that "the Web has shifted from just being a medium in which information is transmitted and consumed, to a platform where content is created, shared, remixed and repurposed" (p.719). In addition to the technology changing, other residual effects are emerging. Popular music styles and trends are being informed by the advances and wide availability of

music technology, as a large portion of new music is being created with an electronic basis. Pop, hip hop, rap, r&b, electronic, and even lots of modern rock music is being created with virtual instruments and plugins in Digital Audio Workstations (DAWs). In my experience, the dominance of electronic-based production in popular music seems to be leading to a decrease in the rock bands that once led the musical direction of conventional popular music. If popular artists are finding their creative identities in new ways with the aid of digital music technologies, is it safe to say that students—as the emerging generation—might also find connection through those same popularized styles of music, and thus the same ways of making music? If certain students are engaging less in music with traditional instrumentation, what creative needs of theirs are not currently being met? The current state of music technology can provide creative possibilities that were not available to previous generations of students.

Today, students find themselves in a relationship with technology that has never before existed, as they have used the Internet, smartphones, tablets, and computers their entire lives. Prensky (2001) refers to these youth as 'digital natives', in which this techno-reality has always existed for them (as referenced in Wise, Greenwood & Davis, 2011; Haning, 2016; Nart, 2016). Although these tools afford students a wealth of possibilities, it is notable how the themes of 'relevancy' and 'authenticity' are emerging (Crow, 2006; Crawford 2010; Southcott & Crawford, 2011; Wise, Greenwood & Davis, 2011; Abrahams, 2015). These technological tools cannot be merely frivolous in usage and implementation, rather they require credibility with students. And when incorporating modern technologies into a music classroom, they too need to be relevant and authentic.

Information Computer Technology, or ICT (Southcott & Crawford, 2011), are currently present in many music classrooms, yet recent studies have shown that they often lack effective

integration (Crawford, 2010; Southcott & Crawford, 2011; Wise, Greenwood & Davis, 2011; Haning, 2016; Nart, 2016). Some schools have computers with limited music technology, but typically lacked sufficient access as they were in a general lab and not in a music setting (Crawford, 2010). Additionally, some teacher prep colleges lack the technological training to equip pre-service teachers with the use of ICT, leaving teachers without the skills to implement these tools successfully in their own classrooms (Nart, 2016). In contrast to students primarily being digital natives, Haning (2016) notes that "...many teachers are "digital immigrants," those who have adopted technology as a useful tool but have not had the same long-term, immersive exposure to it that digital natives have" (p.79). This puts teachers at a disadvantage due to an ever-widening technological gap between them and the students they are expected to lead.

As many music teachers are currently finding themselves behind the technological pace—with a growing gap between them and students at the front of the pack—should we be questioning whether we are running in the correct race, or why we are even running at all? Would we then see our technological 'failure' objectively? The etymology of the word 'curriculum' is often overanalyzed as a race to be run (Collins English Dictionary, 2017), but have teachers confused our roles and implicated ourselves, thinking that we somehow need to be ahead of the pack? Or, is our role rather to be guides and facilitators of our students' learning (Crawford, 2010). Are we teachers truly not understanding the trajectory of where our students are headed? Abrahams (2015) questions this notion, "are school music educators treating the millennial as a marginalized population? Are music teachers trying to mold the young 21st-century citizen into a child of past times?" (p.98). As teachers transition from the source of information to a guide in teaching and learning (Nart, 2016), we can fuel the technological advantage that our digital native students have, and empower them through creative "musical

agency" (Abrahams, 2015, p.100). Here, students have the ability to be agents in both the technical aspects of the technology and in the process of creating and composing with these tools.

Currently, music education finds itself at a prospective confluence where students' desires for technological 'relevancy' and 'authenticity' can be met with current Digital Music Technologies in a music classroom. Crawford (2013) reinforces that "technology provides an important platform in the ability for music educators to close the divide between their students' experiences of music in the classroom and outside" (p.731). This leads us to a sense of creative inquisition (Crawford, 2010; 2013; Southcott & Crawford, 2011), in which we can provide students "musical problems to solve" (Crawford, p.33, 2010). Recording, sequencing, synthesis, and sound design can be used to provide students the ability to generate their own creative works. Audio software and virtual instruments are now widely accessible on computers, tablets, and smartphones, and provide the user with a simulative experience of a recording studio and instruments that previously would have only been available to those who could afford the high cost of entry (Eidsheim, 2009). To which, it seems as the music industry is seeing the effective death in the dominance of the traditional recording studio in favour of a widespread embrace of audio software on personal computing devices. Although Information Computer Technologies in a music classroom do not provide the learning, they do provide certain affordances which, in turn, allow the users agency in their learning (Miksza, 2013). These affordances are not neutral, and do come with their own set of constraints (Bell, 2015), but, this sense of non-neutrality is what provides the capacity in which these tools allow creative possibilities to users. The technological tools afford what could not have been done previously.

Many times a lacking or incomplete understanding of the proper integration of Information Computer Technologies in music classrooms has typically relegated these tools to the outer edges of the room as pieces of fringe-tech. Their perceived esoteric status and unrealized capacities arrest these tools within a xeno-creative state. The fear of needing to learn the technology—and not following through with it—has left many of these machines on classroom shelves: dusty, unplugged, and misunderstood. Recently, I was teaching music at a school that had various old synthesizers, mixers, and effects from what was a music technology course that had previously been offered at the school. On the shelf, tucked away, was a vintage 1970s Minimoog Model D synthesizer. The Model D is arguably one of the most iconic synthesizers ever, as it was the first portable synthesizer (hence 'mini', although by today's standards seeing one—and lifting one—would suggest otherwise). It did away with the behemoth phone-jack cable patching modular systems of the late 60s and early 70s, and was an all-enclosed unit with a defined signal path that a gigging musician could readily implement. I was overjoyed to find this amazing instrument simply sitting there. I plugged it in, and although it partially worked, it did need to be repaired as most electronic instruments of its vintage typically do. Yet, it was still full of life. However, it does feel like a disheartening representation of the relationship between music education and music technology: a sad, dusty old dinosaur from yesteryear that has been relegated to the shelf in the back corner. When, in reality away from the music classroom, the Minimoog is a coveted instrument utilized in many modern recording studios, and commands high resale prices (additionally, due to its iconic status, the Model D had just been reissued as a short run by successor company, Moog Music, between 2016-2017 for $3500.00 USD—a noticeable drop from the prices commanded by vintage units). It was another example of unrealized sonic potential within current music education. The

characteristics of these tools are not that which will transparently aid in the current music education format; they are not just to be included for a little bit of colour or spice, here or there. Rather, they require an embrace in the way that they operate, and can drastically change the way in which we might approach teaching music as forms of sound design and synthesis within the framework of students creating their own original compositions.

In addition to students digitally composing, they need an environment in which they can display their work to receive recognition, learn, get feedback, and to provide content for the collective creative pool. In recent years, YouTube has proved to be this type of hub for the general public, as Cayari (2011) illustrates that "since anyone can post what they would like, some researchers are calling this the democratization of art" (p.6). This creative democracy is fuelled by 'User Generated Content' (Waldron, 2013), in which it operates as "digital artefacts created by ordinary people acting on their own behalf" (Waldron, 2013, p.258). Wise, Greenwood & Davis (2011) ask, "can teachers use technology to bring 'real world' experiences (e.g. students composing and recording songs and then posting them on YouTube, Facebook etc.) into the classroom?" (p.119), to which we might consider how students are already using these types of resources. Abrahams (2015) notes that "when students need help, they go on to social media or post a microblog before they ask a teacher or visit a library" (p.98). Recently, I spoke with a student who said that he had been learning from a science education YouTube channel, as he felt he was not grasping those concepts in class. Students are seeking out other ways to have information relayed back, delivered in new ways, or just to be able to slow it down in real time order to comprehend. To this, those learning new concepts will seek information out on platforms like YouTube, and learning about music technology is no exception (I regularly seek out this resource myself when learning a new technique, discovering new instruments, or

various new technologies). Much in the same way as students are seeking new forms of comprehension, we might consider other ways that students are engaging with YouTube. Music videos can be seen as forms of "cultural transmission", which lead to ways in which to decode and recontextualize content (Waldron, 2013, p.259). This type of original, creative content can lead students to new forms of relevancy and authenticity, as students navigate the world around them.

As technology continues to advance, we need to remind ourselves that our students find themselves in the information age, not the industrial age (Wenger, 2006, as referenced in Partti & Karlsen, 2010, p.41). Technology has provided a paradigm shift in the way things are being done. Digital Audio Technologies in music education can align students on a trajectory that affords them the opportunity to compose their own works, further contributing to the collective creative pool that they find themselves within.

Purpose

The purpose of this thesis is to challenge music education's incorporation of Digital Audio Technologies in a philosophical and audio/visual thought experiment so as to allow the capacities of these tools to afford new creative realities for the user, and not just to be used in a prescriptive way that would yield predictable results.

Significance

As Information Computer Technologies are now readily available to the average person, users are no longer only consuming media content, but are also producing it. As users are utilizing these tools to express themselves in a form of collective sense-making, I believe that Digital Audio Technologies can be used in music education for students to record their own original compositions in order to express creative ideas, and to solve creative problems. This

thesis aims to help reimagine what music education might look like, in hopes to rethink the priorities and values of foundational curricula. Composition has often been thought to be too difficult to teach in music education (Mateos-Moreno, 2011). However, I believe that composition has not typically been aligned with the priorities and values of traditional music education, which seeks to have students comply with specific structures of learning, listening to, and performing music. Digital Audio Technologies have capacities that provide the user the ability to record, layer, sample, remix, and experiment. These technological affordances are not possible with a traditional instrument, and as such, the wide availability of Digital Audio Technologies can now be used by the average student in order to compose their own music pieces.

Current State of Secondary Education Music Programs

Music education in secondary schools is typically based around the traditional concert band format. In recent years, there has been an increase in schools offering guitar classes in which students are learning to read music notation, performing classical and pop/rock pieces, and learning music theory. Yet, this type of offering still follows a very similar format to that of the traditional band class. The conventions of this type of education lead most student down a very similar path, as Wallin (2010) notes that "students are impelled to 'trace' *the* course to be run … ensconced in this logic of *representation*, pedagogical life becomes reactive, fettering student desire to the monotonous sensibilities of the herd" (p.68, 69). Here, the effect of power—and the struggle to wield it—yields controlled and repressed creative encounters within music education. Students currently rely on "reactive ways of thinking that are based on certain conceptions of music" (Lines, 2013, p.24). Children are expected to react to a piece of music in very distinct ways, developing a rigid semiotic relationship between the student and the music: the student is

signified by the music piece and expected to respond precisely, leaving little to no room for any actively unique response.

As students are conditioned to be mechanically obedient, so too are music teachers as they are mechanically expectant of students, giving little to no opportunity to break into new territory. Lines (2013) notes that "the narrowing of the concept of music education to the technical pragmatics of the classroom can mean it loses its own natural interactive space with its own subject" (p.25). Traditional music education is "striated" (Wallin, 2010, p.70), and individual deviation is arrested in exchange for unified congruity. A utilitarian experience of any type of art form does not give due diligence to discovering other meanings and encounters. Lines (2013) expresses the imbalance in music education noting that "the emphasis on music pieces and skillful master-performers in music education is overstated to the degree that more nuanced understandings of music education are often left behind, forgotten, or even ignored" (p.26). Lines also describes how the student has become a "technician," or "skillful renderer" (2013, p.26), and goes on to describe music education as "performative tasks" where invariably "the tail can wag the dog" (2013, p.27). This structuring of traditional music education has relegated students to simply just perform their task.

The striation of traditional western music education is rooted in order and control. Here, students are led by "a pedagogy of repression" (Giroux, 2016, p.355), wherein teaching becomes "...a set of strategies and skills to use in order to teach prescribed subject matter" (Giroux, 2016, p.356). Giroux notes how this silences pedagogy in relation to "...the social and political task of resistance, empowerment or democratization…" and how "knowledge, values, desire and social relations are always implicated in power" (2016, p.356). This struggle for power leads to ways in which music education is organized, and how it achieves order. Order, which abides by values

that have been set out before us, as Attali (1985) notes how in music, "its order simulates the social order, and its dissonances express marginalities. *The code of music simulates the accepted rules of society*" (p.29). Music education is simply abiding by the construct that is set before it; its place within order. According to Attali, the role of music "...is not to be sought in aesthetics, which is a modern invention, but in the effectiveness of its participation in social regulation" (1985, p.30). Attali (1985) also notes how music is made up of various codes (p.57), and describes the point in which its commodification altered the nature of its being, or code:

> When people started paying to hear music, when the musician was enrolled in the division of labor, it was bourgeois individualism that was being enacted: it appeared in music even before it began to regulate political economy. Until the eighteenth century, music was of the order of the "active"; it then entered the order of the "exchanged." Music demonstrates that exchange is inseparable from the spectacle and theatrical enactment, from the process of making people believe: the utility of music is not to create order, but to make people believe in its existence and universal value, in its impossibility outside of exchange. (p.57)

The solidification of music as an art of rigid order has blinded us to the possibilities of other forms of musical enunciation. We, in the wake of order, have abided by a prescribed exchange as participants with music. We have bought into an athleticism of art.

The structure of the orchestra is rooted in power (Attali, 1985, p.65, 66), and as a result the concert band in traditional music education abides by the same conventions. The student is slowly conditioned to comprehend acceptable and unacceptable sounds; ways in which to *enact* music. This emphasis on virtuosity and obedience to harmonic order reinforces a sense of sonic control. Attali highlights the operation of harmonic order: "An ideology of scientific harmony

thus imposes itself, the mask of a hierarchical organization from which dissonances (conflicts and struggles) are forbidden, unless they are merely marginal and highlight the quality of the channelizing order" (1985, p.61). We have been conditioned to favour 'pleasing' sounds over dissonant ones, and have passed that down to our students in music education. Attali describes these dissonances as "differences" (1985, p.62), and because of their rigid compliance and avoidance, here we might see that "difference is the principle of order" (1985, p.62). And, when order is broken, we seek to restore it.

As music abides by a code of order (Attali, 1985, p.68), the order of music education is rooted in much of the same foundations. Attali notes that "...in introducing music into exchange, representation submitted it to competition" (1985, p.68), and continues on to describe a "process of selection" that favours "...those who adapt the best to the system's rules of functioning" (1985, p.68). This parallels the model which we have set up students to fulfill in music education. Virtuosity and complicitness to the musical leader (hence, teacher) has been favoured, leaving the typical idyllic exemplar of student achievement to being a mere carbon copy of that which has been set before them. This result is before us because the musician has forgone the power of music composition in order to condition the listener (and, the musician themselves for having accepted) to buy into the code of musical order (Attali, 1985, p.70). Music education continues to perpetuate this by emphasizing the performative in favour of that which is explorative: we subject our students to be purveyors of their select musical skills in order to embody government mandated forms of 'entrepreneurial spirit' (Alberta Education, 2011), not realizing (or willingly ignoring) that students are being subjected to the commodified, consumptive state of musical capitalism (Attali, 1985, p.38). Demand has been created for music-as-commodity, as the codes have dictated the roles in which we will partake in, in that representation has caused us "...to

train the spectator, to teach him his role" (Attali, 1985, p.77). Educators have taught students to assume the role that representation has assigned them.

