



# Berklee

Berklee College of Music, Valencia Campus

## **Chameleon In My Craft:**

Experimental Electro-Acoustic Technique Through  
Audio Sample Manipulation

A Thesis Submitted in Partial Fulfillment of the Degree of Master of  
Music in Contemporary Performance

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## **Abstract**

The goal of this thesis is to explore the ways in which sound design can be utilized to expand the palette of sounds produced by the saxophone, and how this process relates to the goal of extended technique usage in music. Using Ableton Live Suite 9 and personally recorded samples, the final outcome of this project provides an array of new custom instrument sounds as well as some of the standard foundational sounds expected for the creation of popular contemporary music styles.

While the total collection of sounds and instruments is not exhaustive in any way, the analysis of the creation process and its results provides a clear workflow for manipulating a preexisting set of sample audio files in order to achieve a desired sonic goal, and outlines how deviations from the originally desired outcome can lead to the creation of new innovative sounds.

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## **1. Acknowledgements**

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## **2. Preface**

Every audio sample that I have used in this project to create new sounds was recorded on May 19, 2017 in Studio C of the Berklee College of Music Valencia Campus recording studios using only the alto saxophone, its accessories, and my body. The audio was recorded in Pro Tools, and later exported in whole to be edited. All editing and creating of sample instruments and sounds was done using only Ableton Live Suite 9 and its native audio effects.

### **3. List of Figures**

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Figure 2 – Sample Recording Agenda page 2 page 3

## **5. Introduction/Personal Background**

Before coming to Berklee I would have never imagined that I would find myself at the end of a sound design project that could directly impact my career trajectory and personal skill set. I come from a musical background of piano and saxophone mainly in the study of jazz, pop, funk, and electronic music, however my undergraduate studies also supplemented me with a large amount of classical training specifically in regards to contemporary classical saxophone, music theory study from baroque counterpoint to post-tonal 20<sup>th</sup> century serialism and graphic notation, and a broad survey of western music history. All of these different musical aspects and influences have in some way or form led me to this unique project and ensured that I was able to successfully execute every aspect.

My study of extended saxophone technique and its use in contemporary music gave me the initial inspiration to tackle this project. This inspiration was fostered and shaped through taking courses and learning about audio manipulation using Ableton Live (henceforth referred to as Ableton). After learning about Ableton's vast set of audio manipulation tools, I began to draw comparison between the practice of digital sound design and the process of shaping acoustic sound in saxophone extended technique, and after more thought and deliberation came to the conclusion that this digital sound design process could be used to embellish or enhance extended technique in order to fabricate an entirely new sonic palette from the saxophone that would have never been possible before the aid of computers. I think that this relationship shows how versatile one instrument can be with a little bit of sonic tweaking, and knowledge of the medium.

## **6. Establishing A Creative Workflow**

In order to aid the creative process, it was necessary to develop a method for creating each of these sounds that could be repeated ad nauseam, producing different results with each trial. I wanted the results of each iteration of this method to produce both expected and unexpected outcomes, so I set out to imitate the sonic qualities of a number of already existing sounds. The established method for sound creation I developed is as follows:

1. Record samples of nearly every acoustic sound that I am capable of producing with only the saxophone, its accessories, and my body (used to excite sound from the saxophone in both traditional forms and unconventional).
2. Organize these sounds in a way that allows ease of browsing and selection.
3. Analyze the sonic qualities of these sounds, and compare them to currently existing instruments in order to establish a goal set of sounds to attempt to emulate.
4. Use Ableton's native audio effects to attempt to emulate the goal set of sounds/instruments.
5. Analyze the results of this process.
6. Repeat.

## 7. The Sound Design Process

### 7.1. Sample Recording (Pro Tools)

All of the sample recordings for this project were conducted in a single session lasting four hours where my recording engineer and myself worked to get every sound possible from my saxophone. Going into this session I produced a list of everything to be accomplished in the session (see fig. 1 & 2), and we were able to achieve all of the items on the list and more.

