SPACE

By

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Context

While my own personal directive as a composer stems from the experimentation and production of turning compositions into live-sound, this written document aims to orient my recent work and its major thematic explorations alongside outside influential works by providing context, discussion, and detailed analysis.

The title S P A C E refers to a profound element of interest in my thinking when it comes to not only traditional musical thought (i.e. microtonality and harmonic content, psychoacoustics, spatiality, density, and the aesthetics of minimalism, etc.) but also a newly found well of inspiration that stems from my budding fascination with astronomy and the cosmos.

While some knowledge of 20th and 21st century music and its history is assumed, I will go into detail when it is appropriate, giving definitions and extended background on topics such as microtonality and the experimental music tradition. Finally, I am not a scientist, but I will do my best to provide a clear description of aspects of astronomy that deem noteworthy and weigh heavy upon the scales of personal interest.
Part 1: A Discussion of Major Themes

1.1 Microtonality and harmonic space

Perhaps the most significant aspect of my works from 2016 - 2018 is the intentional use of microtonality (i.e. intervals smaller than a semitone, or 100 cents) and harmonic space (i.e. the measured intervalic space, or distance, between such microtones). As further discussed in Part 2.2 I will address specific arrangements of microtonality in my work that range from the larger distanced quarter tone (i.e. one half of a semitone) all the way down to just one cent difference per tone (i.e. one 100th of a semitone). Although I have not settled deeply on a particular path of microtonal organization in my work, I do feel a pull in many directions and wish to choose the appropriate method(s) on a piece-by-piece basis — a choice which involves many aspects such as instrumentation, player strengths, conceptual inspiration, etc. — with a few notable notation preferences being just intonation\(^1\), cent notation, quarter-tone notation\(^2\) (24-TET) and other equal divisions of the octave greater than 12, directed indeterminacy, and


a hybridity of all of the above. As Hermann Helmholtz stated in 1885, “the first and principal difference between various sounds experienced by our ear is that between noises and musical tones.”\textsuperscript{3} While I will get into the qualities of noise later on, for now it is best to understand all tones as an experienced sensation of empirically calculable periodic waveform. For instance, the space between the beginning and ending of such a waveform can be understood as a markedly clear calculation of the passing of time (i.e. A4 = 440 Hertz (Hz), or the waveform of A4 occurs — in its entirety — 440 times per second). While some high-pitched tones are experienced tens of thousands of times per second and hold a waveform that is a size less than an inch, the lowest frequencies in the human hearing spectrum carry sonic waveforms that are more than 27 feet long in distance.\textsuperscript{4} To listen, compare, and tune such a long sonorous waveform with another, one must be very patient and allow the longer events to unfold over time. The ear’s ability to perceive such a variety of pitches in so many registers is one of the body’s greatest talents. Comparing the ear’s sonic sensitivity to the luminous sensitivity of the eye, Helmholtz goes on to say, “in this respect the ear is far superior to the eye, which likewise distinguishes light of different


periods of vibration by the sensation of different colours, for the compass of
the vibrations of light distinguishable by the eye but slightly exceeds an
Octave.”

While I will not delve into the specifics of neurological sensations of
time perception from a scientific sense, composer and theorist Ben Johnston
makes an interesting note about tuning and the listeners ability to sense
music over time in a variety of ways. Johnston writes:

As an art of time, music affects us on three time scales: macrotime, which is the largest portion of an unfolding event; normal time, which is countable, moment to moment; and microtime, which is the proportions of relative speeds of sound vibrations. The principal effect upon emotion is through microtime events. It is here that the impact of tuning is manifest. With the improvement not only in clarity and resonance but, concomitantly, a sharpening of emotional response to the sounds. This results in a much stronger attraction of the listener’s attention and a consequent increase in what is retained in memory. In this way, the intelligibility of the large-scale form is more accessible to the listener.

Here Johnston brings up an interesting point about the impact and
potential “improvement” on “clarity and resonance” through tuning. In my

5 Ibid.

6 Helmholtz clarifies that this comparison is made “assuming the undulatory theory, which attributes the sensation of light to the vibrations of a supposed luminous ‘ether,’ resembling air but more delicate and mobile, then the phenomena of ‘interference’ enables us to calculate the lengths of waves of light in empty space, &c., hence the numbers of vibrations in a second, and consequently the ratios of these numbers, which will then clearly resemble the ratios of the pitch numbers that measure musical intervals.” (p. 18)

studies with alternative tuning systems (i.e. non 12-tone equal tempered) I have found that when one acknowledges the decisions made right from the beginning of a new work, such as, “How does one tune their instrument?” — that this plays into the possibilities of which spaces can be opened up and thus occupied during the unfolding of the piece. It also leads to questions about the perceptions the audience will encounter, like, “What kinds of tuning will the audience expect?” and “Which kinds will go too far?”. These very basic questions about intonation have filled my head throughout the past few years and given me a space to sit with their very complex answers.

1.2 Form, iteration, and duration

The factors that lend themselves into my decisions regarding form deal largely with calculated systems of ratio-based sectional relationships. This is highlighted in my works A Known Unknown, In the Snow, The Psychological Future, and The Toy Universe.

Mainly used as a method of perception management, iteration has become a favorite compositional tool of mine to show subtle differences in performance practice, aid in the listeners sense of expectation, and to also
provide the opportunity for humor by giving the listener a mysterious — even uncanny — sensation which feels familiar, yet strange. I have also found iteration to be a useful tactic in conceptually showcasing realms of musical simplicity by giving the material space to be presented, returned to, and viewed again from another angle, or passing moment. Inspired by the pictorial techniques in painting which have provided fascinating examples of phenomenological theories of perception, I have also found the idea of presenting an object — whether a visual representation of an apple on a canvas or a sonic representation played by a string quartet of a Ab minor chord first played in root position and then again in first inversion — to be an interesting thought experiment regarding perspective and iteration. For example, in early Renaissance painting, optical perspective brought a change in how pictorial space was experienced. Mark Wrathall goes on to describe how the innovation was achieved through a variety of techniques:

For one, artists began to impose a consistent perspectival distortion on objects depicted throughout the painting — that is, the distortion that would prevail if all the objects in the painting were seen from a single, static point of view. Another development was the use of occlusion to create a sense of depth, closer objects occluding the view of more distant objects, as if the objects in the paintings were arrayed along a third dimension.  

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Working in tandem with microtonality, form, and the phenomena of psychoacoustics, I have begun to explore and experiment with these metaphorical concepts of arrangement (both theoretical and acoustical) and occlusion (bothaurally and conceptually). Revisiting sonic material supports the possibility of enriching our understanding of its meaning and intention, as Alva Noë’s claims in his article *Experience of the World in Time*, stating:

We can bring out the way in which experience is possible only in a setting of familiarity, by the everyday example of listening to music for the first time, even music in a genre which you are familiar. You play a record through. The music is unfamiliar, strange; the album exhibits a kind of opacity. As you become familiar with the music, you begin more fully to experience it. Your experience becomes richer. Where the songs were thin and meaningless before, they are now structured, complex and motivated. Without acquaintance with the music itself, you were, in effect, unable to hear it.⁹

This “acquaintance” Noë speaks of is under scrutiny in two recordings that have had a notable impact on me in the recent past: John Lely’s *The Harmonics of Real Strings* (2006/13) and Laurence Crane’s *Chamber Works 1992 - 2009* (2014), both released on the English label Another Timbre. In Lely’s release, his composition — which asks the performer to slide very slowly (and lightly) up the entire length of the string, highlighting the natural harmonics — is realized 4 times, one on each string

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of the cello, starkly allowing the individual nodes of each to speak. Crane’s release, a double disc featuring players of the English contemporary music ensemble Apartment House, also features three versions of his piece Sparling arranged for clarinetist Andrew Sparling’s long tones over guitar/piano/string quartet. Each realization of Sparling brings a different light of clarity to the composition and a showcase of timbral contrasts.

While my work often deals with what Ben Johnston calls “microtime” (in terms micro-intervals of tone) it also tends to find solace in longer durational works. In addition, while some pieces of mine are only 10 - 15’, many of the works I will discuss in Part 2.2 are upwards of 45 - 60’ in duration. Finally, I must add that finding an artistic balance in the two extremes of microtonality and long durations has been, at times, somewhat disorienting but has also led to rewarding experiences such as my thesis recital concert piece The Toy Universe. In the work, I was able to think about questions such as, “At what iteration does a repeating form make itself known?” and “What kind of durational balance between sections gives the sensation of strangeness, loss of time, familiarity, and expectation?”. 
1.3 Astronomy

For centuries, composers and artists alike have been finding inspiration from nature, whether it be the Fibonacci number sequence in cellular growth or the harmony of the spheres. For instance, Laurie Spiegel channeled the latter in the recording Kepler’s *Harmony of the Worlds*, her 1985 interpretation of notable 17th century astronomer Johannes Kepler’s text on harmony, congruent geometrical forms, and physical phenomena *Harmonices Mundi* (1619). Personally, the space for inspiration between astronomy and my compositions has been one of the more exciting realms of development for me in the past few years. It seems, to me, that astronomy is closely tied to many of the thematic elements I’ve already mentioned: the spatial ideas of microtonality and harmonic space (in terms of distance measurement), with the vastness that goes along with long
durations (in terms of cosmic scaling), and finally in regards to iteration (perhaps, in terms of a type of musical “orbit”). Throughout my scores, I have folded in astronomy in a number of conceptual and poetic ways, some such examples being *The Toy Universe*, *A Known Unknown*, and *Lines & Chevron*. Two other noteworthy examples which have been omitted from the larger discussion are my compositions *Sounds as Brilliant*, a piece which deals with the ratio of luminous matter (4%) versus non-luminous matter (96%) in the cosmos, and *The Universe Was Orange*, a piece inspired by the comic microwave background noise radiation and its temperature deviation ratio of 1 part per 10,000. Finally, some general cosmic inspirations come in the form of inquiries into extremes between chaos versus stability, the idea of discovering meaningful truths by looking into the past (through the “old light” in telescopes), and the disorienting possibility of actually perceiving the size and age of the universe.

1.3.1 The cosmic distance ladder

Nestled within my recent collegiate scholarship regarding astronomy is a newly found appreciation and understanding of the cosmic distance ladder (CDL), the 6-rung standard method for measuring vast distances that
reach toward the outermost regions of the observable universe. By broadly understanding the rungs of the CDL, their main strengths and weaknesses, and providing insight into their inter-relational scale, we can begin to understand how astronomers have been able to illuminate unfathomable spatial relations and thus, have now began to answer questions such as: How do we know the scale of the universe? And how big is it?

Understanding the sizes and distances between that of the Earth, Moon, and Sun are extremely important and, by now, these inter-relational distances calculations have been calculated to extremely small limits of error. By building upon their measurements astronomers find the first rung on the CDL: radar ranging. Simply put, radar ranging involves bouncing radar waves off of an object and observing its return time — thinking musically, one might draw comparisons to reverberation, delay, and echolocation. For instance, imagine Vespers by Alvin Lucier, a composition who’s namesake comes from the North American family of bats Vespertilionidae, and which was written

for any number of players who would like to pay their respects to all living creatures who inhabit dark places and who, over the years, have developed acuity in the art of echolocation, i.e., sounds used as messengers which, when sent out into the environment, return as echoes carrying

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information as to the shape, size, and substance of that environment and the objects in it.\textsuperscript{11}

During a performance of Lucier’s 1969 piece the audience is privy to what could be thought of as a production of the first rung of the CDL: players move through a dark space\textsuperscript{12} executing the task of “acoustic orientation” through the scanning of their environment with Sandals (a hand-held device that emits clicks) which bounce off their environment, giving them the ability to monitor “the changing relationships between the outgoing and returning clicks”\textsuperscript{13}. When Douglas Simon asked Lucier about the adage of art-as-a-communicator, Lucier concurred, admitting,

> We composers always denied it, but if you make a picture in sound about the space you’re in, you’re telling people something. The performers are spread out in the space when they start, and each of them can tell the others where he or she is and what the echo situation is in that geographical location. The audience receives the same information, so I suppose you’d have to say that Vespers is a communication piece.\textsuperscript{14}

While it absolutely has its place as a method of communication radar ranging, unfortunately, is limited to nearby objects which reside, more-or-less, within the solar system, or less than 1.87 light years (ly) away.


\textsuperscript{12} Or, if the space is dimly lit, the score directs players to wear dark glasses, while if the space is well lit, they are directed to wear blindfolds.

\textsuperscript{13} Ibid., p. 16.

\textsuperscript{14} Ibid., p. 27.
Once the distance of objects near earth are calculated, the second rung of the CDL, parallax, comes more into play. Kitty Ferguson defines stellar parallax motion as “the apparent change in the positions of stars as seen from different parts of the Earth’s orbit around the Sun”\textsuperscript{15}. In other words, parallax is calculated on Earth by observing an object every six months, or when the Earth has rotated half of one full revolution. Perhaps, ophthalmologically speaking, parallax could be thought of as experiencing the cosmos with a binocular field of vision — with a smaller field of view, but with much greater depth of perception, or the ability to distinguish the distance of an object — versus the monocular perception provided by a single eye. Using multiple images of one object and a fair amount of trigonometry (often the tangent function of an angle), astronomers are able to determine the distance to the desired object with stellar parallax. The tangent function is equal to 1 astronomical unit (AU, or the distance from the center of the Earth to the center of the Sun) divided by the distance of the new star and this distance — which is calculated in parsecs (where 1pc is 3.26 ly) — is equal to 1 over the parallax angle — which is calculated in arcseconds (where 1arcsec is 1/3600 degrees). Because the degree of change in arcseconds is so small, it quickly becomes difficult to calculate

distant objects — the size of an arcsecond is about the size of a quarter seen from 5km away. To continue thinking musically, perhaps we can correlate one minuscule arcsecond to the tiny harmonic space of one cent — where a single semitone holds 100 cents and an octave is comprised of 1200 cents — and thus, imagine a piano with 8,800 keys to represent each microtonal. This is not a distant analogy from the scale the second rung, parallax, has already provided astronomers.

The third rung of the CDL is known as main-sequence fitting and measures the spectrum of star clusters by charting them on a Hertzsprung-Russell (H-R) Diagram. The H-R Diagram, which has an axis for both luminosity and spectrum type, charts the average flow of the a stars life and is applicable for charting the distance of stars up to about 10,000 parsecs (30,000 ly) away. The spectrum of individual stars is observed through the flux equation: \( F = \frac{L}{4 \pi r^2} \). Unfortunately, a problem can arise when the measurement of luminosity is not exact, so astronomers tend to look at the spectrum of clusters of stars, known as globular clusters, which contain hundreds or thousands of stars within only a few light years. Another issue with main-sequence fitting is that if the desired object is too far away, then the stars become too dim in order to observe their spectrum. Indeed, it is a

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good time to understand that we are only standing upon the midway point of the CDL.

The fourth and fifth rungs of the CDL both deal with what is known as *standard candles*: “objects (such as Cepheid Variables or supernovae) of reproducible luminosity [which] enable [astronomers] to measure distances through their observed energy flux: \( f = \frac{L}{4\pi d L^2(z)} \), where \( L \) stands for the proper intrinsic luminosity (energy per unit source proper time).”

To calibrate the luminosity of any type of standard candle astronomers must do three things: 1) observe many nearby examples, 2) find a pattern within these examples, and finally, 3) properly identify the correct candle. Cepheid Variables – the fourth rung on the CDL – are one particular type of variable star used to measure nearby galaxies and have known brightness-and-dimness fluctuation periods which last between 1 - 50 days. Their discovery is attributed to Henrietta Swan Leavitt who, in 1908, was working for Harvard astronomer Edward Pickering. Because women at that time were not allowed to use telescopes, Leavitt was one of many woman who computed and analyzed data from photographic plates and charted the findings on paper. Although Leavitt focused much of her attention on the Large and Small Magellanic Clouds (LMC and SMC), two dwarf galaxies

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which astronomers now know orbit the Milky Way, she noticed some strange levels of brightness coming from a few particular stars. Leavitt found that their extreme periods of luminosity did not have to do with the distance (since they all were located within the SMC and LMC) but that it had to do with the temporal relationship: the periodic frequency (think repeating rhythm or sound waveform oscillation). Through her observations she found that for Cepheid stars, the longer the period, the higher the luminosity — known now as Leavitt’s Law. Because Cepheid Variables are much brighter than the Sun (thousands to tens-of-thousands times brighter) astronomers could now measure further and further away, and in fact, up to tens-of-millions of light years away.

The fifth rung on the CDL are of those in the category known as distant standards. Most spectacular is the type 1a Supernova, another particular type of variable star that has a brightness which lasts between 80 - 200 days and is used to measure the distances of distant galaxies (up to hundreds-of-millions of light years away). Because type 1a Supernova only occur within white dwarf stars, which always exist within a giant binary star system — one where a giant star is accreting mass into the white dwarf — they can only sustain themselves at a mass of less than 1.4 M\odot (1.4 times
the mass of the Sun, or the Chandrasekhar limit). Astronomers know it is at this point that the carefully balanced electron-degencarey pressure “fails” and explodes into a supernova, making it the most brilliant standard candle. The greater the brightness of a standard object, the easier it is to detect, and the more useful it is in determining even greater distances from afar. There are many types of supernovae but the brightest, by far, are type Ia Supernovae which can be billions of times the luminosity of the Sun. In fact, the typical absolute visual magnitude of type Ia Supernovae is $M_v = -19.3$, or about 5 billion times brighter than the Sun.

The sixth and final rung on the CDL addresses cosmic redshift and is called Hubble’s Law. Hubble’s Law uses the fact that the Universe is expanding to view the expansion of a wavelength’s spectral shift and is useful in calculating distances of up to a billion light years away. To view objects beyond one billion light years away, astronomers add “corrective terms” to the end of the redshift equation. Simply put, the redshift equation finds the difference of wavelength in observed wavelength minus the wavelength at rest divided by the wavelength at rest, equaling $Z$. As an equation it reads as $Z = \frac{\lambda_o - \lambda_e}{\lambda_e}$. Using the rungs of the ladder one-by-one astronomers are now able to tell the current rate of redshift in the

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universe (known as the Hubble Constant or $H_0$) and from there they find Hubble’s Law: $v = H_0 \times d$ (where $H_0$ is the Hubble Constant, $v$ is velocity, and $d$ is distance). Not surprisingly, there are a few difficulties regarding redshift. For instance, individual galaxies can have their own peculiar motions independent of the expansion of the Universe (i.e. they have their own motions in addition to the influence of the expansion) and this can give them a slightly different redshift than expected. But, by looking at the most distant supernovae astronomers can calibrate this standard because the more distant they are, the higher the redshift. When comparing the measurements of the luminosity differences of these very distant explosions and the distance one finds from the results of Hubble’s equation, astronomers can now refine and continue to calibrate the corrective terms to the redshift equation.

