UNIVERSITY OF CALIFORNIA, SAN DIEGO

Form and Figure in an Uncanny Valley

A dissertation submitted in partial satisfaction of the requirements for the degree
Doctor of Philosophy

in

Music

by

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2013
The dissertation of Benjamin Hack Barth is approved, and it is acceptable in quality and form for publication on microfilm and electronically:

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Chair

University of California, San Diego

2013
DEDICATION

To my father, who mentored me as a young composer with such discretion and thoughtfulness, never asking me to be anything but myself. Because of your guidance, I will never stop exploring.
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PUBLICATIONS


ABSTRACT OF THE DISSERTATION

Form and Figure in an Uncanny Valley

by

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This dissertation presents two new pieces for acoustic instruments and electronic sound. An introductory text examines generalized categories of acoustic/electronic interaction followed by a discussion of several passages from each piece.
1 Introductory Text

The two pieces which form my dissertation are focused on creating a cognitive collision between instruments and electronic sound. This conflict is born, in part, from gradually evolving sonic surfaces which sow tension between instruments and loudspeakers, the singular and the collective, and the familiar and the new. In the case of *Am I a Particle or a Wave?*, an eclectic mix of percussion instruments confront an algorithmically created electronic ‘imaginary pianist.’ In the case of *Out among Sharks, a Moving Target*, instrument sounds are absorbed into an electronic world where they are subsequently stretched, deformed and exaggerated, ultimately inciting acoustic revolt.

From the outset I must clarify what I mean by familiarity. After all, the acoustic and electronic material of both of these works is completely original in the compositional sense. And I do not wish to write music where the listener hears concrete references to works by other composers or artists. Here I speak not of musical familiarity per se, but experiential familiarity. This type of familiarity has its origins in the sonic and performative “signatures” that are a product of exposure to the Western musical tradition. It is predicated on the simple fact that repeated contact with the visual and sonic features of performers and instruments creates a base of referential knowledge that enriches and enlivens subsequent encounters.

Whether or not this knowledge is addressed explicitly by the composer, all music written with Western instruments has the potential to participate in such a feedback loop. Hearing old instruments perform new works creates sonic and visual links to other musical experiences in various styles and from different artists. We metabolize unknown pieces not only as autonomous creations, but we spontaneously navigate connections to previous experiences with similar perfor-
mative content. While this seems like a simple and a straightforward assertion, it is significant because our past listening experiences enable a myriad of expressive and emotive aspects of music. I argue that aural impressions such as intensity, aggression, hesitation and virtuosity are markedly more palpable when heard as referential to instruments with which the listener has some familiarity.

For instance, the piano music of Liszt is more virtuosic when contextualized by Mozart. The aura of destruction of Penderecki’s *Threnody to the Victims of Hiroshima* is augmented by an a priori knowledge of how an orchestra normally functions. The disembodiment of Lachenmann’s music is sharpened by our predefined notions of how instruments are supposed to sound. This body of a priori knowledge – the experiential familiarity of instrumental music – is abstract and does not necessarily describe anything specific about the experience of time or form. But it does enable musical impressions which are born out of reference, recollection and departure from previously formed sonic expectations.

The concept of sonic familiarity holds significance for me in part due to my quest to define what role technology can play in the aesthetic integration of the new and the old. The question often before me is how successfully can the aura of performance as a tradition be manifest as sound emanating from loudspeakers? Do we perceive characteristics such as intensity, aggression, hesitation and virtuosity with the same degree of depth and potential for astonishment in an electronic context when compared to sonically similar instrumental performances? Of course, listeners are equipped to discern differences such as fast or slow, loud or soft and dense or sparse. But with acoustic music, the realization of these tropes is coupled to our internalized boundaries of physical movement and framed by a known instrumental tradition and repertoire. Virtuosity is palpable due to a conflict between what we have known is possible and what we now hear. Intensity plays itself out in front of us: a performer and his object, attempting to make improbable phrases speak through improbable apparatuses. With electronic media, the acoustic integrity of instrumental sound is difficult to imitate and any visual feedback is largely denied to the listener. More often than not, the listener is put in a position where s/he must jettison the referentially that comes from the concert
music tradition in order to fully engage with a relatively boundary-less world of raw sonic potential.

When I first began to write computer music, I was drawn to the intrinsic freedom that comes from discarding instrument-based compositional paradigms. In more recent years, I have realized that it is not solely the otherworldliness of computer music that I find alluring, but creating a connection between new experiences and the familiar aura of the concert hall. It is the presence of established sonic tropes that helps to enrich and contextualize the meaning of that which is unfamiliar. Early on, my use of electronics was mainly a way of extending the pallet of timbres and morphologies of the instrumentalists on stage. But, more recently, electronics have become not only a vehicle for augmenting the sounds present in a given piece, but also a portal for interacting with a more generalized knowledge about instrumental performance and tendency. In the program note for *Am I a Particle or a Wave?* I write the following about the electronic gestures of the imaginary piano part:

“...in dramatic moments, streams of pitches synthesize an argumentative barrage of energetic gestures, as if the [electronic] piano can be felt trying to escape from its own sonic straightjacket.”

One can only understand this straightjacket if one has an a priori familiarity of a pianist’s physical limitations. And one may only experience *escape* if there is a binding from which to break free.