The emphasis of order and control within music classrooms leaves little room for deviation or difference. It has left us with a factory model of teaching music, wherein the school likens itself to that of an assembly line (Giroux, 2016, p.352). Our music education programs are churning out students with the same prescriptive skills, knowledge, and approaches. Not only are students being shaped into cookie cutter versions of the same origin, many others are missed or ignored completely as they do not fit into the same mould. As education evolves, and specifically within the realm of emerging technologies, we might consider the requisite shift from an industrial age type of education, to that of the information age (Wenger, 2006, as referenced in Partti & Karlsen, 2010, p.41). Technology is rapidly changing the lives of our students. As power has continued to reign over students, music technologies might provide a way to disrupt order in that "what is noise to the old order is harmony to the new…" (Attali, 1985, p.35).

Current State of Music Technology

The exponential advances in digital recording technologies have radically changed the landscape for the production and consumption of music. These evolving technologies provide new affordances to users (Crawford, 2013; Eidsheim, 2009), such as Digital Audio Workstations, virtual instruments, smartphones, tablets, and web 2.0 which are more accessible to a wider audience now than ever. Students today are of a generation that is both producing and consuming media. These "prosumers" (Waldron, 2013) actively contribute content on social media in the form of "User Generated Content (UGC)" (Waldron, 2013). Crow (2006) depicts the effect of these technological advances:

Powerful computers and fast Internet connections have become affordable and widely

> available. The technology's ability to manipulate audio has meant that many people, who up until now did not perceive themselves to be musicians, can handle, create and communicate music using their computers. They employ inexpensive music software and hardware, which does not require 'traditional' musical skills or conceptual understanding. The software is attractively presented as a set of creative tools, which offer a range of musical choices. (p.123)

This technological reality allows for "non-traditional music (NTM) students" (Order, 2015, p.2) to become "digital musicians" (Hugill, 2008, as referenced in Partti, 2014, p.4), but what remains is for music education to embrace this reality. Why, has this passive disassociation of current technologies prevailed in traditional music education?

Education has incorporated technology in many ways, but in compliance with that of order. Thibeault (2014) notes that "...our wants, needs, values, and practices both shape and are shaped by technological innovation" (p.1). The order of music education has seemingly kept music technology at bay, for it seems its embrace would signify a paradigm shift that has yet to be fully explored. There is evidence of school music programs incorporating Information Computer Technologies, but often they lack proper integration (Crawford, 2010; Southcott & Crawford, 2011; Haning, 2016; Wise, Greenwood & Davis, 2011; Nart, 2016). Herein lies the problem, as students today require that technology provide 'relevancy' and 'authenticity' (Southcott & Crawford, 2011; Crawford 2010; Wise, Greenwood & Davis, 2011; Abrahams, 2015), where, we might read authenticity as that which is meaningful. Ineffective integration of music ICT coupled with a lack of meaningful, relevant usage leaves students with little in the way of progressive education with music technology. As a result, students are left to look elsewhere to bridge the gap.

Assemblage: YouTube + Music Technology

Online environments like YouTube are proving to be an increasingly valuable learning resource (Cayari, 2011; Abrahams, 2015; Wise, Greenwood & Davis, 2011). Users are able to post content, consume content, learn technique, or receive feedback from their work (Cayari, 2011, p.6). It provides a platform to meet the needs of users, and contributes to the democratization of the technological tools (Eidsheim, 2009; Cayari, 2011). Users are able to seek out solutions to problems (Abrahams, 2015, p.98), in a way to decode that which is before them (Waldron, 2013, p.259). Sites like YouTube provide a collective pool of prosumers with the ability to make sense of the world in which they live. Sometimes, it is the unintended consequences or results of how technology is used that truly illustrates what might be done with it, as one could not have predicted the sheer power that the YouTube platform carries today. It has evolved into a learning resource because of its characteristics and capacities, and much as gravity leads water to flow to the lowest points of the land, YouTube users have established their own path. Users are seeing needs to be met, as they are not waiting for instructional content to just be delivered to them, rather they are contributing it back to the collective pool as they see fit. To this, the area of recording, composing, and music technology is no exception. Many times in the video description or in the comments section, I have read how the user felt there was an unfilled gap in their search for learning about a topic or gleaning from a particular electronic instrument. So, their response was to fill it themselves by creating a video highlighting a particular technique, instrument, effect, sound, or style. Much like how the unintended 'misuse' of the Roland TB-303 synthesizer led to an entire genre of acid-house music (Hemment, 2004, p.84; Dayal, 2013), one of the unforeseen uses of YouTube has created into a collective curriculum created by and for users. Tutorials, lessons, and demonstrations are created due to the

general consensus among users agreeing to their importance, fulfilling their own educational media demands.

Increasingly, YouTube music technology videos are not only a resource for learning, but also doubling as a creative hub for content creators. Over time, the production, quality, and musicianship has steadily increased in videos that demonstrate music technology. Specifically within the realm of synthesizers, channels (and their proprietors) like RetroSound, musictrackjp, AnalogAudio1, sonicstate, MrFirechild, SynthMania, cuckoomusic, and Synthpro have contributed vastly to the creative pool on YouTube with demo videos, tutorials, reviews, and repair walkthroughs. And, they hearken back to one of the undisputed kings of YouTube synth demos, Jexus, whose oeuvre of dark, oddball VHS production values and interspersed cuts of 80s television and film make his videos look as if they were produced by Tim Heidecker and Eric Wareheim for a lost horror or thriller movie. Many of these YouTube users also create their own songs and miniature compositions within their synth demos. For some like RetroSound, MrFirechild, and Synth Mania, that is the primary focus to their channel (typically using vintage synthesizers and drum machines from the 70s and 80s). In an interview with former Korg Chief Synthesizer Engineer Tatsuya Takahashi, Richard D. James (a.k.a. Aphex Twin) depicted his affinity for such synthesizer demo videos: "I'm a secret nerd-fan of synth demos, mainly vintage '80s ones currently! Some amazing music has been made as equipment demos, unsung heroes. I collect synth demos. Well, ones that I like. It's kind of an unclassified music genre..." (James & Takahashi, 2017). It is notable how James describes said users as "unsung heroes" … "of an unclassified music genre", as we may not yet realize how significant these nascent artists are in carrying the torch for the electronic music community. Especially, as prolific, mythical artists like Boards of Canada, Burial, and James himself as Aphex Twin are known—and almost

deified—for often having such a limited, obfuscated public presence, contributors to the synthesizer and electronic music community on YouTube may not be fully hailed for their contributions until a time in which the music community understands the gravity of their work.

Many musical synthesizer demos are becoming standalone works of their own. I have often found myself returning to listen to certain pieces that have especially grabbed me, as they have transcended being a simple demo and have deterritorialized to become something beyond their original capacities. One of my own compositions began in this way: on my EP, *You're Glory*, the closing track 'The Revealing' began as a synth demo of my vintage Yamaha CS-60 synthesizer through an old Alesis Midiverb 3 effects unit. After having thought of a few melodies and general chord progression, I decided I would do a video recording of the on-the-spot performance. I uploaded the video, *Yamaha CS-60 - Artisan Loyalist - "The Revealing" demo*, to my YouTube channel, but the 'demo' stuck with me as the improvised, loose-metered metronome-free performance had a life beyond my provisionally limited providence. I ended up taking that performance and reworking it to become that which appears as the final album version. With some revisions and some underlying chord changes, the heart of the song retains what initially carried it in the demo. It became apparent to me that these musical pieces on YouTube not only have meaning for listeners and viewers, but are tapping into the creative spirit of the artists themselves.

The YouTube music community also experiences other spawnings of musical pieces, including cover versions, as users will often record versions of themselves performing a song from another artist. Cover versions and the inclusion of other media or information leads to a form of cross-pollination, connecting users and viewers to other users and their subsequent viewers. In my previous tenure with my former band, Faunts, my song 'Das Malefitz' was

included as the closing end credits song of the video game, *Mass Effect 3*. And, because of the wide-reaching distribution of the game to its dedicated fan base, there is a resulting video of a YouTube user performing the guitar melody from the song. These types of media-based connections can lead to whole other spin off collaborations, too. After the overnight success of Netflix's *Stranger Things* and its accompanying soundtrack, Thorsten Quaeschning & Ulrich Schnauss of the iconic electronic super group, Tangerine Dream, were commissioned to rework a couple cover versions, or "interpolations" (Yoo, 2016) of the original score by Kyle Dixon & Michael Stein. This all comes full circle, as Tangerine Dream were an influence on the creation of the original score (Maerz, 2016, as referenced in Yoo, 2016). Quaeschning & Schnauss' collaboration then led to them composing an entire album together of instrumental electronic music in a similar vein, resulting in the album *Synthwaves*, as Quaeschning notes: "After making the *Stranger Things* fun-recording between two concerts, we had fun just writing 80s inspired music just for two weeks…this a document of our learning process" (Quaeschning in Whitaker et al., 2017). Schnauss continues, adding his experience of what this ephemeral recording project brought about creatively:

> Sometimes really good stuff comes out of a situation where you are just quite relaxed and don't even over-think stuff too much, because when we started working on those things, we certainly didn't have in mind to actually record an album together. So this happened…completely naturally, and without any…pressure. (Schnauss in Whitaker et al., 2017)

Besides views generated because of cross-pollination between artists, sometimes viewers click on a video because of a particular piece of gear that it features, and then they are presented with the artist's rendition using said instrument and/or effect. For some users, the featuring of the gear

used (both visually, and in the title and description) is a deliberate choice as it often leads to higher view counts (Hagberg & Mary, 2015). I experienced this as my video, *Roland SH-3A, Strymon Flint*, had the gear listed and was the central focus of the composition, and thus got featured on the Matrixsynth blog and received a bump in viewership due to the fact it was exposed to their vast audience of users seeking out media on electronic instruments, new and old.

I recently stumbled upon a video that was both a cover of another YouTube composition, and it also prominently featured the electronic instruments that it was created with. The video *Klangteppich - Marc Melià: Arpeggios #1 (Music for Prophet 08 - played on Prophet 5)* by Marius Leicht, is a cover version of Marc Melià's synthesizer compositional video, *Marc Melià - Arpeggios#1 (Music for Prophet 08)*, in which Melià composed a musical piece featuring the Dave Smith Instruments Prophet '08 synthesizer, and the BOSS RE-20 Space Echo delay pedal. Leicht's cover version thus featured the Sequential Circuits Prophet 5 synthesizer and the Roland RE-201 Space Echo tape delay, as an homage to Melià's music piece by using the original vintage synthesizer and tape delay that were the source and inspiration of the instruments created by the successor companies/subsidiaries of that which the instruments in Melià's video were comprised of. As much as Leicht's version is a cover rendition of Melià's, so too is the equipment as the gear is like a cover of themselves; Prophet new to Prophet of old, Space Echo new to Space Echo of old. These compositional videos, each as a 'machinic assemblage' (Deleuze & Guattari, 1987, p.4), leads towards the 'sonic machine' as "...a perspective from which to consider the *conflictual* field of musical forces that conventional musical discourse elides or represses" (Hemment, 2004, p.78-79). Leicht's video serves to beautifully blur the lines between equipment demo and compositional music piece, as the assemblage of user, music

technology, and social media provides the platform for emerging music pieces, demos, and tutorials.

Readily Accessible Technologies

Not only can users learn about technology through platforms like YouTube, but the technology itself—both software and hardware—is more accessible now than ever before. A resurgence of new analog synthesizers has led to a golden age for options when choosing a synthesizer, with options from Korg, Oberheim, and Moog (Lewis, 2015), amongst numerous other manufacturers. Dave Smith Instruments has been at the forefront of the analog synthesizer revival, and, with the rights given back by Yamaha, Smith's former company Sequential is now creating new synthesizers after a hiatus since the company folded in the late 80s (Sherburne, 2015). The movement started slowly and small, as Smith himself was a one-man operation for many years under DSI, with his Evolver line of synthesizers breaking back into the market in the early 00s, along with Korg's initial dipping their toes in the water in their Monotron and Monotribe lines. These small, incremental moves have helped open the floodgates to numerous manufacturers, big and small.

With a seemingly ever-growing electronic musical instrument market, there are currently 166 products listed under the 'synthesizer' heading on the online retailer Sweetwater.com (Sweetwater, 2017). Of the 'big three' manufacturers (Korg, Yamaha, and Roland), Korg continue to amass a number of compact, affordable analog in their synthesizer lineup including the Volca series, Minilogue and Monologue, as well as reissues some of their classics as well as from the ARP line of synthesizers (MS-20 and Odyssey, respectively). Yamaha remains relatively quiet, but have presented their polite Reface series of virtual analog synthesizers, electric pianos, and organs. Roland seem to be continually cashing in on their X0X legacy of

products, including celebrating ‘808 day’ with new offerings of their Boutique line of instruments including the TR-08 drum machine and the SH-01A synthesizer, both utilizing their proprietary Analog Circuit Behaviour technology (Fact, 2017). Seemingly bereft of new product ideas, Roland continues their rehash of the X0X lineup with the aforementioned instruments, amongst others, that abide by their new naming system. The SH-01A (SH-101 remake) needed to be befitted with the ‘A’, as they had already used the SH-01 as a marketing rehash for their GAIA synthesizer. Perhaps Roland did not plan effectively for how long they would need to stretch out marketing tactics by vaguely alluding to legendary instruments of yore like the Juno, Jupiter, TB, and TR series’. Oddly, Behringer responded to Roland’s 2017 808 day offerings by posting a photo to their Facebook page of what appears to be a vapourware clone of Roland’s vintage SH-101 synthesizer (Behringer, 2017). A move in keeping with Behringer’s tendency to capitalize on outdated intellectual property by rehashing a clone or remake, and undercutting the market due to their large economy of scale operation. Despite shortcomings or misgivings of these companies, the selection of brand new synthesizers and drum machines (both analog and digital) available is truly amazing.

Software plugins are becoming increasingly convincing in their striking emulations of vintage pre amplifiers, compressors, and effects. Plugins are blurring lines of sonic authenticity, being virtually modeled after a tactile interface, and the resulting graphic user interface of plugins tends to take on their skeuomorphic layout and design. Companies like Universal Audio, Soundtoys, Waves, Slate Digital, Arturia, U-he, Native Instruments, and iZotope, are pushing the technological limits that the computer hardware can handle, and smaller outfits like Valhalla DSP or Togu Audio Line consist of one proprietor who believe in as great a product, and at a very low cost. These types of trends are also emerging in hardware with companies like Warm

Audio, who create authentic replications of vintage compressors, pre amplifiers, and microphones at a fraction of the cost of the originals, or even of the official reissued products.

Housing many of instruments that these plugins seek to emulate is the National Music Centre in Calgary, Alberta, Canada. This resource centre, burgeoning on electronic music institution, brings music education to the public in a form of electronic pedagogy that can enrich the lives of the general public. The iconic instruments that their collection holds is available for all, and not just relegated to the studios of the elite. These affordances provide the average person a form of electronic democratization that bring these instruments to the masses.

Current music technologies afford the average user the possibility to generate and consume media, and their skeuomorphic design leads the user to engage with them in specific ways. Digital Audio Technologies (DAT) may be technologically biased to lead the user down certain prescriptive paths, but the sheer power of these tools can elicit deeper connections to oneself if we are willing to look beyond the prescribed way in which one might use these tools in order to utilize them as expressive tools of creativity. Integrating these types of DAT into a music education program with a top-down approach would yield similar results to what we are already experiencing in music education, so the importance lies in how we conceptualize new ways in which these digital tools might be used.