It is also important to note that other challenges are found within the CDL, including one particular problem which speaks to the inter-relational means upon which the ladder is constructed — the compounding of errors. Harmonically speaking, this could perhaps be compared to the Pythagorean comma, or the difference between the stacking of equal-tempered fifths versus just fifths (i.e. an additional 2 cents added each time). Because errors carry through from earlier to later rungs in the CDL, if

\footnote{Ibid.}
one is not careful at the beginning, there can be deviating results down the road, or perhaps better stated here: *up the ladder*. Another tricky challenge is that many of the individual techniques for each rung rely on being able to find very specific objects and not all of which are always available in the desired galaxies. For example, Cepheid Variables are generally very massive objects with very short lifespans so, more often than not, observers only see them in young star populations. That being said, sky surveys — such as the Sloan Digital Sky Survey — can help astronomers keep their “eyes” open at all times.20

So what is the scale of the Universe? Current measurements calculate the diameter at about 93 billion light years, putting the edge of the observable universe at 46.5 billion light years away. This is, of course, an unfathomable distance, and a calculation which is measured only by our available tools (both mathematical and technical) rather than our limited human perceptions. Depending upon which theory of the shape of the universe you align with, the whole universe — the part that may or may not exist outside the observable part — could actually be finite or infinite. After astronomer Mihran Vardanyan recently analyzed known data about objects in the observable universe using computer algorithms to look for meaningful

patterns, the result was a new estimate: the whole universe was “at least 250 times as large as the Observable Universe.”21

I believe it is safe to say astronomers have made remarkable discoveries when it comes to measuring the scale of the observable universe, but there is still much to refine and incorporate technologically-speaking and this remains an ongoing challenge. To use both the ordered rungs of the CDL as stepping stones to further our field of vision and also have additional independent methods of observation, the more confident astronomers can be in knowing their measurements are accurately illuminating their views of spatial relations.

1.4 Noise and sound identity

Continuing my work with the psychoacoustic properties of what constitutes all sound (i.e. tone and noise) is an ongoing fascination with trying to find and skew the balance between these two elements. I intentionally began this inquiry in 2016 at CalArts with my B.F.A. graduation recital piece, Taking the Tiger by the Tail, a 56’ piece where I

arranged spectrally-analyzed tones found in Tibetan singing bowls, cymbals, astro-discs, Javanese gamelan gongs, and a 747 engine cowling, for a string dectet with sine-tones. Book-ending each of the five movements is a 1’ sound of two Iranian travertine stones being rubbed together, which creates a hollow noise space and acts as a sort of sonic palette cleanser, giving time for the previous sounds to pass into the listener’s memory and thus, providing space for the new tonal material to reside.

On its own, noise has a way of creating a sense of identity unlike the abilities of a tone (i.e. a sound whose spectrum aligns largely with the naturally occurring harmonic series). The identity of white noise, technically speaking, is the totality of all frequencies sounded at equal amplitudes, and (as German composer and writer Peter Ablinger reminds us), “poetically speaking - all music”. This massive statement almost comes off like a burden and a taxing metaphorical exercise, but I wonder if this noise is not what it seems, perhaps it is quite the opposite. Ablinger goes on to state:

Noise therefore is maximum density, maximum information. But it is the opposite: no information, maximum redundancy. For me it is less than nothing, less than silence. [...] The reason why we hear "less than nothing" is that we just can not connect to it by just listening. It is just too much. We can not do anything with it. The only thing that is left to do is to produce illusions, i.e. to hear something "in the noise that is not there, that can be perceived only individually". In

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this way noise works like a mirror, reflecting only what we project on it.\textsuperscript{23}

Attempting to expand upon this mirror projection comparison, I’d like draw attention to Alain Badiou’s remarks about cultural identity and, in this case, compare it to the qualities and usefulness embodied within noise. I do this not to suggest a new philosophical orientation to the world or social form, but to provide one possible answer to my question: Is it possible, by highlighting the element of noise within a composition, to give a listener the sensation that time (or its identifying markers) has been skewed, suspended, or lost entirely? In his 2017 paper entitled “From False Globalisation to the One Communist World, via the Question of ‘Foreigners’”, Alain Badiou answers the question: What is an identity?

The simplest definition is: an identity is the set of traits, of properties, by means of which an individual or a group can be recognized as being ‘itself’. But what is ‘itself’? It is that which, through all the characteristic properties of the identity, remains invariant. Thus one might say that an identity is the set of properties that support an invariance.\textsuperscript{24}

By working from this definition of identity, if tone is perceived as a phenomenon following the general alignment of the harmonic series (which needs periodic intervals in order to be identified), is not noise (which, does


not adhere to invariant qualities of tone and pitch perception), especially sustained noise, able to distort time? Going forward, I aim to nurture this question and its potentially impactful stamp upon a larger scale by folding it into my future works. For now, the notable pieces in Part 2.2 of this text which heavily involve noise as an attempt to distort the perception of time are *Pitch Gradient with Noise*, *A Known Unknown*, and *The Toy Universe*.

1.5 Indeterminacy, directed playfulness, and the performer-composer relationship

I have grouped these three thematic aspects together because they are all suggestive of a similar directional pull within the larger body of my work: a turn toward sonically complex material via a performance focused on elegance-over-exhaustion (i.e. the path of least resistance), with the intentional aim to include the performer (and her decisions) into the execution of the composed activity. Both directed indeterminacy and intended randomness have been used in the compositional processes, as well as the performance practice, of a number of my recent works and — to a varying degree — this turn manifested itself in my works, yielding a variety of compositions that could be categorized as listening exercises, games,
etudes, or even performance art. By giving the performer a chance to influence the composition, especially in tandem with the suggestion of a random element (whether tone, noise, or action alone), my hope is that a complex textural sound will be created even though traditional methods of composition and sound production were bypassed. Ben Johnston points this out, clarifying:

It has been demonstrated over and over that complexity generated by stochastic means is not distinguishable from complexity generated by serial complications or even by chance procedures. All that is necessary is to arrive at a degree of complexity which the human mind cannot easily unravel.25

Since 2015, I have realized a number of pieces from George Brecht’s 1963 collection of 69 cards entitled Water Yam.26 These event-scores have, undoubtedly, influenced my output and inquiry regarding compositions which deal with

![Image](https://www.moma.org/
collection/work/126322)

Above: Jordan Dykstra, Still Life with Water, 2017, 7' x 7' laser-etched score.


indeterminacy, directed playfulness, and the performer-composer relationship. For instance, when one finds an event-score such as Brecht’s WATER, the performer(s) realizing it are required — though far from undirected — to make a great many (and, easily argued, playful) choices. Personally, I have publicly realized this score three times in the last two years, each with more care and grandiose decisions than the last. In fact, the most recent performance involved three dozen performers who couldn’t avoid the socio-political connotations in drought-stricken Los Angeles, CA. Another realization took the form of a film called Still Life with Water, viewed only via a url which was very lightly embedded into on a laser-etched reproduction of the score and displayed as part of a group show at MAC650 in Middletown, CT in April 2017.27 In the film, I launch glass jugs

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27 “This is Why We Aren’t Friends.” This is Why We Aren’t Friends, https://www.wesleyanmusicdepartment.com/events/. Accessed Apr. 18 2018.
outfitted with cowbells into the Connecticut River across from the Goodspeed Opera House, allowing the river to sound the bells with the flow of the current — the water approaching, staying in the jug for a moment, and then continuing downstream.

Within the realm of play, I also aim to, at times, compose music which allows the performer the freedom to shed the typical sound-producing — and somewhat historically burdensome — approach of formality that much of the classical repertoire often holds over the performer’s head. This is not to say that the music in this category isn’t serious or intentional, it is merely an admission, or an approach, to address the element of play, an element so often feeling like it is missing from a play-er. The last piece mentioned in Part 2.2, The Toy Universe, also addresses this important aspect of my work through its intentional creation of a musical toy which is to be discovered, observed, stretched, poked at, even broken — but, without a doubt, played with.
Part 2.1: An Exploration of Influential Works

2.1.1 Mémoire, horizon, by Jürg Frey (2013/14)

Mémoire, horizon is a 30’ piece for saxophone quartet. Jürg Frey states that “the title refers to a short quote by Edmond Jabès: Indatable regard / Mémoire d’horizon (Indatable look / Memory of horizon) (from: Désir d’un commencement, angoisse d’une seul fin)” and that he “took [the title] without -d’, to make it more open.” With an unbroken sustain for the first 16’, Mémoire, horizon unfolds with gentle, consonant intervals suspended in time. The second half holds a duration of around 14’, and consists largely of repeated 4-note cadential patterns sustained for 4-5” and followed by a short pause.

There is no explicit use or direction for microtonality but, because of the seemingly “still” and “unchanging” unisons, the microtonal fluctuations and soft beating tones between the four saxophones create an environment which highlight subtle differences in pitch frequency. It is also fair to say that the quartet is undoubtedly using their ears to tune with one another, finding just intoned harmonic relationships, thus removing these rough

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28 Frey, Jürg, interview by author, email, April 3, 2018.

29 Ibid.
beating patterns (or intentionally sustaining them with consistency) and yielding a wonderfully human, verified, and interactive listening experience. There is also a number of instances where the quartet plays the same pitch back-to-back-to-back-to-back, but because of the instrument design which showcases different harmonic spectra, transposition, and slight differences in tuning, it’s safe to say the microtonal fluctuations do not go unnoticed even by the most casual of listener.

The form is a curious one which, on a grand scale, could be viewed as an A-B form. The A section is about 16' and consists purely of sustain without release (please note that I am using the Konus Quartet’s 2015 recording of the piece from the album Jürg Frey: Chamber Music as reference). There are two subsections (a1 & a2) which could be viewed as being very still (a1: 0:00 - 11:12) and then picking up momentum (a2: 11:12 - 16:03) while focusing more on a stretched melody spread throughout the quartet. The B section begins with the first instance of silence (b1: 16:03) and is largely focused on the slow and steady repetition of chords with sometimes more than 20 iterations of a single chord before moving on. This gives the sense that time is passing but not so much in the way that there is an urgency to move forward, in fact, it almost feels as if time does not unfold normally along this path. It’s as if time is suspended or stretched in strange ways. Within the framework of this repetition memory
of where the listener’s journey began, where they’ve been, and where they are now are not so clear. But the overall trajectory is not one which pushes you back inward, in fact the space (i.e. silence) between chords acts quite differently, it moves the listener to understand the journey as a very intentional decision of the composer: to be very open, clear, and not quite sad but with a particular emotion which is self-reflective enough to acknowledge a complexity within itself and its surroundings. In shared program notes from the composer, Frey remarked on this relationship between space and sound, stating,

In my music I’m balancing these two presences: path and wideness. One can experience time as a path, and it goes on and on; or time is expanse, the music stands still and the space opens more and more. Mémoire, horizon is on the threshold between these two experiential worlds. When it moves more to the line or path, space is still present, and when the music stands still and opens to the space, it stays possible to experience it as going forward step by step. This fragile field of tension may lead to an inner landscape of horizons and memories.  

The second subsection of B (b2: 20:25 - 24:13) breaks within the established confines of notation and forward-moving time by switching gears. In this subsection Frey vertically notates a list of events for each player, directing them to act independently with “no in advance determined interaction”, a flexible tempo, and “breaks of any duration between

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30 Ibid.

sounds". The final subsection of B (b3: 24:13 - 30:34) — acting as a type of coda for the piece — begins with 3 and 6 note phrases before moving slowly through 40 4-note chords that mainly follow half and whole tone voice leading and resolution.

Clocking in at 30:34, the piece travels a great expanse but at the same time somehow manages to not overwhelm or burden the listener with the feeling that the journey will be tiresome or exhausting. It is as if the piece is composed with the task of presenting itself as a companion upon the path, not leading you but moreover traveling alongside you as it unfolds. As Frey puts it:

While the idea of the path is more strongly associated with essentially melodic thinking — even if melodies, of whatever kind, cannot necessarily be heard in the composition — spatial thinking has more to do with sound or the idea of the monochrome. Melody and the path have a beginning and an end, but sound and space have a timeless presence. Musical experience shows that the two aspects so cleanly separated here engage complexly with one another: for instance, when a static electronic sound is suddenly perceived as a very high speed, or when a movement progressing evenly, step by step, gradually tends towards an experience of monochromy. That is when the path gradually transforms into space. On the other hand, a sound can tell a story, or — by virtue of very small, initially imperceptible changes — a seemingly static, monochrome sound gradually allows us to recognize that we are suddenly somewhere totally different. That is when sound in time lays a path. So we find ourselves in complex experiential worlds: as a result of a long duration in time, a path, a way, can become an expanse or a space — and conversely, where attention is turned to detail, to small changes,

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32 Ibid.
an expanse or space can be experienced as a path, a way. Combined, the two revolve around the core of the piece: monochromy as a sense of the overall, narration as a way from one thing to the next.\textsuperscript{33}

Finally, in terms of the composition dealing with the performer-composer relationship, it is worth mentioning that in the b2 section the performers also switch gears in terms of notation and begin acting in a very different manner than before. They move to an independently aligned list of events that yield overlapping indeterminate harmonic content which is positioned between moments of realignment and unison silence.


2.1.2 Drum Solo, by Liam Mooney (2003/17)

Drum Solo is an extremely loud, intense, and noisy piece which is created from “an array of drums operated as a large membrane reed instrument, via mechanical air supply”\(^{34}\). The strange sight of 6 bass drums and floor toms on their side with lamp parts, rubber bands, and tubing that all lead toward 3 shop-vacs (set to blow air and not suck) is memorable only second to the sound of the massive harmonic thrumming which the vibrating drum heads both produce individually and then collectively.

Spectrally, the piece occupies an interesting microtonal and harmonic space in that the main harmonic material sits in a register that is quite low, yielding a very clear presentation of overlapping higher partials which beat

\(^{34}\)Mooney, Liam. Drum Solo. Liam Mooney, 2003/17.
harshly against one another, become aligned, and then oscillate as they become re-aligned in slightly different orientations. The main microtonal relationship of the harmonic spectra is activated through the micro-adjustments made between the four main factors: the air pressure/leakage in the tubing system, the interaction between the conical glass lamp shade bells and the drum, the tension of the rubber bands holding the bells down, and finally the tension of the drumhead itself. Because each of these extremely sensitive points of interaction highly influence the individual sound output for each drum, they fluctuate again each time an additional drum is added into the larger sound scope.

All 3 vacuums are turned on for the entire 30 - 60 minute piece — adding a noticeable layer of noise throughout — but the individual drumheads are only activated one by one, layered independently and sustained with equal time before bringing in the next. Thus, this form showcases a fairly simple additive 6-section form process piece, giving the sense of something familiar yet which builds and becomes inherently more harmonically complex through the passing of time.

Depending on how one decides to orient their ear to the piece, it may be perceived as an extremely noisy experience with a bit of droning and fluctuating tone throughout, or a slowly-moving tonal drone that slides through a field spectrum of noise. Either way, it is undoubtedly felt as mass
of sound, one which encompasses a spectrum with the liking to noise. (show graphic of sound spectrum?) The main noise element comes from the fact that all three vacuums are on throughout the entire piece (controlled by the same power source) and all have at least one of the manifold valves left empty so that air can escape when the other valves are directed at the drumheads. This empty valve gives the system a safety mechanism which minimizes leakage in the tubing, clasp, and taped connections but also provides an escape for the sound of rushing air through.

While “the essence of [Drum Solo] is in the preparation (i.e., constructing the instrument)” to the wonderful tasks of collecting and assembling the materials for the unique system it calls for, the performance would not be complete without a fair dose of playing with the drums; playing in the sense that the performer should examine and tweak all connections (rubber bands and their points of pressure, lamp shades and their surface contact, tubing and its airflow/leakage of air, tension of drum lugs, etc.) to their liking and exhaust all possibilities under the direction of potential harmonic alignment.

The unfolding 6-section form gives way to quite a long piece, one which spans upwards of 30 - 60’. Even though my realization was only around 22’ I think this duration demonstrated the main ideas suggested by

35 Mooney, Liam. Interview by author, email, 23 June 2017.
a long duration: overwhelming the ear with the sound of mechanical drum drones while surgically making minuscule adjustments to alter and finely tune the wild beast of a system that is the Home-Depot-Frankenstein-Drum-Array-Sound-Icon.

The indeterminate factors at play are numerous and include, but are not limited to: the quality and adequacy of the electrical power supply and vacuum output wattage (I used 3 1.75-Peak HP Home Depot Bucket Head vacuums), the tubing connections and types of manifolds, the drums’ shape and material, the conical bells which interact with the drums, and last (but of course not least) the performance practice itself which determines much of harmonic timing and on-the-fly adjustments.

2.1.3 Ascending Series (5.1), by Michael Pisaro (2009)

Acting as, perhaps, an unusual (and atypical) introduction to the largely considered ultra-minimalist music of the Wandelweiser collective, Ascending Series (5.1) is a complexly structured and extremely dense piece had a big impact on me when I first performed it with the Dog Star Orchestra at CalArts on May 24, 2015. It was a wild experience, trying to wrap the ensemble’s collective mind around not only the concept of the
piece, but the execution for the performance. In the end, I felt like the music sounded something like a psychedelic ambient piece with a thousand points of entry, all leading to a strangely grounded systematic organizational scheme — and to Pisaro’s credit, I think a lot of the work of getting it to that state was done in the highly structured and well-articulated score, which, I would add, is the fifth in the series. A general abstract of the piece, written by the composer, reads:

Ascending Series (5.1) is composed of layers of individual components that can occur in any combination. They stem from a constant b(3) / f#(4) fifth (the same one used in La Monte Young’s Composition 1960 #7), and move outward in lines, planes and spirals. There is a “root system” sketched out in just intonation, reaching outward in increasing tonal complexity (layers 0 - 6 with 7 as a point of transition), and a rhizome system that moves from indeterminate pitch realms out to noise and beats (layers 8 - 13) that may at times overtake the root system (or at other times be totally invisible).36

The entire system for the piece is devised from a sustained just fifth, or “The fifth” (i.e. layer 0), a 3/2 relationship between the two sine tones b(3) and f#(4) +2c. The 2nd layer of the root system, “Pythagoras,” involves a chord which is stretching out from the original fifth using a Pythagorean scale approach (stacked just fifths which add, or subtract, an additional 2 cents over the course of the entire circle of fifths) leading to the Pythagorean comma. The 3rd layer, “The scale,” is a series of eleven pitches

nestled between the original fifth and derived using octave transposition of a (theoretical) 7.716875Hz fundamental of the following partials: 32, 133, 35, 73, 38, 40, 41, 85, 44, 47, 48. The 4th layer, which Pisaro calls “The shadow scale,” is an extension of 3rd layer and includes the 17 partials between 32 - 48 and is performed “generally much softer.” The “Harmonic satellites” in layer 5 correspond to the 11 degrees of “The scale” in the 3rd layer and are tones calculated of the just intoned relationships 11/4, 7/4, 3/2, 4/5, and 4/9 while layer 6, “Constellations built on satellites,” expands this idea even further, colorfully spelling out another five tones per scale degree. The 7th layer in the piece, “Light rays from distant galaxies,” is quite simply devised from partials 10 - 15 of b(3) and partials 7 - 12 of f#(4). The 8th layer, “Free ascent” (which is based on an idea in the composer’s Ascending Series 4.1), instructs a performer to choose a specific pitch on their instrument and then “decide how many steps upward from this tone you wish to make over the [entire] 44 minutes [of the piece] (with a range of 2 to 11 steps)”38. While Pisaro provides the timing for this scalar ascent, he also clarifies that the size of a “step” may be any size, “including all microtonal possibilities”39. While layer 8 acts as

37 Ibid.
38 Ibid.
39 Ibid.
the first step toward harmonic indeterminacy, a less focused approach to microtonality, and a turn which leads to noise and rhythm, the movement between layers 8 - 13 all push in this direction at an exponential rate. Adding to the microtonal mix is layer 9, "Slow moving sliding objects," which directs the player to "make a very long (nearly imperceptible) glissando between any two tones of the scale (i.e. the larger the interval, the longer the glissando will take)". Layer 10, "The rings of Saturn (mixtures of noise and pitch),” acts as a fairly open set of parameters that involves steady-state sounds comprised of “some kind of noise with

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(11) Waves and clouds of colored noise.

