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Glitch Jazz: Improvisers Negotiating Control In A Digital World

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by

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ABSTRACT OF THE THESIS

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In 1985, sound artist Yasunao Toné began manipulating CDs by scratching their surfaces or altering their form of playback to produce unpredictable glitched sounds. Since then, artists including Markus Popp (b. 1968), Ryoji Ikeda (b. 1966), and Carsten Nicolai (b. 1965), have further developed newer and disparate strategies to create music from glitches and related sounds. Although nearly thirty years have passed since Toné's first experiments, and what some may deem the birth of the "glitch music" genre, little has been done to broaden the scope of this genre to include electroacoustic experimentation. Additionally, it would seem that today there are zero known jazz artists who are exploring ways of integrating glitch electronics into their compositions, making it difficult to find records or scholarship that explore the potential for combining glitch music with jazz.

A survey examining the noise content of popular tracks by today's leading glitch artists reveals tendencies of those artists to compose using similar electronic sounds (skipping, buzzing, clipping, hissing, etc.) that share certain characteristics, which make them ideal for pairing with acoustic instruments. After reviewing the literature and establishing a definition of glitch, this document identifies a body of glitch sound materials, and the qualities of those sounds that make them complimentary to acoustic instrumental music. This author also searches for artists from the jazz tradition who have explored the sounds of glitch within their compositions. Finally, this paper examines music composed by the author that initiates a precedent for a marriage of glitch and jazz.

Dani Ahndreç

Glitch Jazz: Improvisers Negotiating Control In A Digital World

Committee Members: Kei Akagi, Michael Dessen, and Peter Krapp

"Medical practice is to 'decode the non-silence of the organs'. A medical doctor is not dealing with the patient's narration but with the primordial noise of the body: 'He is dealing with the noise. Through this noise, he must hear the elements of a message'."[1]

[1] Foucault, "Message ou Bruit?" 6285-86, as discussed in Krapp, *Noise Channels*, xii.

PREFACE

If I think back to the moment when I was introduced to the idea of glitch, I recall no one ever mentioning the word 'glitch.' Rather, I saw a YouTube video of Ryoji Ikeda's installation entitled *The Transfinite*[2] at Park Avenue Armory in New York City, which involved setting up an enormous screen in the center of a warehouse and projecting black-and-white rectilinear images onto those screens. The accompanying music (or noise) was comprised of clipping, high-pitched bleeps, and static. This only begins to describe the work. I remember my reaction to that video, thinking to myself, "Hmm…Glitch!" Nobody said anything to me about glitch; it was just a personal revelation. I was vaguely familiar with what the term "glitch" meant from playing video games, computer games, watching clips online, and even from certain popular movies. The rectilinear back-and-white lines, the static, and the buggy computer sounds that I experienced watching *The Transfinite* reminded me of moments when my PlayStation would crash, or my computer would freeze, forcing me to restart the game consul or computer to hopefully get rid of the problem. I even recalled watching *The Matrix*–the scene where Trinity explains to Neo that what he thought was Déjà vu was actually a glitch in the system, caused because the agents changed part of the environment through the programming. Because I had a sense of what glitch meant, I proceeded to assume that Ikeda, and similar artists, considered themselves to be 'glitch artists,' or part of the 'glitch music' genre. It seemed to me that the idea of glitch music required little explanation–certain sounds and images have become associated with the idea of error and malfunction (an association I made immediately after viewing *The Transfinite*), and the glitch artists of the world were on a mission to elevate those misunderstood and hastily-labeled "undesirable" sounds to the realm of art music. At least, that was my initial thought. It was as if watching the visual component and listening to the audio of Ikeda's multidisciplinary work made the entire aesthetic philosophy of glitch apparent to me in a moment. His work was minimal, yet elegant and striking, and I felt as if I was listening to the language of a digital machine.

For years I was searching for ways to focus my interests in electronic and computer music towards a more manageable body of work. The trouble for me was that there were so many different possibilities with modern technology that the repertoire of electronic music, in my mind, became a

[2] *The Transfinite*. Perf. Ryoji Ikeda. *YouTube*. 16 Jan. 2012. Web. 26 May 2012. <http://www.youtube.com/watch?v=omDK2Cm2mwo>.

towering colossus of vastly dissimilar styles, related only through a common means of production: the computer. As a composer interested in developing skills in writing electronic music, I found myself somewhat lost in the countless possibilities, struggling to identify the appropriate categories of materials, which could best compliment my own acoustic works. I found myself listening to (and imitating) music by Aphex Twin, Radiohead, Trent Reznor, Ben Frost, Beat Music, The Robert Glasper Experiment, Shafiq Husayn, Flying Lotus, Skrillex, Deadmau5, edIT, and Stockhausen. My earlier electronic compositions demonstrated an attempt to emulate these dissimilar artists by making use of layers upon layers of keyboards, synthesizers, artificial drum samples, wobble bass, pads, vocoders, analog lead synths, bell sounds, heavily distorted guitars, MIDI strings, and other noise effects from programs such as Reason and Logic Pro. I admired the ways these artists wielded control over their electronic sounds, some even learning to improvise with the electronics at their concerts. At some point, partially because I wanted to experience that feeling of having total control over every parameter of my music, I even developed a habit of writing acoustic-sounding music through the computer, exclusively using a live-instrument sample-library and sequencing program.

Some of my first electronic compositions removed the element of performance almost entirely from my practice. To perform these electronic pieces required only that I push the playback button. Had I wanted to perform these pieces live and accurately, duplicating every electronic track with a real musician, I would most likely have required a small army of keyboards, synthesizers, drum pads, and more. Alternatively, there was always the option of exploring live performance with *some* instruments, leaving the rest of the materials to be played from a sequencer. Still, I felt it was undesirable to invite improvisers to perform with a sequenced track, which had a fixed total duration of the piece, had a fixed harmonic structure (established by the keyboards, synths, bass guitars, etc.), and had a fixed rhythmic structure (established by the artificial beats, drum loops, and some bass samples). My style of writing for acoustic ensembles often left room for improvisers to stretch the form, re-harmonize chords, pause (breathe), complicate rhythmic patterns with inventive sub-divisions, and essentially make spontaneous decisions that could alter some of the finer details of a piece of music. Ultimately, I realized that the music I was exploring through electronic composition was rhythmically and harmonically *inflexible*, and it made a poor compliment for my acoustic works. Working from so many different models led me to create a body of electronic music that were seemingly unrelated and disconnected from my acoustic works. As a composer ending his studies in the academic world and coming primarily out of the jazz tradition, I felt that my acoustic works had almost no connection to the materials I was exploring electronically, and that any future prospect for

a marriage between electronic and acoustic music in my own compositions was unlikely to create any lasting significance. Then, in 2012, I encountered glitch music.

Now, as a composer exploring the potential for combining glitch music with acoustic music (jazz, in my case), I have found a focal point for my explorations in electronic materials. Rather than working with the entire cascade of electronic materials that are present in the music of the aforementioned artists, composers writing glitch are able to limit their sonic palette to materials which share certain qualities (a complete definition of glitch, written by the author, is provided in the following section of this paper). Some of the first glitch tracks I listened to, which included music by Ryoji Ikeda and COH[3], were mostly comprised of materials which had very little to do with conventional harmony or pitch; it was mostly electronic noise, or glitch noise (buzzing, clipping, static, beeps, etc.). There is rhythmic material in those tracks, but they are not structured in a simplistic 4/4 time signature, as is the case for most popular electronic music tracks. The rhythms in these tracks are meant just to keep a pulse, not necessarily to establish regular measure lengths. I discovered that these glitch sounds could be made to be both harmonically and rhythmically *flexible*, making these electronic materials ideal for pairing with acoustic instruments and improvisers. This discovery pushed me to research and define glitch.