The idea that electronic gestures can be heard as referencing specific aspects of our knowledge of musical instruments requires a careful treatment of timbre and time. It’s not just a question of referencing the relational structures that instruments typically play (melodies, rhythms), but also creating a cognitive link with the very sonic qualities that permit us to differentiate one instrument from another. Over the past five years much of my work with computers has been directed towards cultivating a variety of ways to realistically connect different sonic media. This has caused me to undertake a comprehensive survey of a variety of methodologies for making experiential links between the instruments on stage, the instruments we have internalized in our minds, and instrumental sound emanating from loudspeakers. Under this guise, the experiential familiarity of acoustic
instruments becomes a shared common knowledge; a starting point from which I then extrapolate unfamiliar and sometimes improbable outcomes.

1.1 Categories of Electronic Intervention

Here I list several methods which I use to extend the world of instruments with digital sound. Each item is framed in the context of using sampled content – recordings of instrumental utterances and gestures – as a sonic resource which is then algorithmically treated to be markedly outside of the realm of acoustic possibility. I first offer a technical description of each category, then elaborate on certain metaphorical interpretations which are frequent in my compositional thinking.

1.1.1 Articulative Freedom

When writing music for live musicians, there are a number of technical and physical restrictions on the speed and intricacy of what is performable. However, when writing electronic music, the resolution of time has no limits (or, perhaps better put, is limited only by the rate at which we, as listeners, can parse time). Therefore it is not difficult to supersede the limitations of performers from a variety of compositional standpoints, for instance: faster, longer, louder, softer, smoother, rougher, etc.

Digital artwork which crosses these boundaries, from a phenomenological perspective, is commonplace. In an age of machines, we are saturated with mechanized sounds that exceed the rate, brilliance, amplitude and intricacy of anything heard in the past. I find that, in an isolated context, surpassing old musical limits is not particularly striking. However, when exploring acoustic limits from inside a concert hall, another set of implications arise. The articulative freedom of electronic music has the potential to enter into conflict with our preformed notions of instrumental boundaries and virtuosity. This space – electronic sound framed by its similarity to real world physical and acoustic limits – gives sound emanating from loudspeakers an added degree of depth and excitement. Music which evokes
the acoustic signature of instruments helps to make this virtuosity more palpable in the same way that familiarity with Mozart’s piano music helps make Liszt’s work more astonishing.

1.1.2 Visual Absence

Loudspeaker sound is not inherently coupled to any visual correlate. When encountered in the concert hall, a room designed for both sights and sounds, this can create psychological discord. Such discord is particularly palpable when loudspeakers are paired with live musicians, whose sonic behaviors do necessitate corresponding visual actions. I have come to realize that an important aspect of experiencing performative interpretation comes not from what we hear, but the manner in which sounds are bound to the visible actions of the instrumentalist – the varied manner in which each sound is contextualized before it starts, during its duration, and after it has expired.

Unlike other formulations of electronic music’s role in the concert hall (such as in *acousmatic music*, where the lack of visual stimulus is embraced as a way to encourage a detached, purely sound-based experience), I contend that electronic sound is cognitively incomplete compared to its visually-endowed acoustic counterparts. It is my hope that this incompleteness lends computer gestures a sense of mystery, at times even bordering on mischievous, malcontent and invective. One of the reasons that I gravitate towards using the sounds of recorded instruments in my electronic compositions is that I find it brings this cognitive tension to the fore, adding additional luminescence. The transfer of sonic energy between a visually present body and a veiled utterance serves to stabilize the psychological link between seen and unseen experiences. And, when electronics exceed acoustic limitations, it creates a discursive link between the familiar and the new.

1.1.3 Limitless Density

Computer algorithms provide the ability to create dense textures of overlapping sounds which are not limited by the physics of performance or the number
of musicians present. One may create thick textural or polyphonic structures with relative ease, making it possible to make a chorus out of a singer, or an orchestra out of a soloist.

I usually think about electronic density in terms of an immersive continuum. When layering many copies of similar acoustic sounds, one can intimately control the balance between the experience of monophony, polyphony and complete saturation (or, alternatively: line ↔ lines ↔ texture). I frequently consider this continuum when designing the formal trajectory of my music. For example, by gradually changing cumulative density, I compose transitions between the singular, the plural, and the “fused plural” (many components, but singular in experience). This creates a formal crossfade between the loss of one kind of identity (usually the individual agency of a single performer) and the appearance of a new kind of identity (a fused gestalt which outstrips the capability of any single utterance). The experience of such a gestalt may cause the listener to loose touch with the performers who are before them. In the context of my dissertation pieces, when a performer becomes shrouded by plurality of loudspeakers, the compositional importance of the transformation that takes place rivals those afforded by articulative or morphological alteration.

1.1.4 Spatial Mobility

Unlike instruments, such as the piano, which have a relatively fixed spatial location, electronic media have the potential to be experienced from various directions or as if in motion. Spatial directionality and movement can be seen as a way to deviate from our sonic expectations for concert hall experience, which is normally static and where acoustic energy is overwhelmingly concentrated in the front of the hall.