Photographs of some nebulae:


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Ibid. 40
relatively clear bands of pitch”\textsuperscript{41} which last from about 2 to 4 minutes on average. Explained alongside four images of colorful nebulae, layer 11, “Waves and clouds of colored noise,” involves a (preferably ensemble-based) event by a variety of sustained noises which “have an area of intensity somewhere towards the center of the duration”\textsuperscript{42} and last between 1 and 20 minutes in duration. Moving even further from the realm of pitch into rhythm, the instructions for layer 12, “Objects fading from view (decaying sounds),” point to repeated sounds produced by instruments with decay — with examples given in the score as “pianos, guitars, harpsichords, bells, large drums, contrabass pizzicato, metal objects with resonance, etc.”\textsuperscript{43} — that last between 40 seconds to two minutes and gradually get slower and softer until they taper off completely. Inspired by the celestial event of the same name, the 13\textsuperscript{th} and final layer, “Pulsars”, gives the option for a performer to produce sound objects that beat at a steady rate (anywhere between 0.5 to 20 seconds) for anywhere between 20 seconds to 5 minutes in duration. Pulsars, in fact, sit within the fourth and fifth rungs (known as standard candles) of the previously outlined cosmic distance ladder, the tool used by astronomers to measure the farthest distances of

\textsuperscript{41} Ibid.

\textsuperscript{42} Ibid.

\textsuperscript{43} Ibid.
the observable universe. In addition to this astronomical reference — with words layered throughout the composition such as shadow, satellites, constellations, “light rays from distant galaxies”, the rings of Saturn, photographs of nebulae, and pulsars — it is in no question that the composer felt drawn to make connections between astronomy and astronomy-inspired musical actions.

Although highly detailed in a manner of that extends into conceptual realms, the aesthetic of the score itself feels very playful to me and gives the sense that the world Pisaro has created is one in which playfulness is very important, even if it is extremely calculated play. Acoustically, the way the material is organized makes it seem as if Pisaro was himself playing with ideas of cell growth in nature (i.e. “root systems”), relationships derived from the harmonic series, and distant realms of outer space as he imagined the sound world possibilities. The composition moves further along the lines of indeterminate harmonic activities as the layers progress, but the piece itself gives way to a variety of indeterminate sound possibilities as the decisions of the players unfold and the interplay brings even more unforeseen sonic possibilities. Finally, in terms of the performer-composer relationship, Ascending Series (5.1) is a rich decision-making experience and yields a unique performance every time.
2.1.4 *Atlas Eclipticalis*, by John Cage (1961/62)

Originally a commission from the Montreal Festival Society, John Cage’s *Atlas Eclipticalis* is a piece in which each event contains between 1 - 10 notes, divided into 2 groups. While the varying size of the notated pitches determine amplitude while duration is marked above the events, the tempo of the piece is dictated by the conductor, a time-keeper who gestures hands of a clock. Finding the namesake along the way, to compose this piece, “Cage used the *Atlas Eclipticalis 1950.0* (an atlas of the stars published in 1958 by Antonín Bečvár [1901-1965], a Czech astronomer), superimposing musical staves over its star-charts. In any performance, this score may be played in whole or in part by any number of players, up to the full 86 specified.”

While conducting the New York premiere with the New York Philharmonic (which was received by the audience and then met with an overwhelming amount of “boos”), Leonard Bernstein gave the following details regarding Cage’s compositional process:

Mr. Cage used chance in the very composing of his piece. For one thing, he used the changes of the famous Chinese fortune book *I Ching* and for another he obtained certain notes by placing transparent music paper over the map of the stars called

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Atlas Eclipticalis and inscribing a note wherever a star appeared. He has also obtained notes for this piece by observing imperfections in the music paper on which he was composing it but these are all chance elements. But the piece is even more aleatory than that in the sense that every instrument of the orchestra has a contact microphone attached to it so that the notes they play will be further subjected to random choices of the composer and his assistant who will be seated at the electronic controls. Thus, the composer at the switchboard is ultimately responsible for what comes out over the various loudspeakers that are placed around the hall. And no member of the orchestra ever knows when he will predominate over the others over his colleagues or, for that matter, whether he’ll be heard at all. But remember, this is not only chance music by any means since every note the orchestra plays has been written down by the composer. […] Mr. Cage’s work does not need a conductor but it does need a timing control. Therefore this piece will be conducted by that machine which is simply a clock-like hand which will rotate once very slowly. When the hand reaches the 15” mark, or the first quadrant, 2’ will have elapsed; and so on for the three remaining segments. Thus, when the hand is back in the starting position 8’ will have elapsed and the piece will be over.45

Regarding microtonality and, to a point, indeterminacy (or as Bernstein referred to it as: aleatory), the score remarks that that conventional notation methods are adhered to and “marked #, b, or iteDatabase
[while] the absence of such signs means that the tones are not at conventional points; the player is to use his eye with respect to the space to determine his action.”46 This non-conventional tuning aspect gives way to a


46 Cage, John. Atlas Eclipticalis; Instrumental Parts to Be Played in Whole or Part in Any Ensemble, Chamber or Orchestral, with or without Winter Music… Henmar Press, 1961.
microtonal expanse, even with the majority of notes having extremely short durations. All tones act as points in space and are played as short as possible unless directed with two numbers above the event (i.e. 7-2 above a 9 note phrase means 7 of the notes are "as short as possible" while 2 notes "have appreciable duration"). A fermata indicates that all notes in that phrase have "some duration" which "may not exceed that of a breath or of a bow."47

There are many indeterminate elements of Atlas Eclipticalis including, but not limited to, tempo, duration, microtonality (when no alteration is given to each note), amplification, chosen parts and instrumentation, whether or not Winter Music is also performed at the same time, etc. Finally, although the most playful aspect somehow feels like it stems from the composers involvement with the material, there is without a doubt, an extremely playful element involved with the performers making a myriad of

47 Ibid.
decisions during a realization of the piece. Although a great many details are involved in the preparation of the score before the performance, during the performance itself the performer is each required to make a variety of decisions on the fly.
Part 2.2: An Exploration of My Recent Works

2.2.1 Pitch Gradient with Noise (2016 - 2018)

I began the *Pitch Gradient with Noise* series during the summer of 2016 in Val Verde, California as an attempt to stretch time (and pitch perception) horizontally. While playing through a simple microtonally-deviated chromatic scale of pitch classes, and by establishing a rule for pacing that gives 10 minutes per semitone, a wonderfully dense amorphous and shimmering mass of sound appeared. Also, because of the irregular periodic waveform in the harmonic structure that non-tone or non-pitch (i.e. noise) produces, I felt a desire to include this "noise element" to further distort the listeners sense of time and pitch. Since its inception, I have arranged four versions in the *Pitch Gradient with Noise* series, 3 of which were for ensembles of various instrumentation (between 7 - 16 players), and performed in Middletown, CT, Winterthur, CH, and Los Angeles, CA. Up until now, these pieces have ranged from 20 - 30 minutes in duration — with each centered around the middle pitch (F#, A#, G#, and D) — but the fourth performance at the Museum at the Rhode Island School of Design I was pleased to finally present, for the first time, the full 4-hour, performed
by the wonderful and willing Ordinary Affects (with the addition of viola, a second cello, piano, live electronics, and pre-recorded electronics). Not only did this arrangement include the full 12-semitone chromatic scale beginning and ending on the pitch class A, it fully immersed the listener in the concept by then again traversing another full octave. All 5 pieces in the series are basically the same piece — definitely the same concept — just with different starting and ending pitch classes as well as instrumentation. In each piece, the overall sound is the slow traversing of the a semitone (i.e. the pitch height of 100 cents) over the period of 10 minutes. It should be noted that the microtonal changes of pitch are not done by means of a glissando or slide, it is achieved via the morphing of the ensemble’s overall sound shape through sustained pitches, one by one.

Pitch Gradient with Noise is my second piece to use cent notation, or a systematic approach which divides the semitone into 100 parts (i.e. cents), giving one octave 1200 cents or discrete pitches in which to draw from. Because, in a substantial way, the main conceptual idea for the piece is regarding the magnification of harmonic space — both in terms of distance between pitches (1 cent) and the horizontal stretching of time — without the aspect of microtonality, this piece can not come together conceptually. This piece also deals greatly with when tone can/cannot even fit into a harmonic space. This space, usually reserved for sounds that are
perceived as pitches (periodic waveform occurrences that re-occur regularly) does not, and can not, include a sound which is perceived as noise (non-periodic waveform occurrences that re-occur irregularly). The “noisy” aspect of Pitch Gradient with Noise was included for this particular reason, to include the basic and minuscule elements which comprise all sound. I should also add that while the cent deviations for each pitch class is provided in the score, the octave range/register is freely chosen by the performer. This allows for the potential inversion of the harmonic relationship in that space, as well (i.e. if one player is sustaining A4+25 cents and another player is sustaining A3+0 cents, their harmonic
space adds up to 1225 cents which could be viewed as a raised octave [+25c.] or as a lowered minor 9th [-75c.].) Finally, because of this pitch class choice, performers may choose to enter a harmonic space to be near or further away from another’s sound, this choice will create beating tones and new harmonic relationships that can be re-shaped again and again by other performers who make similar decisions.

The is my longest piece yet, with the full version clocking in at 4 hours in duration. It really cannot be a short piece, because of the stretching of one semitone into 10 minutes time. The full realization really is getting back to the initial pitch, so an octave — or really 2 octaves — is necessary to experience the sensation, as difficult as it is to experience, of returning to the starting place. I also align this piece with Carlo Inderhees’s 24-hour composition für sich (Violoncello)\textsuperscript{48} because of its seemingly long placement within an even larger time frame. A goal of mine is to sequence the ongoing — and never ending — possibility that it is always happening (indefinitely into the future) and a realization is just figuring out the corresponding time for the performance and where in the “never ending score” it lands.

\textsuperscript{48} Inderhees, Carlo. für sich (Violoncello)\textsuperscript{1-24}. Edition Wandelweiser, 1997.
2.2.2 *Lines & Chevron* (2016 - 2018)

The pieces in the *Lines & Chevron* series draw heavily from the player’s perception of harmonic space and its aim is to highlight the awareness of the performer’s acknowledgement of its shape for the audience. Because of the directions given to the performers, microtonality is built in to the score and the audience’s experience. Through various ways in the series, the performers are either producing a sustaining, still, and unmoving line, or they are producing a continuously moving/glissing line (the chevron) which is to remain in a consistent justly tuned intervallic relationship (usually the ratio 3/2, i.e. the just fifth). While the chevron’s role remains the same, the still line’s role is to listen to the chevron’s shape and harmonic direction, ending their sustain once they have reached unison with either edge of the chevron’s shape (the fundamental or the fifth). To quote the directions in the score:

Consistently moving, two instruments with a similar timbre sustain the interval of a just perfect fifth while one instrument of a slightly different timbre maintains a still (unmoving) pitch somewhere between the two. When (or if) the still line is perceived as unison with the moving, it should stop, pause, and then begin again.\(^49\)

The form is such that iteration is key in realizing the main conceptual element of the game in which the players are participating in: the sonic

\(^{49}\) See the *Lines & Chevron* score in appendix.
interaction and physical acknowledgement between the line and the chevron. To highlight this, the players are usually asked to perform for a duration rather than a specific number of cycles or iterations leading to a number of instances in which the line touches with the side, or edge, of the chevron, thus leading to a short pause before beginning again.

The game that is outlined in the form of the piece showcases a few elements in terms of the chevron's role and their ability to influence one another and the line as well. Usually, there is an assigned leader who decides the pacing and direction of the chevron (it can go up and down with a directed rate of around a 4 semitones a minute). Through this pacing and direction element of the game, this allows the leader to influence when (or whether at all) the edge of the chevron is touching (i.e. in unison). In the 2015 series debut performance at CalArts featured myself (viola) and Danny Clarke (clarinet) as the role of the line, while Michael Pisaro (guitar with Ebow) and Ben Finley (double bass) acted as the role of the chevron. During the performance, the bass carried the fundamental of the just fifth interval, guiding the chevron and playing with the unison interaction of the sustaining clarinet/viola line, approaching it ever so closely, creating beating tones, backing away, and then re-approaching our line once again. Of course, the line’s perception of this unison can be different, (i.e. the line might decide it is close enough, for instance, and stop their sustaining pitch
and thus ending ours, as well). This interaction also gives the line some unique part in the game, as well. It’s also fair to note that, other than the form, all of the piece is indeterminate.

In the 2016 version, *A Line & Chevron (for Agnes Martin)*, the line is composed of an accordion and melodica who’s sound literally orbits the audience (mimicking the face of a clock), while the chevron is composed of a cello who follows the slow moving glissando lead by the performer playing the fundamental of the just fifth via a sine-tone.

As a composer, I give the performers a lot of freedom in addressing their reading of the score/game. Other than the limitations such as sustainability and instrument range, they decide which pitches to produce and when to produce them. I think the most interesting relationships regarding this piece are the performer-performer relationships and the
performer-audience relationship. The performer-performer relationship is highlighted in the way that their perception of the sound directly relates to how the piece unfolds and by addressing this directly, the performer-audience relationship is heightened to, perhaps, a more palpable state. That being said, this still does not give the audience influence on the piece in any direct way but I believe, because it’s a listening game, they are able to participate on a more equal playing field that generously allows them to listen, see the reaction, and observe the performers who are going through the same motions.

2.2.3 Found Clouds (2016 - 2018)

Using instruments that can both sustain and non-sustain at the same time, the pieces in the Found Cloud series are focused on creating non-traditional scalar forms that repeat only after the first octave has been passed, giving a cloudy yet also harmonically grounded sense of stability and direction. When layered over one another, the subtle differences in pacing – as well as microtonal intervallic relationships – create spatial
melodies and chords which highlight and exploit the tuning system chosen for that instrument.

The focused idea of harmonic space, especially in the terms of microtonality, is at the forefront of the pieces in the Found Cloud series. For the four versions on the 2018 album release, each had its own unique instrumentation and tuning: bowed and struck vibraphone (12-tone equal temperament), plucked pedal harp with Ebow (just intonation based upon the fundamental of A natural), varying sustains on a Farfisa organ (ditone tuning), and Ebow and plucked piano (just intonation based on Ben Johnston’s tuning for Suite for Microtonal Piano, 1977).\(^5\) Within these frameworks, the recordings of these pieces evolve themselves into harmonic

relationships between the number and intervallic distance between the sustained pitches. For instance, the version for vibraphone is “(9x1)”: 9 layered takes, each take with a sustained fundamental and a non-one-octave-recurring scalar pattern voiced from there in either ascending or descending motion. Because of the subtle differences in punctuating the direction of 15 seconds between each scalar event, the listener is given a number of serendipitous (and quite complex) moments of rhythmic and melodic phrases. Ben Johnston’s writing about scalar order in regards to the octave is worth mentioning. He states:

Almost all cultures intuitively divide the pitch continuum into octaves. An octave, acoustically speaking, is the relation between a given tempo of vibrations and the tempo which is double or half of it (mathematically speaking, in the ratio 2:1). Tones an octave apart seem, apparently independently of cultural conditioning, the “same” tone transposed to different pitch levels. For this reason, music uses the octave cyclically, as the basis of scale formation.51

The form is a simple process that, for each iteration, I call a “found cloud.” Each “found cloud” is about 5’ in duration and begins with a sustained tonic of the scale, followed by a tone (every 15”) in the chosen non-one-octave-recurring scalar pattern. At the 5’ mark the sustain is released and the pattern can continue again, if desired. In the final track (21 Found Clouds (3x7)) from the release, there are 3 takes of grand piano

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with Ebow layered upon one another, each with 7 of these different “found cloud” scalar patterns (adding up to a total of 21 Found Clouds). Because the general idea for the composition is largely a conceptual one, I believe it does it well to live as a few different iterations, each highlighting the idea and giving it space in different ways. In fact, I enjoy this approach so much that I created a new series to showcase the idea called Seeing the Forest in a Tree for Editions Verde, the small-run experimental music publisher I created in 2015.

In a few ways, these pieces are playful as they involve making a number of choices during the process of execution: which instrument can be used, which tuning to implement, which scalar pattern to choose, where to begin the scale, how many times to repeat the process of the piece, etc. In an ideal world, these pieces would be performed by multiple players with the same instrument in the same tuning and arranged in a spatial setting, giving the audience a unique sense of interaction between the individual voices (which are then perceived as a whole) in the arrangement.

Although long duration is not a qualifier for the composition, having heard the difference between a 43’ and a 6’ version I must admit I feel as if the longer the better, especially in the sense that when one has the time to live within the space of this sound world for an extended duration they are
then afforded the ability to hear new material through the process at a pace they themselves choose.

There are multiple indeterminate factors at play which have already been mentioned: which instrument is to be used, which tuning to implement, which scalar pattern to choose, where to begin the scale, how many times to repeat the process of the piece, etc.

The score does have a unique performer-composer relationship insofar as it opens up many decisions to the performer that heavily impact the sonic experience. While the pacing unfolds in a fairly calculated manner, the overlapping of the individual voices (when applicable) creates a wonderful serendipity that allows the audience to find associations and meaning from their sonic memories and imprints.

2.2.4 Ghosting (2017)

Debuted at my fall 2017 recital A Three-Sided Triangle — and written in homage to Jürg Frey’s aforementioned saxophone quartet Mémorie, horizon — the Ghosting series is a heavily consonant slow moving work dealing mainly with unchanging long-sustained notes and the phenomenological aspects of the whole, especially in regard to form. In
fact, a performance of the piece only includes some of the parts, never a sum of the parts.

When experiencing time in regards to music, there is sense that the durations of the sounds must be longer than perhaps anticipated (or even desired), in order to find a sense of losing or letting go of time. In the Ghosting series I composed the piece with hopes to give the listener a similar sense of “letting go”, not only of time, but of the piece, as a whole. The full 8 parts in the score (comprised of 3 bass, 3 alto, and 3 treble clef voices) is never fully sounded as a nonet, it’s parts (as a duet all the way up to an octet) are chosen according to instrument range. Although I clarify in the score that the parts may be doubled and the parts may be voiced with octave displacement, these few, yet crucial decisions for the performer to make before any sound can be produced have a big impact.
on the way the composition unfolds. In making these decisions, the realization that there will always be a part (and most likely many parts) left out becomes quite clear. To clarify this idea to the audience members I require that the piece be realized differently, many times, in the same performance. This heightens the changes, however big or small, such as instrumentation, timbral shifts, spatialization, and chord voicing and range, amongst others. The repetition also brings in the element of memory, a closely tied perception to time.

In regards to the form of Ghosting, there are overlapping sustained notes, lasting between 20 - 70", which create an ambient blanket of sound density, sans silence, for the first 6’ of the piece. It is only during the final minute, from 6:00 to around 7:00, that the ensemble breaks from this fairly consistent and droning texture to voice 9 chords “Slowly & Together” (as directed in the score). One outside observer noted that the final chords very much felt like a cadential moment in classical music that ends a symphony written in sonata form.

Thinking a lot about Laurence Crane’s previously mentioned 2014 album Chamber Works (1992 - 2009), the idea of the multiple iterations stem from the idea that the listener never hears the same thing twice but also from the idea of immediate generosity (giving the audience the chance to hear something pleasant again, and right away). As stated in my score,
Because a central idea of the piece is to explores subtle timbral and harmonic density changes applied to the same musical material, a realization of the piece will include performances of multiple iterations (i.e. different instrumentation, part distribution, the addition of a mute or technique such as sul tasto, etc.) and need not be performed back to back on a program.\textsuperscript{52}

The harmonic content of \textit{Ghosting} is notably consonant and unfolds quite slowly, introducing around one new note per minute. The outline is very close to unison Eb (as a pitch class), the addition of the major second and perfect fourth, a move to a major triad, a unison Db (as a pitch class), the addition of the major sixth, the addition of the major second, stacked major fourths, and then finally the major seventh and major ninth chords, which are played “Slow & Together” during the final minute.