GLITCH: A HISTORY, DEFINITION, AND SCHOLARSHIP

> "Our digital media culture is predicated on communication efficiencies to an extent that can obscure or veil the sources of noise, as faults, glitches, and bugs are too often relegated to the realm of the accidental. Yet glitch electronica puts precisely this raw material to creative use."[4]

In his essay, "Glitch– The Beauty of Malfunction," Torben Sangild defines the glitch as a term "commonly used to describe errors in computer software…or hardware, computers crashing, or, specifically, the sound of a CD or sound file skipping and stuttering. A glitch, also when not connected to audio technology, is often accompanied by some noise, reminding us that something is wrong."[5] In the same article, he describes glitch as "a minor malfunction or spurious signal…the machinery is still running but the performance is poor–either annoying, problematic, or downright useless,"[6] saying "something glitchy is…out of control."[7] Sangild observes that the first recorded

[3] Ikeda, "data.matrix."
COH. "In Spaces Between."
[4] Krapp, *Noise Channels*, 53.
[5] Sangild, "Glitch", 258-9.
[6] Sangild, "Glitch", 258.

usage of the term was done by the astronaut John Glenn, referring to electrical power problems on the early manned spacecraft.[8] Glitch became adopted by the masses to refer to electrical mishaps, malfunctions, sudden unexpected changes, power surges, disruptions, loss of service, and noise due to interference.[9] My computer tells me a glitch is a sudden, usually temporary malfunction or irregularity of equipment. It is the failure of a system. Or, more specifically, it is the failure of a system to meet the demands of its user. A glitch is a system's way of indicating to the user that it is nervous, and is having an accident. Under pressure, a system can glitch, and demonstrate abilities or create materials that its creators did not anticipate. It can represent struggle, distortion, imperfection, transformation, pressure, a fault or flaw, unpredictability, chaos. Sangild states that glitch *music* incorporates these and related sounds, through a variety of techniques, in which "the results are sampled and composed into a specific musical context depending on the aesthetic preferences of the composer."[10]

Caleb Kelly, author of *Cracked Media: The Sound of Malfunction*, offers his explanation, "It will be argued that the practice identified as 'glitch', which became popular in the late twentieth century, was a key marker in the development of digital arts practices. It represented a familiarity with computer-based technologies, as well as a new direction for their use…In the mid-to-late 1990s experimental music witnessed an outpouring of interest as the tools of music production were transformed and rapidly expanded with the mass take-up of digital technology. The general population gained access to more affordable computer and home studio equipment, and a surge of experimentation took place…Glitch, as the genre became known, developed as a central initial part of this outburst of creation."[11] Kelly outlines how glitch developed during the 90s as a result of musical experimentation of new and affordable software by some of the general population. He also connects the glitch scene to the "error-driven" scene, and asks, "how many times can you force something into failure before it becomes creatively uninteresting?"[12]

Arguably one of the most important articles that has been written on glitch comes from Kim Cascone, "The Aesthetics of Failure: 'Post-Digital' Tendencies in Contemporary Computer Music" (2000). Cascone's article has been cited by several others scholars who have written about glitch, including Philip Sherburne, Torben Sangild, Caleb Kelly, Eliot Bates, Greg Hainge, Rob Young,

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[7] Sangild, "Glitch", 258.
[8] Sangild, "Glitch", 258.
[9] Sangild, "Glitch", 258.
[10] Sangild, "Glitch", 259.
[11] Kelly, *Cracked Media,* 7.
[12] Kelley, *Cracked Media*, 10-12.

Janne Vanhanen, and Adam Collis, and it seems that certain ideas from that article have been perpetuated throughout much of the post-Cascone scholarship, namely the notion that glitch adheres to an "aesthetic of failure." Cascone contends, "it is from the 'failure' of digital technologies that this new work has emerged: glitches, bugs, application errors, system crashes, clipping, aliasing, distortion, quantization noise, and even the noise floor of computer sound cards are the raw materials composers seek to incorporate into their music."[13] He goes on to say, "new techniques are often discovered by accident or by the failure of an intended technique or experiment." He explains that there are many types of digital audio failure, which sometimes result in horrible noise.[14] Cascone also begins the critique of glitch music, looking to the German band Oval (regarded today as one of the pioneers of this music), suggesting that "they were using an aspect of 'failure' in their work."[15] This rhetoric is all too familiar in critique of glitch music. In 2001, Philip Sherburne wrote in the liner notes of the CD compilation *Clicks and cuts 2*, "To create click-music [that is to say glitch music] is to harness failure, whether the crackling of the patch cord or the system-crash in mid-sample."[16] Greg Hainge summarizes in his article, "Of Glitch and Men," the discourses of some of the aforementioned scholars, "For both Sangild and Bates, the promise, the beauty, or the importance of glitch lies in its almost redemptive capacity to deploy positively the failures and the short-comings of the system in which it is born."[17] Glitch music, just like the concept of glitch itself, has become invariably associated with error and malfunction.[18]

There seems to be a disconnect between what glitch means conceptually, and what is actually practiced by glitch artists. Put simply as a concept, a glitch is an accident. Therefore, fundamentally, it is not possible for artists to represent glitch in its *truest* sense–that of an accident. If an artist is *presenting* glitch, then how could it possibly be an accident? This is true for glitch artists in both the visual and audio realms. According to Cascone and Sherburne, glitch is supposed to adhere to an aesthetic of failure, or harness failure.[19] It is the collapse of a system due to error. But few glitch artists are able to preserve the error itself. Instead, they learn to imitate error. Composers and sound artists work with systems, practicing ways of creating erroneous sounds (which, because of intention,

[13] Cascone, "Aesthetics of Failure," 13.
[14] Cascone, "Aesthetics of Failure," 13.
[15] Cascone, "Aesthetics of Failure," 13.
[16] Hainge, "Of Glitch and Men," 31
[17] Hainge, "Of Glitch and Men," 32
[18] Notions of error and failure are not new to music. Experimental music in the 60s has explored this topic with some depth. Even before Cage, Luigi Russolo experimented with noise and sounds that were considered undesirable. See Michael Nyman, *Experimental Music: Cage and Beyond*, Luigi Russolo, *The Art of Noises*, and Jacques Attali, *Noise: The Political Economy of Music*.
[19] Hainge, "Of Glitch and Men," 31; Cascone, *The Aesthetics of Failure*, 12.

are not truly accidental). These artists have developed and designed methods of capturing what people hear as the sounds of *mistake*, in order to appropriate that notion and open a discussion that perhaps questions existing ideas surrounding error and noise.

> "For even though both Sangild and Bates are absolutely correct in their detailing of the processes used to prepare or (in Yasunao Tone's case) 'wound' the CDs these artists use for source material, in both of these analyses, the material ontology of glitch is frozen at this point. So although they seem to have described the creation of a material artifact that is imbued with the power to create music that will necessarily be generative and although they acknowledge that this music thus problematizes the high-fidelity ideal by exploiting bugs, glitches, and failures that will cause a system to react in unpredictable ways, by curtailing their ontological material analysis at the stage of disc preparation, they both imbue the disc itself with an agency that it can never have and, furthermore, bypass the process that actually creates the sound that is termed glitch and that is dependent primarily on the hardware of the system's decoder that reads the data and the corrupted data on the disc: the CD player itself…it is perhaps not a serious error, then, to state that in a glitch piece we hear the sound of a CD skipping."[20]

Even Sangild claims, "It may be discussed whether 'glitch' is an appropriate genre term, as it accentuates certain technical aspects over purely musical ones and, therefore, is in danger of over-emphasizing the conceptual perspective."[21] Conceptually and aesthetically, glitch is the representation of error as art ("worship the accident"). But in practice, glitch is the rehearsed imitation of error.

One of the reasons scholars struggle with assigning a definition to glitch music is because the conceptual ideas surrounding what glitch music claims to be made of do not align with realistic modes of practice. If we go along with Cascone and Sangild, deciding that a glitch could be, for example, a computer error, then it would follow that glitch music is music comprised of the sounds of computer errors. However, this notion is not often true. There are electronica artists like Glitch Mob (a trio consisting of Justin Boreta (aka Boreta), Edward Ma (aka edIT), and Josh Mayer (aka Ooah)) who identify themselves not only as electronica artists, but also as glitch artists. Yet their music is not created only from what sounds like error (although that plays a significant role). Their music has electric guitars, synthesizers, and artificial drum samples, as well as a plethora of other audio samples that are in and of themselves not related to error or malfunction.

Rather than establish a definition based on the practice of harvesting the sounds of computer error and related sounds (which is problematic enough), I propose a definition that is based on the content of glitch music, as the genre is currently recognized. That is, the following definition was formulated after compiling a list from multiple sources of the sound materials that have been used in many glitch recordings: Glitch music is a genre of electronic or electroacoustic

[20] Hainge, "Of Glitch and Men," 32-33.
[21] Sangild, "Glitch", 258.

music in which the primary sound materials used may include but are not limited to: computer glitches, bugs, application errors, system crashes, clipping, ticking, aliasing, hissing, CD skipping, buzzing, distortion, noise floor of computer sound cards, fax tones, fax connections screeches, telephone tones, modem tones, sine wave tones, stereo test records, clicks of electromagnetic interference, bad speaker connection hums, ground loops, dither noise, quantization noise, vinyl noise, white noise, analog filter crackles, stutters, radio static, raw data, bleeps, drones, scratches.[22]

Some may be surprised to learn that glitch music, a genre scholars have stitched to notions of error and failure, has also been historically connected to the electronic dance music (EDM) scene. Cascone asserts that the glitch genre arrived on the back of the electronica movement, "a largely dance-based electronic music (including house, techno, electro, drum'n'bass, ambient)."[23] DJs in the early 1990s were experimenting with electronic materials, in search of new musical frontiers ripe for exploration, when a handful of DJs and composers of electronica finally went back to the history of electronic music and rediscovered the works of icons such as Karlheinz Stockhausen (1928-2007), John Cage (1912-92), Morton Subotnick (1933), and Edgard Varèse (1883-1965). Cascone contends that it was the influence of these icons and their work which focused on technique, manipulation, and the quality of the sounds themselves that helped spawn what later became the glitch movement. Some of the first records of glitch music were peripherally associated with EDM labels, and yet "in spite of this odd pairing of fashion and art music, the composers of glitch often draw their inspiration from the masters of 20th century music who they feel best describe its lineage."[24] Interestingly enough, the genre of glitch music occupies an uneasy territory between academia and mainstream dance music.