Consequently, the typical location of performers (front/center stage) holds particular importance for my work in spatializing electronic sound. Utterances or movements outside of this “musician’s space” (the area in front of the audience extending to the left and right-hand side of the stage) create an interval of spatial difference from normative acoustic activities. I frequently strategize that electronic
sounds whose spatial trajectory passes through this space have a heightened potential for metaphorical conflict with acoustic activities – a conflict who’s origin stems from a lack of intelligibility of sonic components. Gestures which pass through this space often disturb and disrupt acoustic stability, imagined as a byproduct of the metaphorical collision between where sound can be verses where is was originally intended.

1.2 Electronic Notation

Each of my dissertation pieces includes a symbolic notation of the computer part. These notations provide information about the activity, loudness and gestural directionality of electro-acoustic events using an automated analysis of the temporal evolution of individual sonic components. Somewhat similar to acoustic notation, information about time-varying sonic characteristics is distilled into a set of symbols which depict sonic categories, intensities and temporal relationships.

I initially created this algorithm in order to give performers an accurate depiction of what they can expect to hear. However, despite its pragmatic origins, these notations quickly became a compositional resource. Since my electronic music typically consists of numerous overlapping sonic elements, these visualizations help me to better perceive the horizontal and vertical relationship of individual utterances. And I have found that I can see relationships in electronic passages that I can not hear. This method of notating computer sound is one possible solution to the temporal trappings of electronic music composition: when working without a score, sounds and ideas must often be auditioned in time, creating an unwavering inertia which can stifle certain timespans of imagination. These notations help me think and react outside of sonic time, offering a broader overview with which to take stock of compositional intent.
1.3 *Am I a Particle or a Wave?*

*Am I a Particle or a Wave?* is a trio for 2 percussionists and an electronic imaginary pianist. It is also a duo between noise and pitch: the percussionists play a variety of noisy instruments while the piano uses almost exclusively traditional pitched sounds. While the sonic resources of the acoustic and electronic parts are jarringly different, they form an ensemble through temporal dynamism – feeding off each other’s energy, creating an unpredictable succession of overlapping gestures and articulations, seeming to drive towards articulative unity though rarely reaching consensus.

From a certain phenomenological perspective the imaginary pianist is intended to sound as realistic as possible. However, rather than try to emulate music that is playable by a person, the piano part is a study in assembling larger phenomena out of many self-similar components. As such, the role of a single piano “note” is quite varied – sometimes notes function only as isolated percussive blips; at other times, aggregates of notes form energetic waves of sound. And, in dramatic moments, streams of pitches synthesize an argumentative barrage of energetic gestures, as if the piano can be felt trying to escape from its own sonic straightjacket.

1.3.1 Performative Forces

This piece is experimental in the sense that I have never composed electronic sounds which are not modeled after the timbre of one or more instruments present on stage. The electronic part here consists solely of unprocessed piano sounds while two percussionists play a variety of noisy objects. Most of these objects are somewhat foreign to the traditional percussion setup (see page 20). The more common instruments, such as the floor toms, have their heads severely slackened such that they sound quite distant from percussionist’s prototypical arsenal. Therefore, in terms of sonic and visual experience, there is a balanced contradiction between musical forces: the percussionists are visually present but sonically unfamiliar while the imaginary pianist is sonically familiar but visually absent.
When attempting to put listeners into intimate contact with a visually absent sound source, the piano is a logical choice. No other instrument from the concert music tradition has a more iconic and well-established sonic signature. And, even though recorded piano sounds incur a loss of experiential immediacy due to the lack of visual stimulus, the instrument’s iconic status ensures a sonic experience which is both instantly knowable yet unpredictable. Going beyond sonic familiarity, I also hope that listeners can feel a pianist’s presence; that the sounds of the electronic piano part are not simply referential, but that we infer the presence of a being who might be performing these gestures. The palpability of performative agency is not intended to be experientially stable over the course of the composition – sometimes the piano part enters into clearly unperformable domains from a variety of corporeal perspectives. But the presence of decidedly playable passages creates an experiential anchor with which subsequent excursions can be measured and made more acute.

1.3.2 Straightjacket

An important dramatic moment in the piece comes early on, before \( D \) in mm. 108-113. Here the piano gestures form a series of surreal articulations which dramatically exceed the physical capacity of even the most seasoned performer (track 1). Large quantities of piano attacks are used to create a vocal-like gesture which pushes towards an energetic conclusion in m. 114, arriving at a new section of music and a tempo change. I colloquially refer to this moment as when the piano “escapes its straightjacket”, crossing into a new sonic realm that forcefully breaches the boundaries of performability. The piano’s timbral signature is faithfully present throughout this passage, but the speed of notes and the exacting way in which events fuse together creates an uncanny mass of sound. Here, rather than being heard as performed, the piano seems to be possessed by an unknown and savage source of acoustic energy.

Compare this passage to earlier gestures from the piano part (track 2). The piece begins quite innocently but, gradually from \( B \) to \( D \), the electronic part increases in complexity. The uncanny passage at \( D \) is not simply stated to the
listener, but part of a gradual formal process in which performative tension emerges from a palpable pianistic agency. I contend that the raw power and aesthetic beauty of the climax in mm. 108-113 is contingent upon this preparation, as the suggestion of physical plausibility makes the arrival the unreal more radiant.