The \textit{Ghosting} series is, in fact, a departure from my microtonal work, and it does address the idea of harmonic space in a unique way: through extreme tonal simplicity. The aim was to harmonically scale back so far, while having an extremely small number of events in the score, that the simplistic elements became complex when taken as a whole rather than a part of a whole: the object is never an object, it is always a subject.

The element of playfulness lies in the wake of the players themselves choosing which part(s) they would like to perform. This choice has to do

\textsuperscript{52} Ibid.
with not only their instrument range but also with their interaction between the parts in the score.

Finally, while the piece is around 7’ in duration, the notes in the piece range from around 5” to 1’ and are, on average, around 45” in duration. This gives the piece a conscious yet expansive (and “traveled”) feel; not one necessarily of a long duration, but of a definitive feeling that a genuine time has passed and this passing has not been ignored. On the contrary, it has been acknowledged, if not more: we have traveled alongside it.

2.2.5 The Psychological Future (2017)

In his 1976 paper “The Making of the Present: A Tutorial Review”, Dutch experimental psychologist John A. Michon wrote about the term “the psychological present” which he defined as “a time interval in which sensory information, internal processing, and concurrent behavior appear to be integrated within the same span of attention.” Michon found that the width of this subjective “present” was highly variable but noted the upper limit seemed to lie between 7 or 8”. Although The Psychological

53 See The Psychological Future score in the appendix.
Future draws its formal inspiration from this upper limit (beginning with 7.5” between each event) and stretches it almost threefold (ending with 20” between each event), its other main concerns involve the anticipation and gradation of micro-intervals, site-specific yet performer-chosen harmonies, and timbral contingencies. If the events in *The Psychological Future* begin within the “present” threshold and then move far beyond the attention span of integration, can this disintegration of the present allow us to move into a new mode of future listening and perception?

*The Psychological Future* has a repeating cyclical form which, by cycling upwards, begins at a rate of 7.5” per pulse (with an increase of...
0.5” per cycle). Each cycle has 4 equal time-based iterations before moving onto the next cycle. For each specifically timed pulse the gamelan ensemble player strikes any note of any gamelan instrument, making sure to always to pick a new note (i.e. never striking the same note consecutively). For each cycle, the string ensemble players each pick one pulse duration and individually select and sustain any open string(s) or natural harmonic(s) of their choosing, making sure to always pick a new pitch (i.e. never bowing the same pitch consecutively). For instance, in Cycle 1 the player might choose to sustain their pitch during Pulse 3 (0:15:0 – 0:22:5) but in Cycle 2 they might choose to sustain their pitch during Pulse 1 (0:30:0 – 0:38:0). The piece ends with a natural fade into silence after the last pulse in the 26th cycle is fully realized.

The playful nature of this piece is due, in part, to the organizing system and its goals. The first system is how one chooses to tune their instrument, the second is to count in microseconds, and the third is to choose when to sustain. The first and third systems are perhaps more individualized because they determine when and which timbre and harmonic space is occupied. For instance, if a player waits to voice their sustain until the fourth pulse then they are able to sustain two pitches back to back, their only opportunity for such an occurrence.
Although the versions so far recorded (strings & gamelan, woodblocks & viola, sine-tones & metal objects) and performed (debuted on April 15, 2017 at the event *Time out of Time* at MAC650 in Middletown, CT by Warren Enström on percussion and objects, Omar Fraire on cello, Tomek Arnold on percussion, Morgan Evans-Weiler on violin, Luke Martin on guitar, and myself on viola) have yet to reach beyond the durational mark of 25’, I believe the true test of form lies somewhere beyond the 20” per pulse realm. In the future I plan on testing this hypothesis by stretching the time between pulses to more than 4x that, reaching toward the arena of 80” per pulse.

Although astronomy is not the focus of *The Psychological Future*, inner space (psychological perception) is more in line with the conceptual trajectory of the work. Through the steady (micro)stretching of the time — 0.5” added to every cycle (or 4x per pulse) — space begins to open in the listener’s ear as the piece unfolds. Perhaps an apt analogy is the perception of scale and relative distance featured in the 1977 film by Charles and Ray Eames entitled *Powers of Ten: A Film Dealing with the Relative Size of Things in the Universe and the Effect of Adding Another Zero*. In the film, the viewer is taken on a journey where a zoom-out from a couple on a picnic in Chicago lakeside park continues at a rate of one power of ten per 10 seconds, at last reaching out to a field of view of $10^{24}$ meters, or the size
of the observable universe. The camera then zooms back in (at a rate of two seconds per power of 10) toward the picnicking couple and then continues by journeying inside the bodies of the couple highlighting the negative powers of 10, until finally the camera comes to quarks in a proton of a carbon atom at $10^{-16}$ meter.

There are two main elements of indeterminacy in *The Psychological Future*, both of which are up to the performers themselves: 1) the harmonic material, and 2) how the musical events will align. First, each gamelan will have a unique harmonic spectra and this will influence the tuning that the performers will draw from as they detune their instruments. Second, because the performers are instructed to sustain one pulse per cycle, the number of performers — and their choice about when to sustain — will inevitably result in a varied alignment of single pitches, dyads, triads, and other more harmonically complex spectrally-based chords.
2.2.6 *In the Snow* (2018)

Through a number of styles, *In the Snow* is designed to give the listener a representation of both pure just-intoned dyads (through the use of natural harmonics) and microtonally altered just-intoned triads (through the addition of a harmonically guided violin pitch).

Throughout the entire string trio, the viola and cello sound chords which are voiced in just intonation, or whole number ratios based upon and derived from the harmonic series of the open G string. The sounding just intervals I chose for the piece are, in order of appearance, the fifth (3/2),
major sixth (5/3), minor third (6/5), major third (5/4), perfect fourth (4/3),
minor seventh (7/4), augmented fourth (7/5), augmented second (7/6),
and perfect unison (2/2/2). Because the cello sounds an octave below the
viola, to create the desired harmonic relationship I had to find voicings that
are both playable for the cellist (i.e. do not extend beyond the upper
threshold of the cello’s G string) but also interact with the viola’s sounding
pitch. This piece’s harmonic content is largely based upon some of the
research stemming from the article *Heavenly Harmony* by Maxwell Miles —
a British theorist and composer⁵⁴ — who makes cases for just-intoned
“perfect”, “imperfect”, and “augmented” consonances.⁵⁵ The violin’s role
in the trio is also one with a grounding in microtonality. Although they must
stay within the intervalllic pitch height of the viola/cello dyad, the violinist
chooses their pitches freely. Also, by repeating each section twice and only
adding the violin during the repeat, a sort of wild card was added into the
piece to highlight the consonance of the seemingly simple intervals heard
alone during the first pass, now colored completely different by the addition
of the violin. In the third section, the violinist is asked to gliss upward from
the open G string ending—and sustaining on the found pitch—only when the

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viola/cello duet enters with their choice of either the minor seventh (7/4),
augmented fourth (7/5), or augmented second (7/6). The piece ends with
the 4th section, a progression of pitches voiced again with natural
harmonics and sounding unison G₄.

Miles Maxwell’s idea of “heavenly harmony”, that some intervals
are more consonant (heavenly) than dissonant (non-heavenly) has its roots
in the ethereal space of “heaven”. In his 1/1 Journal article from Summer
1986, Maxwell spells out his preferences:

Perfect Consonances: all perfect intervals except the eleventh are
strongly consonant.
1 the octave (2:1) and double octave (4:1)
2 the fifth (3:2), its compound, the twelfth (3:1), and its inversion,
   the fourth (4:3)...
Imperfect Consonances: strictly speaking, only the major forms are
valid, but the minor intervals eke out their meager physical
consonance by being easy to understand as inversion of the major.
The following intervals are clearly consonant in polyphonic music,
provided the notes are of rich, but not harsh, timbre.⁵⁶
3 the major third (5:4), its compound, the major tenth (5:2), and,
   doubtfully, its inversion, the minor sixth (8:5)
4 the major sixth (5:3) and its inversion, the minor third (6:5)...
Augmented Consonances: intervals involving the seventh harmonics
are faintly consonant in the Meantone (31-note) and higher systems.
they should be less difficult to detect if hollow tones of clarinet types
were used for certain notes.
5 the augmented sixth (7:4) and thirteenth (7:2)
6 the augmented second (7:6) and ninth (7:3)

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⁵⁶ Because I was using a string trio in a rich timbre (a moderate volume with no
vibrato), I felt that Maxwell’s list of Imperfect Consonances were appropriate for my
piece, as well.
(7) the augmented fourth (7:5)\textsuperscript{57}

As a tip-of-the-hat, I almost titled my string trio “Cosmic Harmony” but the title I did end up using refers to the space where most of the playing takes place: the upper quarter of the fingerboard and reaching almost as high as the bow (where the rosin, i.e. “snow”, resides). The title phrase “in the snow” (or “Im Schnee” in German) is also an anecdote — told to me by my previous intonation teacher at CalArts, Wolfgang von Schweinitz — as being a common expression violinists in Germany use when they are playing extremely high notes and have to wipe the rosin off of their fingers because of it.

Although the form is a simple series of 4 parts, iteration is a substantial part of this piece because of a few ways. To begin, both the first and second sections are repeated with the violin always entering on the second go-around. Next, during the violin’s gliss interaction with the viola/cello chord in the third section, this action is repeated a dozen times. Finally, the fourth section is unifying in that the entire trio is playing the same note in unison and there is again a repeat.

As far as a directed playfulness is concerned, the first two sections give the violinist control over which pitches are voiced as long as they stay

within the harmonic space of the duet’s dyad. So, in a way, they have been
given a game to play, a game which influences the timbral and harmonic
relationship with new formed triad. In similar way, during section 3 the duet
is given control over a game of deciding when to enter—thus cueing the
violinist to stop their glissando and begin sustaining that pitch—and
influencing the duration of the gliss and the voicing of the triad. It is worth
mentioning that the dyad which viola/cello duet voice is also up to the
cellist, who may pick from their 8th, 10th, or 12th harmonic, as the violist
always voices their natural 7th harmonic.

Finally, this trio gave an interesting perspective to me regarding the
performer-composer relationship because I was both the composer and also
a performer. All three pieces for the Trio of Trios concert (held at Russell
House in Middletown, CT on February 18, 2018) were composed and
performed by the same group: Morgan Evans-Weiler on violin, Laura
Cetilia on cello, and myself on viola.

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2.2.7 A Known Unknown (2016/18)

A Known Unknown attempts to sonically represent celestial events, thus treating all sounds as moments within physical boundaries. Because the subject matter which the sounds represent is always moving, no sound should ever be perceived as stagnated, or accented, and thus inevitably overlapping in a fluid manner. These parameters will result in sounds that react, morph, die, and birth new events. In homage to Alvin Lucier’s work Still and Moving Lines of Silence in Families of Hyperbolas, the “Known” sections in A Known Unknown deal mainly with periodic microtonal fluctuations highlighted in an harmonically stable and unchanging space. The microtonal fluctuations are executed through extremely slow sine tone glissandi, highlighting the minuscule cent deviations of the plucked piano strings and stuck crotale, and a slow ascending chromatic scale plucked on the piano or crotale against a “unison” gliss. The stable and sustained element in the “Known” sections is executed through a variety of arrangements including bowing crotales, an Ebow on the piano, and a sustained sine tone. Because the “Known” sections are through-composed without field recording or any “noise”, the silent backdrop amplifies the small sonic events providing a space for things like harmonic interaction (beating tones) and a larger perception of the microtonal landscape.
The duration of A Known Unknown is exactly 60 minutes, with a scored 1 minute of silence before and after the piece. The 5 sections, each of which are divided into the 2 “Unknown” and “Known” sub-sections, fluctuate with time and increase/decrease over the entire piece: Section 1: 4’/8’, Section 2: 5’/7’, Section 3: 6’/6’, Section 4: 7’/5’, Section 5: 8’/4’. The sub-sections maintain a consistent starting point and trajectory with the “Known” sections (1b, 2b, 3b, 4b, 5b) portraying microtonal “interactions with space-time”58 while the “Unknown” sections (1a, 2a, 3a, 4a, 5a) portray sonified representations of celestial event interactions. The form was chosen to balance and guide the listener’s ear through a long duration while still giving the sense of return to a concept or sound texture.

The noise elements are highlighted with the field recording that is added to the “Unknown” sections of the recording (and granular synthesis

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58 See the A Known Unknown score in the appendix.
that is added to the live performance). In addition, noise is suggested seven times as a musical realization of the interaction between the celestial events Nebula, Pulsar, Quasar, Stellar Nursery, Constellation, Impact Event, and Planet.

One of the ways A Known Unknown directs the performers to the idea of play is through the “Unknown” sections of the piece (1a, 2a, 3a, 4a, 5a). In these sections, the players are asked to sonically represent celestial events through a guided improvisation of suggested actions and conceptual embodiments. The 10 celestial events given in the score as options for sonification are: Gravity, Moon, Planet, Star, Stellar Nursery,
Pulsar, Quasar, Constellation, Nebula, and Impact Event. For each event the score provides a formal definition, an abstract of the main musical idea, and 3 or more suggestions of how to execute the musical idea and also guide the player in forming the main conceptual idea if they wish to try “something else entirely...” which is always given as an option. For example, let’s look at the celestial event entitled “Stellar Nursery,” in which players are also encouraged to play non-traditional instruments (i.e. Musician 2 plays percussion sounds such as stones, buckets, bowls, water, grains, plastic bags, superballs, etc.) as well as to play their instruments in a non-traditional manner.

Largely dealing with celestial events, A Known Unknown is the most directly astronomy-themed piece I have composed thus far and is inspired largely by the 2016 - 2018 news events and images of the NASA/ESA Philae lander from Rosetta mission landing on the 67P/Churyumov-Gerasimenko comet. In addition, visual imagery of the mission is included during a live performance situation: “A video projector showing slowed images of space (e.g. Philae lander, Rosetta spacecraft, 67P/Churyumov-Gerasimenko comet, etc.)”59 are to be projected.

Other than the more up-front indeterminate elements of the guided improvisation, there are 2 more elements of indeterminacy depending upon

59 Ibid.
if the event is a live performance or recording situation. If a studio recording is being made, Musician 3 is directed to capture a 60’ field recording during the exact time of the recording session which is then mixed into the “Unknown” sections during post-production. In a live performance situation, Musician 3 is directed to add granular synthesis “in real-time via a live-miking of the room and/or specific instruments and objects.”

The performer-composer relationship is arranged in that performers have a great deal of open/guided instruction for improvisation, highlighted with the option “or something else entirely…” at the end of each celestial event suggestion. I have also allowed the instrumentation for Musician 2 (percussion) to be varied or added to by the performer and their tastes.

2.2.8 The Toy Universe (2018)

The Toy Universe was my thesis concert project that I composed for the New England-based experimental music chamber ensemble Ordinary Affects. In addition to their native instrumentation of violin (Morgan Evans-Weiler), cello (Laura Cetilia), electric guitar (Luke Martin), and vibraphone

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60 See the Ghosting score in the appendix.

61 Ibid.
(James Falzone) — which I named *The Time-space Ensemble* — the score calls for an auxiliary ensemble — which I named *The Fragrant Noise Ensemble* — of four players who strike small chimes tuned to A4 and mix potpourri with a stone in metal bowl. There is also the role of The Conductor (which I filled) whose main task is to live-mix both pre-recorded
and live-produced noise sounds through a circular 12 speaker array. Conceptually the piece focuses on the experience of short and long time periods melding, repetition and iteration, spatiality in both the harmonic and phenomenological sense of perception, and the idea of play. The namesake — inspired by the physics thought experiment (as well as Reza Negarestani’s “toy aesthetics”) — was quoted in the concert program and highlights the idea of play involved with the piece:

“The purpose of this Toy Universe is to show, in a simple way, how the ideas of geometry, force, dimension, and particle interrelate to build a profound worldview. This Toy Universe is worth examining because it is rich in insights. But it is only one example of how to build a Toy Universe [...] This Toy Universe is not a flight of fantasy; its Toy Predictions are falsifiable by experiments in the real universe. Because to learn from a Toy Universe; it must be breakable in the real universe.”

Thomas Neil Neubert
A Toy Universe (2013)

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section in which the *Time-space Ensemble* is directed not to play, briefly at the beginning sections of 1:00 (when all players begin by voicing A4), 3:00 (when the players voice a perfect fourth), and finally at 10:00 (when the ensemble voices a very open and dense chord) before expanding out in their designated direction. During each of the eleven sections of the piece, the element of microtonality is present — or at least given as a suggestion to the players. It is suggested by way of indeterminate pitch material and notated as either an upward or downward sloping arrow, opening up the possibility of calculated microtones or even microtonal dyads or triads. To aid the players with this calculated pacing I gave 4 guidepost chords as landing places for the ensemble: unison A4 at 1:00, a perfect fourth at 3:00, an A quarter-sharp and F quarter-sharp dyad combination at 6:00, and finally a open spaced 7-note chord at 10:00. The piece deals with harmonic space in that it opens up harmonically from the middle outward, with the violin and vibraphone stretching to their upper register limits while the cello and electric guitar head toward their lowest register thresholds. Finally, with the drone of noise that is sounding in 12 varieties throughout the work, one can argue noise is the most complex microtonal sound to our ears.

While the form follows a simple 12 hour clock rotation, one unique thing about it is that the time-flow through the piece is directed in an audible
fashion, as opposed to the visual direction that a conductor normally provides with their baton and arm movements. Conceptually, the idea of iteration is exploited heavily throughout the work as the score is repeated 5 times consecutively — although each of the iterations involve varied, and at times extremely skewed, time frames. These time frames range from 5’ all the way up to 26’ and were organized not only to maximum the audience’s uncanny perception of the familiar versus the unfamiliar, but also so that the harmonic content of the Fragrant Noise Ensemble would overlap in a consonant and well-planned manner with the harmonic material of the Time-space Ensemble creating a sonic texture that surrounds the audience from many directions. Two examples of this careful planning involves both ensembles aligning with a unison A4 on at the 15:00 mark while at the 45:00 mark the very dense final chord of the 4th 26’ iteration is mixed with the beginning A4 twinkling of the bells from the Fragrant Noise Ensemble. The pacing throughout the sections of the piece has a great deal of influence on the main group of performers and their perception as not only a chamber ensemble but a group which is guided through messages delivered via an outside person, the Conductor (me). The auxiliary ensemble is, perhaps, much more playful in the sense that they really have a hand in creating a multi-sensory experience for everyone which is done by peeling citrus fruits and mixing the peels together, by stone, with other
fragrant natural materials. They do this peeling and mixing action at the 20', 40', and 60' points in the piece, dividing the experience into thirds. The duration has much to do with the sense of time passing, because, phenomenologically-speaking, one loses themselves in long moments. As Alva Noë puts it,

the phenomenology of the world-be presence-in-absense of the already elapsed portions of the sustained note is altogether different. Simply stated, there is not even a first-blush sense in which the elapsed sounds seem to be going on now. There is a sense that you can now hear the temporal extent of the sustained note.\textsuperscript{62}

The moments of perceptible loss of time in junction and the reorientation of oneself when they are brought back into the moment is what the piece most aims to provide.

Twelve unique noise sources — some pre-recorded, some live-producing noise — were used as the sonic material for the 12 speaker array or clock that kept time and directed the performers through the piece. The pre-recorded noise quality was that of digital sounds (white, brown, violet, grey, blue, pink) played back through both digital and analog devices as well as both static and sometimes moving radio noise. The live-producing noise qualities were a pink/white mixture from an Arp 2600 synthesizer, surf sounds from a noise machine, and 2 hand-selected reverse-biased diodes built by Matt Wellins. I chose to use noise as the main sonic material.