Torben Sangild's essay on glitch also examines a prehistory, and explores styles and subgenres. Sangild divides glitch music into three subgenres:[25] "conceptual glitch" contains the work of sound artists who explore glitch as a conceptual phenomenon, usually as part of installations; "oceanic glitch" combines the sounds of glitch with other elements borrowed from electronica and rock music, creating complex textures of diverse sonic material; and "minimal click" contains the work of sound artists who strip away everything until they are only left with "dry, repetitive movements of the tiniest, sometimes inaudible, clicks of computer and sound technology, thereby

[22] Krapp, *Noise Channels*, 55; Cascone, *The Aesthetics of Failure*, 13; Sangild, "Glitch", 257, 265.
[23] Cascone, "The Aesthetics of Failure", 15.
[24] Cascone, "The Aesthetics of Failure", 15.
[25] Sangild, "Glitch", 260-66.

exposing these sounds musically, often without adding melodic material."[26] These descriptions of sub-genres are helpful in recognizing the distinctions between some of the worlds leading glitch artists, reminding us that glitch artists have subtle yet powerful differences in their production, performance, and practice.

1985 may be the year of the first glitch recording, continues Sangild, as he looks to Yasunao Toné, whom he identifies as the pioneer, and a component of the "conceptual glitch" subgenre (Nick Collins also identifies Toné as the starting point in the history of glitch[27]). In his pieces *Techno-Eden* and *Music for 2 CDs*, Toné "prepared music CDs by slicing them with razor blades or attaching scotch tape filled with pinholes. The result was unpredictable chunks of sound as the CDs glitched and skipped–fragments of the original music (classical works by Beethoven and Tchaikovsky) combined with noises from the CD players, trying in vain to read the digital information on the damaged discs."[28] Toné was experimenting with the idea of composing sounds through a process of damaging a system (i.e. wounding the compact discs). This random, unmediated glitch music demonstrates how composers of this subgenre divorce themselves from having control over the outcome and form of this music.

For composers who looked to have more direct control over the clicks, squeaks, and fragments, Sangild offers the term "oceanic glitch" to encompass artists who arrange glitch sounds as musical textures in combination with other musical practices. The German band Oval is considered by many to be the most important name in glitch, and Sangild classifies them as belonging to the subgenre of oceanic glitch. The band released their debut album, *Wohnton* in 1993 as a trio, with tracks being assembled from glitch loops and the sounds of CD skipping combined with melody and catchy pop lyrics, regular rhythmic patterns, and a harmonic structure. But since 1996 the name Oval has been an alias for Markus Popp alone, collaborating with different individuals from project to project.[29] In 1994, Oval released the album *Systemich,* which was constructed from glitch loops with clicks accentuating the beat, and with rumbling, distorted tones above. By combining the sounds of glitch with voice, instruments, rhythmic patterns and harmonic structures, Oval took the idea of glitch music further than Yasunao Toné, setting the agenda for glitch. "Working on the borderline between noise and tone, Oval uses his skilled ear for harmony to

[26] Sangild, "Glitch", 260-61.
[27] Collins, "Electronica," 343.
[28] Sangild, "Glitch," 261.
[29] Sangild, "Glitch," 262.

transform the annoying into beauty."[30] Caleb Kelly writes in his book *Cracked Media: The Sound of Malfunction*, "Oval's audio represents the planned use of glitches. No longer is the glitch an unexpected or even chance occurrence, as it is sampled and sequenced."[31] This marks a significant leap forward in the development of glitch music.

Finally, Sangild identifies a third subgenre of glitch in his essay: "minimal click." Japan's leading electronic composer, Ryoji Ikeda, is arguably the best example of this style. His music sometimes explores a single sound for ten or twenty minutes, while slowly transforming its timbre using digital processing (+/-, *0°C)*. His glitch sounds come from sine tones, stereo test records, radio static noise, clicks and ticks and so on. Sangild likens Ikeda to a scientist who "explores the micro-semantics of isolated sounds, carefully and gradually combining them to create a minimal gesture."[32] This work differs from that of Toné in that the results are not random, although the sounds themselves may be very similar. At the close of his subchapter, Sangild concludes, "Minimal click provides the opportunity to relate more consciously to the sounds we are involuntarily exposed to in our techno-environments, and to become aware of the stress they inflict upon us as well as the potential beauty they possess."[33]

It would seem that today, composers generally have a great level of control regarding how much interference, distortion, and noise they want in their recordings. Eliot Bates, author of "Glitches, Bugs, and Hisses: The Degeneration of Musical Recordings and the Contemporary Musical Work" comments on this as he writes about the transformation of glitch as a phenomena into a genre of music, exploring how despite the music industry's efforts to eliminate error and noise from recordings over the decades, this genre has emerged built from the non-intentional sounds of our systems. He explains, "Glitch is that which betrays the fidelity of the musical work."[34] Bates outlines fidelity in recording systems, the so-called 'deterioration' of 'the musical work,' playback idiosyncrasies, and finally the idea of the work of art in an age of mechanical reproduction. Of particular interest, Bates investigates the work of Markus Popp, mentioned before as the man behind the name Oval, illuminating a relationship between Popp and Cage. "Oval's work references the electronic music palimpsest, drawing in part on Satie, Antheil, and Cage's experiments in transforming everyday sounds into music, but most specifically in encouraging listeners to hear

[30] Sangild, "Glitch," 263.
[31] Kelly, *Cracked Media*, 265.
[32] Sangild, "Glitch," 265.
[33] Sangild, "Glitch," 266.
[34] Bates, "Glitches, Bugs, and Hisses," 277.

technological function and malfunction as music."[35] There has been a trend with recording technology and its use by musical artists, engineers, producers, and computer musicians throughout history to explore and develop *better* technologies, which attempt to eradicate noise and interference altogether. The goal, it would seem, has been all along to purge the system of faults so that we can experience the pure audio content of our choice.[36] "The very condition of possibility of sound reproduction and amplification is also a constant source of contamination, and the history of audio recording and reproduction technology can seem to align along a progressive pursuit of transparency into the inaudible."[37] Despite this trend to improve technology, some artists have chosen to preserve glitches and focus their efforts on elevating these materials from the realm of noise to that of music. These artists are taking materials that would otherwise be discarded as accidents and are finding innovative ways to represent them as meaningful art forms. We live in an age where our technology permits us to filter our recordings with great precision, albeit not entirely as digital artifacts and glitches still find their ways into our systems. The glitch highlights our shortcomings, and works as a critique of our era–the pursuit of digital perfection.

I believe one of the most important identifying factors within glitch music involves its process–that of turning sounds related to technological accidents and mistakes into usable materials, and presenting those materials as the focal point of the work. As glitch has come to suggest error, system failure, distortion, etc., artists and composers intentionally incorporate these materials into their works for aesthetic reasons. For some, glitch represents struggle in the digital age. Others are drawn to the chaos and unpredictability implied and experienced through glitch. Artists are taking materials that have been relegated as accidents or mistakes by a system and finding innovative ways to reorganize those materials into new forms of usability.[38] These composers have carefully arranged their materials into intricate musical forms, perhaps ironically leaving little or no room for error. The glitch has been captured, studied, transformed, polished, and re-presented as something new.

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[35] Bates, "Glitches, Bugs, and Hisses," 287.
[36] Krapp, *Noise Channels*, 56.
[37] Krapp, *Noise Channels*, 56.
[38] Menkman, Rosa. "Glitch Studies Manifesto." *Video Vortex Reader II: Moving Images beyond YouTube*. By Geert Lovink and Rachel Somers. Miles. Amsterdam: Institute of Network Cultures, 2011. 336-47. Print. 343.

FROM ELECTRONIC TO ELECTROACOUSTIC

Although glitch is usually described as a form of purely electronic music, I am curious about the prospect of experiencing glitch music combined with acoustic instrumental music. Having studied the history of glitch music and its dissemination, I recognize that the highest profile glitch artists predominantly use exclusively electronic materials. Indeed, the very definition of glitch music specifically requires the use of certain electronic sound materials, but the genre of glitch music should not be permanently isolated from the potential of acoustic hybrid forms. It is time for more experimentation between glitch and acoustic music, and a move towards electroacoustic glitch music. Thankfully, there are artists today who are exploring the potential of combining glitch with acoustic instruments–some of these artists (for example) focusing primarily on pairing glitch noise with the sounds of the acoustic piano. Interestingly enough, this model of blending the sounds of the piano with noise from elsewhere has been with us for over half a century; John Cage set the precedent in the late forties with his pieces for prepared piano.