CHAPTER TWO

PEDAGOGY I

Philosophical Framework

In this chapter, I will centre my discussion on two philosophical concepts, namely the 'rhizome' and 'multiplicity' (Deleuze & Guattari, 1987, p.6; p.8). The rhizome is a conceptual lens used to describe, understand, and reimagine growth, movement, and decentred, non-hierarchical organization. Deleuze and Guattari utilize the rhizome due to its lateral growth and multiple offshoots, and it differs from the arboreal figure of the root tree which is characterized by linear growth. In using the rhizome, my intent is to rethink composition using music technology in secondary music education, as it allows one to conceptually reimagine possibilities as it provides an alternative to arborescent schemas characterized by the concert band model within the traditional music education paradigm. Deleuze and Guattari remark that "a rhizome as subterranean stem is absolutely different from roots and radicles. Bulbs and tubers are rhizomes" (1987, p.6). The important difference between a rhizome and that which is arboreal, like the root or radicle, is the trajectory of growth. Deleuze and Guattari depict the difference noting, "there are no points or positions in a rhizome, such as those found in a structure, tree, or root. There are only lines" (1987, p.8). This allows one to reimagine the confines of power, communication, or any other discourse not only as a linear, top-down method, but rather through the potential of lateral growth and heterogeneous connectivity. What is noteworthy are the 'lines'—the possibilities of lateral movement. An arboreal, or root tree method, limits itself to elicit ossified meaning as a recurring return to homogeneous organizational structures. It is not that arboreal and rhizomatic methods necessarily oppose each other (1987, p.2), but rather what is more important is the connection between the two as "a rhizome ceaselessly establishes connections

between semiotic chains, organizations of power, and circumstances relative to the arts, sciences, and social struggles" (1987, p.7). One of the largest differences between the arboreal and rhizomatic understandings is the way which they both travel. The arborescent assumes an origin and a final destination. Much like the way traditional music is expected to be communicated, arborescence proposes an origin of creation, and the performer or listener are the end of the line. The rhizome, however, has no predetermined path. It cannot be cloned or stamped. It is generative. It moves.

The rhizome provides a deviation from a top-down method, as a rhizomatic lens can be used to help conceptualize that which is not realized. Within Western music education, students are implicated by the construct set before them: they learn to read music and repeat the piece back verbatim. We might consider music theory to be very much like a language, and it is important for the student to learn to speak and communicate musically. However, students do not learn to speak a language only to recite works from authors who are long dead, never to utter an original thought. Yet, that is often how music is taught to students: learn to perform a piece written by someone completely disconnected from the student, uttering *their* thoughts, emotions, or feelings. This is an arboreal way of teaching which edifies the term Deleuze and Guattari describe as 'tracing', as they note that "all of tree logic is of tracing and reproduction… The tree articulates and hierarchizes tracings; tracings are like the leaves of the tree" (1987, p.12). The leaves of a tree are genetically destined to become exactly that single entity—a leaf. It may vary slightly in shape, size, or colour, but it will ultimately be recognized for its singularity. Arboreal tracing will result in closely replicated recreations, as music students are regulated to 'play back' the notation on the page. To counter this, Deleuze and Guattari liken the rhizome to a map, noting "what distinguishes the map from the tracing is that it is entirely oriented toward and

experimentation in contact with the real. The map does not reproduce an unconscious closed in upon itself; it constructs the unconscious" (1987, p.12). This is the opportunity for an encounter, and composition can provide forms of expressive, musical communication (Nielsen, 2013, p.61). Composition can allow for new musical territory to be discovered, as opposed to the tracing, "which always comes back 'to the same' " (Deleuze & Guattari, 1987, p.12). Deleuze and Guattari deterritorialize the music score in the image at the beginning of 'Introduction: Rhizome', which Bogue (2014) notes as one of *A Thousand Plateaus'* most important visuals (p.472). However, I would venture to say that the score needs to be deterritorialized even further, as **"**musical notation was a form of recording, but a static one, and one that privileged the eye over the ear" (Cox, 2011, p.153-154). Music education needs to make a drastic departure from the music score in order to free students from musical tracings.

A way to turn away from the notion of tracing is in the concept of 'multiplicity' (Deleuze & Guattari, 1987, p.8). Multiplicities allow for the rhizome to move away from the arborescent, as multiple ways of experiencing, seeing, or encountering allow themselves to not be semiotically reduced: "A multiplicity has neither subject nor object, only determinations, magnitudes, and dimensions that cannot increase in number without the multiplicity changing in nature (the laws of combination therefore increase in number as the multiplicity grows)" (Deleuze & Guattari, 1987, p.8). The multiplicity differs from the arboreal in that it can be unwieldy. The arboreal often denotes the subjugation of the signified by the signifier. This is how an agenda can be pushed, power reinforced, or control maintained. In the case of traditional music education, this is how the concert band model retains order over students through the musical score and the hierarchy of the teacher-as-conductor. What is crucial is that the concept of the rhizome is not distant from the individual. The individual can encounter new experiences or

understandings, as Deleuze and Guattari note that "it might be objected that *its multiplicity* resides on the person of the actor, who projects it into the text" (1987, p.8). This is a personification of the rhizome; it takes the unreal and allows the individual in the character of the multiplicity to house a new reality. Change lies within the exponent of possibility. Deleuze and Guattari depict the connections, noting that "multiplicities are defined by the outside: by the abstract line, the line of flight or deterritorialization according to which they change in nature and connect with other multiplicities" (1987, p.9). These lines of flight allow one to reimagine what might not have previously been possible. Composition can bring about new multiplicities when one thinks of the sonic possibility of a soundscape rather than repeating notated music in which the performer plays back something that has already been musically conquered: affording students to chart new sonic cartographies can provide a host of opportunities for comprehension, expression, and becoming. What needs to be clarified is that new multiplicities need not negate the arborescent, but that they allow a multitude of interpretations and deviations. Deleuze and Guattari note the effect of the multiple stating that "the tree imposes the verb "to be," but the fabric of the rhizome is the conjunction, "and… and… and…" This conjunction carries through enough force to shake and uproot the verb 'to be' " (1987, p.25). The significance is within what has not yet happened. Fixating on 'to be' already designates not just an outcome, but *the* outcome; it has a beginning and an end point. What separates the rhizome is not its origin or final destination, but that "…it is always in the middle, between things, interbeing, *intermezzo*" (Deleuze & Guattari, 1987, p.25). The rhizome is continually in-between.

Educators can encounter other effective teaching practices and create varied learning opportunities by allowing a learning environment to grow like a rhizome. The rhizome and the arboreal are not a binary (Deleuze & Guattari, 1987, p.9). They are not opposed. They can both

portray characteristic growth of the other as neither is completely heterogeneous (Deleuze & Guattari, 1987, p.15). Practical application of the rhizome is understanding that it can be connected to an arboreal construct, as rhizomatic growth can emerge from the root (Deleuze & Guattari, 1987, p.13). Allowing rhizomatic growth, even just a little, can bring about exponential change far beyond the initial exposure. Following, a complete reform of something like the education system in itself would not be rhizomatic, as that would instill the arborescent. An educational reformation, even with the best of intentions for new encounters, would nonetheless be pushing an agenda. This seems to be the most important aspect of the rhizome that can easily be overlooked. If change is tethered to conformity, even for the 'good', it has had an end in sight that has now been met. What has to be acknowledged is that the rhizome can be dangerous; it can be cancerous or unruly (Deleuze & Guattari, 1987, p.7). However, to negate its volatility would disprove the rhizome entirely. To allow change to happen rhizomatically, an idea, thought, or movement must be introduced and allowed to grow. It cannot be forced. It cannot be wielded. The figurative rhizome lends itself to uncovering new possibilities, but they can be adverse. As long as rhizomatic growth is in one's favour, it is seen favourably. Once it gets out of control or elicits a contrary result than what one desired, it can be seen as harrowing. Just as if a flame is given the chance to burn beyond the confines of the fireplace, it surely will. It will burn an entire house down if given the chance, yet we see that negatively. In reality, the fire is reacting and responding as it always has in the conditions provided to it, just as the rhizome germinates if given the opportunity. With its properties considered, we might consider how rhizomatic qualities could be given room to germinate within music education.

As traditional music education has already set out to achieve a hierarchical order between teacher and student, perhaps it is possible for the assemblage of teacher *and* students to

collectively grow outwardly, pulling one another into new territory. Lines (2013) illustrates Deleuze's image of the rhizome as an "emergent new" (p.28), and goes on to reimagine music as a form of "sound-arts" (2013, p.30). Here there is less focus of formal theory and limitations, and more along the lines of how composer Brian Eno has described his own experimental music as "painting with sound" (Sheppard, 2009), or Stockhausen's imaginative way to describe how one might "compose with colours" (Stockhausen in Brookes et al., 2005). For example, recording technology creates the opportunity and foundation for electronic-based music (Hemment, 2004, p.77) to become a "musical assemblage" (Deleuze & Guattari, 1987, p.343, as referenced in Hemment, 2004, p.77). Recording software can afford creative exploration, as Lines (2013) highlights that "...sound in education offers opportunities for the exploration of imagination and nuance in thought and perception" (p.30). It is these types of technological-musical philosophies that are ready to be hemmed into modern music education.

Integrating DAT into a music classroom in itself is not a rhizomatic action. Computers are often thought to be rhizomatic, but they are arboreal as they still have a central core and 'set' algorithms, and as such, we should be wary of "false multiplicities" (Andermatt Conley, 2009, p.34), as the integration of DAT in music education does not equate a multiplicity. However, the musical assemblage of student + recording technologies is what can provide rhizomatic growth, as Hemment (2004) notes that "the rupture of recording is already plural" (p.90). If we consider the student as composer (Minott, 2015: Miksza, 2013), they might begin to determine their own creative path, breaking away from the hierarchized nature of traditional music education. Recording and composition can reinforce this creative autonomy, as Attali (1985) notes that, "after the process of identical repetition has extended to the whole of production, the end of differences unbridles violence and shatters all codes. Composition can then emerge.

Composition, nourished on the death of codes" (p.36). Composition can now be accessible to students because of the affordances of current music technologies.

The non-neutrality of Information Computer Technologies (Bell, 2015) leads to the very characteristics and capacities that these tools are capable of providing. Bryant (2012) notes that we need to consider not only the qualities of a substance, but his concern is in highlighting "...the powers or capacities hidden and coiled within substances...what objects *do*, their capacities" (p.533). Recording technologies have the capacity to act upon the user. Bryant describes qualities as "...the effects of an object's or substance's powers or affects, not these substances or powers themselves" (2012, p.536). With DAT, we may think of their qualities as merely being able to play back what the user has inputted. Yet, their "potentia", or "affect as power" (2012, p.534), would suggest that they are capable of far more, as they compel the user to make creative choices that they would not have been able to do without being assembled with these technologies. For music education to embody the rhizome, it must rely precisely on the capacities that DAT have on the user. Bryant (2012) highlights that, "our tendency is to divide the world into subjects and objects. Subjects are characterized by intentionality and purposive action, they are actors; whereas objects are passive recipients of action" (p.542), but he reinforces that "...all entities are actors" (2012, p.542). An actor is " '. . . any thing that . . . modif[ies] a state of affairs by making a difference…' " (Latour, 2005, p.71 as quoted in Bryant, 2012, p.542). Digital Audio Technologies have capacities that afford users the ability to compose music that is revealed in the process due to the ways in which these tools might act upon the user. These characteristics can provide new realities to students within music education as they begin to compose their own works. Students can now generate material artefacts in the form of musical recordings, resulting in a body of expressive work.

Thought Experiment I: Philosophical Experiment

Philosophy of Music Technology

My philosophy of music technology has been heavily shaped by my experiences with hearing, seeing, and utilizing various musical tools, or rather, the ways in which they have enacted upon the senses. I do, in gratitude, also acknowledge having grown up in a family that valued a process of 'musicking' (Small, 1998, p.9) as something we did individually and together: my mother taught piano lessons and regularly performed at church, my father curated music for vocal ensembles he organized and performed in (in addition to having recorded and released vinyl records of his quartet in the 70s), and, my siblings and I all undertook lessons in classical piano and/or guitar under the Royal Conservatory, leading each of us to being involved in music education at some point in our lives. We have also spent years playing in various bands or groups, as each one of us writes and performs original music. I realize that when growing up, my household was always involved in music in some shape or form, and as a result has afforded me the opportunity to learn, compose, and perform music in an environment that *valued* such things. Even if in areas not fully understood or realized, this musical presence was very much welcomed.

In the late 80s, my parents purchased a 'keyboard' for us kids to practice piano on. We already had a family piano, but since my mother was often teaching piano lessons on the acoustic piano, the intent was that we would be able to practice on this new keyboard with headphones on. New it was not, as it was purchased used from a family friend, but it was new to us. It was not a cheap digital piano keyboard, but rather unbeknownst to us, it was a Roland Juno 106 analog synthesizer (something we did not fully appreciate until many years later upon realizing its status amongst hailed vintage analog synthesizers). My parents, however, did choose it

intentionally, not only for us being able to practice piano keyboarding on it, but also because of its ability to produce various sounds, and, its MIDI[2] connectivity. The intent was that we would interface it with our Macintosh computer via sequencing software. However, amongst the possibilities and wonder of what that might conjure, it never ended up happening. In defense of good intentions, this was at a time where the personal home computer in itself was very much a novelty, never mind setting up an esoteric electronic home studio. Despite that scenario not materializing, that Juno 106 is a token for me personally, reminding me that music technology was *valued* in our household. So much so, I ended up purchasing one for myself several years ago, as the family Juno currently resides with my brother. The Juno 106, a relatively simple synthesizer, remains one of the core instruments in my personal studio, despite others that might have a higher technical capacity or more sophisticated sonic architecture. It is a writing tool that I often begin at or return to, for its familiar sound and wide tonal sweet-spot, and that it was the synthesizer on which I learned the principles of synthesis. It is an instrument, if not *the* instrument, that will always feel like home.

Over time, what has occurred to me is that a successful entrance into the world of recording music technology often requires some form of 'in'. This can take shape in its most basic sense as the physical equipment itself, but also in some form of helping hand. It is the pairing of both the equipment and assisting in the know-how as techno-musical-assemblage that leads to greater success in learning esoteric technology. One Christmas in the late 90s, after much begging, my parents gifted my brothers and I a 4-track cassette recorder. In some ways, this seemed to be a follow through of sorts, or 'refrain' (Deleuze & Guattari, 1987, p.323), to the

[2] MIDI stands for Musical Instrument Digital Interface, a universal digital communication language (and accompanying peripheral ports and cables) in which to connect electronic musical instruments

home MIDI studio configuration of the Juno and computer that did not end up coming into fruition. In some ways, the 4-track recorder sated some of those creative-compositional desires, as "…refrains are not just closures but openings to possible change" (Bertelsen & Murphie, 2010, p.145), but it was in ways which we could already register with in our tacit understanding surrounding the conventions of rock music and basic multi-track recording. The 4-track recorder allowed us to track, layer, and arrange simple demos, but really was an extension of the ways in which we could already conceptualize; a musical notepad, of sorts. What the home MIDI studio might have unearthed is a creative production environment capable of 'machinic potential' (Mackay, 1997, p.253), which, I did end up encountering when I began to learn on my first computer recording setup years later, but, not as a complete assemblage of user + music technology + the 'in' of a helping hand. I was lacking the assistance needed to propel me further into engaging with the music technology. My brother had been doing much of the same around the time I was learning these concepts, and I believe we both felt equally lost at times when learning the myriad of technique required to operate it all. Much of what we had been initially creating was an extension of the notepad-style of recording ideas, versus the many sonic possibilities now afforded to us through sound design, sequencers, and synthesis all enclosed within the music software.