\textsuperscript{62} Ibid.
for the piece largely to create an environment which highlighted the
different qualities of noise and also challenged the listener’s perception of
what listening to their environment, in this case a thesis concert of “music”,
really consists of: sounds made from a mixture of noise and pitch. Because
of the lack of periodicity found in noise versus the intervallic periods of
recurring waveforms found in pitch, I also chose noise as a conceptual idea
to shed a familiar connotations regarding identity the listener associates
with the qualities of traditional music.

I would be remiss not to acknowledge the inspiration of spatial
orbits on the composition. Of course this aspect is highlighted by the
elliptical motion of the clock and the auxiliary ensemble, but the noise
element is also somewhat inspired by the cosmic microwave background
(CMB) noise left 400,000 years by the big bang and my piece The
Universe was Orange. In The Toy Universe the experience of sensing the
passing of time (both on a minuscule and grand scale) is very much a
fascination and focus of the piece. This inspiration comes directly from my
research with the cosmic distance ladder, the ruler for measuring distances
in outer space, even as far as the observable universe.

Finally, the most compelling aspect of the performer-composer
relationship is the pacing of the tempo by the composer/conductor to the
performers which is entirely observable, and largely focused upon, by the
audience. The performers do have a unique relationship to the score through their interaction with the given pitch direction (i.e. the five guideposts along the path) which act as a unifier, guiding the pacing of the ensemble.
Looking Up: An Idea for the Future

When I walk back to my home on Fairview Avenue from campus, I always make a point of passing the Van Vleck Observatory, one of my favorite places at Wesleyan. When an observation is taking place, the dome gives off a red glow, letting the public know there is a session going on, but also helping the observers eyes adjust to the darkness of night — giving space for a clearer impact from the distant light. It always gives me comfort to know that there are people inside looking up into space, for a new perspective from the cosmos.

Going forward, I need to give myself more space to process what it is I have gone through. In a way, the past four years — the first two to finish my B.F.A. at CalArts and these past two with my M.A. at Wesleyan — has been my life’s most impactful education, but also a whirlwind of growth and self-reflection, as well. I feel the desire to sit in one place for some moments and think, to let time pass before choosing to revisit some of my work with a new perspective and attitude. I also feel the continued desire to create, not only music, but inspired objects to share with others, space (both real and imaginary) to share special events of all sizes, and thoughtful collaborations with other people — people who are also looking up into space, for a new perspective from the cosmos.
Works Cited


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Cage, John. Atlas Eclipticalis; Instrumental Parts to Be Played in Whole or Part in Any Ensemble, Chamber or Orchestral, with or without Winter Music... Henmar Press, 1961.


_______. Interview by author, email, 3 Apr. 2018.


______. Interview by author, email, 23 June 2017.


Appendix

Cited scores (in order of appearance) by Jordan Dykstra:
1. Sounds as Brilliant (2017)
2. The Universe Was Orange (2017)
3. Taking the Tiger by the Tail (2016)
4. Pitch Gradient with Noise #1 (in F#) (2016)
5. Pitch Gradient with Noise #2 (in G#) (2017)
6. Pitch Gradient with Noise #3 (in A#) (2016)
10. A Line & Chevron (2016)
14. Seven Found Clouds (2016)
15. Four Found Clouds (2016)
17. The Psychological Future (2017)
18. In the Snow (2018)
19. A Known Unknown (2016)
20. The Toy Universe (2018)
Jordan Dykstra
Sounds as Brilliant

for an ensemble

May 2017
Middletown, CT
Sounds as Brilliant
for an ensemble

Jordan Dykstra
2017

For Astronomy Professor Seth Redfield and his guidance in Exploring the Cosmos.

Without a timer—and, perhaps, before a sunrise—the ensemble begins the piece together.

Each performer’s score consists of 3 sections (Δ, □, and ○) all of which will be played once and may be arranged in any order:
Δ = 74% of the total duration, with no intentional sound-actions,
□ = 4% of the total duration, with intentional sound-actions, 1 part per performer,
○ = 22% of the total duration, with no intentional sound-actions.

Once during the piece, each performer chooses when to play one extremely short intentional sound action lasting 0.001% of the total duration (0.0279 second).

The piece ends after 100% has passed (46.5 minutes).
A few notes regarding *Sounds as Brilliant*:

*Sounds as Brilliant* realigns two relationships to create new aesthetic meaning: compositional make-up as sound and distance as time. On one hand, if luminous matter is treated as sound and non-luminous matter as silence, 96% of the universe is silent; current scientific data states that while dark energy accounts for 74% of all mass-energy in the universe and dark matter accounts for 22%, ordinary matter (luminous matter made up of protons, neutrons, and electrons) accounts for just 4%. On the other hand, if the distance to the edge of the observable universe is translated as a ratio of one-billion-light-years to one-minute-of-Earth-time, the time needed to travel to the edge of the observable universe is experienced as 46.5 minutes. By exposing these two relationships as the structural form, the listener comes in contact with the two goals represented in *Sounds as Brilliant*: 1) to encounter a great expanse, and 2) to receive a surprisingly minuscule presence in relation to the whole.

Although 46.5 minutes (or 2,790 seconds) is quite specific, I do not expect the performers to precisely execute this duration. On the contrary, my aim is for each performer to experience a larger sense of time passing through the psyche of the entire group, one that comes with a consensus regarding large formal structures of intentional and non-intentional sound-actions. Using a percentage structure as the guiding force, the performers collectively feel their way through this metaphorical duration, aided by the 3 sections: \(\Delta\), \(\bigcirc\), and \(\square\). Although both the \(\Delta\) (74% of the whole) and \(\bigcirc\) (22% of the whole) sections involve only indirect sound production, the placement of the intentionally-sound-producing \(\square\) section (4% of the whole) becomes a decision of great proportion. Each performer freely chooses their part from the 40 given that is suitable to their range. In regards to the placement of the \(\square\) section within the entire piece, it’s 4% will inevitably be situated in one of the following four possibilities: 0-4%, 22-26%, 74-78%, 96-100%. Worth noting as well is that the middle 26-74% of the piece will be overwhelmingly occupied with non-intentional sound-actions.

A cosmic microwave background fluctuation variable has been included for each performer, who chooses when to play this single extremely short event (0.0279 second) at any point in the piece. The duration of 0.0279 seconds not only represents 1/100,000th of the intended total duration (46.5 minutes) but also the amount of fluctuation observed in the 2.7K temperature uniformity amongst the cosmic microwave background astronomers find throughout the observable universe.

A frontal layout of the performers must be avoided.
Copies of the score should be made available for the audience.
The performance may be planned so that it begins 46.5 minutes before a sunrise, sunset, eclipse, or other celestial event that especially delights the performers and audience members.

Jordan Dykstra (May 2017)
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

(1.4)

Jordan Dykstra, 2017
Sounds as Brilliant
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

□ (1.7)

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017

(1.9)
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

(2.2)

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017

(2.4)
Sounds as Brilliant

(2.5)

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

(2.10)

Jordan Dykstra, 2017
Sounds as Brilliant

☐ (3.1)
Sounds as Brilliant

Jordan Dykstra, 2017

(3.3)
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant
Sounds as Brilliant

☐ (3.6)

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

☐ (4.1)

Jordan Dykstra, 2017
Sounds as Brilliant

(4.2)

Jordan Dykstra, 2017
Sounds as Brilliant

☐ (4.3)

Jordan Dykstra, 2017
Sounds as Brilliant

(4.4)
Sounds as Brilliant

☐ (4.5)

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Sounds as Brilliant

☐ (4.7)

Jordan Dykstra, 2017
Sounds as Brilliant

Jordan Dykstra, 2017
Jordan Dykstra
The Universe Was Orange (2017)

for static stone noise and deviation
“This all-sky [cover image] map shows temperature difference in the cosmic microwave background (CMB) measured by WMAP (Wilkinson Microwave Anisotropy Probe). The background temperature is about 2.73 K everywhere, but the brighter regions of this picture are slightly less than 0.0001 K hotter than the darker regions — indicating that the early universe was very slightly lumpy at the end of the ear of nuclei. We are essentially seeing what the universe was like at the surface marked ‘380,000 years’.”¹ (Image: ESA and the Planck Collaboration)

The discovery of the cosmic microwave background was announced in 1965. Arno Penzias and Robert Wilson, two physicists working at Bell Laboratories in New Jersey, were calibrating a sensitive microwave antenna designed for satellite communications (microwaves fall within the radio portion of the electromagnetic spectrum). Much to their chagrin, they kept finding unexpected “noise” in every measurement they made. The noise was the same no matter where they pointed the antenna, indicating that it came from all directions in the sky and ruling out any possibility that it came from any particular astronomical object or any places on Earth.

Meanwhile, physicists at nearby Princeton University were busy calculating the expected characteristics of the radiation left over from the heat of the Big Bang.² They concluded that, if the Big Bang had really occurred, this radiation should be permeating the entire universe and should be detectable with a microwave antenna. On a fateful airplane trip home from an astronomical meeting, Penzias sat next to an astronomer who told him of the Princeton calculations. The Princeton group soon met with Penzias and Wilson to compare notes, and both teams realized that the “noise” detected by the Bell Labs antenna was the predicted cosmic microwave background — the first strong evidence that the Big Bang had really happened. Penzias and Wilson received the 1978 Nobel Prize in physics for their discovery.³

“During the era [of nuclei, around 380,000 after the Big Bang], a supercharged particle with a temperature of several thousand degrees permeated all of space. At this temperature, it’s too hot for electrons and protons to even coalesce into atoms, let alone stars, planets, or galaxies. This ionized soup is called a plasma…and it was emitting a thermal distribution of electromagnetic waves. But because there were no neutral atoms yet, the light the plasma emitted just couldn’t travel very far before it would run into an electron…So at this moment, it was as if flash bulbs were constantly going off everywhere in space, but the light was being snuffed out by an [orange plasma] fog.”⁴


² The possible existence of microwave radiation left over from the Big Bang was first predicted by George Gamow and his colleagues in the late 1940s, but neither Penzias and Wilson nor the Princeton group were aware of his work.

³ Ibid., p. 654.

⁴ “Cosmic Microwave Background Explained | Space Time | PBS Digital Studios.”, YouTube, uploaded by PBS Space Time, 25 Mar. 2015, https://www.youtube.com/watch?v=3tCMd1ytvWg.
INSTRUCTIONS

Alone, or in a group: Create a static noise sound by rubbing a roughly textured surface with a stone. At some point during the performance, allow an extremely slight deviation from the static noise sound — with the relationship of 1/10,000th of the total duration — to speak.

For instance, the debut performance (by Jordan Dykstra, J. P. A. Falzone, Dave Scanlon, and Benjamin Klausner, and as part of John Cage’s Musicircus on December 7, 2017 in the choir loft of Crowell Concert Hall at Wesleyan University in Middletown, CT) was 5 minutes in duration. The quartet members each rubbed round stones on a large stone shingle for the entire performance, but at one point there was an extremely short, yet audible, “chirp” — a 2018 Hz sine-tone (the pitch I found my microwave sang when it was done) — which was programmed to play from a small speaker and lasted 0.03 seconds, or 1/10,000th of the entire 5 minute piece.

Spring 2018
Middletown, CT
Jordan Dykstra

Taking the Tiger by the Tail

An evening-length performance in five sections

for string sextet, two percussionists, three technicians, and electronics

2016
PERFORMANCE NOTES

All performers

A projected timer is needed to synchronize all performers. Per request, a custom timer sketch is available from the publisher Editions Verde.

A computer with the open-source software Processing and a projector (or large screen) will need to be provided.

Empty bars and empty boxes are silent.

Unless notated otherwise, all entrances and exits should begin and end from silence.

A subtle uniform for all performers, such as all black with a camouflage top, is optional but encouraged.

Percussionists

Make note that some entrances need to be more precise than others.

Use lots of resin on the bow for technique constancy.

For continuous bowing of the singing bowls: holding the bowl in your hand, bow downward on the lower lip of the bowl, changing to the upper lip of the bowl with an up-bow when you’ve reach the bow’s tip.

If astro-discs are not available use the four largest, bowable, pitched-percussion instruments (of the same family) you can find.

If an engine-cowling is not available use one or more large sheets of metal.

String players

Attention to cent deviations is extremely important.

No vibrato throughout.

Contrabass 1

The tuning of your lowest string should be capable of C1.

If this is not possible you may voice the written notes an octave above.

Live-mixing engineers

Field recording equipment (or something similar) should be used to amplify the quite sounds of the percussion instruments.

If possible, use a portable pre-amp that offers the engineer an output for their headphones as well as an output to the house and microphones capable of a wide frequency range.

Live-mixing engineer (doubles as sine-tone performer)

This role is to be filled by the composer.

A playback track of carefully selected sine-tones has been produced in order to be live-mixed into the texture of the ensemble.

The live-mixing should be approached with the mindset that all acoustically-produced composed sounds should be audible.

The reoccurring and isolated sections called Stones (I–VI.) should be amplified a bit more than the other sections.

A tasteful, 4-channel output from the mixer is optional.

www.editions-verde.com
Taking the Tiger by the Tail

Jordan Dykstra (2016)
### Mic 1

- **33:00-34:00**
  - STONES

### Mic 2

- **33:00-34:00**
  - STONES

### Percussion 2

- **34' - 35'**
  - SUPERBALLS

### Score

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Details</th>
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<tr>
<td>33:00-34:00</td>
<td>STONES</td>
<td>Mic Percussion 1</td>
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<td>34:00-35:00</td>
<td>SUPERBALLS</td>
<td>Rubbing stone, circular #n</td>
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<td>35:00-36:00</td>
<td>GONG MALLET DRONE IMPROV</td>
<td>3-12 strikes per minute</td>
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<td>36:00-37:00</td>
<td>BOUNCY BALL IMPROV</td>
<td>3-9 per minute</td>
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<td>SUPERBALLS</td>
<td>Rubbing stone, circular #n</td>
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<td>38:00-39:00</td>
<td>GONG MALLET DRONE IMPROV</td>
<td>3-12 strikes per minute</td>
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<td>39:00-40:00</td>
<td>BOUNCY BALL IMPROV</td>
<td>3-9 per minute</td>
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### Notes
- Independently: one long, quiet bow (per cycle) sans vibrato
- Leave space for resonance
- Rubbing stone, circular #n
- Bouncing ball improvisation at 3-9 per minute
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**NOTES:**
- *COWLING* and *OUTSIDE COWLING* are used throughout.
- *MEDIUM volume* and *SOFT volume* are indicated for different sections.
- *MEDIUM** and *LOUD** are used for volume levels.
- *6-10 taps per minute* and *6-10 stabs per note* are used for rhythmic patterns.
- *5-taps per minute* and *5 stabs per note* are used for more precise rhythms.
- *Gliss.* indicates glissandos, and *BOUNCY BALL TOSSING* indicates ball tossing.
- *Rubbing* and *Brashing* are used for textural effects.
Pitch Gradient with Noise in F#
for 2 percussion, 2 grand pianos, 2 guitars, and 4 bowed string instruments

Jordan Dykstra, 2016
Pitch Gradient with Noise in F#  

PERFORMANCE NOTES

I. Score in C.
II. Pitches should be thought of as pitch classes and thus may be voiced in any octave. String players may also use harmonics, sul ponticello, and/or sul tasto.
III. Instead of a pitch, any player may choose to produce a quiet, sustained noise (on their instrument). Eg. bowing the wooden body or tailpiece of their instrument, sliding their finger up/down the string, etc.
IV. Single or multiple players to a part is fine.
V. Very quiet throughout, with minimal entrances/exits, and without vibrato.
VI. Guitar and piano players should always use an Ebow. Piano players: using a wedge for the sustain pedal will be useful; when the sustained note is finished lift the Ebow from the string, allowing the tone to fade naturally.
VII. String players will need to use a tuner with a contact microphone to find the cent deviations from equal temperament.
VIII. Percussionists should find non-pitched “instruments” capable of being sustained, possibly through bowing, and that provide noise (or unstable pitch). Eg. bowed woodblock, stones continuously rubbed together, a soft brush on a drum head, lightly bowed metal objects, steady stream of rice or sand on a cymbal, etc.
IX. The performance layout should look something like this:

Val Verde, CA. July 2016
Pitch Gradient with Noise in G#

for clarinet, percussion, grand piano, 3 bowed string instruments, and electronics

Jordan Dykstra, 2017
PERFORMANCE NOTES

(1) Score in C.
(2) Quiet throughout, with minimal attack on entrances and exists, and without vibrato.
(3) Pitches should be thought of as pitch classes and thus may be voiced in any octave. String players may also use harmonics, sul ponticello, and/or sul tasto.
(4) Instead of a pitch, any player may choose to produce a quiet, sustained noise on their instrument. E.g. bowing the wooden body or tailpiece of their violin, sliding their finger up/down the string, blowing un-pitched air through their clarinet, white/pink noise, etc.
(5) For all players: attention to cent deviation is extremely important. While certain performance decisions—such as micro adjustments to find a stable beating pattern with an ensemble member—are fine, finding a pitch continuum regarding the overall pitch trajectory is key and it is recommended that bowed string players use a tuner with a contact microphone to aid in this process.
(6) The pianist always uses an Ebow and a pedal wedge is useful for sustain. When the sustained tone is finished, lift the Ebow from the string allowing the tone to fade naturally.
(7) The clarinet may be substituted for any reed instrument with similar microtonal capabilities. The piano may be substituted for any keyboard/mallet instrument capable of sustain or being bowed.
(8) Percussionists will need to find non-pitched instruments capable of being sustained, possibly through bowing, and that provide noise or unstable pitch (i.e. something that doesn’t follow the ordering of the harmonic series). E.g. bowed woodblock, stones continuously rubbed together, a soft brush on a drum head, lightly bowed metal objects, a steady stream of rice or sand on a cymbal, etc.
(9) Single or multiple players to a part is fine.
(10) The person producing the sine-tone may request a Max-MSP patch via jordandykstra@gmail.com. Their loudspeaker will be placed non-directionally and their dynamic just below noticeable when the full ensemble is performing.

Total duration is 11’ which includes 30” of silence at the beginning and end.
Unlike the other pieces in the Pitch Gradient series which traverse one semitone over 10 minutes, for the sake of the occasion (first performance by Ensemble TaG in Zürich, Switzerland on May 7, 2017) this version addresses the full height of the semitone in 5 minutes.

Middletown, Conn. (March 2017)
Pitch Gradient with Noise in A#
for 3 percussion, accordion, bassoon, electric guitar, pitched percussion, 3 bowed string instruments, and sine-tones

Jordan Dykstra, 2016
Pitch Gradient with Noise in A#

PERFORMANCE NOTES

I. Score in C.

II. Pitches should be thought of as pitch classes and thus may be voiced in any octave. String players may also use harmonics, sul ponticello, and/or sul tasto.

III. Instead of a pitch, a player may choose to produce a quiet, sustained noise (on their instrument). Eg. bowing the wooden body or tailpiece of their instrument, sliding their finger up/down the string, unpitched air running through an instrument, etc.

IV. Single or multiple players to a part is fine.

V. The accordion may be substituted with a similar instrument such as a pump organ, harmonium, or shruti box, etc.

VI. Quiet throughout, with minimal entrances/exits, and without vibrato.

VII. The electric guitar player should always use an Ebow. The pitched percussion player should also use a bow (most likely a well-rosined double bass bow) to sustain their pitch.

VIII. Most players will need to use a tuner with a contact microphone to find the cent deviations from equal temperament.

IX. Noise percussionists should find non-pitched “instruments” capable of being sustained, possibly through bowing, and that provide noise (or unstable non-following-of-the-harmonic-series pitches). Eg. bowed woodblock, stones continuously rubbed together, a soft brush on a drum head, lightly bowed metal objects, steady stream of rice or sand on a cymbal, etc. Although acoustic instruments are crucial, non-acoustic “instruments” (such as the white noise on a radio or the buzzing of a circuit) may also be added at an appropriate volume.