1.3.3 Temporal Adhesive

Because the sonic resources of the percussion and imaginary piano are so jarringly different, the temporal coordination of musical forces is critical to creating the perception of interactivity. In an extended passage from $H$ to $L$, there is a strong link between the articulative speed and timbral unfolding of the percussion and piano parts. The piano articulates a series of repeated pitches which drift freely between different rhythmic divisions of the beat (track 3). The percussionists play soft tremolos whose speed is coupled to that of the piano articulations, creating a rhythmic thread which provides a global consistency for several minutes (track 4). As if tethered together, changes in the stability of this thread act as a provoking force. The piano’s gradual but unpredictable expansion in pitch space arouses more dramatic timbral/instrumental changes in the percussion writing. In response, the percussionist’s articulative techniques become more varied and aggressive, inciting harsher attacks and increased jumpiness in the piano’s stream.

1.3.4 Scratch Section

In a third passage, I attempt to make a performative connection between playing techniques in the percussion and electronic parts. The passage in question, around $O$ (m. 315), exhibits a sudden shift in the sounds of the piano (track 5). Up to this point, the imaginary pianist has only played notes from the keyboard. But at $O$ playing techniques change to scratching and plucking sounds made by performing on the strings inside on the piano. In the same sense that the straight-jacket passage creates a developmental trajectory of increased tension and discord, here the piano has become more obscure and unstable than before. Scratching inside the instrument is relatively rare, exclusively a contemporary performance
technique first pioneered by Henry Cowell in 1925. Thus, all of a sudden, we completely lose touch with the notion of the piano from the classical and romantic periods and are thrust into a more prominently avant guard gestural pallet.

Although this change in sonic resource is quite sudden, it is the percussionists who foreshadow and morphologically prepare this moment in preceding passages. Beginning at $N$ (m. 297), the percussionists gradually shift their playing techniques from attack-based sounds (similar to the attack profile created by a piano played from the keyboard) to pairs of rapid back-and-forth scraping movements on instruments with hard-edged surfaces (track 6). Therefore, there is a kind of imagined physical connection in the source of stimulation between the visible performers and the hidden electronics. It is the percussionists’ transition to a new articulative resource that entices the piano to shift its own articulative arsenal. This concept of a morphological link between disparate sound worlds also occurs later in the piece at $Q$, where the piano plays a series of elongated sustained chords to accompany the first percussionist’s drawn out ratchet solo (track 7).

1.4  Out among Sharks, a Moving Target

1.4.1  Performative Forces

This piece is written for a nonstandard quintet of acoustic instruments: flute, clarinet, cello, trombone and percussion. The electronic part is made from a combination of sampled sounds from each of these performers. As with other pieces I have written, the timbral and temporal world of the computer part is modeled after the spectral and gestural signatures of the instrumentalists. Unlike Am I a Particle or a Wave?, where the sounds of the computer part are visually absent from the stage, the formal design of this piece revolves more intimately around creating contrast between that which is seen and heard, that which is only heard, and moments where the link between seeing and hearing is obfuscated.

The timbres of electronic gestures are always related to those of the instruments, but composed to exhibit differing degrees of experiential semblance and cohesion. Sometimes the sounds of the electronics are relatable only by gestu-
ral contour, other times through timbral imitation, and at key moments they are experientially indistinguishable from instrumental utterances. This continuum of likeness is used to realize a formal tension between individuality and togetherness, playing a central role in determining which sonic forces are in control of musical time and which forces follow.

1.4.2 Opening Mixture

A frenetic opening builds a charged exchange of noisy counterpoint between players and electronics (track 8). A primary goal is for the electronic gestures to be on a par with the level of energy, complexity and acoustic fidelity of the instrumental parts. The opening electronic phrases are generated entirely with a single recording session of a snare drum. By using this drum’s sonic consistencies, the computer part presents a spectrally intricate sound world (similar to that of the percussionist) which has its roots in acoustic logic but is decisively other (track 9). Somewhat as with the piano part of *Am I a Particle or a Wave?*, the electronics are fabricated through selecting and layering individual snippets of this recording session such that they fuse together to make morphological continuities.¹

The interaction of acoustic and electronic gestures in the opening creates a contrapuntal texture which partly feels directional due to an ever-present upward movement in the pitch-height of noisy streams. However, due to countervailing gestural energies, this counterpoint also exhibits a pervasive formal stasis, seeming to be at once fixed and in motion. This experiential discord resolves forcefully at three distinct moments: at A, at C and at E (track 10). These resolutions are created through cooperation between electronic and acoustic forces in articulating a series of fused timbral objects, forming a single gesture. The rise in pitch from the opening contrapuntal passages is now more overt, articulated by the cello after A (m. 49), the clarinet around C (m. 124) and later in the trombone at E (m. 194). Upwards motion always ends somewhat abruptly, metaphorically

¹As with the electronic piano part of the previous piece, these gestures are made with the software environment that I wrote in collaboration with researchers at IRCAM in Paris. See B. Hackbarth, N. Schnell, P. Esling, D. Schwarz, “Composing Morphology: Concatenative Synthesis as an Intuitive Medium for Prescribing Sound in Time”, Contemporary Music Review, 2013.
evaporating rather than reaching a sonically decisive conclusion. When comparing the opening phrases to the phrases of A, the persistent presence of ascending trajectories creates a linkage between these two otherwise contrasting passages. A lack of resolution or contrary motion in pitch creates an interrogative feel. Taken as a whole, the opening establishes a kind of push-and-pull rapport where each player and the electronics briefly assert morphological prominence only to be quickly overwhelmed by the energy of the next entrance.