During 1946-48, John Cage wrote *Sonatas and Interludes*, a series of pieces for the prepared piano, introducing new noisy sounds to the realm of piano music through experimentation. Cage effectively transformed the piano from being merely a percussion instrument with fixed pitches into something which was both a musical instrument as well as a control device for triggering foreign sounds that had not previously been identified as being part of the traditional language of the piano, thereby allowing performers of his piano works to access (from the keyboard) the extended range and sonic capabilities of this mutated instrument. "[Cage] adjusted the timbres of the piano by inserting foreign objects between the strings: the printed music includes a 'table of preparations' that gives instructions for the placing of screws, nuts, bolts and pieces of plastic and rubber to alter the sounds of forty-five notes, so that the piano comes to make largely unpitched noises like those of drums, gongs, and rattles."[39] The detailed manner in which Cage wrote out instructions in his table of preparations from *Sonatas and Interludes* indicates that he was carefully mapping new noisy sounds to be controlled from the keyboard. This method of exploring noise, as well as systems to control that noise, seems especially appropriate for composers of both electronic and acoustic music who, during the process of composition, improvise with materials in search of the sounds they desire. "Preparation of the piano offered the composer the opportunity to explore and transform his sound

[39] Griffiths, *Modern Music and After*, 22.

material in a very direct manner, by inviting an empirical mode of working similar to that being made possible by the electronic medium."[40] Cage demonstrated how the piano could effectively be transformed into an instrument with greater capabilities (having an extended range of new timbral sounds). He showed us that the sounds of the piano, and noise from elsewhere, could both be triggered from the keyboard. These lessons have influenced a new lineage of composers, and have played an important role in the development of electro-acoustic glitch music.

Some of the most interesting, compelling, and beautiful glitch music I've heard in recent years comes from artists whose ideas may have evolved from one of the examples of Cage–marrying noise to the piano. In 2002, German audio and visual artist Carsten Nicolai released his first collaborative recording with pianist/composer Ryuichi Sakamoto, *Vrioon.*[41] Under the alias Alva Noto, Nicolai is internationally renowned as a leading electronic composer, and he is most often categorized alongside Ryoji Ikeda within the glitch genre (the two have even collaborated together, releasing records on the label Raster-Noton). Nicolai organizes his own electronic materials into mathematically sound relationships:

> Alva Noto's work...is organized around the tension between polyrhythmic glitch textures and a singular focus on the timbre of noise…In his music, he relies on mathematical processes to govern rhythm, and he uses modems, telephones, and fax tones to compose atonal, syncopated soundscapes; he 'recognizes and embraces the fact that it is impossible to maintain perfect integrity in the communication of any information and instead focuses attention, not on the information transmitted, but on the enigmatic character of the system of transmission itself. The predominant sound materials in his music are noises of imperfect systems; clicks of electromagnetic interference, ground loops, dither noise, aliasing and vinyl noise and so on.'[42]

Nicolai and Sakamoto's first album together is one that deserves scholarly attention, as it is one of the first records to take the elements of the glitch style and to combine them in a complementary fashion with the sounds of the acoustic piano in strikingly beautiful ways. The ambience provided by Sakamoto's sweeping piano chords creates a stark contrast to Nicolai's rhythmic yet minimal glitch sounds, combined with the effects of granular synthesis on the piano. It seems to me that this pairing parallels the work of Cage's prepared piano, insomuch as the resultant music explores the marriage of the piano and noise. This landmark record could mark the beginning

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[40] Griffiths, *Modern Music and After*, 22.
[41] Doswald, *Carsten Nicolai*, 151.
[42] Collis, "Sounds of the System," 31-39, as discussed in Krapp, *Noise Channels*, 55.

of an electro-acoustic lineage of glitch music, inviting experimentation from composers, performers, and improvisers of acoustic instruments into the world of glitch noise. Nicolai and Sakamoto have continued to work together writing music that combines the sounds of glitch with those of the acoustic piano, releasing *Insen* in 2005, and *Summvs* in 2011.

Not only have Nicolai and Sakamoto pioneered a musical combination of glitch and the acoustic piano, they also took the next step in the musical evolution of glitch from being purely electronic to becoming electroacoustic by composing a work for glitch and large chamber ensemble. In 2008, the duo came together and released *UTP_* [*sic*], an album of ten tracks with Nicolai providing electronics (audio and visual), Sakamoto on piano, and Ensemble Modern providing orchestral accompaniment. This release marks a pivotal moment in the evolution of glitch music, as it illuminates the success of pairing orchestral instruments, piano, and glitch. Furthermore, this electroacoustic combination emulates the works of Stockhausen and Cage, cited earlier by Cascone as being important influences for some of the earliest and most significant figures in the history of glitch. "The result of the collaboration like the former projects of Alva Noto and Ryuichi Sakamoto - *Vrioon* (2002, r-n[•] 50), *Insen* (2005, r-n 65) and *Revep* (2005, r-n 72) - is a synergetic mixture of electronic and natural sounds, that is expanded by the potential of the classical instruments of ensemble modern. *UTP_*, the title of the new composition is deduced from the term utopia and hence describes an approach that leaves space for further extensive associations."[43][*sic*]

Following Nicolai's examples with Sakamoto, my piece *Zero Haven* (2013) was composed for solo piano and glitch electronics, intended to illustrate what I believe to be the complementary pairing of a conservative classical instrument with the sound of digital malfunction. To achieve this, I used Max/MSP to assign triggers on a disklavier (or keyboard) using MIDI signals. When struck, these triggers would playback short millisecond samples of glitch noise stored in my Max patch. The assignment of these triggers was saved to different presets within the Max patch, and each preset has a new library of glitch sounds stored for use. After completing a digital score, a MIDI score was created and uploaded into the Max patch, thereby allowing the program to follow the pianist during performances. At key moments during the piece, a trigger causes the program to change the mapping of the keyboard to follow a new preset. In this way, multiple libraries of sound can be stored and recalled throughout a single piece, allowing different glitch samples to be used as the piece develops. The result was music written for piano where certain notes on the keyboard caused

[•] Raster-Noton

[43] Noto, "Alva Noto + Ryuichi Sakamoto. UTP_."

glitch noise to be heard. This, too, is not very different aesthetically from what John Cage himself was exploring during the late 1940s. I am continuing the tradition of exploring and transforming sound using a system of very direct control (the keyboard with Max/MSP mapping triggers), not for the sake of novelty, but for the sake of convenience (rather than playing piano and laptop simultaneously, I have brought the laptop controls into the keyboard). One difference between my work and Cage's, however, was that where Cage may have only used one prepared piano for a single piano piece, my composition for disklavier uses what could be deemed the equivalent of a separate prepared piano for every different preset assigned in Max/MSP, with the computer essentially reworking the innards of the 'prepared piano' at set points throughout the work. *Zero Haven* explored a blending of noise and the timbre of the piano, whilst navigating a narrative that explored space, form, and improvisation.

Learning from the precedent set by Nicolai's *UTP_* [*sic*] project (glitch and chamber ensemble), and from the success of that sonic combination, my own works have moved away from a purely electronic medium, and now explore electroacoustic pairings. During my thesis capstone performance in 2013, I presented a body of works that explored different electroacoustic instrumentations (primarily centered around the pairing of piano and glitch). Included in the program was music for 1) solo piano and glitch 2) piano, upright bass, drums, and glitch 3) piano, contrabass, cello, violin, and glitch. It was my goal to explore a means of integrating the control of glitch electronics into the piano itself (by using either a keyboard or disklavier, or other piano that uses MIDI signals). This provides the pianist (and in my case, the composer as well) with very direct physical control over the glitch electronics via the keyboard, thereby enabling the performer to focus on the instrument alone, without resorting to handling a multiplicity of devices for control over the electronics. It was the example set by Cage's prepared piano that provided me with a model: noise does not need to be triggered elsewhere (i.e. a laptop or control pad)–the pianist can trigger noise from the instrument, or control glitch from the disklavier. Unlike Nicolai's work with *UTP_*, which was performed with Nicolai himself behind laptops and other control devices, alongside the Ensemble Modern and Sakamoto, I'm currently much more curious about integrating those control devices into my instrument.

CAPTURING/IMITATING GLITCH

"It is failure that guides evolution; perfection offers no incentive for improvement."[44]

Glitch artists use a variety of techniques to create glitch noise. Among the most useful tools and processes I have adopted for making interesting electronic sounds are circuit bending, data conversion, granular synthesis, and using the computer programming language Max/MSP for both audio synthesis and for designing integrated triggering systems. These techniques allow composers to either capture the sounds of glitch, or reproduce and imitate those sounds.