X. Both the electric guitar and sine-tone players will need an adequate amp and should carefully balance to the dynamic of the ensemble.

XI. The performance layout should be staged in a semicircle or placed around the audience.

XII. This edition was composed as half of a performance on October 4, 2016 at Wesleyan University. Alongside it was a performance of Four Found Clouds which is why this edition contains 2 minutes of silence at the beginning and end. If Pitch Gradient with Noise in A# is performed on its own, the silence at the beginning and end may be adjusted accordingly (shortened or lengthened).
Pitch Gradient with Noise #4 (in D♭)

for 2 brass instruments, 2 percussion, 10 bowed string instruments, and sine-tones

Jordan Dykstra, 2017
PERFORMANCE NOTES

(1) Score in C. Pitches should be thought of as pitch classes and, thus, may be voiced in any octave. String players may also use harmonics, sul ponticello, and/or sul tasto.

(2) Medium dynamic throughout, with minimal attack on entrances and exists, and without vibrato.

(3) A seating arrangement should be chosen with the lowest audible spectrum in the center and fan out from there, with the highest spectrum on either edge of the semicircle.

(4) Instead of a pitch, any player may choose to produce a quiet, sustained noise on their instrument. Eg. bowing the wooden body or tailpiece of their instrument, sliding their finger up/down the string, blowing un-pitched air through their instrument, white/pink noise, etc.

(5) Attention to the cent deviations is extremely important. While certain performance decisions—such as micro adjustments to find a stable beating pattern with an ensemble member—are fine, finding a pitch continuum regarding the overall pitch trajectory is key and it is recommended that bowed string players use a tuner with a contact microphone to aid in this process.

(6) Guitarists will always use an Ebow and slide to find the altered pitch. When the sustained tone is finished, lift the Ebow from the string allowing the tone to fade naturally.

(7) String parts may be performed on any bowed string instrument and horn/trombone parts may be performed on any suitable brass instrument.

(8) Percussionists will find non-pitched instruments capable of being sustained, possibly through bowing, and that provide noise or unstable pitch (i.e. something that doesn't follow the ordering of the harmonic series). Eg. bowed woodblock, stones continuously rubbed together, a soft brush on a drum head, lightly bowed metal objects, a steady stream of rice or sand on a cymbal, etc.

(9) Single or multiple players to a part is fine.

(10) The players producing the sine-tone may request a MaxMSP patch via jordandykstra@gmail.com. Their loudspeaker will be placed near them and non-directionally; their dynamic just below noticeable when the full ensemble is performing.

Total duration is 31’ which includes 60” of silence at the beginning.

Middletown, Conn. (Spring 2017)
Trombone

**Pitch Gradient with Noise #4 (in D ♭)**

for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Percussion 1

Pitch Gradient with Noise #4 (in D ♯)
for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Sine-tone 1

Pitch Gradient with Noise #4 (in D ♭)
for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Pitch Gradient with Noise #4 (in D ♪)
for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Sine-tone 2

- 27th measure: +2c
- 28th measure: +19c
- 29th measure: +33c
- 30th measure: -50c
- 31st measure: -38c
- 32nd measure: -14c
- 33rd measure: +19c
- 34th measure: +33c
- 35th measure: -33c
- 36th measure: -11c
- 37th measure: ±0c
Pitch Gradient with Noise #4 (in D ♯)
for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Pitch Gradient with Noise #4 (in D ♭)

Jordan Dykstra (2017)
Pitch Gradient with Noise #4 (in D ♭)
for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Pitch Gradient with Noise #4 (in D ♭)
for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Pitch Gradient with Noise #4 (in D♮)

for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Viola 2

21
\[ +3c \]
\[ +7c \]
\[ +12c \]
\[ +20c \]

22
\[ +25c \]
\[ +30c \]
\[ +33c \]

23
\[ +39c \]
\[ +44c \]
\[ -45c \]

24
\[ -40c \]
\[ -34c \]
\[ -30c \]
\[ -25c \]

25
\[ -14c \]
\[ -8c \]
\[ -2c \]

26
\[ +6c \]
\[ +10c \]
\[ +16c \]
\[ +25c \]

27
\[ +33c \]
\[ +39c \]
\[ +44c \]

28
\[ +48c \]
\[ +50c \]
\[ -47c \]
\[ -44c \]

29
\[ -34c \]
\[ -27c \]
\[ -20c \]

30
\[ -17c \]
\[ -11c \]
\[ \pm 0c \]
Pitch Gradient with Noise #4 (in D ♭)
for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Pitch Gradient with Noise #4 (in D ♭)
for the 2017 Dog Star Orchestra
Jordan Dykstra (2017)
Double Bass 1

Pitch Gradient with Noise #4 (in D ♭)
for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Pitch Gradient with Noise #4 (in D 4)
for the 2017 Dog Star Orchestra

Jordan Dykstra (2017)
Pitch Gradient with Noise (in A)

Two octave 4-hour version for a performance by Ordinary Effects at the RISD Museum in Providence, Rhode Island. Jordan Dykstra (2018)

Instructions for non-tempered instruments
1) Freely choose entry and exit times.
2) Subtract the entry time from the exit time, find the corresponding cent deviation on the ruler (at the middle point).
3) Voice this pitch class (with cent deviation) for your chosen duration.

Instructions for producing noise
As an alternative to pitch, all performers are invited to produce noise at any time.

For the purposes of this piece, noise is defined by a sound that is perceived to have much more noise than pitch (i.e. a sound which strongly deviates from the harmonic series).
Jordan Dykstra

_A Line & Chevron (Abstract)_

_for 2 moving lines and 1 still_

Consistently moving, two instruments with a similar timbre sustain the interval of a just perfect fifth while one instrument of a slightly different timbre maintains a still (unmoving) pitch somewhere between the two. When (or if) the still line is perceived as unison with the moving, it should stop, pause, and then begin again.

_Ano Syros, Greece, 2016_
Carefully following the extremely slow eBow glissando of the electric bass guitar, the electric guitar, also using an EBow and slide, should create a parallel glissando a just fifth above the bass. Choosing a note within the guitar duet’s fifth, the clarinetist then begins a back-and-forth passing of this pitch with the violist (one breath or bow per instrument, per turn). This overlapping note is “sustained” and passed between the two players until the pitch frequency meets (in unison) with either edge of the guitar’s glissando. This “interaction” with the guitarist’s glissando triggers the end the clarinet and viola duet’s line. After a (short to long) pause, the clarinetist then picks a new note within the guitarist’s unbreakable fifth and the same procedure is repeated a number of times.

The direction of the glissando may move up or down (or even change direction) but it must move very slow, traversing a maximum of four semitones per minute, although less is much preferred. Since the bass guitarist leads the glissando in both its speed and direction, they will need to make sure the range of the glissando does not extend beyond the range of the clarinet, or D3-A5 (conservatively). Agreeing on the beginning note of the glissandi is encouraged but not mandatory.

All players should avoid articulations (or any other movements) that distract the listener from the interaction between the still and moving lines.

The dynamic of all instruments is medium to loud. Both amplified guitars should have a similar warm tone and a volume equal to the upper range of the clarinet.

No vibrato throughout.

The duration of the piece is 12 minutes (or much longer).

Note to electric bass guitarist: Make sure to use a five-string electric bass guitar with a C3 for the top string tuned up a whole step to D3.

Composed for the 12th annual Dog Star event “Math Is Unnatural” on June 12, 2016 at The Wild Beast in Valencia, CA. Debuted by Michael Pisaro on electric guitar, Ben Finley on electric bass, Jordan Dykstra on viola, and Daniel Clarke on clarinet.
A Line & Chevron (for Agnes Martin)

Jordan Dykstra

Version for Ensemble Pamplemousse: cello, sine-tone, accordion, and melodica
As performed on December 13, 2016 at Crowell Concert Hall at Wesleyan University in Middletown, CT

Agnes Martin, Untitled 1959
A Line & Chevron (for Agnes Martin)
Jordan Dykstra

Instrument relation
This piece is divided into 2 duets: One duet consisting of the sine-tone player and cellist who produces the chevron, a continuously-glissing just perfect fifth. The second duet comprised of the accordionist and melodica player produces the line, a still and unwavering pitch existing inside the fifth.

Sound production
1. The sine-tone player voices and sustains a pitch which acts as the fundamental in relation to the fifth. The player then creates a very slow glissando with a maximum rate of 4 semitones per minute.
2. Shortly after the glissando begins, the cellist joins in, voicing a just perfect fifth above the sine-tone's pitch. Together they slowly gliss throughout the duration of the piece.
3. After a short while the accordionist voices and then sustains a note which lies anywhere within the boundaries of the chevron.
4. Some time later the melodica player periodically matches the accordion's pitch, pausing periodically between notes.
5. When (or if) the line is perceived as perfect unison with either edge of the chevron, the line-producing duet should:
   (1) stop producing sound
   (2) pause for some time
   (3) begin again with step 3

Positioning and movement production
The cellist should be sitting in a centrally located area at one end of the hall, perhaps elevated to project sound evenly throughout the hall. The sine-tone player should voice their tone through a fixed and upwardly-facing stereo playback system in order to diffuse the sound and evenly project throughout the hall.

Once they enter during steps 3 and 4 both the accordionist and melodica player should walk slowly and comfortably around the seated audience, making sure to stay within the physical boundary of the chevron-producing duet. They should maintain the sense of being tethered to one another, preserving equal proximity as much as possible. When (or if) this line-producing duet finds their tone to be in unison with either edge of the of the chevron-producing duet's fifth (outlined in step 5), they should cease their movement and move again only when they begin again with step 3.

Form
The 5 steps listed above regarding sound production should begin the piece. When the line-producing duet has achieved around 5 full revolutions (~20 minutes) they should stop moving and wait for the chevron-producing duet to slowly fade out, ending the performance.

Pitch range
Because the line-producing instruments have tempered pitches, the chevron-producing duet must be mindful of staying within their fixed pitch range.

Dynamics
All players should aim for a dynamic of medium-loud while maintaining the integrity and quality of pitch. This should be regarded in relation between both duet members as well as between both duets.

October 2016, Middletown, Conn.
Three Lines & One Chevron
(Another Algorithm for Unification)
Jordan Dykstra

for 4 performers with sustaining instruments capable of glissando
for Euler Quartet
Three Lines & One Chevron (Another Algorithm for Unification)
Jordan Dykstra

1) One after another: Performers 1, 2, and 3 (creating the Three Lines) gradually choose and then sustain a pitch, creating a three note chord.
2) After a while: Performer 4 finds the tonal center of the chord and then begins a slow glissando outward in either direction.
3) Eventually: Performer 4 reaches one of the Three Lines and finds perfect unison.
4) Once unification is found: Performer 4 (creating the shape of the Chevron) leads the two unified performers on her continued journey to reach, find unification with, and then “collect”—one by one—each of the other sustaining Lines.
5) Finally: After Performer 4 has “collected” the pitches of the entire group, she guides everyone to a resting point of silence.
6) Repeat steps 1-5 until all performers, who would like to, have had a chance to lead the Chevron, or “collecting” role.

Performance Notes
Please be mindful of one another’s instrument ranges in order to avoid unmatchable pitches (ie. a violinist cannot find unison with a cellist’s G2). The performer with the “collecting” role should move at a very slow pace of no more than four semitones per minute. Pitches should be voiced with clarity and without vibrato. Dynamics should be audible yet avoid overpowering one another. Performers may choose to close their eyes or wear a blindfold. This is an individual choice that aims to both aid in the listening experience and encourage the mental image of the form in one’s mind.

December 2016, Middletown, Conn.
A *found cloud* is a veiled and textured non-one-octave-repeating scalar pattern that emerges when the fundamental is sustained and the other tones in the scale are voiced with a much shorter duration. After the *found cloud* is performed once in ascending order the pattern may be continued in either ascending or descending order, a combination of the two, or ended entirely and began again anew. Any temperament or tuning system can and may be adapted.

Some possible *found clouds* in equal temperament:

1. 5 (*repeat*)
2. 1-4 (*repeat*)
3. 1-2-2 (*repeat*)
4. 4-1 (*repeat*)
5. 3-2 (*repeat*)
6. 1-2-2 (*repeat*)
7. 7 (*repeat*)
8. 1-6 (*repeat*)
9. 1-3-3 (*repeat*)
10. 6-1 (*repeat*)
11. 3-3-1 (*repeat*)
12. 2-2-2-1 (*repeat*)
13. 3-1-3 (*repeat*)
14. 1-3-3 (*repeat*)
15. 2-5 (*repeat*)
16. 3-4 (*repeat*)
17. 4-3 (*repeat*)
18. 2-2-3 (*repeat*)
19. 8 (*repeat*)
20. 7-1 (*repeat*)
21. 1-7 (*repeat*)
22. 6-2 (*repeat*)
23. 2-6 (repeat)
24. 5-3 (repeat)
25. 3-5 (repeat)
26. 2-3-3 (repeat)
27. 3-2-3 (repeat)
28. 3-3-2 (repeat)
29. 2-4-2 (repeat)
30. 9 (repeat)
31. 8-1 (repeat)
32. 4-4-1 (repeat)
33. 2-2-4-1 (repeat)
34. 2-2-2-2-1 (repeat)
35. 1-8 (repeat)
36. 1-4-4 (repeat)
37. 1-2-6 (repeat)
38. 1-6-2 (repeat)
39. 1-3-3-2 (repeat)
40. 1-4-2-2 (repeat)
41. 7-2 (repeat)
42. 2-7 (repeat)
43. 6-3 (repeat)
44. 5-4 (repeat)
45. 5-2-2 (repeat)
46. 4-5 (repeat)
47. 2-2-5 (repeat)

Val Verde, California, July 2016
I. Place the EBow on the strings of any note that contains a trichord².

II. As you press down the sustain pedal gently pluck³ the middle string of that trichord, this activates the EBow⁴ and is the first note of your cloud scale sequence.

   A. Your 5-minute cloud scale sequence may be chosen from one of the following suggestions (listed below in intervalic semitones and performed in either ascending or descending motion) or you may sequence your own non-one-octave-recurring pattern:

      1. 2-3-3 (repeat)
      2. 3-2-3 (repeat)
      3. 3-1-3 (repeat)
      4. 3-3-1 (repeat)
      5. 3-3-2 (repeat)
      6. 5 (repeat)
      7. 3-4-1 (repeat)
      8. 7 (repeat)
      9. 3-4 (repeat)
     10. 4-3 (repeat)
     11. 2-2-3 (repeat)
     12. 3-2-3-2 (repeat)
     13. 3-3-2-2 (repeat)
     14. 9 (repeat)
     15. 10 (repeat)
     16. 4-3-2-1 (repeat)
     17. 5-3 (repeat)
     18. 3-2-4-1 (repeat)
     19. 4-2-3-1 (repeat)
     20. 4-1-1-3 (repeat)
     21. 4-1-3-1 (repeat)
     22. 4-3-1-1 (repeat)
     23. 11 (repeat)
     24. 5-6 (repeat)
     25. 6-5 (repeat)

III. Continuing your chosen scale, pluck the notes very slowly (around 4 notes per minute).

IV. Toward the end of your 5-minute cloud scale sequence silently lift the EBow from the string as you pluck a note.

V. As you finish your chosen scale, gently pluck the last few notes, keeping the same steady pace. Let the last note ring and then fade. Finally, release the sustain pedal.

VI. Repeat steps I-V seven times.
Any tuning is fine. For instance, the one I found (and used for the recording) was loosely based on the harmonic series of C1. Perhaps incorrectly, the piano was tuned using the following cent deviations:

<table>
<thead>
<tr>
<th>Note</th>
<th>Cent Deviation</th>
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<tbody>
<tr>
<td>C</td>
<td>±0</td>
</tr>
<tr>
<td>C#</td>
<td>+4.955</td>
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<tr>
<td>D</td>
<td>+3.91</td>
</tr>
<tr>
<td>Eb</td>
<td>-2.49</td>
</tr>
<tr>
<td>E</td>
<td>-13.68</td>
</tr>
<tr>
<td>F (natural seventh of G)</td>
<td>-29.22</td>
</tr>
<tr>
<td>F (quarter sharp)</td>
<td>-48</td>
</tr>
<tr>
<td>G</td>
<td>+1.955</td>
</tr>
<tr>
<td>Ab</td>
<td>+40.52</td>
</tr>
<tr>
<td>A</td>
<td>+5.87</td>
</tr>
<tr>
<td>Bb (natural seventh)</td>
<td>-31.18</td>
</tr>
<tr>
<td>B</td>
<td>-11</td>
</tr>
<tr>
<td>C</td>
<td>±0</td>
</tr>
</tbody>
</table>

Listed below in ratios and cent equivalence, another tuning example could be:

<table>
<thead>
<tr>
<th>Ratio</th>
<th>Cent Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1</td>
<td>0</td>
</tr>
<tr>
<td>567/512</td>
<td>177</td>
</tr>
<tr>
<td>9/8</td>
<td>204</td>
</tr>
<tr>
<td>147/128</td>
<td>240</td>
</tr>
<tr>
<td>21/16</td>
<td>471</td>
</tr>
<tr>
<td>1323/1024</td>
<td>444</td>
</tr>
<tr>
<td>189/128</td>
<td>675</td>
</tr>
<tr>
<td>3/2</td>
<td>702</td>
</tr>
<tr>
<td>49/32</td>
<td>738</td>
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<tr>
<td>7/4</td>
<td>969</td>
</tr>
<tr>
<td>441/256</td>
<td>942</td>
</tr>
<tr>
<td>63/32</td>
<td>1173</td>
</tr>
<tr>
<td>2/1</td>
<td>1200</td>
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</tbody>
</table>

The EBow will rest nicely on the neighboring strings, allowing the middle trichord string to vibrate. The EBow won’t work on a note containing only a bichord (upper range) or single piano string (lower range) as the EBow sled has nowhere to rest.

It is best to use your finger but a guitar pick (or similar tool) may also be used to pluck the middle string of the trichord as long as an unusually sharp attack is avoided.

Although a fresh 9V battery will encourage engagement of the EBow on the string, if there is no immediate activation continue on, often sympathetic resonances will trigger the needed vibration.

A solo performance of *Seven Found Clouds* is fine, but more ideal is a performance with multiple performers, each with their own grand piano set spatially throughout a resonant hall.

*California, April 2016*
*Updated: Connecticut, October 2017*
Four Found Clouds  
Jordan Dykstra  
for pedal harp with Ebow

I. Place the EBow adjacent to any metal string on the harp and pluck it. This pitch will not only act as the first note of your cloud scale pattern, it will also be voice throughout the scale.

II. Choose your 5-minute cloud scale pattern from one of the following options (listed in number of strings) or create your own (be careful to avoid patterns that land on the first octave). Either ascending, descending, or a combination of both is fine:

1. 3 (repeat)  
2. 5 (repeat)  
3. 2-2-1 (repeat)  
4. 6 (repeat)  
5. 3-3 (repeat)  
6. 7 (repeat)  
7. 3-4 (repeat)  
8. 3-2-2 (repeat)  
9. 4-3 (repeat)  
10. 2-2-3 (repeat)  
11. 2-3-2 (repeat)  
12. 9 (repeat)  
13. 3-3-3 (repeat)  
14. 10 (repeat)  
15. 5-5 (repeat)  
16. 11 (repeat)  
17. 5-6 (repeat)  
18. 6-5 (repeat)  
19. 12 (repeat)  
20. 6-6 (repeat)  
21. 7-5 (repeat)  
22. 5-7 (repeat)

A cloud scale pattern is a veiled and textured non-one-octave recurring scalar pattern that emerges when the fundamental is sustained and the other tones in the scale are voiced with shorter durations. See Found Clouds (Abstract) for more information.
23. 13 (repeat)  
24. 7-6 (repeat)  
25. 6-7 (repeat)  
26. 14 (repeat)  
27. 7-7 (repeat)  
28. 15 (repeat)  
29. 7-8 (repeat)  
30. 3-4-4-4 (repeat)  

III. Continuing your chosen scale, voice the notes very slowly (around 4 notes per minute).

IV. Toward the end of your 5-minute cloud scale pattern lift the EBow from the string after you have voiced the last note. Let all sound fade.