The 'in' that I felt I was missing when first learning synthesis, sequencing, and recording with my computer could have been embodied by someone with the know-how to teach me the basic principles of the tools I was working with. Today, as ambitious, emerging electronic creators rise up to do the same, they have that need met with online resources like comprehensive tutorials and demos on sites like YouTube, among others. Although this method requires the user to typically learn from a distance, and possibly on their own as well, it does

allow individuals to reach further, learning to create their own original, 'agency-enhancing' compositions (Muhonen, 2016, p.274). Seeing this electronic music curricula flourish online causes me to question why, is it, that music education does not typically provide this type of 'in' for our students to learn to create their own electronic music compositions? At times I wonder what type of electronic creations I would have made as a child if we were to have successfully set up the home MIDI studio and unlocked its machinic potential. It is that same question that I wish to posit within a present-and-future electronic music pedagogy that would provide students the 'in' that they require in order to become sonic sculptors capable of wielding their own 'creative agency' (Muhonen, 2016) or 'musical agency' (Abrahams, 2015).

Modern recording technology has now changed the creative and technological conditions which we find ourselves in. For many new users, they are able to begin composing and creating music for very little money, or sometimes for no money at all. While professional digital recording setups can still be very expensive, what has changed—or evolved—is the platforms in which recording technologies are available, as simple iOS and Android apps can additionally prove to be powerful compositional tools. As smartphones are nearing ubiquity, they, as well as tablets and other devices are providing users a platform to try out virtual instruments or recording apps. Not everyone is committed to purchasing expensive items like a high end computer, audio interface, software, and MIDI controllers in order to get some exposure into digital recording. However, free apps like Figure far lessen the barriers to entry for users to begin working with music technology software. Even as computing solutions and recording equipment has become more available and have lowered in price, more and more users are afforded the opportunity to create their own music. My first laptop recording setup cost me somewhere

around $2000 just to get started. Now, before users might be inclined to outfit themselves with that type of setup, far more offerings exist as entry points into the creation of electronic music.

Faith alone cannot be centered on the technology as being that which we look to for progress. Virilio warns us of the possibilities that technological progress brings with, as he notes how, “inventing a plane is not only inventing the crash but also inventing the breakdown” (Virilio in Dumoucel & Virilio, 2010). He heeds us to consider the way in which technology is implemented and integrated, specifically, in his term ‘dromology’, which, in part, concerns itself with the risks surrounding the speed in which technology is exponentially changing (Virilio, 2006). The significance of music technology lies within the affordances that it now brings over multiple platforms, and to the masses. One can concern themselves with Virilio’s dromological warnings, and although it applies to music technology relating to the reliance on working hardware, it does not necessarily instigate trouble. Music technology peripherals, specifically around computer processing, will always be a point of developmental contention, in that we are expectant of computers to be increasingly powerful, capable, and no-less-than-remarkable machines. What computing technologies have presented us with are affordable and powerful machines that allow one to create compositions that would have been previously only possible within the professional recording studio. Virilio (2006) highlights our intentions in exponential developments, noting how “Western man has appeared superior and dominant, despite inferior demographics, because he appeared more rapid” (p.70). His warning causes us to question our intent, as we find ourselves continually within a technological ‘arms race’, per se. We are so focused on technological progress, implicating ourselves because of what we can do, not necessarily because of what we should, or need to do. Virilio aptly describes how “speed is the hope of the West” (2006, p.70), to which we might consider the implications of needing to

always be concerned with technological progress. Virilio's warnings might have us consider the perpetual obsolescence of computing technologies, breakdown of computer hardware, and crashing software. These things considered, they often are symptomatic byproducts of chasing the latest developmental trend: constant updates, legacy hardware not complying with newer computer operating systems, and a lack of processing power required to run the latest plugins and virtual instruments. However, I would argue that these 'problems' are, typically, part-and-parcel to the *privilege* of having accessibility to the latest in computer processing, recording software, and plugin instruments and effects. One does not *need* the latest updates in order to create music. It may provide new features that make the process easier, or more powerful, but high quality recordings can still be created on legacy systems precisely because of the quality that digital recording has steadily provided in the years leading up to our current state of music technology. I just recently finished professionally recording and mixing a new solo album on a computer (and accompanying operating system) that is eight years old. I did so simply because it is a stable system that just *works*. I have, however, assembled a newer studio computer with more power and a newer operating system because I would like to have access to certain virtual instruments and updates. It is a want, and not a need, though. I want more processing power and various plugins, but I could still make professional quality music on my old setup. With these types of technologies, there seems to be a period of leveling out, where the updates are not as drastic as they once were. Similarly with smartphones, the initial updates and developments were seemingly exponential in what these machines could *do*, however, they seemed to have experienced diminishing returns in recent available updates and features. We might concede that despite this technological shadow, more of these technologies are available to users than ever. If we alter our gaze from that which is of limited privilege to that which is technologically

democratic, more can be served by what these technologies are capable of, and not just for the perceived status value that we put upon them. Shifting technological priorities can allow more people to benefit from established advances than just the elite.

In recent years, the U.N. declared that the Internet is a basic human right (Kravets, 2011). Our needs and values stir us to no longer consider such technological advancements to be only of privileged opulence. As these technologies become part of our basic needs, their availability allows the average person to generate their own media. We have moved away from the arborescent singularity of the television network, to where social media is being utilized to create educational tutorials, personal fitness videos, comedy, and the broadcasting of world events in real-time. Here, the conceptual viral video emerges as a rhizomatic line of flight from these democratized media platforms. Music is no exception here, as the technology is not only affording users the ability to create it, but is heavily influencing the styles of music that are being made, as offshoots churn out new growth. The musical-machinic assemblage that technology now affords users is leading to various new styles of music: trap, futurebass, and even the long-in-the-tooth dubstep, which for our purposes here, might be one of the earlier examples of a spawning genre of democratized, digi-centric production style of the 2010s. Artists like James Blake, Bon Iver, Flying Lotus, and Grimes have been blurring genre lines with their tech-forward productions, yet not falling into established, quantified genres like techno or dance music.

Purity Ring has accepted the ‘future pop’ tag that has been assigned to describe their forward thinking blend of electronic textures, indie twee, and hip-hop production (Brown, 2015). Their music emerged in 2011, initially as a one-off collaboration by Megan James and Corrin Roddick, as both were members of the band Gobble Gobble (later becoming Born Gold). Their

first song, ‘Ungirthed’, was posted to one of Roddick’s social media pages and began to spread quickly to various music blogs, lauded for its emergent sound. From that initial track, their sound developed around Roddick’s hip-hop style drum production and the way in which he took James’ vocal performances and deterritorialized them into chopped up, detuned layers that danced around as an instrument with the rest of the production layers. This rhizomatic line of flight emerged from the assemblage of computer + music software + producer + vocal recording. I would venture to label this as a rhizomatic offshoot because of Roddick’s previous background in recording rock bands; a further deterritorialization along the electronic music “plane of consistency” (Deleuze & Guattari, 1987, p.4) that had already been established by Born Gold/Gobble Gobble proprietor, Cecil Frena. The rock band construct is inherently arborescent, as its limited variation in player roles has been more or less defined since the mid twentieth century. Roddick and James were able to create a line of flight in their productions simply because all the structural layers of guitar, bass, and drums were stripped away from the outset. Having been established in early tracks like ‘Lofticries’, ‘Belispeak’, and the aforementioned ‘Ungirthed’, their now signature sound of stuttered, detuned vocals layers, in my opinion, has gone on to influence emerging pop music. As of late, there has been a developing trend of vocal production, specifically within the chorus or bridge of a song that has come to be known as the ‘pop-drop’ (Harding, 2016). Heard in many contemporary pop songs, this production technique seems to hearken back to Roddick’s deconstruction and repurposing of James’ vocals, as producers lately are assuming similar techniques to chop up, detune, and in a sense, synthesize the vocal line as a melody and instrument of its own being. Moving away from the body, it is deterritorializing what we typically understand a vocal melody to be as a form of *representation* (Attali, 1985, p.31-32), to then becoming reterritorialized as an autonomous lead instrument,

unassuming of the conventions, characteristics, and tropes that we might previously have assigned to it via its semiotic extension of the body as voice-producer. The voice now ruptures its assumed form of enunciative representation as an autonomous break.

We might consider the popularity of the 'pop-drop' due to the function of the musical-machinic assemblage of user + music technology, as these emerging producers are aiming to replicate what they are hearing in popular music. They are encountering far less of the electric guitar, and far more of these types of deterritorialized, synthesized vocals, which these young producers are aiming to replicate in their own work. Here there is less in the form of 'lifting' guitar riffs, melodies, or playing styles, and more production, editing, and layering techniques. The rock band construct has its own structural limitations (typically guitar, bass, and drums), but also a higher barrier to entry: years of practicing an instrument, assembling with others who have done the same, and then the issue of recording the music. The cost to record a band in a professional studio can be highly cost prohibitive. It might be considered that emergent electronic-based music styles are emerging because of what is now afforded to young musicians. As recording software is becoming cheaper and more readily available over a wider number of platforms, more young musicians are able to experiment with their own electronic compositions. Previously, this may have been in the form of the guitar player 'riffing' in their bedroom. But, the significance now is in that emerging electronic musicians are able to create a tangible product in the form of the audio recording artefact. It may lose the ephemerality of the riffing or jamming, but it produces itself as a token of sorts for the musician. The various parts that previously would have to have been played by the other members of the band can now be programmed, performed, or recorded by the electronic musician on their own. Rather than the time investment needed to assemble the rock band, in addition to the exorbitant cost of the

recording studio, young electronic musicians are removing these barriers to entry by completing these tasks on their own. The sound of this emerging generation is predominantly electronic, as it is largely produced on laptops by another young producer, to which emerging artists are doing the same in order to try and replicate the sounds of contemporary music. Here, the rock recording studio paradigm simply does not hold the same capital as it once held in the music industry.

Simply, the conditions of popular music have changed. Opposite to expensive rock recordings, production techniques like the pop-drop require far less to accomplish, as the samples are typically derived from the vocal of the song, and can all be re-pitched and effected within the computer itself, or 'in the box'[3]. The producer only requires a microphone and audio interface to record the vocals, as well as a Digital Audio Workstation with a few plugin effects and instruments. A professional audio recording can now be made at home for very little money, and in turn has contributed to the democratized creative landscape which many young musicians now have access.

Synthesizer as Affect-Producing Machine

My entrance into creating electronic music was, in part, due to that which could not be done with traditional instruments and instrumentation. Within classical music, the notation was held as a "system of power" (Attali, 1985, p.57), being assigned as some 'truer' form of refined music, and I was further drawn to the electric guitar and the drums because of their occupancy in other sonic and creative territories. But, there came a point where I wanted new sounds, however the sonic confines of the guitar would not produce much other than its mid-range sonic identity. In my teenage years, I spent time practicing the guitar to increase proficiency so that I could play the parts, and keep up with the music. But, in my late teens, I did not want to play any faster, or

[3] 'In the box' is a term that refers to the process of recording or mixing that is solely within the computer software; not engaging with external hardware.

more technically. I could see the road that led to, and the music that legendary virtuosic guitar heroes played seemed, to me, so void of soul. Sure, it may be technical, but it felt like a way to communicate athleticism rather than to enunciate something from within.

In my early 20s, I was collecting more guitar pedals to alter the sound, but was ultimately faced with inherent limitations of the tones I could create with the guitar. There were certain sounds I wanted to achieve, but the various guitar synth and effect pedals could never quite get into the sonic territory I was aiming for. As much as I tried different pedals in different configurations, they ultimately came down to being pedal-as-*effect*, in that they were always altering the final, fixed state of the electric guitar sound. What they lacked is the capacity to become pedal-as-*affect*, in which they would be able to formulate all sorts of sounds, rather than feigned modulation or attempting to change what was already of a set sonic structure. The synthesizer, however, does have the capacity to move between the fixed, static architecture of the strings that the guitar, bass, and piano must adhere to. In this capacity, affect can be considered to be "...assemblages of human and non-human processes" which consist of the "...life and vitality which circulate and pass between bodies" (Blackman, 2012, p.1; p.4). Rather than the guitar effect pedal as a noun of fixed proportions, *the synthesizer—as fluid verb—is an affect-producing machine.*

Although the synthesizer was certainly capable as such, it was not fully conceptualized or accepted in such a way. Jowi Taylor describes the way in which synthesizers were initially presented to the public market:

> I suppose that was the expectation of synthesizers. That they would create synthetic versions of things we knew. And there was a kind of pejorative sense of that word: synthetic. And when you think about it, lots of the early showcases for synths were kind

> of like that – different synth tracks took the corresponding instrumental parts of classical arrangements. But the amazing thing is that living in those sounds was a whole new universe just waiting to be explored – by musicians and listeners who wanted to hear the synthesizer be itself – to just love the electronic sound for what it was, not what it could imitate. (Taylor in Brookes et al., 2005)

To some, the synthesizer was an initial failure of representation. It did not represent the brass, string, or woodwind instruments that some preset settings intended to achieve. This is also a result of the tools being predefined by the manufacturers, rather than going out to the market and seeing what might result of users' various implementations or interpretations of the instrument. For the synthesizer to break away from semiotic confines and become its own entity, it had to work between the fixed points of that which it was thought to emulate.

Sometimes it requires the experimentation, misuse, unintended, or unrealized operation of technology in order to uncover what its capacities are truly capable of. Conlon Nancarrow's experiments orchestrating two player-pianos led to compositions that were machine performed in a way that humans could not do on their own (Willey, 2014). Additionally, in the 90s a whole genre of acid techno emerged because of the misuse of the 303 synthesizer. Botond (2014) illustrates how, "...the Roland TB-303 bass synthesizer is responsible for the acid sound, the history of which emerged from the creative perversion of technology by certain early producers" (para.2). Originally intended as a bass accompaniment instrument, the 303 was a market failure. It was thought that gigging solo musicians would purchase the 303 (and possibly the 606 drum machine in addition) as way to provide their own backing 'band' of sorts, without the need for additional personnel. The 303 did not achieve this feat, as it—much like Taylor's description of how synthesizers failed to replicate traditional instruments—sounded very little like the bass

guitar that it was intended to replicate (Dayal, 2013). The parameter settings for achieving a bass guitar-style sound would involve more of a closed filter setting on the low pass filter, as 'closing' the filter involved letting through low frequencies while filtering out most on the upper, high end. This muted sound typically speaks less to the individual character of the filter, which is thought to provide the most signature part of a synthesizer's sound. However, when the filter is opened up to let higher frequencies through, the 303 especially comes to life. Additionally, the filter design differed from that of the more conventional 4-pole, 24dB/octave Moog-style filter, or even the brassy 2-pole, 12dB/octave Oberheim-style filter. The 303 implemented an unusual 3-pole, 18dB/octave filter that, when adjusted with increased resonance, created a unique squelchy sound that has become signature of the machine itself, and to the entire acid techno genre. The 303 also lacked a conventional keyboard, as the user would input note information into a one octave sequencer (Dayal, 2013). The implementation of the 303's sequencer, along with others like the Roland SH-101 synthesizer, allowed for continuous patterns to play out and evolve with changes to the synthesizer's controls. Botond (2014) notes the significance of the possibilities that these sequencers provided: "Particularly in the genre of techno, the key structural particularity of the music lies in the manipulation of repetitive loops: the music is thus engaged in further repetitions of a copy that lost its original" (para.3). The hypnotic, continuous sound creates a territory in which, "...the act of copying the copy is associated with subtle changes in the sound layers, leading to a differential repetition" (Botond, 2014, para.3). Even in its limited functionality, the 303, when used to capacities previously unknown, can deterritorialize sonics leading to uncharted musical landscapes.