My favorite and most practiced method of creating new sounds is through the use of circuit bending. This practice encourages experimenters to deconstruct electronic devices and test out various new electrical connections, which were unintended by the original designers of the product, resulting in surprising new noises that sometimes consist of buzzing, humming, beeping, crackling, hissing, and many of the sounds identified earlier as being part of the body of glitch noise. Circuit bending is also relatively simple to learn; one does not need to pay for expensive hardware or software, read through any instruction manuals, or be savvy in any coding language to be successful in extracting brilliant sounds from cheap devices. Nicolas Collins stated in his article on "Live Electronic Music," "Reed Ghazala started publishing articles on what he dubbed 'Circuit Bending' in the influential (if quasi-underground) journal, *Experimental Music Instruments* in 1992. Ghazala incited readers to transform inexpensive found electronics, such as toys and cheap keyboards, by connecting wires between various points on the circuit board at random, until one either induced an interesting new noise or the toy blew up. Circuit bending tries hard to preserve the innocent enthusiasm of accidental discovery."[45] Part of the reason circuit bending is associated with glitch is because the final products of circuit bending are the results of accidental discovery–sounds which were originally unintended, but are revived by the curious and resourceful experimenter. Circuit bending is a very useful strategy to create glitch noise, where one can exhaust numerous different sounds from every system, provided one has the patience to experiment with a great deal of rewiring.

In addition to circuit bending, those seeking to discover the sounds of glitch can also turn to their computers. By converting, editing, corrupting, or rewriting data from different files, users can experience a cascade of strange computer noises. Data conversion is the process by which computer

[44] Whitehead, *The Intuitionist*, as discussed in Cascone, "The Aesthetics of Failure," 12.
[45] Collins, "Live Electronic Music." 52.

data is transformed from one file type to another, edited, and then read by the computer as an audio file, resulting in the sonification of pure data. A very simple example of this would be to take a jpeg file (read .jpeg) and change the last characters of its name to .raw. One could then open up that file (originally an image) and hear it transformed by the computer into sound using something like QuickTime player.[46] Although the computer can change the file-type, the data within that jpeg file was not originally intended to be read as audio, so the resulting sounds are quite noisy and highly suggestive of a computer system error. This method is one of the ways I started looking for glitch sounds on my computer.

After glitch noise has been created and recorded, artists still have many options for further transforming those sounds to meet their aesthetic preferences. One of the most interesting and useful methods composers have of transforming recorded sounds to generate interesting new effects is through the application of granular synthesis. In 1957, granular synthesis was proposed to be "the representation of acoustic spectra in terms of very small grains or quanta."[47] It is the process by which a sound is crushed into very small quantities called grains, which, when played back in rapid succession, sound extremely altered from their original recorded sound. Generally credited as the first composer to develop granular synthesis, author of *Microsound* and *Computer Music Journal* editor Curtis Roads "has demonstrated the ability to form mesmerizing 'clouds' of sounds from layering individual grains, which are controlled by the musician in a half random/half deterministic fashion."[48] Granular synthesis has numerous applications for creating exciting new sounds, and for incorporating those sounds into real-time performance. Indeed, "The full potential of [granular] synthesis can only be explored in a full implementation that generates or extracts grains in an operating environment that allows significant dynamic control over key parameters such as their individual enveloping and duration, density, and crucially in a re-synthesis context, the ability to vary the speed of movement through the natural time domain of the sounds selected for granulation. Whereas the last requirement makes it necessary to work with prerecorded data, the scope and extent of the live transformations that are possible outweigh the possible drawbacks when working in a live performance context."[49] As stated here, composers using granular synthesis are able to wield

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[46] Sangild, "Glitch", 259.
[47] Manning, Peter. "Sound Synthesis Using Computers." *The Oxford Handbook of Computer Music*. By R. T. Dean. Oxford: Oxford UP, 2009. 95. Print.
[48] Bailey, *Micro-Bionic*. 98.
[49] *Ibid.*, p. 95.

great control over the quality of sounds produced from the grains, by directing their decisions to manipulating various parameters.

Some artists may wish to build their own devices that produce glitch sounds, which they can revisit again and again, perhaps learning to treat the device as an instrument itself, or just as a useful source for generating material. In his book *Handmade Electronic Music: The Art of Hardware Hacking*, Nicolas Collins illuminates many ways in which amateur (and professional) electronic artists can build their own electronic devices and instruments. His chapters lay out valuable information, such as the tools and materials needed, practical information and general advice on hacking systems, instructions on how to solder, how to take apart electronics to find different circuits, how to use oscillators, how to make switches, how to make distortion, and what to know about analog to digital conversion. The book includes many helpful images, figures, and charts that serve as examples to those trying to build their own devices. As an active composer and performer of electronic music himself, Collins's book is an invaluable source for glitch artists looking to create their own noise making devices.

Instead of always trying to create glitch sounds from circuit bending various devices or trying out data conversion on computers, occasionally I might find myself lucky enough to encounter an interesting sound coming from an analog or digital device that strikes me as 'glitchy' and thus, desirable. In these cases, I might hastily grab a recording device (or mobile device) and try to capture that sound and store it away for later experimentation. Some of the sounds I might record in this manner might include a CD skipping, a modem, a fax machine, a light bulb buzzing, white noise on a TV, radio interference, a sine tone, or even just static. These moments remind me that the sounds of glitch can be discovered at any time from regular devices we encounter on a daily basis at school, work, home, or elsewhere.

One of the primary tools used by many computer musicians for audio synthesis, programming, and incorporating technology into their compositions is through the use of the computer program Max/MSP. In 1988, IRCAM released the first version of the program, created by Miller Puckette, designed to "support real-time interaction between the performer and computer [while providing] a rich array of virtual patches and controllers for the management of audio processing."[50] Two years later, a musician-friendly version was introduced, making the program more accessible. This software allows the user great flexibility in the design of the systems they develop, and has been instrumental in facilitating the exploration of glitch music in live

[50] Holmes, *Electronic and Experimental Music*, 221.

performance. The Max environment is very useful for artists who may not have an extensive background in programming, because the user-interface allows for "intuitive development of real-time audio manipulation systems."[51] In addition to programming controllers that manage audio processing, in Max it is very easy to create white noise, sine tones, and the sounds of clipping by writing very straightforward patches to do so, and mapping triggers of those sounds onto various control devices. Max/MSP is especially useful for glitch artists as it can create many of the sounds of glitch music from scratch. Nevertheless, the primary reason I use Max is to integrate all of the electronics and control devices directly into my instrument.

Max/MSP allows me to create glitch noise, store all of my audio files in one place, access those files via triggers, and map those triggers onto any control device of my choosing. Once I have created and recorded an ample amount of glitch noise, I can then import those files and load them into buffers in Max/MSP. From there, accessing those samples is only a matter of pushing a trigger (a trigger can be a button, a note on a MIDI-keyboard, a physical gesture that is interpreted by sensors or a camera, or the trigger can just be a numeric value that is reached through some process, such as timer that counts down and reaches zero, thus triggering some programmed effect). For my thesis capstone project, I had been exploring ways to trigger electronic samples while I am seated at my instrument–one of those ways being by using controllers placed on or near the piano during performance. One such device I have worked with is the KORG nanoKONTROL2, which uses eight dials, eight faders, and thirty-five different buttons, providing me with a lot of flexibility for control. Despite the flexibility of having so many buttons and faders for control, using a separate controller to trigger electronics forces me either to have at least one free hand during select moments of a piece of music so that I can reach the controller and activate the trigger, without messing up whatever it is I am performing at the piano, or to have passages of silence composed into the piece giving me the opportunity to reach the control device to activate the triggers. Even during stages as early as the composition process, knowing that I will be using a control device, like the nanoKONTROL2, requires me to carefully consider where in the performance I will trigger the electronics, since activating triggers is considerably difficult if both of my hands are occupied at the keyboard playing busy passages, or improvising. That is why one of the most effective means of controlling the playback of samples (for my music in particular) is through the use of MIDI commands triggered by specific pitches or motifs on a keyboard or disklavier. The computer can read the incoming MIDI notes and trigger the appropriate samples at specific moments during the

[51] Doornbusch. "Early Hardware And Early Ideas In Computer Music." 56.

music, while I am still at the keyboard performing. After the music is fully composed and notated, I make a special MIDI score that the computer can follow, and import it into Max/MSP. Using the Max/MSP object "follow," the program reads through the piece on the MIDI score just as I play along in real-time. This is considerably easier than having to use multiple interfaces to trigger glitch sounds. This strategy allows me flexibility during the compositional process to eliminate restrictions on the amount of different glitch samples I intend to explore and trigger during my pieces.

COMPOSING FOR ENSEMBLES AND ELECTRONICS

In this section, I wish to provide a short autobiographical account of some of my musical influences, which may in some ways illuminate similarities between myself and other young composers who share stylistic qualities in their music. Additionally, this section examines how I have assimilated the use of electronics into my practice.

Composers born in the late 80s grew up with diverse bodies of musical influences, and by the mid to late 90s they had an enormous library of music made available through the accessibility of the Internet. In the early 2000s, with Google, iTunes, and YouTube, these same young composers could listen to samples of any piece of music that Internet users were willing to share. Today, with Spotify, Grooveshark, iHeartRadio, Pandora, and other internet radio and internet library companies, combined with the mobility of smartphones, laptops, and tablets, there appears to be seemingly no restrictions on what music this generation may access, or where they choose to do so.