V. Repeat steps I-IV 4 times.

Possible tuning
A pedal: A# ±0 c. 1/1
B pedal: B -45 c. 35/32
C pedal: C (B#) +4 c. 9/8
D pedal: D (Cx) +51c. 11/9
E pedal: Eb (D#) -2 c. 4/3
F pedal: F (E#) +2 c. 3/2
G pedal: G# -31 c. 7/4
Jordan Dykstra
Ghosting

A Modular Piece for a Variety of Ensembles
Jordan Dykstra

*Ghosting (2017)*

*A Modular Piece for a Variety of Ensembles*

**Performance Notes**

1. *Ghosting*, as a whole, consists of 9 parts (3 treble, 3 alto, and 3 bass) but no performance of the piece will include voicing all nine parts—a minimum number of players is a duet (2), a maximum of an octet (8). Each ensemble player will choose an appropriate part for their instrument range. Multiple parts may be combined into a single players part and voiced on the same instrument (i.e. a two-hand keyboard interface playing both a treble and a bass part) or even multiple instruments (i.e. an organ playing a treble part and a synthesizer playing an alto). The doubling of a single part is not only acceptable, it is encouraged.

2. Because a central idea of the piece is to explore subtle timbral and harmonic density changes applied to the same musical material, a realization of the piece will include performances of multiple iterations (i.e. different instrumentation, part distribution, the addition of a mute or technique such as *sul tasto*, etc.) and need not be performed back to back on a program.

3. Octave transpositions are okay, but are to be avoided as much as possible.

4. The solid, bolded line indicates sustain. An extension of the sustain line beyond the end of a measure indicates the sound continues on, the note tied to the following measure on the next staff line. The sustain may be removed completely from an individual part as long as at least one other ensemble player is sustaining.

5. Precise entrance times are given as boxed text. Exit times are relational to the staff (1 minute per line) and should be planned accordingly so as entrance times are given enough preparation, synchronized with other players (when applicable), and made musical. From the 6’ mark onward the piece continues “Slow & Together”, as notated, and without timers.

6. Dynamics are medium throughout.

Debuted on October 25, 2017 at Beckham Hall at Wesleyan University in Middletown, CT, *Ghosting* was realized in the following 3 arrangements:

**Ghosting No. 1**

Treble-2 & Bass-1: J. P. A. Falzone (vibraphone)  
Alto-2: Jordan Dykstra (viola)

**Ghosting No. 2**

Treble-1 & Bass-3: J.P.A. Falzone (reed organ)  
Alto-1: Jordan Dykstra (viola)  
Alto-2: Nadya Potemkina (viola)

**Ghosting No. 3**

Treble-3 & Bass-2: J. P. A. Falzone (vibraphone + synth bass pedals)  
Alto-3: Jordan Dykstra (viola)  
Alto-2: Nadya Potemkina (viola)  
Treble-2 & Bass-1: David Scanlon (reed organ)
Ghosting
Jordan Dykstra (2017)
Ghosting (full score)
Ghosting (full score)
Treble-1

Treble-2

Treble-3

Alto-1

Alto-2

Alto-3

Bass-1

Bass-2

Bass-3

Ghosting (full score)
Ghosting (full score)
Jordan Dykstra

*The Psychological Future*

*for an ensemble of gamelan and string players*
Program Notes

The Psychological Present

In his 1976 paper “The Making of the Present: A Tutorial Review”, Dutch experimental psychologist John A. Michon wrote about the term “the psychological present” which he defined as “a time interval in which sensory information, internal processing, and concurrent behavior appear to be integrated within the same span of attention.” Michon found that the width of this subjective “present” was highly variable but noted the upper limit seemed to lie between 7 or 8”. Although The Psychological Future draws its formal inspiration from this upper limit (beginning with 7.5” between each event) and stretches it almost threefold (ending with 20” between each event), its other main concerns involve the anticipation and gradation of micro-intervals, site-specific yet performer-chosen harmonies, and timbral contingencies. If the events in The Psychological Future begin within the “present” threshold and then move far beyond the attention span of integration, can this “disintegration of the present” allow us to move into a new mode of “future listening” and perception?

Instrumentation

The entire ensemble is divided into 2 equal halves: half gamelan players and half string players. The string half is comprised of any bowed instrument capable of sustaining. The gamelan half is comprised of any Javanese or Balinese instruments with at least one gong. Before beginning all players need to jointly decide whether to uniformly play either a pelog or slendro scale.

Scordatura

The string players carefully tune all open strings to any sounding pitch from (any of) the gong(s). This includes not only the fundamental but any overtones. It is recommended that the tuning be aided by a spectral analysis software such as the program Spear. If needed (although not preferable) the string players may choose an octave displacement to avoid excessive stretching of the string.

Form

Cycling upwards, the pieces begins at a rate of 7.5” per pulse (with an increase of .5” per cycle). Each cycle has 4 equal time-based iterations before moving onto the next cycle. For each specifically timed pulse the gamelan ensemble player strikes any note of any gamelan instrument, making sure to always to pick a new note (i.e. never striking the same note consecutively). For each cycle, the string ensemble players each pick one pulse duration and individually select and sustain any open string(s) or natural harmonic(s) of their choosing, making sure to always pick a new pitch (i.e. never bowing the same pitch consecutively). For instance, in Cycle 1 the player might choose to sustain their pitch during Pulse 3 (0:15:0–0:22:5) but in Cycle 2 they might
choose to sustain their pitch during Pulse 1 (0:30:0–0:38:0). The piece ends with a natural fade into silence after the last pulse in the 26th cycle is fully realized.

Versions
Finally, I would like to add that as long as the performers stay within the essence of the piece, there are other combinations of instrumentation that could and may work. I myself have tried other versions including one with 24 metal objects (which replaced the gamelan ensembles role and was performed by a percussion duet) with sine-tones (whose pitches were generated through spectral analysis of the metal objects, the one pulse per cycle randomly chosen, and performed by two players). In another version we used 15 pitched woodblocks (performed by a percussion trio replacing the gamelan ensemble) with a viola trio (again, their pitches generated through spectral analysis of the woodblock). The essence of the piece mainly lies within two areas: the form, which conceptually stitches the sound events together, and the scordatura, which connects both ensembles through pitch content. If there are any questions regarding what may be understood as “going too far” or “pushing against the score” please feel free to contact me (honestly I will probably either tell you its fine or to go much further).

Jordan Dykstra

Middletown, Conn.
January 2017
### Full Score Timeline

<table>
<thead>
<tr>
<th>Cycle duration</th>
<th>seconds per pulse</th>
<th>(seconds per cycle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 0:00:0—0:30:0</td>
<td>7.5”</td>
<td>(30”)</td>
</tr>
<tr>
<td>2) 0:30:0—1:02:0</td>
<td>8”</td>
<td>(32”)</td>
</tr>
<tr>
<td>3) 1:02:0—1:36:0</td>
<td>8.5”</td>
<td>(34”)</td>
</tr>
<tr>
<td>4) 1:36:0—2:12:0</td>
<td>9”</td>
<td>(36”)</td>
</tr>
<tr>
<td>5) 2:12:0—2:50:0</td>
<td>9.5”</td>
<td>(38”)</td>
</tr>
<tr>
<td>6) 2:50:0—3:30:0</td>
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<td>(40”)</td>
</tr>
<tr>
<td>7) 3:30:0—4:12:0</td>
<td>10.5”</td>
<td>(42”)</td>
</tr>
<tr>
<td>8) 4:12:0—4:56:0</td>
<td>11”</td>
<td>(44”)</td>
</tr>
<tr>
<td>9) 4:56:0—5:42:0</td>
<td>11.5”</td>
<td>(46”)</td>
</tr>
<tr>
<td>10) 5:42:0—6:30:0</td>
<td>12”</td>
<td>(48”)</td>
</tr>
<tr>
<td>11) 6:30:0—7:20:0</td>
<td>12.5”</td>
<td>(50”)</td>
</tr>
<tr>
<td>12) 7:20:0—8:12:0</td>
<td>13”</td>
<td>(52”)</td>
</tr>
<tr>
<td>13) 8:12:0—9:06:0</td>
<td>13.5”</td>
<td>(54”)</td>
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<tr>
<td>14) 9:06:0—10:02:0</td>
<td>14”</td>
<td>(56”)</td>
</tr>
<tr>
<td>15) 10:02:0—11:00:0</td>
<td>14.5”</td>
<td>(58”)</td>
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<tr>
<td>16) 11:00:0—12:00:0</td>
<td>15”</td>
<td>(60”)</td>
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<tr>
<td>17) 12:00:0—13:02:0</td>
<td>15.5”</td>
<td>(62”)</td>
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<td>18) 13:02:0—14:06:0</td>
<td>16”</td>
<td>(64”)</td>
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<tr>
<td>19) 14:06:0—15:12:0</td>
<td>16.5”</td>
<td>(66”)</td>
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<td>20) 15:12:0—16:20:0</td>
<td>17”</td>
<td>(68”)</td>
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<tr>
<td>21) 16:20:0—17:30:0</td>
<td>17.5”</td>
<td>(70”)</td>
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<td>22) 17:30:0—18:42:0</td>
<td>18”</td>
<td>(72”)</td>
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<td>23) 18:42:0—19:56:0</td>
<td>18.5”</td>
<td>(74”)</td>
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<td>(76”)</td>
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<td>25) 21:12:0—22:30:0</td>
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<td>(78”)</td>
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<td>26) 22:30:0—23:50:0</td>
<td>20”</td>
<td>(80”)</td>
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The Psychological Future, Page 4
<table>
<thead>
<tr>
<th>Cycle</th>
<th>Pulse 1</th>
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<tr>
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<td>0:38:0</td>
<td>0:46:0</td>
<td>0:54:0</td>
</tr>
<tr>
<td>3</td>
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<td>1:10:5</td>
<td>1:19:0</td>
<td>1:27:5</td>
</tr>
<tr>
<td>4</td>
<td>1:36:0</td>
<td>1:45:0</td>
<td>1:54:0</td>
<td>2:03:0</td>
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<tr>
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<td>8:39:0</td>
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<td>10:31:0</td>
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<td>13:18:0</td>
<td>13:34:0</td>
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<tr>
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<td>15:46:0</td>
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<tr>
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<td>16:55:0</td>
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</tr>
<tr>
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<tr>
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<td>22:50:0</td>
<td>23:10:0</td>
<td>23:30:0</td>
</tr>
</tbody>
</table>
In the Snow
for string trio

Jordan Dykstra (2018)

Violin

Any pitch in between sounding diad

Perfect 5th

Perfect 5th

Perfect 5th

Perfect 5th

Perfect 5th

Perfect 5th

Perfect 5th

Perfect 5th

Perfect 5th

Slow

2nd time only

10"
Violin

2nd time only

Sounding

Viola

Violoncello

5/3 5/3 5/3 6/5 6/5 5/3 5/3

Major 6th  Major 6th  Major 6th  Minor 3rd  Minor 3rd  Major 6th  Major 6th

-14c  -14c  -14c  +2c.  -14c  +2c.  +2c.

+2c. +2c. +2c.  -14c -14c +2c. +2c.

5 5 5

5/3 5/3 5/3 6/5 6/5 5/3 5/3

Minor 3rd  Minor 3rd  Major 6th  Major 6th

-14c  -14c  +2c.  +2c.

+2c. +2c. +2c.  -14c -14c +2c. +2c.

5 5 5

6 6 6

12 12 6

6 6 6
Sustain pitch (stop glissing) once viola/cello diad begins.

Choose one diad then sustain:

- **Minor 7th** (7/4)
  - Interval: 7th
  - Tuning: -31c.
- **Augmented 4th** (7/5)
  - Interval: 7th
  - Tuning: -31c.
- **Augmented 2nd** (7/6)
  - Interval: 7th
  - Tuning: +2c.
## In the Snow
*Jordan Dykstra (2018) for string trio*

<table>
<thead>
<tr>
<th>String</th>
<th>Soundings</th>
<th>Violin (2nd time only)</th>
<th>Viola</th>
<th>Cello</th>
</tr>
</thead>
<tbody>
<tr>
<td>Violin</td>
<td>(3/2)</td>
<td></td>
<td></td>
<td>: = , = , = , = , = , = , = , = , =</td>
</tr>
<tr>
<td>Viola</td>
<td>(5/3)</td>
<td>5 , 5 , 5— — — — — — — — — —</td>
<td>5— — — — — — — —</td>
<td>6 , 6 , 6 , 8 , 8— — — — — — — —</td>
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<tr>
<td>Cello</td>
<td>(2/2/2)</td>
<td>2 , 2 , 2 , 2 , 2 , 2 , 2 , 2</td>
<td>2 , 2 , 2 , 2</td>
<td>4 , 4 , 4 , 4 , 4</td>
</tr>
</tbody>
</table>

Sounding:
- **Violin (2nd time only)**: (12x)
- **Viola**: (12x)
- **Cello**: (12x)

**Sounding**:
- (3/2)
- (5/3)
- (2/2/2)

**Soundings**:
- (3/2)
- (5/3)
- (2/2/2)
In the Snow
Jordan Dykstra (2018)
for string trio

Diad and Symbol Key

Diad Key
These diads are just intoned intervals executed with natural harmonics on the G string with partial numbers in box above notated finger placement.

Symbol Key
2, 6, 5
E.g. second, sixth, fifth natural harmonic on G string
= any pitch sounding in between the viola/cello diad
, short pause (~3")
, long pause (~10")
— sustain (until next event)
/> glissando

Last updated: 2018.01.10
A Known Unknown

Jordan Dykstra

for grand piano, percussion, and electronics

Val Verde, CA (August 2016)
Instrument and Accessory List

1. **Musician 1** plays grand piano. They will also need an EBow and a wedge for the sustain pedal.
2. **Musician 2** plays percussion. They will need the following: crotales, 3 or more additional pitched metal objects (e.g. cymbals, triangles, vibraphone bars, bell etc.) with soft and medium density rubber mallets, 3 or more non-pitched objects (e.g. woodblocks, small/medium/large stones, shaker, etc.), 3 or more resonators of different sizes (e.g. drum heads, buckets, bowls, etc.), 3 or more bowls of grains (e.g. rice, corn, beans, teff, etc.), 1 or more plastic bags, small to large Super Balls, and 1 well-rosined double-bass bow. Additional percussion instruments may be added to this list.
3. **Musician 3** plays electronics. They will need the following: a computer with noise and sine-tone generating capability, a loudspeaker system for playback, and a portable radio. A video projection showing slowed images of space (e.g. Philae lander, Rosetta spacecraft, 67P/Churyumov–Gerasimenko comet, etc.) may also be used during a live performance.
   I. The performer in charge of electronics is also responsible for the tasteful application of granular synthesis to aspects of the “unknown” sections.
      (1) In a recording situation: Granular synthesis should be added in post-production and applied to a field recording. The field recording should be created (anywhere in the world) exactly during the time of the studio recording of *A Known Unknown*. It should then be added to the recording session but audible only during the “unknown” sections.
      (2) In a live performance situation: Granular synthesis should be added and processed in real-time via a live-miking of the room and/or specific instruments and objects. This should be calculated carefully beforehand through the use of digital automation.
Performance Notes

1. *A Known Unknown* attempts to sonically represent celestial events, thus treating all sounds as moments within physical boundaries. Because the subject matter which the sounds represent is always moving, no sound should ever be perceived as stagnated, nor accented, and thus *inevitably* overlapping in a fluid manner. These parameters will result in sounds that react, morph, die, and birth new events.

2. Dynamics:
   I. The dynamic in the “unknown” sections is relative to the celestial event choice and interactions of that event with other events. In general, each performer should be mindful of one another but play with a sense of independent determination. The added granular synthesis should be folded tastefully into the ensemble’s sound, never overpowering the acoustic nature of the texture as a whole.
   II. The dynamic in the “known” sections is medium to loud, but—realizing that as the microtonal interactions are the main focus—a balanced sound is needed. For this section it is recommended to place the crotales further away from the audience so the piano’s EBow sustain (which is very quiet) will not be overpowered. An additional set of crotales may be used to ease this transition.

3. Choosing your celestial event(s) during the “unknown” sections:
   I. For each section the performers may choose any one celestial event or a number of celestial events (e.g. a pianist may choose to delegate their left hand as a star and their right hand as a planet, of course in this scenario the right hand will “orbit” around the left) while making sure each celestial event is acutely aware of its surroundings. Although surroundings in space are often vast expanses of imperceivable “nothingness”, this does not necessarily equate to silence as even the subtle forces of physics apply everywhere in the observable universe.
   II. Performers should feel comfortable allowing their celestial event to morph into another celestial event if they notice circumstances have altered the fundamental definition of your event (e.g. a stellar nursery may morph into a star, a star may morph into a planet, a planet may morph into a moon, a moon may have an impact event with a planet, etc.).

4. Performing the “known” sections:
   I. Each bar represents 1 minute of time. All entrance and exit times are in boxed text.
   II. Musician 1 (grand piano) is given 2 different performance instructions:
       (1) Sustain a pitch by placing the EBow on both string edges of a tri-chord note. Once the EBow has been placed and is switched on, press the sustain pedal for the duration of the activity.
       (2) Pluck the piano string with the sustain pedal wedged down.
   III. Musician 2 (percussion) is given 2 different performance instructions regarding crotales:
       (1) Sustain by bowing a selected crotale.
       (2) Strike a crotale with a medium-density rubber mallet.
   IV. Musician 3 (electronics) is given 2 different performance instructions:
       (1) Sustain a sine-tone, which should begin and end with a 6-8 second fade in/fade out.
(2) Create a sine-tone glissando from one pitch to another. The production of the sine-tone should follow a natural frequency-based linear algorithm (e.g. if you move from 400 Hz to 500 Hz over 100 seconds, 440 Hz should sound at exactly 40 seconds). Glissandi should begin and end with a 6-8 second fade in/fade out.
Form

*A Known Unknown* is divided into 5 12-minute sections with each section divided into 2 subsections: parts *a* and *b*. In part *a* one finds the “unknowns” and in part *b* one finds the “knowns”. Here, an “unknown” is defined as a section of guided improvisation where players sonify a celestial event’s attributes and thus potential interactions with one another. In contrast, a “known” is defined here as a section of detailed through-composed music where players sonify their instrument’s interaction with space-time.

While the piece begins and ends with silence, the middle form follows a back-and-forth between the “unknowns” and the “knowns”. Transitions between the sections should be minimal and periods of silence before and after the “known” sections are okay.

<table>
<thead>
<tr>
<th>action/section</th>
<th>enter-exit</th>
<th>duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>syncing of stopwatches, silence</td>
<td>0’-1’</td>
<td>1 minute</td>
</tr>
<tr>
<td>Section 1a (<em>Unknown</em>)</td>
<td>1’-5’</td>
<td>4 minutes</td>
</tr>
<tr>
<td>Section 1b (<em>Known</em>)</td>
<td>5’-13’</td>
<td>8 minutes</td>
</tr>
<tr>
<td>Section 2a (<em>Unknown</em>)</td>
<td>13’-18’</td>
<td>5 minutes</td>
</tr>
<tr>
<td>Section 2b (<em>Known</em>)</td>
<td>18’-25’</td>
<td>7 minutes</td>
</tr>
<tr>
<td>Section 3a (<em>Unknown</em>)</td>
<td>25’-31’</td>
<td>6 minutes</td>
</tr>
<tr>
<td>Section 3b (<em>Known</em>)</td>
<td>31’-37’</td>
<td>6 minutes</td>
</tr>
<tr>
<td>Section 4a (<em>Unknown</em>)</td>
<td>37’-44’</td>
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<td>57’-61’</td>
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<td>silence</td>
<td>61’-62’</td>
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“Unknowns”: Interactions Between Celestial Events

List format:

1. Event Name - formal definition of celestial event.
   1. Abstract of main musical idea.
      (1) Specific musical equivalent and performance suggestion #1.
      (2) Specific musical equivalent and performance suggestion #2.
      (3) Specific musical equivalent and performance suggestion #3.