Beyond the 303, synthesizers with a more comprehensive set of controls and functionality can lead to a greater sonic palette. Deleuze and Guattari note how the fluid

functionality of a synthesizer alters music in that it "...becomes a superlinear system, a rhizome instead of a tree, and enters the service of a virtual cosmic continuum of which even holes, silences, ruptures, and breaks are a part" (1987, p.95). The way music is created and experienced is altered because of the inherent structure of the synthesizer, due to the 'continuous variation' of its set of controls (Deleuze & Guattari, 1987, p.95; p.109). What the synthesizer does, as Deleuze and Guattari depict, is completely blur the lines between hard-lined parameters of musical, or sonic restrictions, and fold them over into one another, to which they illustrate that, "it is only at this point that one reaches the abstract machine, or the diagram of the assemblage. The synthesizer has replaced judgment, and matter has replaced the figure or formed substance" (1987, p.109). What Deleuze and Guattari are raising is that for the synthesizer to be a rupturing, affect-producing machine, it must be used as its own sonic force, capable of sound design that traditional acoustic, non-electronic instruments could never hope to achieve. One can orchestrate it as a sonic tool to wield the spaces in between non-electronic instruments rather than a representational 'synthetic' (Taylor in Brookes et al., 2005) playback machine that fails to capture acoustic vibrations within its electrons.

A way in which we might understand the sonic affect within the confines of the outlined, structural elements of the synthesizer is to utilize Deleuze & Guattari's (1987) theory of the nomad: "the nomad has a territory; he follows customary paths; he goes from one point to another; he is not ignorant of points" (1987, p.380). We might liken this to the architecture of a synthesizer, as various forms of synthesis have their own 'customary paths' that they follow in which to generate their sound: be it subtractive, additive, FM, granular, or possibly even sample or ROM-based, each has their own way of functioning. Even if just to focus on the more conventional subtractive synthesis, as oscillators, filters, low-frequency-oscillators, modulation

generators, and envelope generators can begin as fixed architectural points, but begin to blend various portions of sound, reaching trajectories not possible by acoustic instruments. For the nomad, these points are not random, but an integral part of the journey. Within the synthesizer, the core architecture as 'points' are not separate from another, but their interaction is what creates the sonics that exist in the spaces between as "every point is a relay and exists only as a relay"; entire sonic territories exist in the in-betweens as "a path is always between two points... the life of the nomad is the intermezzo" (Deleuze & Guattari, 1987, p.380). As acoustic instruments are limited by the fixed properties of their physical vibrations, synthesizers can serve as nomadic instruments capable of traversing sonics, leading towards territories in between fixed, acoustic points.

To further reiterate, we can look to Eno's dichotomy centered around the musical *Oklahoma!*, wherein he likens artists as being either like 'the farmer' or 'the cowboy': he describes the farmer as "...the guy who finds a piece of territory, stakes it up and digs it, and cultivates it; grows the land", and in contrast, depicts the cowboy as "...the one who goes out and finds new territories" (Eno, 2013). Similarly nomadic, Eno states that, "I would rather think of myself as the cowboy, really, than the farmer. I like the thrill of being somewhere where I know nobody else has been" (Eno, 2013). Even if somewhat simple, the analogy—musically and creatively—helps define what exactly musicians aim to accomplish: entering into "the plane of consistency" for it "...is like the smooth, open space of the desert on which the nomad roams" (Cox, 2003, p.13). Going out to chart new territory is uncertain, and not guaranteed to yield a creative moment, but it is the act of 'going out' of one's way to seek out creative inspiration. Eno also notes how, "it's not so much creating something...it's noticing when something is starting to happen" (2013). While enacting processes akin to the farmer, whether in music, education, or

both, we can expect to 'harvest' a predictable set of results—churning out a copy from the mould. However, the path of the cowboy, or nomad, can allow exploration between fixed points in which we might find uncharted sonics, or even unrealized creative moments.

These sonic spaces in between, as producing affect, can be considered in Deleuze-Guattarian terms as 'molecular', as they state that:

> When forces become necessarily cosmic, material becomes necessarily molecular, with enormous force operating in an infinitesimal space. The problem is no longer that of the beginning, any more than it is that of a foundation-ground. It is now a problem of consistency or consolidation: how to consolidate the material, make it consistent, so that it can harness unthinkable, invisible, nonsonorous forces. (1987, p.343)

Here, Deleuze and Guattari iterate how the synthesizer is "...a musical machine of consistency, a *sound machine* (not a machine for reproducing sounds)", in that "...its synthesis is of the molecular and the cosmic, material and force, not form and matter…" (1987, p.343). Their claim can be further reinforced in that the synthesizer, as capable of "producing affects" (Wallin, 2012, p.42), is separate from producing mere *effects*. It is not limited to, or retracted as a "machine of reproduction" (Deleuze & Guattari, 1987, p.344). Deleuze and Guattari highlight how, "the material must be sufficiently deterritorialized to be molecularized and open onto something cosmic, instead of lapsing into a statistical heap" (1987, p.344). It must become subterranean affect as rhizomatic, sonic offshoots.

Historically, It could be considered that Buchla synthesizers were even further deterritorialized in the 1960s than that of Moog, as Don Buchla's machines were noted for having very unconventional ways of triggering notes, or inputting that which the user 'plays'. The synthesizer as we currently know it—as physical object of particular design, shape, and

capacity—is largely in part due to the success of Moog's design, particularly that of the Minimoog Model D: In collaboration with Herb Deutsch, Robert Moog released the Model D as a synthesizer that was far more portable and user friendly than the large modular systems. The success of the Model D, over Buchla's equally amazing creations, was in part to the organ keybed that was attached to it (the physical keys themselves). It gave musicians a tacit way to input note information, and was already a tactile skill that many had. Buchla synthesizers, however, had various unconventional controllers and input devices, which even further deterritorialized the sonic experience. Unfortunately for Don Buchla's legacy, much of the synthesizer glory goes to Robert Moog solely because of the market success of his instruments. Not because Moog synthesizers were better, but rather that they had more capacities for being *familiar* to musicians, even if they had never played a synthesizer before. Robert Moog was creating his synthesizers on the east coast of the United States, whereas Don Buchla was innovating his own synthesizers in California; neither supersedes the other, however Moog typically has received credit because of how his instruments were more readily commodified, and thus more commercially successful. The organ keybed, in relation to "...the tonal or diatonic system of music", in a sense, did striate and stunt some of the sonic lines of flight that artists might have taken with them, as it adhered to "...a linear, codified, centered system of the arborescent type" (Deleuze & Guattari, 1987, p.95). Or, at least it delayed the time in which artists would deterritorialize the machines themselves to see what lies between the fixed points of the keys on the organ keybed.

Multiplicity as Tone Colour

Music education is currently at the fork of a technological confluence wherein students can generate expressive electronic musical works. Students as assemblages with affect-producing

machines, engaging in rhizomatic ruptures of arborescent music education pedagogy, as "*collective assemblages of enunciation* function directly within *machinic assemblages;* it is not impossible to make a radical break between regimes of signs and their objects" (Deleuze & Guattari, 1987, p.7). These forms of creative enunciation serve to reinforce students as a multiplicity. Deleuze & Guattari (1987) note the conditions from which the multiplicity is derived:

> The multiple must be made, not by always adding a higher dimension, but rather in the simplest of ways, by dint of sobriety, with the number of dimensions one already has available—always n - 1 (the only way the one belongs to the multiple: always subtracted). Subtract the unique from the multiplicity to be constituted; write at n - 1 dimensions. A system of this kind could be called a rhizome. (p.6)

This notion of 'n - 1' could be considered in music education as that which we objectify as a form of singular outcome or success, and needing to remove oneself from that focus, as the multiplicity "...ceases to have any relation to the One as subject or object, natural or spiritual reality, image and world" (Deleuze & Guattari, 1987, p.8). This might be a favouring of musical virtuosity, or the arborescent structures of Western-oriented scalings, modes, and repertoire. Current music education might be likened to a figurative classroom of students, sitting in a circle and facing towards the centre. It typically cannot be left at that, opting for equality amongst the actors in the room. We revert to filling that centered space—the space in which our gaze has been set upon—with that of subject or object. That central subject that students have been conditioned to aspire to; not only do they have their gaze set upon that object, but they are also codified by the responses of the others in the group that they see across the encircled room, whose gazes are equally centered. By removing that central focus of subject or object, by which

of ‘n - 1’, we might see the multiplicity emerge by way of its various trajectories (Deleuze & Guattari, 1987, p.8). Here, we can allow for sonic and creative exploration beyond the confines of the centered, circular group: the walls, the corners, and the vertical space above.

This creative enunciation does away with a sense of ‘unity’ being focused on a singularity, away from the quantifiable, as a multiplicity cannot be measured in units (Deleuze & Guattari, 1987, p.8). This multiplicity within music education does not consist of students creatively ‘floating’ around a music room like atoms, occasionally bumping into one another as they occupy the same space. Rather, that students occupy a creative “*plane of consistency”*, as “...they fill or occupy all of their dimensions” (Deleuze & Guattari, 1987, p.9). All of sonic and creative space can be discovered by students, yet our arborescent model of teaching has relegated them to learning rigid, structural forms of music. Here, I will liken our students’ creative potential to that of musical timbres, or *tone colour*. Tone colour is “the quality of a musical sound that is conditioned or distinguished by the upper partials or overtones present in it” (Collins English Dictionary, n.d.). Tone colour is utilized to describe the various sonic characteristics in a musical piece. Tone colour, leading to the various timbres that create foundational sonics, are not bottlenecked to become the same type of timbre, they just *are*. They exist all throughout every space that we are within. Within music education, however, we have consigned timbral *potential*, for striated, dominant sounds of Western acoustic instruments. To move beyond these tonal points, to the spaces in between, we must come to terms with the sonic hegemony put forth by these instruments. The power that the voice has, as Deleuze and Guattari note that “...as long as the voice is song, its main role is to "hold" sound, it functions as a constant circumscribed on a note and accompanied by the instrument” (1987, p.96). Deleuze and Guattari consider ways in which the voice might move away from “...a privileged axis of

experimentation, playing simultaneously on language and sound" (1987, p.96), towards the timbral variation that unlocks the potentia of the voice:

> Only when the voice is tied to timbre does it reveal a tessitura that renders it heterogeneous to itself and gives it a power of continuous variation: it is then no longer accompanied, but truly "machined," it belongs to a musical machine that prolongs or superposes on a single plane parts that are spoken, sung, achieved by special effects, instrumental, or perhaps electronically generated. (1987, p.96)

We might take this further, then, that assemblages of students and affect-producing machines can lead to all sorts of creative, expressive, original works. Their creativity is not just fixed to various points, but is made up of various lines of flight; deterritorialized, creative enunciations that make up the entire *tone colour of the multiplicity*. The importance lies not only in the variety of sounds or music piece that each may come up with, but the significance is hinged upon each student figuratively representing an individual, yet complex tone colour[4] of the music classroom: they are a creative body made up of unique, expressive parts. Students have more to offer creatively than educators currently afford them.

Each student has a unique, creative contribution to bring, raising creative enunciations over athletic, performative representations of notated musical pieces. Such representations have been favoured by current music education, resulting in virtuosity and athleticism establishing a 'top spot', with the remaining to fall-in-line within the resulting descending order. However, in other fields, the multiple is welcomed: we value the catalog of many artists, not just a few. We celebrate that each has something unique to bring to the table, so why not the same with our

[4]Rather than students being moulded into becoming carbon copies of the same prescriptive curricular outcomes, I believe that each has a unique creative identity—their own characteristic 'tone colour' that makes up the collective multiplicity. It is through personal expression via recording technologies that I believe students can unlock and harness this creative potential.

students? Enriched by the works of many authors penning multiple stories; valuing the opinions and corroborated knowledge of many, not just one or few. Having previously favoured recreation over creation, foregoing modulation for representation, how might we move forward?

Not athletic performativity,

however spatial temporality

Not virtuosic hegemony,

but creative expressivity

Not a musical oligarchy,

rather a sonic multiplicity

A multiplicity as tone colour

This multiplicity, made up of numerous tone colours, might also be conceptually thought through the architecture of a synthesizer. It is the duration and intensity that the synthesizer is able to wield (Deleuze & Guattari, 1987, p.343), as it can transcend the fixed sonic characteristics of acoustic instruments. Rather than plucking a string or striking a reverberant surface, the synthesizer's core sound begins with an oscillator, which generates a tone (followed by a wave-shaper, which presents us with conventional waveforms like square, sawtooth, and triangle waveforms). The oscillator provides fixed pitches that the keyboard controls, unless otherwise changed by a form of modulation. The oscillator can then be altered, modulated, and changed by various components including filters, modulation generators / low-frequency oscillators, or envelope generators. What these components do, is take a harmonically rich initial sound, and subtract frequencies from which to generate new, unique sounds (hence, dubbed as 'subtractive synthesis'). Low-pass and high-pass filters attenuate frequencies, altering the sound by taking out high and low frequencies respectively. Modulation generators / low-frequency oscillators modulate the sounds by adjusting pitch or amplitude over various speeds over time, giving a rise and fall of frequency and volume. Envelope generators serve to shape the way in which the sound passes through the filter and amplifier envelopes, resulting in short, snappy sounds, or long, languorous tones, as the 'attack', 'decay', 'sustain', and 'release' parameters allow the user to adjust how quickly the sound comes in or raises (attack), how quickly it falls thereafter (decay), how long the sound holds while a key is held (sustain), and how quickly the sound drops off after the key is depressed (release). If we were to think of acoustic instruments in this regard, their parameter settings would result in fixed filter and envelope settings, with modulation only coming by way of bending a string, or some other actual change in pitch (wherein the piano cannot alter much other than note intensity). When we consider music

education programs, they are working from a limited palette that the instruments are only capable of, and much the same, we have structured the creative learning and sonic experiences to that with fixed characteristics, rather than with fluidity. Not only are the sonic structures of the instrumentation predetermined, so too are their implementations due to the confines of curriculum, class structuring, and the concert band model.

Students have creative, individual realizations and corporate offerings of the assemblage; resulting sonic enunciations of the multiplicity that exist between the fixed points of current music education outcomes. Each student, as their own contributing tone colour of the musical-creative multiplicity, brings about the necessary elements to bring about the most complete expressive, united assemblages. This creative-expressive multiplicity is not made up of reproductions of the same model, trajectory, or outcome—it is not the result of students putting forth representations of the *same* ilk. Rather, in the overlay of differences as creative and sonic solutions the multiple can be found. Participants in this multiplicity are not "...units *(unites)* of measure, only multiplicities or varieties of measurement" (Deleuze & Guattari, 1987, p.8). They are not united for their sameness or uniting factor as a group, as "unity always operates in an empty dimension supplementary to that of the system considered (overcoding)" (Deleuze & Guattari, 1987, p.8). We might liken this to students performing entirely in unison: it may be focused and united, but what it lacks is the harmony, counter-melody, and respective timbres that make up the *collective* enunciation, rather than the singularity of one voice replicated by many. This overcoding is the result of the systematic, hierarchized structures of traditional music education. A creative multiplicity of sonic expression can allow for collective enunciations, as "...a rhizome or multiplicity never allows itself to be overcoded…" (Deleuze & Guattari, 1987, p.9). This multiplicity cannot be overcoded, as each assemblage of user + affect-producing-

music-technology has an entirely unique, expressive voice that cannot be replicated by any other individual or similar assemblage. These territories will never be fully charted, as there are always new combinations of sound, emotions, communication, rhythms, samples, melodies, harmonies, and sound design. Any combination of tone colours, although having certain characteristics, is never fixed. These creative enunciations by their sonic proprietors are always emerging, always being, and always becoming.