1.4.3 Glissando Section - Free Fall

At G the instruments are suddenly pulled into the undertow of a relentlessly descending thicket of glissandi (track 11). A strong experiential contrast is created with the opening due to a vivid change in global morphology and contour. While earlier passages use almost exclusively energetic, unstable noisy sounds, here the electronics and instruments produce soft, sustained pitches. And, while the opening sections present a continual and unmitigated pitched ascent, here all sounds unmistakably bend downwards at a relatively common rate and steepness. This level of saturation and consistency would not be possible with instruments alone. It is the limitless density and precision offered by computer control that give this downward motion such dominance.

The music at G also creates a strong contrast with the experience of plurality in opening. In the beginning of the piece, sonic forces consist of soloistic lines which are disjunct and uncoordinated, but at G the instruments and electronics are assimilated into an energy stream whose unrelenting density ensures the marginalization of any single voice.

The use of instrument sounds in the computer part creates a newfound experiential parity between the live musicians and the loudspeakers. Rather than create an electronic passage which emphasizes phenomenological purity, like a descending Shepard Tone (track 12), the presence of many simultaneous voices (flutes, cellos, clarinets and trombones) couples familiar timbres to an improbable experiential outcome. As a consequence, over the course of mm. 219-235, the previously individual identity of each sonic participant gets lost in a dovetailed pattern of
self-similar shapes. Because the acoustic sounds are no longer as intelligible as individual utterances, the performers on stage cease to appear as live. They now seem to be felt more than they are heard. The electronic sounds no longer feel as distanced (or, alternatively, instrumental presence has become equally distant). In addition, there is a marked contrast in the experience of space. In the opening sections of the piece, all electronic sounds are spatialized to be heard in the front of the hall, occupying the same phantom locations as the instruments. But at $\text{G}$ electronic sound emanates from all directions, distributing sonic energy throughout the hall rather than privileging the musician’s space.

1.4.4 Impulse Section

After getting lost in $\text{G}$, the instruments begin to exhibit a change in behavior that permits them to escape from the previously monotonic texture (beginning near $\text{J}$, m. 270). This escape is achieved by changing both the spectral content and gestural shape of instrumental activities. From $\text{I}$ to $\text{K}$, the instruments gradually cease playing stable pitched sustains, switching to more unstable and localizable noisy timbres. In addition, they abandon the decrescendos at the end of each utterance in favor of a series of percussive releases that further compound their acoustic and visual intelligibility. Metaphorically, this can be seen as a response to the relentless directionality of $\text{G}$: the acoustic instruments, unhappy with their loss of individuality, find a way to reassert sonic primacy and play a more active role in directing gestural traffic (track 13).

As $\text{K}$ draws near, the instruments continue the morphological transition towards noisy, bright and more visually assertive spectra. Note durations continue to become shorter and, by m. 277, instruments decisively cut through the pitched electronic continuity with sharp tutti attacks. We now arrive at $\text{K}$, in which the electronics dramatically vanish. And the listener is left with only aggressive, dry and fiercely coordinated instrumental articulations.

It is important to retrace the route by which we arrive at $\text{K}$. The glissando section created an experiential aura where the overlapping succession of both instrumental and electronic sounds voided the primacy of individual events. In a
bid to regain temporal control, the acoustic performers gradually poke and prod this pitched monotony in an effort to once again be heard. But, in order to overcome this relentless force, the instruments must play together in order to amass the sonic authority needed to overcome the electronic sound stream. Thus, in an effort to be “present” once again, the performers band together at $\text{K}$, succeeding in breaking through with a tutti rhythmic passage. Now there is no longer a push and pull between different performative identities – here instruments function as a whole. In a metaphorical sense, it is the loss of acoustic identity through electronic intervention at $\text{G}$ that helps to spur this newly discovered acoustic outcome (track 14).

1.5 Conclusion

My dissertation pieces offer contrasting approaches as to how I use technology to reference and extend the world of acoustic music. In *Am I a Particle or a Wave?*, a sonically familiar but unseen sound source is placed in continuous contact with an articulative contour arising from two percussionists. The form of the piece is organized around creating a series of cognitive tensions which link familiar piano sounds to a gestural world characterized by surpassing performative/acoustic limitations. A series of contrasting sections are woven into a fabric of interactivity – actions by the live percussion and the sampled piano resource create streams of mutual influence, each metaphorically provoking the other to stop, continue, hold forth or break free.

In *Out among Sharks, a Moving Target*, the perceptual distance between instrumental sound and loudspeaker sound creates cognitive gaps of different magnitudes and between different musical dimensions. At any given moment, the degree to which we can parse material is a key aspect of the formal design of the piece. Adherence to a global profile of morphology and density creates a dialogue among musical forces. This dialogue results in tense interactions and provocations, gradually altering the stability of sonic intelligibility and identity.