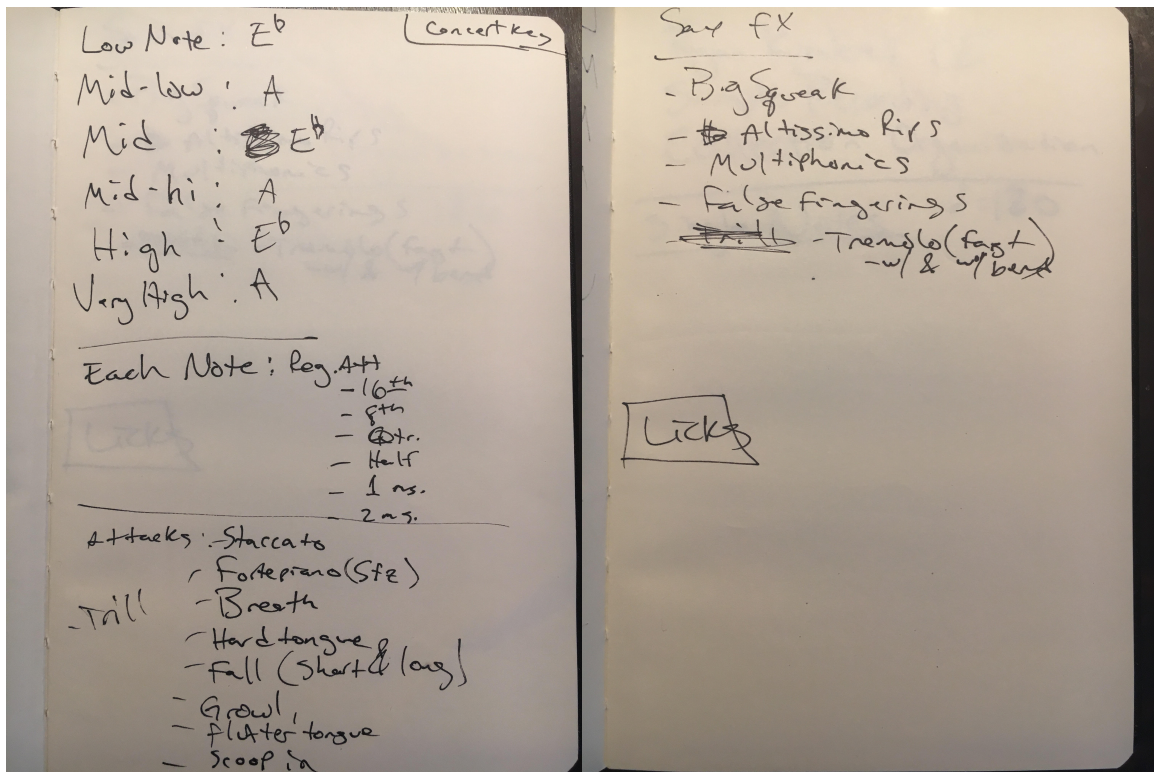


figure 1

figure 2

As notated in figures 1 and 2, I began by recording samples of six pitches alternating in tri-tones, and spanning the full range of the saxophone. I implemented various note lengths, attacks, dynamic contrasts, and extended technique effects on



each of these notes to get all of the required samples for a large, but typical saxophone sample library. From here I moved on to some of the less common sounds in order to complete the collection. These less common sounds included altissimo notes, squeaks/extreme range, multiphonics, false fingerings and microtones, trills, and tremolos.

After recording these basic sounds, I decided that it would also be useful to record the many physical and more percussive sounds of the saxophone that can be achieved through striking the instrument, in various places, pressing keys, blowing air through the instrument without tone production, and sounds created while inhaling through the instrument rather than exhaling.

## 7.2. Sample Organization (Ableton Live)

Following the sample recording session, I exported the audio from Pro Tools and imported it into Ableton where I would be completing the rest of this project. The first step after importing the audio was to chop up each sample and organize them in a fashion that allowed for ease of navigating samples and ease of locating samples. Because the audio files were particularly long, with a lot of space in between each sample, I began by separating the recorded material into the following groupings in the order recorded:

- Licks and Melodic Lines
- All attacks and durations of the lowest concert E-flat on the alto saxophone
- All attacks and durations of the concert A above that
- All attacks and durations of the concert E-flat above that

- All attacks and durations of the concert A above that
- All attacks and durations of the concert E-flat above that
- All attacks and durations of the highest concert A on the alto saxophone
- Sound Effects and Extra Sounds

After this initial organization step, which organized the samples by pitch and technique, I went a step further and proceeded to organize the samples by individual technique or note value. In this process I also trimmed each audio sample to begin right at the attack of the note and to end at silence following the duration. This organization method allowed the techniques themselves to be displayed vertically rather than horizontally for ease of access. Those organized techniques are as follow:

- Inhaled Noises
- Octave Key/Neck strap sounds
- Air/White Noise
- Flicking the reed/body of the saxophone
- Key Clicks and Key Closes
- False Fingerings
- Squeaks/Altissimo
- Multiphonics
- Trills
- Sixteenth Notes
- Eighth Notes

- Quarter Notes
- Half Notes
- Whole Notes
- Eight Beat Holds
- Sixteen Beat Holds
- Staccato
- Forte Piano Crescendo
- Breathy Attack
- Hard Tonguing
- Falls
- Growl
- Flutter Tongue
- Scoops
- Re-sampled audio tracks of the full combination of sounds played simultaneously

### 7.3 Sonic Emulation Goal Set

After completing the organization of each sound, it was time to make a list of desired sounds to emulate. I began by choosing five sounds to emulate, which proved to produce a wide variety of results as I succeeded and failed to produce convincing emulations. I also produced unrelated sounds inspired during this process born out of serendipity and inspiration. The five initially attempted sounds were Harmonica, Pipe Organ, Marimba, Kick Drum, and Snare Drum. These five

choices were made to give a diversity of monophonic and polyphonic sounds as well as percussive elements. The diversity and difference between each of these sounds is what allowed new sounds to be inspired from the process. The sounds created from this process were Harmonica, Plucked String Bass, Woodblock/Cross-stick, Calliope/Steam Organ, Tube Marimba, Electronic Snare/Clap, White Noise, Water/River Sounds, Alarm Noise, and other various synth pad instruments.

#### 7.4. Sound Design and Results

Each of these sounds were created with a process individual to the needs of the original sample as well as the desired outcome, but more often than not this process began by bringing the sample into Ableton's Sampler and adjusting the Attack, Decay, Sustain, and Release of each note much as one would do for basic wave shaping in subtractive synthesis. From that point, I was able to apply a variety of other Audio effects to either achieve the desired sound, or deviate from it creating a brand new sound. Detailed descriptions of the process for the creation of each of the sounds, and deviations from the attempted sounds, can be found in the Appendix.

The results from using this creation method were a great success, and mostly came out the way I expected them to. I was able to create variations of each sounds I set out to create, and through that process of trial and error created an even greater number of interesting new sounds an instruments I would have never been able to imagine on my own.

## **8. Moving Forward/Conclusion**

This project has turned out to be more successful than I ever would have imagined it could become. Besides the library of great sounds that I have created over the course of this project, I also have compiled a library of sample sounds (many of which are still unused), and have developed a sound creation method that can be repeated as many times as I would like, bearing different results each time. In the future I plan on continuing to utilize this process in order to craft my sonic identity and to create individual and unique sounds. I would like to compile these sample instruments that I have made thus far and organize them into a pack that I could use professionally either for sale, or other distribution to Digital Audio Workstation software designers (Ableton, Native Instruments, etc.) as well as for my own personal use.

The wide variety of other completely unused samples that I recorded will allow me to continue to create sounds for a long time without the need to go back into the recording studio to record more. It was very fortunate that I came into that recording session organized so that I could execute a large amount of material quickly and with great quality. From all of these samples, I will be able to make many more editions of new sound packs and saxophone sample packs which will allow me to grow professionally as a sound designer and composer.

Looking forward into my professional goals, I do wish to continue with my education and pursue a doctorate. This will ultimately allow me to realize one of my greatest professional goals which is to teach at the higher education level. I hope to develop this process of design and recording into a teaching curriculum as a course

example for what I can offer to a university. This is looking far down the line, but I believe that if I continue to apply myself in this endeavor, and through this application continue to grow and become a better sound designer, I will be able to offer both great sounds for musicians creating all kinds of music as well as offer a new style of sonic creation to students who are interested in this pursuit.

Throughout the completion of this project I have been able to take my preexisting notion of the value of extended saxophone technique, and open it up to an entire new realm of possibilities. Extended technique is just that: an extension of the technical basis of an instrument. Utilizing Ableton or other Digital Audio Workstations to manipulate the sonic quality of extended technique sounds is a way to provide a further extension of extended technique, and hopefully will allow musicians to leap forward into the unknown realm of what the future of music looks like. Some people believe that computers will become the sole basis of music creation in the future, but I believe that an amalgamation of the acoustic world with the digital world is the true way forward. My generation has seen the total rise of computers in regards to its function in all of our lives, and I think that the combination of these two worlds (digital and physical) will allow for musical expression to help us find balance in this brave new world.