CHAPTER THREE

PEDAGOGY II(A)

Becoming Electronic Music Pedagogy

Evolving Values

As our world grows and changes, so do its accompanying values and basic tenets of what we hold to. As we adapt to the evolving world around us, so too must our values change in alignment. I recently attended a keynote lecture in which Dr. Shain Shapiro, a nightlife consultant, spoke about his experience in helping various major centres around the world become music-based cities. Shapiro spoke about the need for valuing nightlife and for valuing music as a central core of the community. He reinforced that the values of the city needed to change in order to align to the music-centric ideal that some of these major centres had envisioned for their municipalities. Successful music cities like Austin or London had to work at establishing themselves as such, as it was not something necessarily inherent (Shapiro, 2017). To that, we might question similarly what the values of music education are currently. Further, could these values be rethought in order to set new trajectories, leading to possibilities and capacities within music education that reinforce a new set of priorities in music education?

Values around technology in education are continually changing. I used to think that when a student showed up to class without a pencil, it was a sign of them being unprepared. I often still find myself making this assumption, yet, it causes me to pause and consider that there might be a different circumstances beneath the surface than I had been willing to consider. Is it possible that there is less truth in that assumption currently? With increasing integration and a heavy emphasis of technology in the classroom, is a tool like the pencil slowly facing some sort of eventual obsolescence? Perhaps not fully, but in part? Although teachers and students do not

rely on computer technology for every task, there are classes where students are writing far less by hand, or that are mostly paper-free. A change in values results in shifting priorities. Students rarely ever forget to bring their cell phone with them to class, as it is the tool that keeps them within direct contact with their friends, the world, and all sorts of attainable knowledge. To this, is education resistant to accept these emerging changes? Are we turning a blind eye to the technological transitions before us because our values are misaligned, resulting in a distant, atrophied form of connection and confused value system?

Other emerging value are presenting themselves within education, but often out of some form of long-term diligence or necessary succession plan. Computer coding has been embraced throughout K-12 schools in recent years as a tangible way to teach students to write their own scripts for video games, apps, or other logic-based programs. In part, it serves to centre teaching and learning most entirely around problem solving, incorporating skills and concepts from various disciplines, but it also doubles as a reinforcement for political, social, and economic values for the years to come. Computer coding affords many emerging technological possibilities we currently utilize, and those to come that have not yet been created. Coding can be thought of the next form of blue collar work (Thompson, 2017). This reiterates how the lens or gaze in which we look upon our tech sector is now changing. We need to set our sights on what the new 'norms' are, as many are in the emerging technologies. However, coding might be favoured because of its commodified capacities and value for its capitalist-producing capabilities. Although there are many merits in students learning to code, educators should be wary of teaching skills only for the sake that they 'produce' some sort of commodifiable product in the form of student abilities. Technology need not only be utilized for market-based outcomes, rather, it provides capacities far beyond the social, political, or economic ties that are often

attached to it. McCray (2016) describes technology as “politics turned into substance”, and to this, we might evaluate the possibilities of the values of technology in music education as a form of becoming (McCray, 2016)

What is Becoming?

As the values of music education and technology change, questions often centre on what these changes *should* be. But rather, how might we posit new questions, eliciting responses of what these emerging values *might* be? We might consider these changes within the assemblage of technology and music education as a form of ‘becoming’. Wallin (2011) notes how “...as a process of entering into new relations and times of living, becoming is not oriented toward its becoming some thing…” (p.297). It is these values that need to be given the freedom to emerge, free from the socio-political and economic pressures currently applied to them. Wallin continues, stating how “…becoming might more adequately be thought as the symbiotic encounter in which what is drawn into a potentially productive heterodox configuration with what it is not yet” (2011, p.297). Deleuze and Guattari describe a rhizome as “...all manner of "becomings" (1987, p.21), wherein providing students the opportunity to create rhizomatic, expressive compositions might illuminate the distinct emerging values of an electronic music pedagogy that our music education programs might adopt. Semetsky (2006) aptly describes the process that is ‘becoming’:

> The subject-in-process, that is, as *becoming*, is always placed between two multiplicities, yet one term does not become the other; the becoming is something *between* the two, this something is called by Deleuze a pure *affect*. Therefore *becoming* does not mean becoming the other, but *becoming-other*. (p.6)

It is with these considerations of becoming in mind, that we might consider ways in which both students and educators can posit themselves in a continual state of becoming these new values of music education. It must be an authentic encounter, as "to become is never to imitate" (Deleuze & Parnet, 1987, p.2); the actors must undergo a process of becoming electronic music pedagogy.

What is Becoming Electronic Music Pedagogy?

For music education to take on technology in a way that enacts various forms of becoming, it must position itself in such a way as to allow for rhizomatic movement to emerge. As "a rhizome has no beginning or end; it is always in the middle, between things, interbeing, *intermezzo*" (Deleuze & Guattari, 1987, p.25), we might turn our gaze further toward the plateau, for "a plateau is always in the middle, not at the beginning or the end. A rhizome is made of plateaus" (Deleuze & Guattari, 1987, p.21). It is within the plateau where we might position ourselves, as it is not a place in which we stake out a delineated plot, but rather a way of pivoting between forms of becoming. From music education to an electronic music medium. An electronic music pedagogy is non-static, and always becoming. Not merely some fixed beginning or end of a course or calendar date or timeline, rather that we, as a multiplicity made up of assemblages of students and teachers with affect-producing music technology are *continuously becoming electronic music pedagogy.* Electronic music has capacities to move. It is not bound by the "fixed strata" (Cox, 2003, p.12) and codes of the rock band paradigm. The rock band finds itself not only within the pre-defined roles of guitar, bass, and drums, but also the sonic structures that those instruments are bound by (strings, amplifiers, drum skins and shells, cymbals). An electronic music pedagogy can harness the wide sonic palette of affect-producing-machines like synthesizers, and begin to arrange and layer these sounds within Digital Audio Workstations as original, expressive compositions. This form of pedagogy might allow students

to take more creative risks, as forms of space exist between the fixed points of traditional music and its accompanying instrumentation. In this middle ground of plateaus, creative territory can exist that affords students to navigate between these boundaries: nomadic musical movement, wherein these plateaus can be thought of as "...any multiplicity connected to other multiplicities by superficial underground stems in such a way as to form or extend a rhizome" (Deleuze & Guattari, 1987, p.22). It is within this network of plateaus that pedagogic actors of electronic music should house themselves. In a practical sense, I see this reality in my students as they learn DAT software, comprehend the science of sound and synthesis, create beats, compose melodies, and construct musical arrangements and songs. The technology provides students these affordances, but it is the positioning of the teacher, students, and other stakeholders within the plateau of becoming electronic music pedagogy that allows for these opportunities to take place within the classroom.

Classroom Application

Since I began writing this thesis, I accepted a teaching position at a local high school. In addition to my assignment of teaching graphic arts and organizing school technology, I was afforded the opportunity to start a grade 10 electronic music course, Digital Music 15. It was a late offering for student registration, and without actually having any students signed up, I was going to have to advertise and try and drum up interest for this course. The course would be offered out-of-timetable: an after school class with which I had zero students registered. So, I set about to try and spread the word through our school announcements and word-of-mouth, and by the third day of school, I was already over capacity with registrants for the course. In the coming days, interest in the course continued to grow, as I had over 40 students crammed into my classroom to learn about subtractive synthesis on various vintage synthesizers that I brought into

the class. Within the following weeks, Digital Music 15 had such a positive response from students that I was able to run a second section, totalling nearly 50 students between the two classes. As I spoke with students, wondering about their interest in this course and creating electronic music, recurring themes seemed to emerge. Many had a general interest and wanted to learn more so that they could create their own music, others had lyrics written and wanted to be able to accompany their work as completed songs, but, one of the most common themes was that student had been trying to use music technology on their own, were getting stuck, and did not know how to move forward. In the short time that this course has been running, I have been able to see the excitement in students as they make pedagogical connections to the sounds that they have often heard but not fully comprehended. Further, students seem to connect to affect-producing machines like hardware synthesizers, resulting in myself connecting with students over the instrument as an authentic learning tool, and them to others. I purchased a Korg Monologue synthesizer for the program, and I am already seeing how integral it is to have these affect-producing machines readily available to students. I have students that will come by and play the synthesizer, learning about its functionality, augmenting the sounds, or it being utilized as a vehicle in which to drum up conversation, wherein I am getting to know students away from the formalities of my scheduled classes. Not only do these instruments have affect-producing capacities in that they afford the user the ability to sonically steer sounds beyond the fixed points of traditional instruments, they are also conducive to continuing an environment of continual becoming.

I am seeing the direct effect of providing students with opportunities that reflect the values of the world in which they find themselves in. Muhonen (2016) notes that “as the contextual influences of students’ individual and social worlds change, the challenge for music

education is to set agentive aims that allow the students to become capable agents in the musical world" (p.278). But, here the key is in offering this at a time when it is readily received by students. My concern at this point, is that educators do not wait too long to engage students in an electronic music pedagogy, as the timing seems to be just right. I do, however, acknowledge that the conditions have to be favourable for this type of music education to work. Back in 2011, I was teaching at a high school and I offered an electronic music club, wherein we would learn and engage with an electronic music pedagogy. I only had a handful of students interested in the after school club, and it slowly fizzled out over time. That point in time was not quite yet fertile ground in which to grow this electronic music pedagogy. What I am seeing in my current scenario is a mix of strong student interest, complimentary popular music styles, allocated school budget funds, readily available music technology, and the continual support and encouragement of my principal, department head, and fellow colleagues. All of these inner-workings contribute to the capacity in which this digital music course might thrive.

Sonic Underpinnings

In order to rethink students as creative composers, sound at its core needs to be reconceptualized. Cox (2011) describes that, "if sounds are particulars or individuals, then, they are so not as static *objects* but as temporal *events*" (p.156). It is this consideration that allows for the capacities of an electronic music pedagogy to emerge as a form of an expressive, compositional outlet, rather than simply playing around with electronic music equipment. This affordance allows one to consider the creative engagement with electronic music technologies as being within the realm of the affective domain (Krathwohl et al., 1964). Cox (2011) continues on, depicting this way in which we might consider the properties of sound:

> Sound is not a world apart, a unique domain of non-signification and non-representation. Rather, sound and the sonic arts are firmly rooted in the material world and the powers, forces, intensities, and becomings of which it is composed. If we proceed from sound, we will be less inclined to think in terms of representation and signification, and to draw distinctions between culture and nature, human and nonhuman, mind and matter, the symbolic and the real, the textual and the physical, the meaningful and the meaningless. Instead, we might begin to treat artistic productions not as complexes of signs or representations but complexes of forces materially inflected by other forces and force-complexes. We might ask of an image or a text not what it *means* or *represents*, but what it *does*, how it *operates*, what changes it effectuates. (p.157)

What Cox aptly depicts here is a significant sonic underpinning of not just *how* we might reconceptualize an electronic music pedagogy, but *why*. It points directly to the aspects of life that much of our traditional music education programs have failed to provide for students. As recording is "the death of representation" (Attali, 1985, p.85), the accessibility of available technologies, coupled with an electronic music pedagogy, can lead to students breaking through the barriers of representation. Attali (1985) illustrates how this rupture unfolds:

> Music is becoming *composition*. *Representation against fear, repetition against harmony, composition against normality.* It is this interplay of concepts that music invites us to enter, in its capacity as the herald of organizations and their overall political strategies—noise that destroys orders to structure a new order. A highly illuminating foundation for social analysis and a resurgence of inquiry about man. (p.20)

These lines of sonic inquiries lead to awakenings that, when hemmed into an electronic music pedagogy, can bring both students and teachers into territory that leads to multiplicities of becoming.

What these forces of sonic materiality are capable of, is to equip students to become agents of independent, creative thought and output; no longer do they need to simply 'fall in line' with the rest of the group. Education has typically reinforced that students must accept and employ a level of docility, wherein they are subjected to a subset of information set before them. Our students have been raised up to be 'docile bodies', as Foucault (1979) describes how "a body is docile that may be subjected, used, transformed and improved" (p.136). We educators have utilized this docility to reinforce our own politics, priorities, and values, all while negating the perspectives that students might bring forth in their own autonomous musical creations. With docile bodies intact, students can then be used in order to serve a pedagogy of power and order, as Foucault notes how, "the classical age discovered the body as object and target of power" (1979, p.136). Questions must be raised and answered, centering on why it is that music education must seemingly loom over students in a form of creative hegemony where students are not given the chance to compose, create, or generate their own body of musical works.

In other visual arts courses, like photography and design, there is emphasis surrounding copyright and not presenting the works of others as your own. Interestingly though, in music education, this topic is seldom touched upon. Students have been conditioned to think that the works of others are that which they might represent in musical performance. While there is merit in studying the structure of other music pieces and in turn learning to do the same by performing the piece, it is an incomplete creative perspective. What it does do, is stifle the uncertainty of creativity—solely learning and performing the musical works of other artists suppresses the

creative agency of all musicians, and not limited solely to students. It is most obvious within students and music education, as it is not their own choice to only perform the works of other artists, rather it has been decided for them by the values and priorities set forth by the educational community. It becomes more apparent, when we begin to consider *why* such docility would be favoured in music education: *if students are able to be controlled, then educators can establish predictable results, outcomes, and behaviours for them to enact*. This removes any possible volatile opportunities.

To think otherwise—in embracing a community of creative producers and artists—is most certain to bring about some level or form of volatility. What seems to prevail is a fear that if educators were to allow students to take the creative reigns, we do not know what will emerge. However, that will be always be a factor when entering into unknown territory, as Spinoza (Spinoza et al., 2002) describes how "…nobody as yet has determined the limits of the body's capabilities: that is, nobody has yet learned from experience what the body can and cannot do" (p.280, as quoted in Bryant, 2012, p.534). Yet, traditional music education has employed an 'acceptable' level of musical plagiarism, wherein students are to continually replicate the works of other artists, many of whom are long dead and have little to no connection to the world that students find themselves in today. The music score has established itself as a form of commodification and control (Cox, 2011, p.154), and traditional music education has fully embraced this notion of quasi-plagiarized performative musical tracings; I have yet to see any high school art classes teaching students to paint over a copy of a Monet or van Gogh and call it their own. What music education requires is to embrace new ways that students might creatively interpret and respond to the conceptual or abstract, utilizing sound as a material force.

Sonic Response

One way in which we might afford students to engage in creative, musical expression is to consider offering up opportunities for individual interpretations of a prompt in the form of a 'sonic response'. 'Soundtrack to X' is an effective audio-based response project that allow one to interpret "non-sonic phenomenon" as form of musical expression (Beier, 2013), and 'Mood Experiments' aims to have the student to interpret various mood descriptors as brief musical pieces (Beier, 2015). Additionally, visual artists might employ a 'Drawing Jam' as a way to quickly express a concept, while disrupting confines that limitless time seems to put upon oneself (Barry, 2014, p.108-113). To this, we might combine the characteristics of 'Soundtrack to X', 'Mood Experiments', and the 'Drawing Jam' to prompt students to respond by creating a musical piece (or sound design) that, in 10 seconds or less, could express a phenomena, emotion, or concept. This type of sonic 'sketch', when practiced regularly, could allow students to strengthen their sonic responses as effective forms of emotional communication. I have employed the sonic response with my Digital Music classes as a way for students to begin creating short, responsive pieces in order for them to think less about whether it is 'right' or 'wrong', but rather how they might tackle a mood as a musical emotion. This also allows students to get comfortable with creating brief, truncated pieces, as a musical response does not need to only follow the conventions of a three-and-a-half minute pop song.