In the opening paragraphs of this document I refer to a “boundary-less world
of raw sonic potential” in describing purely electronic music. Not incidentally, I also use terms indicative of conflict to describe the sonic and formal interactions of instruments and electronics in my music – tension, collision, provocation, invective, savage, escape, etc. My predilection for conflict in unifying these forces comes from a desire to write music which exhibits both consonance and dissonance. And dissonance is not an experience, but a relationship between experiences – one must comprehend a stable framework in order to deduce tension. In my case, the familiarity of instruments acts as a scaffolding from which we may interpret electronic behavior. It is acoustic sound that provides a mold so that the molten liquid of boundary-less media may be cast into an earthly shape.
2 Am I a Particle or a Wave?

for 2 percussionists and imaginary pianist, 2011
INSTRUMENTS

Each percussionist uses the same basic set of instruments, written on the staff as follows:

- on edge of table – always played with the shaft of the mallet
- Plastic Bucket – 15-18 liters in size, inverted on a snare stand for maximum resonance.
- Small Cymbal – capable of producing different colors, strike in different locations.
- Inverted Teacup – By default, struck in the center of the raised rim such that the sound is fairly unpitched.
- Ratchet – Staccato notes are a quick burst of ratchet clicks. Tremolos indicated a sustained series of clicks. Sometimes the speed of ratchet clicks in indicated about the staff.
- Cabasa – Mounted to the table such that the top and beads can be played easily with a single hand.
- Shekere – Mounted such that beaded and unbeaded surfaces can be played with ease.
- Guiro – By default, played as a single strike on the body. If a trajectory is indicated on the location staff, sweep lengthwise perpendicular to the grooves.
- Chimes – placed on the padded table so that the sound is dampened.

These instruments can be mismatched and even made from different materials. For example, percussionists' guiros can be of different materials; one player's chimes can be wood while the other player's are glass, etc.
STAGE SETUP

STAGE SETUP

PERCUSSION I SETUP

PERCUSSION II SETUP

PERCUSSION I SETUP

PERCUSSION II SETUP
TEXT INSTRUCTIONS

Bold text provides expressive/interpretative instructions. Non-italic text applies to the method of playing instruments. Italic text applies to playing locations on individual instruments.

By default text instructions are written above notes. When simultaneous notes are to be played differently, text above the staff applies to notes notes with stems up while text below the staff applies to stems down.

By default, notes on all instruments are to be played with mallets of the players' choosing, except when non-italic text above notes indicate otherwise. Text indications only apply to the note they are near unless extended by a horizontal bracket or prolonged by *sempre*.

PLAYING LOCATIONS

Above the instrument stave is a location stave where, when needed, additional information about the area of the instrument to engage is specified.

In addition to the location stave, italic text instructions apply to the location of performance and are somewhat unique to each instrument. Instructions include:

- **tom**
  - *rim* - on the rim
  - *mounted cabasa*

- **top** - on the top (wooden circle)

- **beads** - on the beads/side

- **shaker**
  - *beads* - on the portion with the beaded covering

- **wood** - on the portion without beads

- **teacup** (inverted)
  - *top* - in the middle of the small raised circular rim; unpitched

- **side** - on the side; pitched

- **guiro**
  - *grooves* - perpendicularly across the wooden/metal ribs

PLAYING TECHNIQUES

Common techniques indicated by non-italic text include:

- **shf** - play with the shaft of the mallet. Sometimes accompanied by information on the location stave which indicates near the butt (low) to near the head (high).

- **0** - play jeté with the approximate number of bounces, speed and change in speed over the duration of the note. By default, with the head of the mallet. If shf is specified, sometimes accompanied by a trajectory on the location staff indicating location on the shaft.

- **butt** - play with end of the shaft of the mallet, normally scraping it across the surface of the object under pressure.

- **hand** - slide hand across the instrument, usually over the beads of the cabasa or shaker.

- **comb** - slide a comb across the surface of the instrument.

- **scraper** - slide a plastic scraper across the surface of the instrument.

- **brush** - slide a stiff-bristled brush, preferably metal across the surface of the instrument.

- **bolt** - scrape a threaded bolt shaft across the edge of the instrument.

- **TS** - scrape a textured wooden shaft across the edge of the instrument.

TREMOLI

All tremolos are as fast as possible unless specific otherwise.

If specified, speed is indicated by bold arabic numbers (4) above the staff which indicate the number of impulses per beat. For scraping sounds, an impulse corresponds to a single directional motion; for the ratchet, an impulse corresponds to individual clicks.

Tremolo speeds may be interpolated with horizontal arrows, indicating a gradual change which takes place over the relative duration of the arrow. Section H is replete with this type of notation. Finally, there are moments when random and unpredictable rhythmic patterns are specified as two bold numbers in parenthesis where the two numbers indicate the minimum and maximum speeds in a random range of possibilities. Thus, (1, 4) indicates that impulses should be made randomly between once per beat and four times per beat. In this random distribution rhythmic notation, rhythmic continuity is not generally desirable.

Two additional tremolo indications, features in section H, indicate the motion which creates repetition.

- **→→** - move side-to-side across the instrument. Always played with the shaft of the mallet at random.

- **→** - repeated strikes, only given to distinguish between the side-to-side technique above.
Am I a Particle or a Wave?

for two percussionists and imaginary pianist

Benjamin HACKBARTH
tremolos until section H are fragile, nervous, uneven; they occupy a small physical space on the instrument. All tremolos are played \textit{sfz} followed by \textit{subito p}, unless otherwise written. For the shekere and cabasa, tremolos are made with a single finger on a single bead or band of beads. For all other instruments, tremolos are to be made using the head of a brass mallet moving over the grooves of the instrument, unless otherwise specified.
H tremolo are more nuanced, subtle, musical and also more fluid and continuous than before. Initial tremolo speeds follow the approximate speed of repeated piano notes.