From an early age, my father exposed me to rich, highly influential music, including works by jazz phenomenon Pat Metheny, as well as music by the legendary Canadian trio Rush. As an active drummer, pianist, and songwriter himself, my father had been interested in becoming familiar with new sequencing and recording technologies during the late 80s and early 90s, working with Atari computers and Triton synthesizers. Although he was primarily focused in the Latin Pop music scene, he continually exposed himself to popular music of the time in both pop and smooth jazz, listening to artists including Seal, The Police, Tears for Fears, Lyle Mays, The Rippingtons, Hiroshima, Wynton Tisdale, Dave Weckl, and others. Inevitably, I digested and internalized ideas of harmony and rhythm from these artists during my youth, and developed an interest in the relationship between technology and musical performance from my father's example, tucking away these concepts until I was older and eager to create my own compositions.

My composition process almost always begins with improvisation at the piano; the early

stages require that through experimentation I search for useable chord progressions, melodic ideas, or interesting rhythms and meters that satisfy my aesthetic standards. I audition materials for lengthy stretches of time until I feel those materials are noteworthy, at which point I will memorize or scribble down the ideas; complete notation happens much later. It is only after I have truly internalized those musical materials through practice (as a performer), that I feel confident in my ability to command those musical ideas and direct other performers for whom those materials are being written.

A combination of my methodology as a composer and my early musical influences has resulted in my works having recognizable attributes, often due to certain techniques that I've adopted. Some of the techniques I have adopted into many of my compositions include 1) left-hand piano patterns performed in unison with a bass player 2) repeated notes or repeated chords in the right-hand of the pianist 3) the use of many odd meters and metric modulations 4) a strict adherence to a set of principles that guide my harmonic sensibilities 5) establishing a concrete rhythmic outline that is draped over an entire piece, resulting in most sections of said piece to sound meticulously stitched to rhythmic patterns 6) a stylistic approach to playing piano that incorporates both the use of chord voicings in the lower register of the piano, and the use of unusually dense seven, eight, and even nine note chords, in addition to ornamenting the attack of those chords with uneven acciaccaturas and grace notes. These techniques were developed in response to certain musical influences I've studied, and in response to my various musical experiences, described below:

1) The use of left-hand piano patterns performed in unison with the bass player is something that has been practiced in jazz by countless composers, but I first began internalizing this stylistic choice after spending weeks listening to the music of Hiromi Uehara, especially tracks such as "XYZ" and "Another Mind" from *Another Mind* (2003), "Brain" from *Brain* (2004), and "Spiral" from *Spiral* (2006). Uehara was one of the most important and influential young jazz artists experimenting with rhythm, form, time, instrumentation, and electronics in the past decade. As I recall, most of the young up-and-coming jazz musicians with whom I'd met at shows or in school between 2006-2008 had admitted to studying Uehara's records. Her music played a significant role in the development of my own musical aesthetics.

2) The concept of repeated notes or chords is not something I am trying to historically trace back to its roots, but I would like to comment as to when I began to integrate that stylistic choice into my works. Although I did not study (or even become aware of) minimalism until I was a sophomore studying music in college in 2008, I had heard the latest record by the Pat Metheny

Group entitled *The Way Up* (2005), which drew a lot of influences from the works of Steve Reich.[52] This particular album contained a single, hour-long piece of music, that explored repetition, long form, odd meters, metric modulation, shifting time signatures, different solo sections for each performer, and the use of sequencers and electronics. I would venture to say that this single piece of music was *the most* influential musical recording that I had heard in my life, which has since guided my aesthetic sensibilities as a composer.

3) Odd meter is something that I have always had a deep interest in exploring, even as early as my childhood listening to Pat Metheny and Rush. When I started composing seriously in college, I was listening to records like *Time Control* (2007), recorded by Hiromi Uehara's group "Hiromi's Sonicbloom," and *Virtue* (2009), recorded by the young jazz prodigy Eldar Djangirov, both records featuring several works that incorporate odd meters. I began to develop fluency in using odd meters, becoming more comfortable writing in time signatures with numerators like 5, 7, 9, 11, 13, and so forth. Studying in college with masters of complex rhythms, like bassist Mark Dresser, also helped foster a great love for odd meter within me. Most recently, I learned of and began listening to Nik Bärtsch's *Ronin* project, with *Rhea* (2004), *Stoa* (2006), *Holon* (2008), and *Llyrìa* (2010). My piece *A Drop of Blood in A Bowl of Tears* has a section that was very much inspired by Bärtsch's "Modul 35."

4) The principles that guide my harmonic sensibilities have been taught to me by listening primarily to the artists I have already named above, as well as countless others. I've been especially influenced by pianists who've incorporated late 19th century and early 20th century composers (Shubert, Chopin, Debussy, Ravel) into the "impressionistic jazz piano language," emulated best by luminaries like Bill Evans, Keith Jarrett, and Brad Mehldau. Much of what I compose is centered on chord qualities rooted in a tertiary language. My progressions tend to be based on chromatic movement that emphasizes major and minor contrast, and they rarely, if ever, contain a tonic, yet they invite the performer to establish hypothetic tonics given which the chord progressions can be analyzed as derived from scales suggested by the hypothetical tonic. Admittedly, this is an elusive way of establishing tonality. Nevertheless, my music can be described as being tonal (or by some, modal, in the sense that my music forces improvisers to treat each chord separately).

5) Having a strong rhythmic foundation in my music is something that I have learned from many of my favorite artists, and from playing in bands as a leader and a sideman for years. Attending jam sessions in San Diego, Long Beach, Santa Monica, Hollywood, and LA, reinforced my notions

[52] The opening of "The Way Up" starts with repeated notes on the marimba and guitars, which very nearly quotes the opening of Reich's "Music for 18 Musicians," both in rhythm and in harmony.

that the mark of a good rhythm section is having excellent technique and ability to play together, carefully coordinating rhythmic patterns (among other things). Especially working with the piano trio, I have focused my rehearsals around getting the group to play together with a solid "groove," i.e. synchronizing our inner metronomes, our downbeats, out accents, and even our breathing, so that as a trio we sound like a solid rhythmic force. Significant albums that showed me the importance of having a band with a tight rhythmic center are *Suspicious Activity?* (2005) from The Bad Plus, *You Can Have Your Moment* (2010) by Kneebody, *Yesterday You Said Tomorrow* (2010) by Christian Scott, and *groundUP* (2012) by Snarky Puppy.

6) There are a number of stylistic decisions about jazz piano performance that I have internalized and exhibited in my playing. One technique I have adopted is the extensive use of ornamentation to playing chords, namely using acciaccaturas, grace notes, and sustain pedal. I most likely learned this habit from listening to one of the most talked about jazz pianists in recent years, Robert Glasper. He has been especially recognized for incorporating hip-hop and electronic elements into his music with the Robert Glasper Experiment, featuring musicians such as Chris "Daddy" Dave (drums), Derrick Hodge (bass), and Casey Benjamin (woodwinds, vocoder, and electronics). Aside from Glasper's work with his ensemble, I have learned mostly from his performance techniques that involve him playing the notes of his chords in a staggered way, almost rolling his chords so as not to play every note together on a single beat. This characteristic may be best demonstrated on "Centerlude" from *Canvas* (2005) and "J Dillalude" from *In My Element* (2007). Another technique I've integrated into my playing style is the use of chord voicings in the lower registers of the piano. This practice has mainly arisen out of my move away from having bassists play walking bass lines. While the bass player plays ostinato figures, vamps, or unison lines with the piano, the problem of having the bass player and pianist compete for "real estate" in the lower register has nearly been eliminated. This type of writing for the bass player allows me as a pianist to revisit and explore ways of performing in lower registers.

As I have added electronics to my vocabulary of useable materials for composition, some new concerns must be considered. During the compositional process, I must take into account what will become the presence of glitch noise into the music. Therefore, while I compose, it is very important for me to seriously consider how to provide ample space in the music so that both the performers and the electronic noises have opportunities to be clearly heard. I also must consider the mechanism by which the glitch noises are triggered (whether by MIDI signal from a disklavier, or manually by pressing a button on a device like the KORG nanoKONTROL2), and compose music

that offers performers enough time and mental clarity to activate those triggers in a way that augments the performance experience. The challenge will be to do this in such a way so as to allow myself the freedom to improvise, and have the computer provide the electronic sounds that I have predetermined to be appropriate during said improvisatory passages.