Creative Problem Solving

Further building on the sonic response, music education can utilize music technology to allow students to engage in creative problem solving (Assey, 1999, as referenced in Nielsen, L. D., 2013; Crawford, 2010; Southcott & Crawford, 2011; Crawford, 2013; Kuzmich & Dammers, 2013; Order, 2015). This can provide students with the framework in which to make creative

decisions. Removing all structure can, at times, be as creatively inhibiting as retaining complete rigidity. What we might consider are ways that students can tackle and solve creative tasks. For instance, they might score a film made by students in a film studies class, they might create sound design for a drama production, they might compose music for a dance class production and/or they might create brief, musical pieces for school promotional videos (thus also addressing issues of schools using uncleared licensed music). Further, students' work might amass into a collection of functional musical pieces—a sound library of sorts—that could serve the promotional media needs of an entire school district. Students might go beyond and generate their own works to solve individual creative problems centering on expression, emotion, and existentialism. Additionally, students might take up the task of remixing each other's songs and pieces, further extending the creative possibilities and interpretations now set before them. All this to lay the foundation for ways in which students might be decisive, musical problem solvers.

Songbird / Birdsong

Traditional music education typically creates a mould for students to fit into, reifying the idea that students are vessels to be filled. What might happen if the mould is taken away, allowing for what is to come? Might the results be rhizomatic? Can music education be structured in a way which students could be providing their own mould, without the limiting capacity of what the music piece might do? Here we might consider getting away from the emphasis on student directed learning, as it is typically placing the weight on students, and not actually alleviating us all of the formation and expectant outcomes. I wonder if the emphasis of 'student oriented' or 'student directed' learning is actually just absolving the educator of their role and responsibilities—is it then easier to place any blame of failure on the student? In order

for rhizomatic movement to happen in music education, a process of letting go is required by both students and educators in order for both to take up possible newfound roles.

Music education has long nuzzled itself within the 'refrain' of the traditional band construct. Deleuze and Guattari depict the refrain as "...any aggregate of matters of expression that draws a territory and develops into territorial motifs and landscapes" (1987 p.323). My aim for the Digital Music course is that students might find ways to invite their own creativity, away from the limitations of the typical refrain of the limiting structures that music education has provided. Students might find themselves embracing the songbird, as Dunst (2008) describes, "songbirds are meant as an exemplary instance of deterritorializing the refrain; of a line of flight away from identity, and of true music. A composer is a becoming-birdsong, a performer becoming-songbird" (p.7). The songbird and birdsong embody the sense of becoming that an electronic music pedagogy could provide. This deterritorialization moves from the refrain of traditional music, to allowing students each their own unique refrain. Deleuze and Guattari depict how "a bird launches into its refrain. All of music is pervaded by bird songs, in a thousand different ways…" (1987, p.300). Similarly, all of the music that students encounter in their world is also 'launched in a thousand different ways', but that musical openness has *not yet* been afforded to students. However, how might an assemblage of an electronic music pedagogy and the songbird / birdsong provide such opportunities?

Distortion is Character

Not only does the student as songbird/birdsong contribute to alleviating the creative restrictions of a predetermined musical mould, but the songbird/birdsong must be *sonically* set free—free to nomadically explore sonic territory between the fixed points of 'acceptable' sounds. What educators need to prioritize is that there are many ways of approaching sound,

some of which may be technically wrong, but creatively right for the part. Brian Eno speaks to this notion, noting how "distortion is character…everything we call character is the deviation from perfection. So, perfection, to me, is characterless-ness" (Eno, 2013). It is this aim for united perfection in traditional music education that has denied students their own creative expressive; not only in the perfect performance of a music piece, but also in denying the fact that our students are not perfect, and come with their own subset of imperfections. Yet, this is the character that Eno speaks of: it is this character that allows for the music classroom as creative multiplicity to be a complete body.

Educators need to also be wary of the perfect capacities of computers and DAT. Computers, especially, will always act in the way which they have been programmed to do so. This is an incredible affordance, especially in how quickly and readily one can record, edit, and arrange musical ideas. However, this type of perfection can easily become a crutch as once complicated tasks now become increasingly simple, and, an overuse of computer-aided correction like pitch-correction and quantization can lead to a sheen on current popular music that tends to lose the human-like qualities of the musical performance. Eno reminds us to be wary of chasing musical perfection, as he notes that "…the least interesting sound in the universe… is the perfect sine wave" (Eno, 2013). He describes it as "perfection", and "…the sound of nothing happening", and that "it's boring" (Eno, 2013). To this, music educators need to teach ways in which to add creative distortions and disruptions when using DAT; ways in which to allow for happy accidents to occur.

Educators must also be aware of how the characteristics of DAT will act upon the user. Many Digital Audio Workstations and virtual instrument plugins employ a certain degree of skeuomorphism in their graphic user interfaces. This helps introduce the user to the interface in a

familiar, tacit way. However, it can end up limiting the possibilities of these programs, as they are technically capable of very complex operations, yet they are often set up in a structured way that the user already understands. This is understandably so, as software developers do not want to make something so overly esoteric that it becomes a commercial failure, yet, it can also be the source of lack in technical innovation. Why push into new territory if digital emulations of tried-and-true musical equipment seem to sell well? While there are extremely powerful, progressive software programs like Max/MSP, what is crucial is how music educators encourage students to engage with any type of DAT. Much like how early users of the synthesizer initially focused on its ability to replicate the sound of acoustic instruments, now we find ourselves presented with virtual instrument plugins that are often emulating the nuanced, unstable behaviour of those early synthesizers. Or, new virtual instruments or plugin effects that cannot seem to shake the traditional operations of these instruments. One way in which we might respond to the characteristics of these types of music technology is to find ways to continually rupture their perfections, resulting in new forms of creation that we might not be able to do without these technologies in the first place. Just as our students make up a multiplicity of tone colours, each offering up their own unique characteristic, so too might we consider how every computer program, Digital Audio Workstation, virtual plugin, or instrument might be used in a different way. Other than prescriptive, predefined approaches which attempts to organize the user in *the* way that developers think they ought to use a certain program, what music educators can do is encourage students to take up music technology in a multitude of ways, each option presenting a possible solution to a creative problem.

CHAPTER FOUR

PEDAGOGY II(B)

Thought Experiment II: Audio / Visual Experiment

In accepting Digital Audio Technologies into music education programs, it is important for educators to remember both the capacities that these tools have and concomitantly, that they are not the only answer for moving forward in an electronic music pedagogy. Rather, they are a tool that afford users new realities that were not possible without these technologies. It is not that these tools hold some sort of creative dominion over users in that they must adhere to the software and all its implied or intended usages. It is imperative that educators realize that in order to afford students the opportunity to be creative agents, they not only need to remove the creative hegemony that has been placed upon them through many years of iterative musical tracing, but going forward, need to ensure that any new integration does not concede to the same stagnation. DAT are capable of being integrated in a way that reinforces the same musical tracings in that they are simple enough to provide students with prescriptive, formulaic approaches to electronically producing music to varying degrees of success. That said, what must be illuminated here is that the users of these technologies have the ability to use these tools in any way that they see fit and further, in myriad ways relative to creative problems. The functionality and graphic-user-interfaces of these tools will compel users to engage with the technology in specific ways, which, is great for yielding the desired results for complex processes. However, we can choose to find ways to ‘productively misuse’ these tools, or to engage with them in a way that moves outside the stratified structures of quantization, sequencer grids, and predictive looped phrases. We can utilize computers, especially, to manage far more complex permutations than the musician could ever carry out on their own.

Working Against the Software

In my own music, I have found ways in which to simply ignore certain characteristics of music software. One of the approaches I have undertaken when writing ambient electronic music is to focus on live, improvised performances in which the concern was not so much around the performance being the perfect take, but rather the correct feeling. In order to make that process work, I had recorded both the audio and MIDI performances at the same time. With the audio, I wanted to get immediate feedback as to what I was doing, so capturing the feeling of the performance was important, especially with characteristic effects like reverb being applied. This allowed me to listen back and take note of when certain movements in the music piece were beginning to take shape. Capturing the MIDI notes of what I had just played allowed me to go back to the take, remove any incorrect or unwanted notes, and then route that note information back into the synthesizer in order for it to 'play back' what I had already inputted. However, this time around I would re-record the entire take and focus on performing various aspects of the synthesizer itself: adjusting the cutoff filter, manipulating envelope generators and low-frequency oscillators, or adjusting parameters of the effects units that were being recorded in real time. This process allowed me to perform the music piece as it was being actualized in front of me, as opposed to spending endless hours mapping out automation levels, note information, or any such adjustments. What this approach afforded me was to remove myself, albeit briefly, from the temptation to over edit and map out every and any possible parameter change—a process which results in a time consuming feedback loop of mapping automation, listening, adjusting, repeating. Rather, the importance lied upon feeling the music piece as it unfolded, and adjusting parameters with real time response; a resulting take that either felt right or wrong in whole, not in part, and if it did not have the right feeling, it would be done again until it worked.

Although, this methodology rarely required multiple redos as the first take—if allowed to unfold as it seemed fit—often ended up becoming the final version.

Another approach with a song I had recently completed, was to base the entire piece around a loop I created on the sound-on-sound mode on a Strymon El Capistan delay pedal. The El Capistan is a digital emulation of vintage tape echo units[5], many of which had a sound-on-sound mode which was like a primitive looper[6]: rather than utilizing the tape feed to create an echo sound, it would continuously repeat, allowing the input signal to be layered upon itself with each new layer pushing the previous down sonically as it degraded and eroded beneath the latest inputted signal which occupied the highest fidelity. Although the El Capistan is digital, it does an amazing job at recreating this effect, and so, I utilized it to create a rhythmic, melodic loop with one of my synthesizers. It was very loose in meter, but had an amazing feeling to it, which I knew straight away would be the basis for a new idea. I recorded that loop into Ableton Live, and structured an entire song around the degrading loop. I utilized some of the time-stretching facilities of Live in order to clean up a few parts of the loop that were heavily pulling the track out of time, but tried to retain as much of the original feeling and tempo as I could. This approach, however romantic I thought it would be, did prove to be extremely frustrating, causing me to spend more time editing and mixing this one song than any other on the rest of the album. The intention was not to start some perfect beginning point within Live, which that piece of

[5] Tape echo effects units of the 1970s were comprised of a looped magnetic tape that worked somewhat like a reel-to-reel in that the tape passed through play heads. Rather than just recording or playing back sound as on a reel-to-reel, the tape echo recorded an input signal (microphone, instrument, etc.) and repeated it back as an echo, or delay effect.

[6] Looper pedals have been popularized in the last decade or two by solo musicians who want to perform multiple parts consecutively, typically in a live setting. A musical phrase can be recorded into the looper, and then layered upon many times thereafter. The looper pedal can be seen as a modern take on the sound-on-sound mode of vintage tape echo units, as that functionality operated in a similar, albeit unpredictable and unwieldy sense.

software is especially great at—perfectly looped phrases, with an incredible ease of use in editing, stretching, adjusting, and sequencing. I knew that the degraded loop that had presented itself was a unique, ephemeral offering that would not emerge again, at least not in the same way. So, the undertaking was to take that piece and structure an entire song around it, free from the metronome and sequencer grid. The creative challenge was in how far I could take an inherently flawed piece of audio, which, to me, seems far more creatively exciting than beginning with a perfected loop paired with endless iterations and options that I could explore. I wanted to do something with next to nothing.[7]

Additionally, one thing I have experimented with recently is using plugins in ways that they were not intended to be utilized. De-esser plugins are utility-oriented, and are used in order to remove sibilance, or the 's', 't', and 'c' plosive sounds from vocal performances. I placed a de-esser plugin on a heavily reverberated drum track, which resulted in a curiously musical form of compression and gating[8], turning out to be quite usable, and not just novel. While these digital tools are deliberately created to function in a particular way, they may have unforeseen uses beyond their original intentions.

Emerging Randomizations

Another way in which we might disrupt the nature of the tools which we work with, is to utilize them to structure forms of randomization, allowing for emergent themes to present

[7] Here, my aim is to embrace the imperfection of a performance rather than resorting to a state of perpetual audio repair. Part of the functionality of Digital Audio Technologies are their perfect abilities, which is a great consistency in production and recording. However, these tools can easily become a crutch for the artist, performance, or sonic variations as a heavy emphasis can be set upon utility functionalities like digital tuning, time-stretching, and quantizing audio.

[8] Compression is an audio technique that reduces peaks within the audio and then brings up the overall sound to compensate for the loss in volume, resulting in a sound that can 'thicken' the audio, or help 'glue' it together. Gating is a technique where audio pertaining to a particular threshold will be cut off, or drastically minimized after a set amount of time.

themselves as they occur. Some of Steve Reich's earliest tape machine experiments involved setting up two machines with the same loop, and allowing them to start at the exact same time: "I discovered that the most interesting music of all was made by simply lining the loops in unison, and letting them slowly shift out of phase with other" (in Reich et al., 2002, p.20). Reich continues on, noting the musical emergence that this process now offered up: "This process struck me as a way of going through a number of relationships between two identities without ever having any transitions. It was a seamless, uninterrupted musical process" (Reich in Reich & Hillier, p.20, 2002). Similarly, in a visual context, Brian Eno's *77 Million Paintings* installation consisted of ephemeral, digital paintings that would continually come up with a new, unique iteration of the piece (Kaganskiy, 2013). Kaganskiy notes how these "algorithmically generated" works were formulated:

> ...*77 Million Paintings* explores a vast set of permutations of visual and sonic elements made by Eno. The project continues Eno's exploration into the aesthetic and formal qualities of light, experimenting with projected imagery as a malleable light source that produces unknown and unpredictable patterns. (2013)

It is this type of lofty experiment with digital technologies that plays upon the principle(s) behind Reich's tape experiments, but rather than using the random, unpredictable nature of magnetic tape, *77 Million Paintings* utilizes the precise perfection of computing power in order to generate forms of 'randomness', although the perception of their randomness is truly just a deep permutation that burgeons beyond our human pattern-recognizing capacities.

Another digital music line of flight can be found in *Listen to Wikipedia*. The project centres on utilizing Google analytics of changes to Wikipedia entries, and interprets them as musical performances:

> Listen to the sound of Wikipedia's recent changes feed. Bells indicate additions and string plucks indicate subtractions. Pitch changes according to the size of the edit; the larger the edit, the deeper the note. Green circles show edits from unregistered contributors, and purple circles mark edits performed by automated bots. You may see announcements for new users as they join the site, punctuated by a string swell. (Hashemi & LaPorte, n.d.)

Although its 'performance' is seemingly random, it is the actualization of every contributor to the Wikipedia platform now becoming a contributing artist. Not only does it blur the lines surrounding who the artist or performer is, what it so eloquently does is provide generative music that is completely rooted in its own ephemerality.

It is not that these musical approaches are entirely random in their generation, but what they do is remove us from our typical musical understandings and de facto approaches to melody and arrangement. At home, my cat will often sit upon my CP-70 piano, and at times will walk across the keys. Here, the cat is engaging in a micro-musical performance, despite however harmonically or rhythmically 'incorrect' it may be. In as much as artists aim to create something unique, there are often musical pieces or themes emerging all around us. What we can do, is to utilize DAT in ways that allow for those little musical motifs to present themselves. The computer can allow for randomized, melodic or rhythmic lines of flight wherein the exposure of randomization of melody and rhythm can be utilized by the producer-as-listener in a form of creative curation.

Audio / Visual Examples

In order to carry out the arguments that I am putting forward, I have created a selection of musical compositions using recording software and virtual instruments. The point of these musical pieces is to provide a possible approach to using DAT in a way that does not just

become prescriptive, but allows for experimentation and for creative ideas to reveal themselves to the user because of the capacities that the tools have. My aim here is to not just utilize DAT in ways that artists can simply do on their own, rather, to utilize the characteristics and power of the software in order for new musical realities to emerge.