## 10. Appendix

### Appendix A – Sound Design Process

#### Clap + Kick Drum

- Instrument Rack
- Keys Closing (Messy Sample) for Acoustic footprint (pedal squeak, etc.)
  - Turned Down 20dB
  - Filter/Global in Sampler -> Fade in Attack with ADSR parameter control
- Flicking reed sound for punch of the kick
  - EQ: Boost ~150, Dip ~250, Boost 1k, High end low shelf
  - Saturator +2.86 dB (add robustness to the sound)
  - Filter/Global in Sampler -> Faster Decay from ADSR parameter control
- Key Closing (Clean & Pitched) for Body of the Kick Drum
  - Used ADSR control to quiet down the sound of the key closing, then I put a low pass filter at 300Hz to completely eradicate the key noise, and only leave the pitch content. I kept the Keys closing sound very low but still in the sample because it makes it sound as if you're plucking the string hard and get some wobble, and also because it replaced a lot of the high frequency content that I removed from the other bass sample.

TURNED OUT: Ended up scrapping trying to make this into a kick drum once I could not manage to re-create the timbre of the beater hitting the bass drum, but once I removed the Flicking reed sample I have an actually pretty good plucked bass sound! ( Used the ADSR controls to let pitch ring after I lift my finger off of it; extended release)

#### Woodblock Sound/Cross stick sound

- Instrument Rack
- Sample of my nail flicking the reed
  - Filter/Global Sampler, make Decay faster to avoid extra white noise

#### White Noise Generator

- Instrument Rack
- Sample of me blowing air into the saxophone (boosted volume)
- Created crossfaded loop from .33sec – 1.33sec to allow infinite loop

#### Dual Purpose White Noise Riser and Downlifter Instrument

- Put the “White Noise Generator” Instrument Rack into a Drum Rack

- Run it through the Vocoder with maximum band setting
- Add two Auto Filters (one to use as a High Pass Filter, and one as a Low Pass Filter)
- Map the Frequency parameters of the HPF and LPF to the Macros on the Drum Rack for easy knob usage.
- Do the same with the resonance Q for each filter
- Set a ping pong delay at a one 16<sup>th</sup> note delay, then use a Max For Live LFO to control the dry/wet knob on the Ping Pong Delay. This allows for a broader stereo white noise generator that pulses and ebbs and flows. It especially works well if you turn up the phase cancellation on the LFO, and also I have mapped the “Jitter” function to a Macro on the Drum Kit so that if I want the white noise to get jittery I can just turn it up.

#### Microtonal Rhythm Sound

- Instrument Rack
- Set up loop to perfectly loop the pattern over and over.
- Applied Grain Delay option with macros on the most effective parameters (Frequency, pitch, and spray)

#### Snare Drum/Clap

- Added Key Click, Reed Flick, and White Noise (Air) to an instrument Rack Stack Chain
- Isolated the Key Click, and tightened up the attack and release of the sample through ADSR controls in Filter/Global settings in sampler
- Put the “Utility” effect on the the Key Click and on the Reed Flick sound. I inverted the phase on the left stereo channel of the Key Click, and the right stereo channel of the Reed Flick. This lessened the overall phase cancellation, as well as increased the perceived stereo field produced by the clap sound
- Did the same with the white noise, making a more gradual attack to leave room for the “stick hitting the drum sound” and then allowing the sound to propagate after the attack to fill in the “metal snare” sound.
- I attached the length of the white noise sample to a macro in order to simulate the option of a tighter or looser snare
- I also added the saturator to the reed flick sound to make the snare punchier and louder

#### Reverse Double Tongue

- Put Double Tongue sample into sampler in instrument Rack
- I wanted it to sound like an organ so I tripled the sound and de-tuned two of them in opposite directions to attempt a rotor sound.
- Did not sound enough like an organ so I tried to add LFO’s at different note values to each of the three copies of the sound
- Did not sound enough like an organ so I tried to add some waves to the pre-existing sound to “beef it up” a little.



- This did not particularly work, however it gave me a very interesting arpeggiated pad sound.

#### Dubstep Lead

- Inhale squeal noise into Instrument Rack
- Set up loop to loop the pitched part of the beginning of the sample
- Played the samples up more than two octaves until new oscillations came out of the speed of the sample.
- Added a saturator and set the frequency at  $\sim 2.7\text{kHz}$ , width at 80% and depth at  $\sim 13$
- mapped the frequency, width, and depth knobs to macros for custom shaping

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