While composing for ensembles and glitch, I have found it helpful to categorize my glitch materials, in order to better differentiate the characteristics of those sounds, better informing a composer on how s/he might want to incorporate them into a composition. In my works (*Embrace*, *Fiver's Dream*, *Variations on Ryoji Ikeda*, *Zero Haven*), I generally use glitch sounds in one of two ways 1) as a texture, or background, or an entity which functions independent of rhythmic patterns being performed by the musicians 2) as an electronic percussion instrument (or an enhancement of one such as the piano/prepared-piano) and rhythmic device, completely dependent upon the rhythms performed by the musicians. An explanation of how I use glitch sounds in both contexts is provided below:

The use of lengthy glitch samples in my music requires that I arrange and compose those samples in advance, making aesthetic decisions governing the arrangement of sounds and space within that sample. Once the sample is triggered, its reproduction is unaffected by the human performers, allowing the sample to work independently. If the electronic materials in these samples appear dependent upon performed rhythms of the musicians, it is just an illusion, composed ahead of time. These samples can be used to establish a rhythm, which the musicians will hear and then imitate; or the samples can work against the rhythms and structures of the ensemble, creating contrast and dissonance. Most of these samples are likely to range from between a few seconds to a few minutes in total duration. Fig. 1 shows an example where a chord triggers a sample in measure 19, a note triggers another sample in the following measure, and another chord triggers another sample in measure 23. The glitch materials are acting as a layer of texture beneath the sounds of the performers.

To use glitch as a percussive element, organized intricately around the actual rhythms of the performers, and even triggered by those performers, requires the use of much shorter samples. Most of the clips I use in this manner are between 25 and 500 milliseconds in total duration. The goal effect is the reproduction of a very brief noise. That noise can then be mapped to notes and phrases on the keyboard; the lifespan of those noises lasting about as long as or shorter than the lifespan of a struck note on the piano (without the use of the sustain pedal). I am interested in using these short samples to accentuate the rhythms performed by the group, which requires that those samples

function in a way completely dependent on the patterns played by the pianist. In Fig. 2, one can see the relationship between the glitch noise labeled on the bottom of the staff, and the rhythms of the right-hand of the piano. Everything here is synchronized. The sounds of glitch are experienced simultaneously with the sounds of the piano.

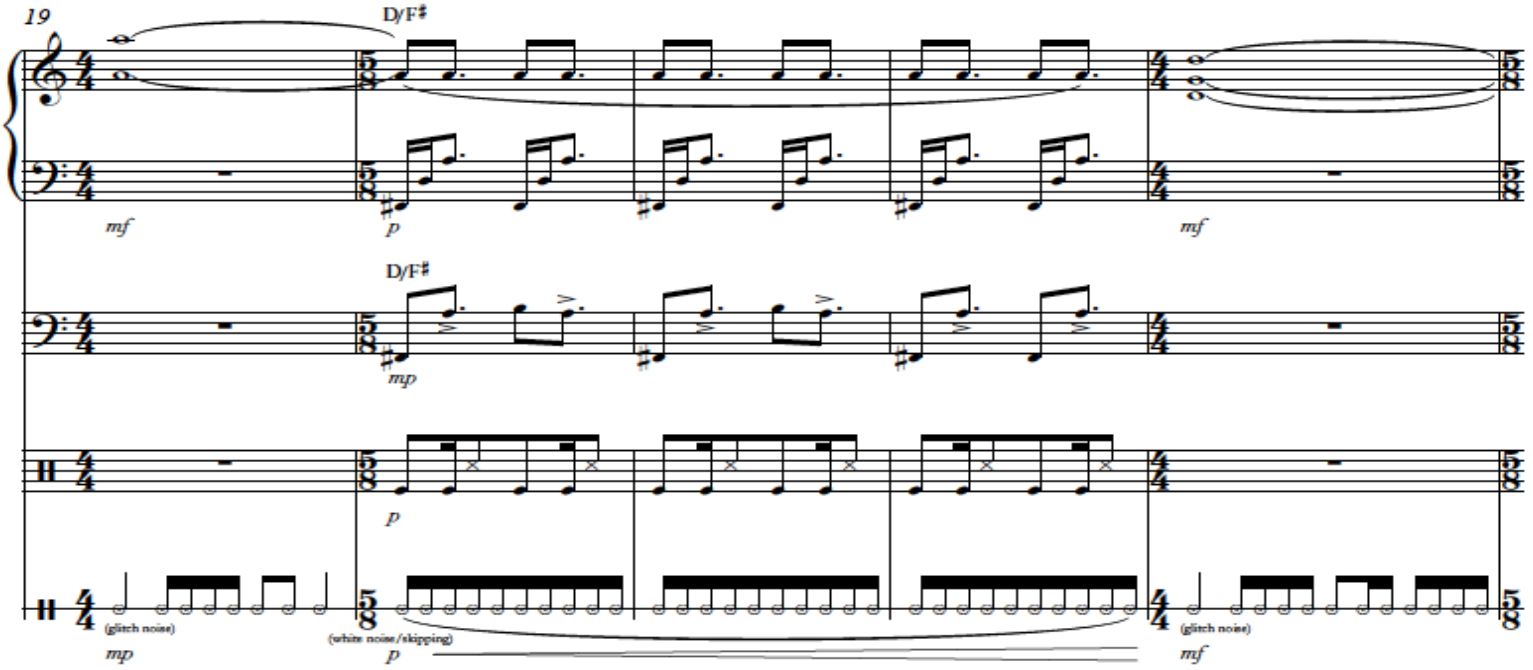

Fig. 1 (above): The chord played by the right hand of the piano in measure 19 triggers a short sample of glitch noise to start. The sample plays four beats at a fixed tempo. In the following measure, the low F# played in the left hand triggers a loop of white noise and CD skipping to be repeated ad infinitum, while gradually getting louder. In measure 23, the chord played in the right hand of the piano triggers the loop to end, and a new sample of glitch noise to play (again, four beats at a fixed tempo).

Upon comparing my own recent compositions, those that contain glitch and those that do not, I observed few significant differences other than of the obvious use of electronics, and the addition of more overall space in the piece (for the electronics to fill). This may be because the glitch sounds are an element that behaves just like an instrument. One could think of today's glitch artists working on their laptops and devices, as working on their instruments. Indeed, the sounds of glitch can even be though of as embodied by speakers, monitors, PA systems, audio networks, and the computers connecting everything together, further cementing the idea that the presence of glitch is akin to the presence of another instrument.

Fig. 2 (above): Between measures 32 and 35, one note on the keyboard (E4) triggers a short 50-millisecond sample of glitch noise. As this note gets repeated through all four measures, the glitch also gets repeated. Observe how the rhythms of the right hand of the piano align perfectly with the rhythms assigned for the glitches.

If the glitch materials are thought of as another instrument, then it is reasonable to conclude that a composer who predominantly writes for acoustic instruments, and begins to incorporate glitch electronics into his/her practice, will likely continue to compose following the same principles and guidelines which s/he has been using all along. The addition of more instruments to an ensemble does not always require that the composer make significant changes to the composition of a piece. For example, adding cello to a piece of music means I may write a soloistic passage for that instrument, contrapuntal lines, background figures, new interweaving melodies and harmonies, and/or unison or doubling parts. Adding cello to a piece of music does not necessarily mean I will reshape the formal design of the music, discard my aesthetic sensibilities for using harmony and rhythm, alter the way I improvise, or change the way my performers interact. Similarly, the incorporation of electronics into the acoustic ensemble doesn't always require significant changes to the composition of a piece either. For me, the glitch is now just another line on the staff, below piano, upright bass, and drum-set. It can be an *important* line, but it is still just a line. I do not give special weight to the electronics; the parts I compose for each instrument (including the electronic

materials) are *equally* important in my view. Within my music, I am looking at technology as a tool to allow musicians to alter and transform the sounds of their instruments by blending the sounds they produce with a layer of glitch electronics. Because I use the glitch as another sound source in my music, adding glitch electronics to the ensemble has not fundamentally changed the way I compose or improvise (which has facilitated my transition from composing for acoustic ensembles to composing for electro-acoustic ensembles).

At this point, it is appropriate to bring up and question the idea of performers referencing glitch through their physical and musical actions. If my music is incorporating the sounds of glitch into the ensemble, why not have performers themselves try to suggest glitch-like noises? Since the instrumental training of many musicians is centered around good technique and the avoidance of noisy, accidental sounds, it would make sense to incorporate those accidental and noisy 'mistake-like' effects into my music as a method to further incorporate the idea of glitch into my work. Here I must clarify that I am especially interested in the sounds of digital and analog technologies. I am not particularly curious about the expansive idea of accidents and mistakes, and its countless ways of being manifested. That would be exhausting, and probably difficult to condense into a useable or logical range of performance ideas for a thesis recital. I am not looking to have my performers break their expensive instruments in order to find interesting new sounds (not that they would need to completely break their instruments to find those sounds), nor am I asking them to deliberately make mistakes during my MFA thesis concert. Instead, I am looking to have trained human musicians do what I feel they do best: to sound like trained human musicians. I'll leave it to the computer to sound like a computer. In other words, I'll leave it to the computer to generate the sounds of glitch.