A/V-1

Figure AV-1 was created by inputting various notes of a pentatonic scale in the virtual synthesizer plugin OBXD within Ableton Live, and setting them all at various looped intervals. Ableton makes it very easy to loop to the sequencer grid in both session and arrangement views depending on the tempo and time signature of the song. To avoid predictable repeats of the notes following 4-beat measures, the interval repeats were set at durations of prime numbers so that they would only repeat the complete sequence once the multiple of each collective loop length had been reached. Since the experiment would not loop in a typical fashion (and would take a great length to actually start over), various little melodies and phrases would start to emerge as the loops repeated and cycled over one another. Even though I had set up the

Figure 1

values in which this loop would function, it had begun to create musical phrases of its own. This would not be possible by doing so on my own, or without software like Ableton Live. Each of the six looped phrases were set to the notes G#1, D#2, F#2, G#2, A#2, and C#3, and the durations of each loop were set to 11, 13, 17, 23, 29, and 37 beats respectively. Each instance of OBXD has some slight high-pass filtering in order to reduce muddiness in the entire track, and all have effects sends sent to an instance of fully wet reverb, Valhalla Vintage Verb. The master bus has some multiband compression and limiting in order to balance out the track and ensure it is loud enough.

Figure 2

Listen to / view figure 2 here: **https://youtu.be/_PzG3uwylxg**

Listen to the full audio version of figure 2, 'Thesis Thought Experiment 1' here:

https://soundcloud.com/rbatke/thesis-thought-experiment-1/s-91Y84

A/V-2

The second experiment, Figure A/V-2, takes up a similar approach to Figure A/V-1 but is within an A minor sequence: A2, E3, F#3, G#3, C#4, B3, respectively. Six tracks are set up, each running an instance of the TAL Bassline 101 synthesizer plugin. Again, each is set to loop one note, playing their respective notes at the beginning of the loop. Loop lengths are set up to be one beat short of the next additional 4/4 measure: 15, 19, 23, 27, 31, and 39. Ping Pong delays are added to each of the six tracks, respectively, and increase in delay divisions by 1/16ths subsequently: 1/16, 2/16 (1/8), 3/16 (dotted 1/8), 4/16 (1/4), 5/16, 6/16 (3/8). Each has the feedback control set to the full 95%, and the wet/dry amount set to 50%. What begins to emerge is a set of melodic polyrhythms as each note bounces off one another. The master bus, again, has some multiband compression and limiting in order to balance out the track and ensure it is loud enough.

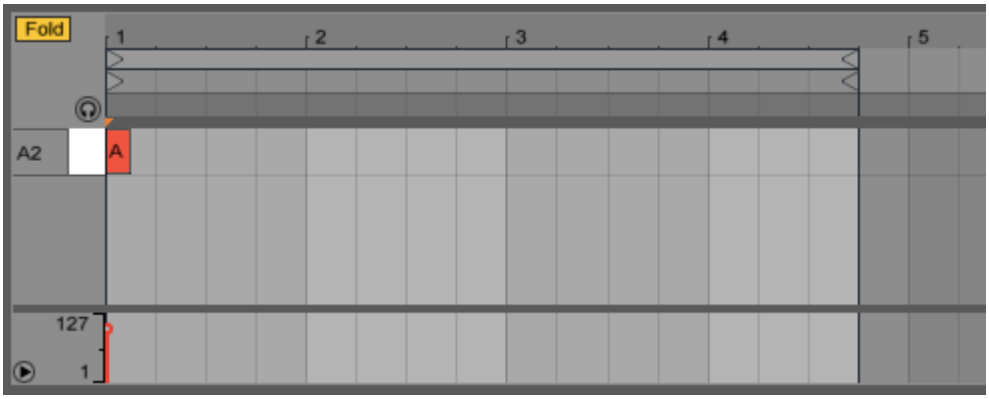

Figure 3

Figure 4

Figure 5

Listen to / view figure 5 here: **https://youtu.be/ImjnenZvD-0**

Listen to the full audio version of figure 5, ‘Thesis Thought Experiment 2’ here:

https://soundcloud.com/rbatke/thesis-thought-experiment-2/s-76e79

Possible Future(s) of Music Software?

It seems as though we may be coming to the apex of what current iterations of music software can do. Ableton Live 10 has just been announced, and although impressive in its most recent additions and capacities, is still moving forward marginally when looking at the grand scheme of music technology. What will truly rupture the way in which we approach DAT is a complete paradigm shift in how we approach music creation with a computer. In a recent *Sonic Talk* podcast episode (Batt et al., 2017), Steve Hillier brought up how he envisioned a possible future of digital recording software, wherein he described how artificial intelligence might be utilized to become like a studio assistant of sorts. Here, the AI would learn your individual creative habits, choices, and nuances in order to assemble its own subset of your artistic choices and responses to particular musical or technical problems: a musical and technological palette of sorts. Then, with all of the user's particular characteristics amassed, the AI would then generate its own set of mix choices, write melodies and musical phrases, and create whole musical passages and completed songs. The music created, Hillier notes, would be the creation of the user, effectively, although the AI had put the possible permutations together and generated the piece, those choices themselves were of the user and not of the AI. It would be one's own musical piece because the choices made are solely from the input of the user (Hillier in Batt et al., 2017). This prediction is not far off, as artificial intelligence has been utilized recently to create self-generating music, notably the song 'Daddy's Car' in the vein of a 60s Beatles pop song **(**Lobenfeld, 2016). Although 'Daddy's Car' studied the structure of many classic pop songs in order to formulate its own take on a similar piece, we do not yet have any software that would do the same process for individual users and in real time, as per Hillier's concept. Perhaps this is a possible technological way forward that provides a rupturing of creative blockages or

technological limitations. It is possible that Hillier's prediction might be a response of sorts to the model of the famous painter who, although receiving credit for prolific works, often had uncredited assistants complete the work alongside them (Jeffries, 2013, para 5). This could possibly replace instances of contributing artists lacking due credit, as the software would merely be a tool in the creative process. It is not an inherently good or bad trajectory, but rather a possible path in which music technology might be headed.

We might approach these possible technological affordances in terms of the virtual. Deleuze (1994) notes how "the virtual… is the characteristic state of Ideas: it is on the basis of its reality that existence is produced, in accordance with a time and a space immanent in the Idea" (p.211). Hillier's notion of the potential of artificial intelligence becoming co-creators with artists thrusts the concept further into territory that blurs the virtual with the actual. Deleuze helps clarify this, depicting that "the virtual is opposed not to the real but to the actual. The virtual is fully real in so far as it is virtual" (1994, p.208). In order to engage in new forms of virtual-musical assemblages, we need to not only accept but embrace that their offerings are as fully real as any encounter with a traditional musical instrument. If artists can transition these newfound ways of allowing artificial intelligence into their workflow, it could alleviate barriers in the creative process, as "the virtual possesses the reality of a task to be performed or a problem to be solved" (Deleuze, 1994, p.212). The model that Hillier proposes is not necessarily going to be the de facto way forward, but a possible reality. Hillier's vision about emerging technological affordances are creating new realities for artists, music education, and especially students of an electronic music pedagogy. These possible futures allow these stakeholders a way forward with technology that is fluid and uncharted. According to Spinoza, "we do not know what the body

can do…" (as cited in Deleuze, 1988, p.17), which causes us to consider the possible trajectories in which the body of music education burgeons toward an electronic music pedagogy.

CHAPTER FIVE

CLOSING / CONTINUING

Technology is Changing the Realities of our Students

Students today are faced with technological possibilities that previously were not available to the average person. They have grown up with technology their whole lives as 'digital natives' (Prensky, 2001; Haning, 2016; Wise, Greenwood & Davis, 2011; Nart, 2016). Students are often well versed with the available technologies around them, and are capable of adapting to emerging trends due to the intuitive senses and skills they have developed their entire lives. For this very reason, teachers ought to consider their role as a facilitator of technology (Crawford, 2010; Abrahams, 2015; Nart, 2016) rather than being the direct source of information and learning. To this, Order (2015) notes that "our role as teachers is surely to cultivate our students' creative disposition" (p.2). Current DAT in music education can provide students with new creative realities in which they can generate their own expressive works. New realities wherein students are not just musically tracing a music piece set before them, but are creative agents navigating composition afforded by current music technologies. Nielsen (2013) highlights this in that "the issue facing educators has not been how to learn the technology, rather how to integrate the technology to enhance learning strategies in teaching music composition" (p.55). This assemblage of student and music technology is what allows for these new accessible forms of composition to emerge.

The accessibility of current music technologies can now allow for students to develop creative agency. Order (2015) describes composing as "the development of self" (p.2), wherein students can engage in forms of creative problem solving (Assey, 1999, as referenced in Nielsen, L. D., 2013; Crawford, 2010; Southcott & Crawford, 2011; Crawford, 2013; Kuzmich &

Dammers, 2013; Order, 2015). The recording studio can be seen as an instrument in its own right (Thibeault, 2012), but previously would only have been available to those who could afford it. Now, recording software is widely available and affordable, and can be seen as a simulation of the recording studio (Eidsheim, 2009). The virtual studio now as virtual instrument allows to user to shape their own creative expressions as a form of "plastic art" (Hemment, 2004, p.80). These virtual musical environments are very much real (Deleuze, 1994, p.208) as they provide users with newfound ways of expressing thought and emotion by utilizing the technology to generate original, musical works.

Although DAT in music education can provide new possibilities, we still need to be wary of the way in which they are integrated into classrooms. We can still fall into the same traps of traditional music education, where performative tasks and prescriptive usage of DAT could churn out similar results amongst students. For this reason, students should not be thought of as musical technicians, as Partti (2014) notes that "music producers are not to be equated with studio engineers" (p.8). Rather, we might consider that the computer is "an instrument of musical thinking" (Partti, 2014, p.9). Composing with DAT can help to provide relevancy to students, especially those that are not in traditional music classes, as these students "...might thrive in music classes where their musical experiences from school and home overlap" (Tobias, 2015, p.33). The democratization of these tools helps to rupture the order of music education, as there is no one right way in which to use them and to make mistakes is "...a normal part of the creative process" (Nielsen, 2013, p.60). Music education needs to provide students with the possibility to become creative agents in order to align with the technological reality that they currently find themselves in. This reality is now present due to the affordance of available music technologies, coupled with the relevance of electronically-produced music and students' accompanying desires

to create and contribute to this collective creative pool.

Closing / Continuing

Ultimately, the emergence of powerful Digital Audio Technologies has provided affordances to musicians of all types, resulting in multiplicities of musical-technological assemblages. These tools are providing new ways in which we *might* create music; new possibilities as creative-compositional solutions. Justin Vernon of Bon Iver fame has in recent years drastically altered how he writes music with technology, switching the bulk of his writing from a guitar to the Teenage Engineering OP-1:

> It's a sampler-based synthesizer, and I honestly think it's the most important instrument that's come into my life since I first picked up a guitar when I was 12 years old. I'm not exaggerating at all. I never leave the house without it. I don't travel with the guitar anymore. I travel with just my OP-1. It's been a big deal living with this thing. I love making music with it. I love traveling with it. I like using it as a writing extension. It's a really special technology, essentially what a guitar is to me. (Vernon in Hyden, 2015)

What has emerged because of the assemblage of Vernon and his OP-1 is a deterritorialized, pastoral form of electronically uprooted folk music, notably on Bon Iver's latest release, *22, A Million*. What his growth as an artist has exemplified, is a desire to dive further into the temporal and cerebral, by means of an affect-producing machine like the OP-1: this is a present reality that begins to blur creative and technological lines between the artist and instrument as the OP-1 further uproots the long established, sedentary roles. The artist and instrument begin to merge and exchange with one another, exchanging opportunities for producing affects and having affects being acted upon. Vernon's musical growth does not centre around becoming more performative in terms of musical athleticism, rather more introspective, reflective, and

embodying—through music—what it means to be human; a form of neo-techno folk music.

Through affect-producing machines, we are able to engage in cartographic, nomadic sonic movement. At its most basic form, we are engaging with sound itself; not just being affected by it, but being capable of producing affect in and through it. Cox (2003) notes how "this experience of sound itself is equally the experience of a non-pulsed time" (p.13). Through these affect-producing encounters with sound, we experience them "…as a free-roaming flux, pure possibility, no longer or not yet attached to musical forms or functions" (Cox, 2003, p.12). Cox describes sound as being in "virtual form" (2003, p.12), which in Deleuzian terms would be considered as much of a 'real' experience as playing an acoustic instrument. As these engagements in and with sound provide us access to the molecular level, "…we hear process and duration" (Cox, 2003, p.13). It is through the engagement of sound with affect-producing machines that students might find rhizomatic opportunities of composing, creating, and continual forms of becoming electronic musical agents.

The rhizome provides music education the ability to move around and past the creative hegemony that has been set forth by traditional music education. Opposed to the musical tracings that have propagated throughout traditional music education, Deleuze and Guattari note that "…the rhizome pertains to a map that must be produced, constructed, a map that is always detachable, connectable, reversible, modifiable, and has multiple entryways and exits and its own lines of flight" (1987, p.21). It is through the use of affect-producing music technologies that students can engage with these sonic maps; ways in which to move away from the tracing, which "injects redundancies and propagates them" (Deleuze & Guattari, 1987, p.13). Here, the aim is not to send students out into the sonic unknown and expect them to somehow musically arrive. My hope is that through these tools and affordances, educators can allow students to engage in

meaningful, expressive musical creation and creative problem solving. Finding new ways to uncover knowledge about themselves and the world around them, as Wallin (2011) notes that "…what is required for learning is the fabulation of a perplexion that continually requires the recasting of knowledge and action into new forms of organization" (p.298). These new forms of knowledge are the response to the new realities that students find themselves in; it is not that we are preparing them for a future that is to come, rather, trying to catch them up on ways in which to understand and engage in world that they know to be theirs. Our students are a musical multiplicity. Much like the complex sonic structures and components of a musical piece, each student is like a corresponding tone colour to the body of students that make up the entire musical-technological assemblage. Rather than churning out the same type of 'model' music student, our present opportunity is to embrace a diverse group of electronic music students as a form of tonal harmony: in the same way that each tone colour makes up the nuanced complexities of a music piece, each student and their own unique creative identities make up the rich variations of an electronic music classroom.

Moving forward, we—as educators, students, musicians—must orient ourselves to continually becoming electronic music pedagogy. We must think in terms of constant ephemerality, as the technological, political, social, and cultural surroundings of music education will constantly be in flux. My current perspective is solely at this point in time. There will always be myriad influences and pressures upon music education, which is why we need to move with them as they evolve. That is why we have not yet arrived. We have not found ourselves to have become electronic music pedagogy, rather, we are perpetually setting our gaze upon what is to come next as we are continually *becoming*. Deleuze (1988) articulates how we might undertake this notion:

> It is not just a matter of music but of how to live: it is by speed and slowness that one slips in among things, that one connects with something else. One never commences; one never has a tabula rasa; one slips in, enters in the middle; one takes up or lays down rhythms. (p.123)

To this, our undertaking as educators is not to begin alone from nothing, away from the structures of traditional music education. Rather, we might take what is already there and present affordances to students so that they too might find rhizomatic ways to engage with and create the musical map; ways that they might encounter musical creation as a continual form of becoming electronic music pedagogy.

"Write, form a rhizome, increase your territory by deterritorialization, extend the line of flight to the point where it becomes an abstract machine covering the entire plane of consistency."

Deleuze & Guattari, 1987, p.11

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