   1. Gravity, p. 7
   2. Stellar Nursery, p. 8
   3. Star, p. 9
   4. Planet, p. 10
   5. Moon, p. 11
   6. Pulsar, p. 12
   7. Quasar, p. 13
   8. Constellation, p. 14
   9. Nebula, p. 15
  10. Impact Event, p. 16
1. **Gravity** - *the force that attracts a body toward the center of the earth, or toward any other physical body having mass.*

   I. A subtle growth/decrease in amplitude and/or pitch range.
   (1) A glissando toward another sounding pitch/texture.
   (2) A crescendo toward another celestial event, perhaps decrescendo-ing once *contact* has been made.
   (3) Or something else entirely…

II. For percussion, use gravity to produce sounds and textures.
   (1) Dropping small grains/pebbles onto a resonator from a short distance (a few cm), a medium distance (up to 1/3 of a meter), or a large distance (up to a meter).
   (2) Pouring water from one vessel into another.
   (3) Allowing a plastic bag to fall to the ground.
   (4) Or something else entirely…
2. **Stellar Nursery** - where stars are born; a type of interstellar cloud, the density and size of which permit the formation of molecules.

I. A situation where small-to-large gaps (e.g. intervals) in pitch/rhythm close in on themselves, resulting in a single tone/pattern.
   (1) Two distinctly different pitches that move inward toward one another, resulting in a single, unwavering pitch (a star).
   (2) Two distinctly different rhythms that move inward toward one another, resulting in a single, unwavering rhythm (a star).
   (3) Or something else entirely…

II. Very large expanses of star-stuff (pitches) that are unable to sustain and result in very short fragments (or molecules) of micro-tones, many imperceivable.
   (1) A burst of noise.
   (2) A single grain thrown against a resonator.
   (3) Pre-verb added to any sound.
   (4) Or something else entirely…

III. Very infantile rhythm and tones (extremely low, extremely quiet, and/or extremely noisy).
   (1) Scraping a piano string softly on the lower register.
   (2) Extremely soft and low register sine-tone pitches with added noise.
   (3) Softly rubbing a bass-drum head/cymbal/gong with a large Super Ball.
   (4) Random strikes on a percussion instrument portraying a non-perceivable rhythm.
   (5) Very quiet and equalized band of radio-waves that borders on the spectrum of pitch/noise.
   (6) Or something else entirely…
3. **Star** - a fixed luminous point in the night sky that is a large, remote incandescent body like the sun.

   I. A fixed (still and constant) reference point used for the determination and placement of self.

      (1) A single, unwavering pitch or rhythm with dynamic nuances dictating a movement of proximity (e.g. closer or further away). Keeping in mind that because the hottest stars die young, the higher the pitch the higher of likelihood of a “star death” (e.g. silence or the absence of sound).

      (2) An EBow drone on a relatively high pitched piano string with added soft plucking of yet even higher pitched strings.

      (3) Bowing a cymbal or crotale at a steady pace.

      (4) Or something else entirely…”

   A Known Unknown, p. 9
4. **Planet** - a celestial body moving in an elliptical orbit around a star (THUS: there cannot be a planet without a star).

I. Since planets revolve around stars they may be thought of as having a pitch (melodic or harmonic) or rhythmic relationship to the star they are revolving around.

   (1) If a star is sounding a pitch—and depending upon how far from that star a player perceives their planet to be—their planet could perhaps take the form of a partial of that star’s pitch. For instance, if the star is sounding a tone at 1000 Hz, a planet very near in relation to that star may sound the 2nd partial (2000 Hz) or 3rd partial (3000 Hz) while a planet much further away might sound the 293rd partial (293,000 Hz). The harmonic series in reverse, or sub-harmonic series, could also aptly entertain this idea.

   (2) If a star is sounding a rhythm—and depending upon how far from that star a player perceives their planet to be—their planet could perhaps take the form of an elongation of the original rhythm (stretching time linearly) or perhaps a distant echo of the original rhythm (quieter and delayed).

   (3) Atmospheric noise.

   (4) Or something else entirely…
5. **Moon** - the natural satellite of the earth (or any planet), visible (chiefly at night) by reflected light from the sun (or its nearest star). The moon is always in a phase in relation to its star and to its planet (THUS: there cannot be a moon without a planet).

I. The shape of a moon will depend upon its planet’s influence and, in addition, its planet’s influence will depend upon its star’s influence. Another way of putting it: stars influence planets and planets influence moons. Thus, if you take the form of a moon you will be tonally and rhythmically influenced by your planet; the same systematic parameters a star/planet relationship has should be applied to a planet/moon relationship.

1. Tonal, if your planet is sounding 100 Hz a moon might sound exponentially lower in frequency, depending upon its perceived location, *perhaps* at 50 Hz.
2. Dynamically, if your planet is sounding 100 dB a moon might sound exponentially quieter, depending upon its perceived location, *perhaps* at 50 dB.
3. Rhythmically, if your planet is sounding at 100 bpm a moon might sound exponentially slower, depending upon its perceived location, *perhaps* at 50 bpm.
4. Or something else entirely…
6. **Pulsar** - a celestial object, thought to be a rapidly rotating neutron star, that emits regular pulses of radio waves and other electromagnetic radiation at rates of up to one thousand pulses per second.

I. Predetermined: Create a steady and periodic pulse of sound or noise for some time before fading out.
   (1) A note or plucked string on the piano.
   (2) Two small/medium/large stones periodically tapped together.
   (3) A burst of noise.
   (4) Or something else entirely…
7. **Quasar** - A massive and extremely remote celestial object, emitting exceptionally large amounts of energy, and typically having a starlike image in a telescope. It has been suggested that quasars contain massive black holes and may represent a stage in the evolution of some galaxies.

I. A cluster of soft high-frequency sounds (noise with a low-pass filter and/or high-pitched tones) that spread evenly in all directions from its core (a bit like the opposite of a Stellar Nursery).
   1. A noise-band filter, spreading from a single band into a large spectrum.
   2. A single tone—the fundamental—that grows throughout the harmonic series.
   3. A large cymbal or gong placed in the distance, sustained for a very long time.
   4. A steady stream of pebbles or grains dropped into a bucket of water.
   5. Or something else entirely…
8. **Constellation** - a group of stars forming a recognizable pattern that is traditionally named after its apparent form or identified with a mythological figure. Modern astronomers divide the sky into eighty-eight constellations with defined boundaries.

I. A grouping of stars which are, for our purposes, defined as single unwavering pitches or rhythms with a noticeable form. Subtle dynamics should be applied to inner/outer movement.

(1) If there are many tonal stars: *perhaps* a chord.
(2) If there are many rhythmic stars: *perhaps* a polyrhythm.
(3) If there are many noisy stars: *perhaps* a band of noise.
(4) Or something else entirely…
9. **Nebula** - a cloud of gas and dust in outer space, visible in the night sky either as an indistinct bright patch or as a dark silhouette against other luminous matter.

I. A cloud of clustered tones or noises.
   (1) A handful of fine grains dropped onto a resonator.
   (2) A glissando on the strings inside a piano.
   (3) A noisy hiss that grows and then dissipates.
   (4) Or something else entirely…

II. An active participant in the change of perception.
   (1) An influence on sound in terms of a color change from bright-to-dark or dark-to-bright.
   (2) An influence on sound in terms of a dynamic change from loud-to-soft or soft-to-loud.
   (3) An influence on sound in terms of a rhythmic change from fast-to-slow or slow-to-fast.
   (4) Or something else entirely…
10. **Impact Event** - a collision between celestial objects causing measurable effects. Impact events have physical consequences and have been found to regularly occur in planetary systems, though the most frequent involve asteroids, comets, or meteoroids and have minimal impact.

I. An extremely small to medium sized mass of sound that slightly, yet noticeably, interacts with—and thus affects—the celestial event with which it has **collided**.
   1. A band of noise that crescendos toward another celestial event and, upon impact, alters the celestial event's stability (e.g. pitch, dynamic, amplitude). The impact event may not be perceived right way (e.g. a sonic boom) and may possibly take the form of an echo.
   2. Or something else entirely…

II. A devastatingly large and attention-grabbing sound situation that overwhelms the listener's perception. This sound should grow, peak, and then fade away with the following ratio: grow=3/10th, peak=1/10th, fade-away=6/10th.
   1. A tone or rhythm that begins imperceptibly and grows to an overwhelming dynamic.
   2. Or something else entirely…

III. *Perhaps* this event ends an “unknowable” section of guided improvisations.
“Knowns”: Interactions with Space-time

Section 1b: 5'-13' (8 minutes)
Crotales: Strike C#4 (sounding C#6) every 15 seconds

Piano: With the sustain pedal pressed down, pluck C6 every 15 seconds

Sine-tones:
5'-6': Fading in, sustain 1077.16 Hz (C#6 -50c)
6'-7': Gliss from 1077.16 Hz (C#6 -50c) up to 1108.73 Hz (C#6)
7'-9': Gliss from 1108.73 Hz (C#6) down to 1046.50 Hz (C6)
9'-11': Gliss from 1046.50 Hz (C6) up to 1108.73 Hz (C#6)
11'-12': Gliss from 1108.73 Hz (C#6) down to 1077.16 Hz (C#6 -50c)
12'-13': Sustain 1077.16 Hz (C#6 -50c) and begin fading out around 12:45
**Section 2b: 18’-25’ (7 minutes)**

Crotale: Sustain by continuously bowing C#4 (sounding C#6)

Piano: With the sustain pedal pressed down, pluck from F#5 up to C6 6 semitones ascending—once a minute, on the minute

Sine-tones: Fading in, gliss from 739.99 Hz (F#5) up to 1108.73 Hz (C#6), begin fading out around 24:45
Section 3b: 31’-37’ (6 minutes)
Crotales: Strike from D4 (sounding D6) up to C#5 (C#7)—11 semitones ascending—once every 30 seconds, on the minute and the 30” mark.

Piano: With the sustain pedal pressed down, pluck from D6 up to C#7—11 semitones ascending—once every 30 seconds, on the minute and the 30” mark.

Sine-tones: Fading in, gliss from 1174.66 Hz (D6) to 2217.46 Hz (D7), begin fading out around 36:45.
Section 4b: 44’-49’ (5 minutes)
Crotales: Sustain by continuously bowing A4 (sounding A6)

Piano: With the sustain pedal pressed down…
44’-45’: Pluck from A6 up to B6, 1 semitone per 20”—A6 at 44:00, A#6 at 44:20, B6 at 44:40
45’-46’: Pluck from C7 down to A#6, 1 semitone per 20”—C7 at 45:00, B6 45:20, A#6 45:40
46’-47’: Pluck from G#6 up to A#6, 1 semitone per 20”—G#6 at 46:00, A6 at 46:20, A#6 at 46:40
47’-48’: Pluck from A6 3 times, once per 20”—at 47:00, 47:20, 47:40

Sine-tones: Fading in, sustain 1760.00 Hz (A6), begin fading out around 48:45

\[ A \text{ Known Unknown}, p. 20 \]
Section 5b: 57’-61’ (4 minutes)
Crotales:
57’-58’: Strike E4 (sounding E6)—down 3 semitones—to C#4 (sounding C#6) once every 15”
58’-59’: Strike C4 (sounding C6)—up 3 semitones—to D#4 (sounding D#6) once every 15”
59’-60’: Strike E4 (sounding E6)—up 3 semitones—to G4 (sounding G6) once every 15”
60’-61’: Strike G#4 (sounding G#6)—up 3 semitones—to B4 (sounding B6) once every 15”

Piano: With the sustain pedal pressed down…
57’-58’: Pluck E6—down 3 semitones—to C#6 once every 15”
58’-59’: Pluck C6—up 3 semitones—to D#6 once every 15”
59’-60’: Pluck E6—up 3 semitones—to G6 once every 15”
60’-61’: Pluck G#6—up 3 semitones—to B6 once every 15”

Sine-tones:
57’-58’: Fading in, gliss down 4 semitones from 1318.51 Hz (E6) to 1046.50 Hz (C6)
58’-61’: Gliss up 12 semitones from 1046.50 Hz (C6) to 4186.01 Hz (C8), begin fading out around 60:45
The Toy Universe
JORDAN DYKSTRA (2018)

for violin, cello, electric guitar, vibraphone, an auxiliary quartet, and live-mixing of noisy electronic sounds through a circular array of 12 speakers

for Ordinary Affects

First performance March 26, 2018, Beckham Hall, Wesleyan University, Middletown, CT
“The purpose of this Toy Universe is to show, in a simple way, how the ideas of geometry, force, dimension, and particle interrelate to build a profound worldview. This Toy Universe is worth examining because it is rich in insights. But it is only one example of how to build a Toy Universe [...] This Toy Universe is not a flight of fantasy; its Toy Predictions are falsifiable by experiments in the real universe. Because to learn from a Toy Universe; it must be breakable in the real universe.”

THOMAS NEIL NEUBERT
A Toy Universe (2013)
PERFORMANCE NOTES for *The Toy Universe*

Duration: 61:00

**Instrumentation:** 2 groups and a Conductor

**GROUP 1: Time-Space Ensemble**
Player 1 - violin
Player 2 - cello
Player 3 - electric guitar (with Ebow and slide)
Player 4 - vibraphone (with a pair of hard and soft mallets, 2 bows)

**GROUP 2: Fragrant Noise Ensemble**
Players 5-8 - an energy chime in A, a metal bowl of potpourri\(^1\), and a large stone

**CONDUCTOR**
Player 9 - live-mixing of 12 unique pre-recorded noise sound sources with playback through a circular array of 12 individually controlled speakers

---

\(^1\) The potpourri should consist of a unique, carefully selected, and delicate combination of sweet and savory fragrances such as citrus peels, flowers, herbs, spices, oils, etc.
Stage Layout:
Through careful stage layout, *The Toy Universe* is set. GROUP 1, the *Time-Space Ensemble*, sits closely together in the center of the stage, all facing the same direction. Surrounding them is an array of 12 speakers which are controlled through a mixing board at the Conductor Station. The audience is seated surrounding the speakers. GROUP 2, the *Fragrant Noise Ensemble*, sits spread out on the outskirts of the stage, ideally unseen but close enough for the sounds and fragrances to reach the audience.
Directions for GROUP 1:
When sound emerges from one of the 12 speakers, GROUP 1 plays the corresponding cue in the score for that speaker. The 12:00 cue for GROUP 1 is silence. The score acts mainly as a guide for a morphing of overall density and harmonic space with the arrows indicating pitch direction only (no glissando). The pitch content for the entire group is only given 4 times (1:00, 3:00, 6:00 and 10:00), all other times the pitch material is open and microtonality is encouraged. All players are given a boxed “DENSITY” marking on a stave above their part which indicates the duration of events versus the seconds in between the event. Finally, all players act independently, with medium dynamics throughout.

Directions for GROUP 2:
GROUP 2 sits equidistance from one another yet somewhat far away from the audience, ideally unseen. GROUP 2 mainly follows two directions:
1) Every 15 minutes: continuously strike the energy chime for 1 minute per player, orbiting through the group with some overlapping, and
2) Every 20 minutes: rub a large stone in the metal bowl of potpourri, creating a fragrant noise.
During the time when GROUP 2 is not performing these 2 actions, they will be silently peeling citrus fruits, adding the peels to the potpourri mixture. At the 60’ mark, GROUP 2 ends the piece with a combination of both actions: a 1’ sustain of their fragrant noise mixed with striking of the energy chime.

Directions for the CONDUCTOR:
With varied pacing, the Conductor goes through the score 5 times, yielding 5 unique iterations each different durations (for instance, at the premiere the durations were 10’, 5’, 7’, 26’, 12’).

Technological note for the Conductor:
All 12 speakers should be of similar make and model (if not identical) and placed on stands. There needs to be a variety in the sound sources for playback (i.e. tape players, cd players, synthesizers, radios, digital sources, etc.). The sounds themselves should consist of generally noisy and static textures (radio static, brown/white/pink/grey/violet/blue noise, static stone texture, reverse-biased diodes, etc.). Finally, when live-mixing through the score, slow crossfades are desired.
The Toy Universe

Medium dynamics throughout
All players always acting independently
Arrows indicate pitch direction only [no glissando]
Use given pitches as a guide for pacing, all other times the pitch content is open and microtonality encouraged
DENSITY = duration: frequency (duration of event vs. seconds in between events)

Jordan Dykstra (2018)
### THE TOY UNIVERSE by JORDAN DYKSTRA: timeline score for CONDUCTOR

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# THE TOY UNIVERSE by JORDAN DYKSTRA: timeline for the Fragrant Noise Ensemble

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<td></td>
<td>Fragrant Noise (1')</td>
<td></td>
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<td><strong>4</strong></td>
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<td></td>
<td></td>
<td></td>
<td>peel fruit</td>
<td></td>
<td></td>
<td>Fragrant Noise</td>
</tr>
<tr>
<td><strong>Chimes (1')</strong></td>
<td>peel fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fragrant Noise (1')</td>
<td></td>
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</tr>
</tbody>
</table>

### Time Blocks:
- **30:00**
- **30:30**
- **31:00**
- **31:30**
- **32:00**
- **32:30 - 38:59**
- **39:00**
- **40:00**
- **41:00 - 44:59**
- **45:00**
- **45:30**
- **46:00**
- **46:30**
- **47:00**
- **47:30 - 58:59**
- **59:00 - 60:00**
- **60:00**
- **61:00**

**THE END**
15:00 - 16:00: chimes

19:00 - 20:00: peel fruit
20:00 - 21:00: fragrant noise

30:00 - 31:00: chimes

39:00 - 40:00: peel fruit
40:00 - 41:00: fragrant noise

45:00 - 46:00: chimes

59:00 - 60:00: peel fruit
60:00 - 61:00: fragrant noise and chimes
The Toy Universe
by Jordan Dykstra
PLAYER 2

15:30 - 16:30: chimes

19:00 - 20:00: peel fruit
20:00 - 21:00: fragrant noise

30:30 - 31:30: chimes

39:00 - 40:00: peel fruit
40:00 - 41:00: fragrant noise

45:30 - 46:30: chimes

59:00 - 60:00: peel fruit
60:00 - 61:00: fragrant noise and chimes
The Toy Universe
by Jordan Dykstra

PLAYER 3

16:00 - 17:00: chimes

19:00 - 20:00: peel fruit
20:00 - 21:00: fragrant noise

31:00 - 32:00: chimes

39:00 - 40:00: peel fruit
40:00 - 41:00: fragrant noise

46:00 - 47:00: chimes

59:00 - 60:00: peel fruit
60:00 - 61:00: fragrant noise and chimes
The Toy Universe
by Jordan Dykstra
PLAYER 4

16:30 - 17:30: chimes

19:00 - 20:00: peel fruit
20:00 - 21:00: fragrant noise

31:30 - 32:30: chimes

39:00 - 40:00: peel fruit
40:00 - 41:00: fragrant noise

46:30 - 47:30: chimes

59:00 - 60:00: peel fruit
60:00 - 61:00: fragrant noise and chimes