As it turns out, the manner in which I am incorporating glitch electronics into my music deals very little with the notion of failure (as it would pertain to musical performance). Granted, it might suggest error to an audience wondering if those beeps and hisses coming from the PA system are intended or not as part of my compositions. But the fact of the matter is that those sounds are not accidents as I use them. As a composer, I have taken the time to carefully create these glitch noises through various processes, and I have meticulously decided precisely how they should enhance my works. Admittedly, my process of searching for useful glitch sounds is strikingly similar to my process of improvising at the piano during the process of composition as I search for useable musical materials. The noisy computer sounds that end up in my works are the result of improvisation with technology, and not necessarily the result of error (although they may sound erroneous). I make decisions about what to incorporate and what to discard. I imagine the form of a

work, its duration, its mood, and I imagine which of the materials that I have developed would be best to use at specific points. I am not presenting glitches as errors in my pieces. They have become transformed into musical materials, just as an improviser transforms his ideas (and occasional mistakes) into music. When someone asks me, "What is glitch?" I can answer that question, but the answer will not likely fully explain my music or its aesthetics. I am an improviser and composer who is expanding his list of usable materials to include the sounds of digital technology, and glitch.

GLITCH + JAZZ

The use of the word jazz is one that is familiar to me. The majority of my study in music has been in the field of jazz; a significant amount of my instructors were and are reputable jazz artists. My understanding of harmony first came from transcribing the works (and the language) of jazz musicians. The compositions presented in this paper tend to focus both on a dynamic relationship within small groups, and also on improvisation, and the artistry of the individuals. Because it is well beyond the scope of this paper to present a definition of jazz, this document will attempt to do no such thing. Rather, I intend to position myself in such a way so as to be understood as a disciple of jazz. I have the utmost respect for the jazz tradition, and hope to be recognized someday as being part of that ever-transforming lineage. Among the artists who have influenced my recent works are Christian Scott, Vijay Iyer, Snarky Puppy, Kneebody, Hiromi Uehara, The Bad Plus, Esbjörn Svensson, Bugge Wesseltoft, and Vardan Ovsepian. These artists have continued to create music that has sometimes challenged conservative opinions regarding what it means to play jazz. I am interested in emulating these artists, following the lessons they have taught me, and discovering ways of further experimenting with the jazz tradition by incorporating electronics into the music.

There has been a long history of experimentation in jazz with electronic instruments. Miles Davis famously explored the potential of integrating electronics into the ensemble as far back as *Filles de Kilimanjaro* (1968), *In A Silent Way* (1969), and *Bitches Brew* (1970). Today, there is no shortage of jazz artists who have married electronics and found exciting ways of bringing them into the band. Robert Glasper comes to mind, mentioned earlier as the internationally famous jazz pianist and producer, and he has continued this same interest in combining jazz with more electronic elements; and so have his contemporaries Matthew Shipp, Mark Guiliana, Adam Benjamin, Marco Benevento, and many others. However, one of my primary interests is in identifying jazz artists who have explored the integration of computers into their work. For this current research, the utility of

electronic instruments (electric guitars, keyboards, etc.) by these artist's and their bands is not enough to identify them as useful models for combining glitch and jazz. It is imperative to study models that have embraced computers and the sounds of glitch. Which improvisers are looking more closely for the sounds of glitch?

Bugge Wesseltoft is one of the world's best-known jazz artists working with live electronics and computers. He is an accomplished jazz pianist and successful producer. Anne Estoppey writes in his biography,

> **"Jazz goes clubbing**
> The beginning of the 90s was also the time when jazz musicians started to play spontaneously in clubs with DJs, after their regular gigs. It was a two-way street, allowing DJs to contribute to the sound like traditional musicians, and allowing Jazz musicians to communicate with an audience that had not previously been their primary target. Jazz meeting house and techno beats resulted in an energetic groove, perfect for the club crowd to respond to. The music is built up on the spot, as an improvising collective, with a pulsating beat as guideline, coming out of the hands of skilled DJs and their turntables. Bugge's next project was heavily influenced by these elements.
>
> **1994: A New Conception of Jazz**
> Within the framework of his project New Conception of Jazz, Bugge successfully fused elements of jazz, house, techno, ambient, noise and free improvisation. This sound has been referred to as Future Jazz. In addition to grand piano and Fender Rhodes, Bugge uses different keyboards, percussion instruments, samplers, programming devices, and vocal effects, both in live performances and in studio recordings."[53]

Working towards the fusion of jazz, techno, house, ambient, and noise is certainly a step in the right direction towards a goal of glitch jazz, and Wesseltoft is perhaps the best example we have today of a renowned jazz artist incorporating the computer (and the elements of EDM) into his practice. Wesseltoft uses a laptop, controllers, mics and a mixer, all setup on a table close to a piano, where he can move back and forth between playing piano and adjusting the controls on the computer.[54] Some of the electronic materials he uses are primarily loop-based, allowing him to endlessly improvise on top of that layer from the piano. Yet, there are more efficient models of computer-integrated performance that seem more suited to the pianist/electronic artist.

My own strategy of integrating control of the electronics directly into the instrument has already been outlined previously, and does not need repeating here. It is my contention that this method of triggering electronics in the context of a jazz combo is very efficient, and deserves greater attention from both artists and scholars. My research demonstrates useful ways of controlling electronics via the keyboard using Max/MSP–this particular technique has been documented much more extensively in the field of computer music than it has in the field of jazz and improvisation.

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[53] Estoppey, "Bugge Wesseltoft."
[54] "Bugge Wesseltoft Live at Badechief Berlin summer 07."

Admittedly, artists including George Lewis, Steve Coleman, Steve Lehman, and Vijay Iyer, have experimented with electronics and computers in improvisation. Yet none of their work makes exclusive use of glitch materials, or makes any attempt to fuse the stylistic elements of glitch music with those of jazz. The marriage of glitch and jazz is one that seeks to discover ways of integrating glitch noise into the well-established tradition of the piano trio. My music attempts to dismantle and combine ideas from glitch and from jazz, blurring the boundary of established genres.

Because I am interested in performing as both a pianist and as an electronic musician, I have focused my studies on integrating the computer (or controls) into the piano. But had I not been a pianist, it is very likely that I would have happily focused on the laptop as my instrument, still searching for ways to unite electronic and acoustic music further. In fact, most glitch artists today continue to perform on laptops and other control surfaces (nanoKONTROL2, LEMUR, etc.). It is unclear to me to what extent those artists are *improvising* live, in other words making *spontaneous* decisions about rhythm, timbre, volume, arrangement of materials, silence, quality of sounds, characteristics of noise, and other variables that constitute the makeup of their glitch music. It is not difficult to imagine a similar type of artist, perhaps even a *glitch improviser*, who works behind a laptop or similar control device, and who performs with an acoustic ensemble, and improvises with them. Many of the current problems that my research with the disklavier and Max/MSP has encountered would likely not be issues with the glitch improviser scenario (i.e. the computer becoming confused during improvisation, and skipping ahead in a composition). Admittedly, it is probably easier to teach a human improviser the details of a musical work than it is to teach a computer those same details. One may even find that the human is a better improviser than the computer. It is my belief that we will start to see more laptop musicians collaborating with acoustic ensembles, and especially (hopefully) with jazz artists, paving the way for the arrival of the glitch improviser, and perhaps glitch jazz.

It is out of love of the jazz tradition that this author wishes to push that tradition forward, inviting the integration of electronics further and further with jazz. Especially with computers, and the aesthetics behind glitch music, there is an opportunity right now for jazz musicians to borrow elements of that genre, and find meaningful ways of synthesizing the two art forms together. It seems that nearly every decade, some jazz musicians can be seen experimenting with brand new forms of usability and (often controversially) expanding the definitions of what jazz means. Improvisers explore new forms as the tradition evolves, and audiences find ways of making the music personally relevant to the times. In 2013, digital technologies (and the faults that come with

them) have permeated nearly every facet of society. I encounter glitches now in smart phones, iPods, tablets, computer games, GPS devices, TV screens, game consuls, webpages, musical equipment, and even in the DVDs I own that examine jazz icons today. As a music lover myself, and devotee of the tradition, I am eagerly waiting for more jazz artists to explore glitch within their compositions, establishing a musical narrative that includes these elements that are now part of everyday life. Within my own compositions, I want to portray the struggle of the individual trying to proclaim his worth as a human in a world that is becoming dominated by digital technologies, and I believe the juxtaposition of the piano trio with glitch noise captures that idea very well. As pianist and scholar Vijay Iyer has attested, "If we define it provisionally as real-time decisions and actions, then what *isn't* improvisation? We're improvising from the moment we acquire sensation and motion…Life begins at improvisation. Life is a sustained improvisational interaction with the structures of the world, of the body, of culture."[55] We are all improvising together, and we are all improvising with and around digital technologies; we regularly improvise with glitches (most often by ignoring them, or by trying to eliminate them). The glitch reminds us that our digital world will continue to surprise us in ways we had not anticipated. We are forced to improvise and come up with solutions when our digital technologies glitch and behave in unexpected ways. Call it overstatement but I'll say it anyway: we are all improvisers negotiating control in a digital world.

[55] Iyer, "Improvisation," 171.

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