Perc I

Perc II

Elect.
Perc I.
Perc II.
Elect.

279
Q \[ q = 60 \]

Perc I.

Perc II.

Elect.

### High Pressure Against Edge of Slab
- Not too fast, gritty, unperiodic
- Metal bolt

### Tap on Individual Beads in Different Locations
- Comb, perpendicular to grooves

### Comb, perpendicular to grooves
- (0.5-4) subito
- (2-6) (0.2-3)

### Tap on Individual Beads in Different Locations
- (0.5-4) subito
- (2-6) (0.2-3)

### Comb, perpendicular to grooves
- (0.5-4) subito
- (2-6) (0.2-3)
3 Out among Sharks, a Moving Target

for flute, clarinet, cello, trombone, percussion and electronic sound, 2012
NOTES FOR THE ENSEMBLE

- m.1 to G: In general, lines and articulations are soloistic and can be played with some degree of temporal flexibility.

- K to O: With the exception of sustained events, all articulations are tutti with a majority of the ensemble. Most events are also loud – care should be taken to balance the sounds so that they mix well with other sounds. No one player should overly dominate. Any impulse with a written duration of an eighth note or shorter should be played as short as possible. Even through a variety of quickly-changing techniques are used, try to maintain a relatively constant dynamic level with respect to note-to-note phrasing.

- P to end: like previous sections, attacks and releases are intensely tutti throughout the ensemble and should blend together. However, everything is much softer and the quality of sounds can be more fragile and unstable.

FLUTE TECHNIQUES

- Tongue Pizzicato. By default, articulated with a syllable, but also performable with p or ts if indicated.

- Half pitched, half noise.

- An unpitched noise made by blowing through the instrument while fingering the indicated note. By default, exhaling.

- Tongue ram. Both fingered pitch and resulting pitch (a major seventh lower) are notated.

- Key click with a hint of pitch. Sometimes written with a closed embouchure hole; in this case, both the sounding note and the written pitch are indicated.

- Sounding pitch played off of the diamond-shaped fundamental.

- m. p. = Exhale.

- v.v. = Inhale.

- ʘ = Cover embouchure hole completely with lips, exhaling (by default) or inhaling (if indicated) into the instrument.

- ✓ = Stop note with tongue.

- ʘ, Ø, p, k = Written above notes; these indicate syllabic additions to normal or unpitched tones or articulations.

- d.t. / fl. = d.t. = double tongue as fast as possible. fl. = flutter tongue.
CLARINET TECHNIQUES

- Slap tongue.

- Key click.

- Smack/Kiss.

- Tongue ram.

- Stop note with tongue.

- Play a honkey multiphonic off of the written fundamental.

- An unpitched noise made by blowing through the instrument while fingering the indicated note. By default, exhaling with open oral cavity.

- Half pitched, half noise.

- Exhale.

- Inhale.

- Closed oral cavity.

- Blowing into the instrument, but with some air escaping around the mouthpiece to create a more audible airy quality.

- Bow diagonally across the bridge, catching the strings on either side to produce a combination of noise and high frequencies.

- Tap the wood of the instrument in a resonant location. Locations should vary from note to note as possible. By default, let vibrate; staccato indicates dampening after striking the instrument.

- Scratch tone on the string binding behind the bridge.

- Col Lengo Battuto, played by bouncing the wood of the bow against the string(s). Almost always with a muted notehead, below.

- Mute strings with left hand resulting in a mostly unpitched sound. When this notehead is used, register corresponds to vertical bow placement – higher notes are closer to the bridge, lower notes are over the fingerboard. Left hand placement should also be used to sharpen registral differences. Clef is insignificant.

- Scratch Tone.

- Play a honkey multiphonic off of the written fundamental while simultaneously screaming into the instrument.
A low pizzicato where insufficient left hand pressure creates a noisy buzzing due to the poor contact between the string and the fingerboard.

- Forcefully slap the strings on the fingerboard with the left hand.
- Highest note possible. Harsh and squeaky when loud.
- A scratch tone glissando performed by moving the location of the bow on the string. Low=near bridge, high=near pegs.

Half harmonic pressure. Physically between harmonic pressure and no pressure. Sonically in between the specified harmonic and the specified fundamental.

- A fingerboard pizzicato created by percussively depressing the given pitch with the left hand – right hand is not used.
- Harmonic pressure.

TROMBONE TECHNIQUES

- An unpitched noise made by blowing through the instrument in the position of the written pitch. By default, exhaling.
- Blowing into the instrument but with some air escaping around the mouthpiece to create a more vivid burst of air.
- Flap tongue. An unpitched sound created by pushing the tongue into the mouthpiece with air pressure. A percussive thud.
- Pedal Tone. Somewhat unpitched due to the low frequency. Frequency can be unstable, but still short and articulative.
- Percussive sound made by abruptly closing the plunger into the bell. Always written on low E.

Indeterminate pitch created by quasi-random partial changes created with the lip. Airy – written pitch doesn't matter. It's only a general guide for how high to play.

- A un-metered trill produced with the embouchure.
- A un-metered trill produced with the valve.
- Stop note with tongue.

Noteheads which indicate various degrees of ‘pitchness’. Less black is an airy articulation. More black is close to full pitch. Always written with plunger.
PERCUSSION SETUP

Top Staff
- large logdrum, wooden guiro, wooden block, wooden chimes laying on foam, large inverted tin can, small metal object, metal snares

Bottom Staff
- small kickdrum, low floor tom, medium low floor tom, canya, snare drum, small snare drum

PERCUSSION TECHNIQUES

- Staccato – deadstroke.
- Play with the shaft of the mallet.
- A dashed slur indicates a single gesture where the attack (first note) remains depressed and the release (second note) is created from an energetic and noisy gesture scraping the articulative implement off of the instrument.
- Rimshot.
- Play with the tips of the fingers on a resonant location of the nails.
- Like tips, but also with nails in contact with instrument’s surface.
- A tremolo produced by a frantic back-and-forth motion with the stick in constant contact with the surface of the instrument. As fast as possible.
- Play with the butt-end of a mallet’s shaft, pressing down onto the instrument oriented vertically.
- Play with a texture stick, usually scraping over the rim/edge of an instrument over the specified duration. Change direction for repeated articulations. Up/down bow indication indicated weak/heavy accents, respectively.
- A double-attack where the second articulation is formed by a very quick bounce. The second bounce is dampened, creating a dead-stroke-like effect.
palm
– Play with the meat of the palm on a resonant location of the instrument.

ELECTRONIC NOTATION

Electronic sounds are notated on an 18 line staff where the middle space corresponds to middle C. Contrary to typical Western notation, the interval between any adjacent line-space or space-line is a semitone. Thus, the staff's top line corresponds to F5 (the normative top line of the treble clef) and the bottom to G3 (the normative bottom line of the bass clef).

Events are shown in a “piano-roll” type notation which is synchronized to the acoustic score. Pitched electronic events are notated according to their time-varying fundamental frequency. Unpitched sounds are notated according to time-varying measure of mean spectral energy.

Amplitude is shown with notehead and sustain bar thickness and darkness.

The color of noteheads/sustained lines indicate the following sonic resources: black: snare drum, yellow: flute, green: clarinet, red: cello, blue: trombone.

The following noteheads/sustained lines indicate the following sound categories:

- Snare play with sticks / Noisy instrument articulation
- Snare drum played on the rim
- Snare drum played with a superball
- Sustained discontinuous rubbing
- Sustained smooth rubbing / Instrument sustained sounds
- Sustained rough rubbing / Noisy instrument sounds
ELECTRONIC PERFORMANCE

Depending on the size of the hall, slight amplification may be used on select players in order to boost the overall level to meet that of the electronics. At a minimum, the flute part should be amplified from mm. 0-200, fading out over mm. 200-208.

The electronic part is realized with a Max/MSP patch available from the composer. The spatialization algorithms in the patch may be configured to reproduce the electronic part for any number of loudspeakers. The minimum channel count is 2.1 – configurations up to 24.2, including elevated channels, have been tested. It is important to note that subwoofer channels are supplied by the patch and should not be summed at the console due to delay-based panning algorithms.

Electronic sections are triggered by the patch operator. Often times, these sections provide click for the conductor in order to coordinate electronic and acoustic components. Electronic cues are labeled with large red boxes at the top of the score. Clicks are provided where indicated.

THANK YOU

Thank you to the following researchers who's insights and ideas have inspired and enabled my work: Norbert Schnell, Joachim Goßmann, Arshia Cont, Diemo Schwarz and Philippe Esling. Also thank you to Alice Teyssier, Derek Stein and Samuel Dunscombe whose past performances were a source of inspiration for flute, cello and clarinet parts, respectively.
Out Among Sharks, A Moving Target

Alto Flute

Clarinet in Bb

Cello

Tenor Trombone

Percussion

Electronics

Conductor clicks start 7 "prep" eighth notes

Concert Pitch Score by Benjamin Hackbart
maybe a harmonic!
Blend into the texture with the electronic bass, except "peak" out on accented notes,
hesitant, stifled; articulate and intense but softer
brush
near rim
slightly dominating the ensemble

preparations changes:
• remove membrane from snare drum, snares off.
• remove buzzy objects from toms
• add thin, cracked surface to each tom, kind of like a wood membrane, but snappier?
• something similar to kick drum.

To Flute

lip
206  \( F_q = 88 \)

Fl.

Cl.

Vc.

Tbn.

Perc.

Elect.

```
... and gets faster...
```

smooth winding glissando harmonics/non-harmonics are equal amplitude

S.F.

trill speed starts off a little slower...
Smooth, continuous, unbroken glissandi.

soft individual clicks, gradually slowing down, then speeding up at crescendo
292

Fl.

B. Cl.

Vc.

Tbn.

Perc.

Elect.

\[
\begin{align*}
\text{Fl.} & \quad \text{B. Cl.} & \quad \text{Vc.} & \quad \text{Tbn.} & \quad \text{Perc.} & \quad \text{Elect.}
\end{align*}
\]
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- Slightly separated, breath-like
- Buzz

conductor clicks start

Interpolate rhythm
9 conductor clicks start

- Fl.
- Cl.
- Vc.
- Tbn.
- Perc.
- Elect.
more and more vib.
sub. pitched, no vib

I CL Bat
S.P. pizz arco

5

[pedal]

Nov. 14, 2012. San Diego, California