

## **Sounding Loops and Instances of Discourse: Sonic Mass in Motion**

In 1899, German Physicist Max Planck theorized the natural unit known as the Planck length. At the time, this discovery singlehandedly tied together several gaps in our understanding of the quantum world thereby setting in motion a series of research practices that eventually led to the development of string theory (Burgess 2007). String theory posits that the universe—that is, all matter—is comprised of impossibly small strings that resonate at different frequencies. These one-dimensional strings account for the entire catalog of all elementary particles and therefore constitute the most fundamental building block of material life. In the end if you add all of these strings' frequencies together and mix them together, what you're left with is the viral, internet-baiting meme that that the universe is 'tuned' in some way to the frequency of approximately 432 Hz. This tone finds its own sort of epistemic resonance through our own cultural and societal structures. Despite the rather problematic teleological implications of a universe being "tuned", a slew of anecdotal and experimental evidence—Schumann (electromagnetic) resonances, Tibetan bowl tunings, DNA rhythms, even conspiracy theories of governmental sonic warfare, to name a few—are pointed at to corroborate this universal tuning<sup>1</sup>. Ultimately this theory declares sound to be omnipresent, a static phenomena of the elusive ether we inhabit. This we are told is an

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<sup>1</sup> Additionally, these findings have inspired an entire genre of holistic medicine which focuses on the notion of *entrainment*: audible exposure to certain frequencies can induce different cognitive states.

unyielding constant tone; and its very existence precludes our perceptual latching onto it. Nevertheless, sound doesn't travel in space. Sound needs a medium through which to express itself and a receptor from which to be internalized, to be heard, to "vectorize some delimited space" (Ihde 2007). What we think of as free space is actually a chamber onto itself as our earth's atmosphere dictates the conditions from which sound can travel. The duality of sound as being transmitted from within to the outside, from some inner body to an exterior one, is problematic in this sense.

But the experience of sound is conducted within a seemingly closed system, within the confines of our perceptual structures, within what we might call our inner ear. We apprehend sound within this region yet it seems to come from outside of it, from what might be called the invisible ether of our existence. We experience sound transitively as a process, one that forms a resonance between an inner and outer modality. As David Chaim Smith writes, "Sound and hearing are mutually interdependent. Neither has independent existence, but both arise to reflect the uniqueness of the other" (Chaim 2010). To hear something is to verify it as an ontological entity, one that is transmitted outward from one chamber to another. Listening allows for this transference to take place. This dialectic between the inner and outer forms the basis for our experience of sound as a cognitive resonant structure. To listen to sound is to allow their "mutual interdependence" to play out in time and space (Chaim 2010). Not unlike the physical motion of sound waves, our cognition of sound oscillates between these two inner-outer modalities.

The oscillating strings of String Theory seem to suggest that the material world is synthesized from sound and that sound can be said to composite the most basic elements of life, that our universe's object-ness is an emergent process made manifest by these fundamental sound objects that are transmitted across different channels of reception. This text is an attempt to ground one of my installations, *HiveMind (2015)*, within such a framework, one that investigates the ways in which these networks of cognition, sound, and sonic synthesis can be embodied within a physical sound-based praxis.

### **Bowls as Nested Loops, Potential Energy Wells, and the Language of Discourse**

Like many other forms of art and design, pottery can be looked at as a bridge between utilitarian and aesthetic concerns. Bowls for instance call attention to their function by the very nature of their appearance. In a physical sense, they are chambers to hold material substance, a repository from which to possibly store, manipulate, and transport material goods. In this sense, they suggest potential in the form of their housing, their physically nested wells. And to place an object anywhere within the bowl is to intuit that that object will fall down the walls, eventually settling at the base of the well. Newtonian Classical Mechanics provides us with equations that relate two states, kinetic and potential energy, in terms of derivative force (e.g. position and velocity via acceleration). From the perspective of an object dropped into a bowl, its potential energy is converted into kinetic energy. In both instances, these equations forecast the bowls' inherent capacitance as repositories of oscillatory energies. This account of their motion in terms of energy

potential is an apt metaphor to relate the dialectics of sound as signifier and signified, inner and outer, language and discourse.

Emile Benveniste in his essay, “The Nature of Pronouns” (1971), attempts to describe the “referential organization” (grammatical implications) of using the word “I” or “You” as a speaker. His description mirrors the process of sound and hearing as he writes,

“*I* cannot be defined except in terms of “locution”, not in terms of objects as a nominal sign is. *I* signifies “the person who is uttering the present instance of the discourse containing *I*”...*I* can only be identified by the instance of discourse that contains it and by that alone” (218, Problems in General Linguistics)

In this phrasing, *I* is inherently recursive in that it refers to itself by creating an instance of itself. In fact, *I* can only be said to exist when it is verbally uttered; it can never be referred to outside of this context (Benveniste 1971). The adverbs *here* and *now* fall within a similar construction. Just like sound’s inherent ephemerality, evoking the word *now* only makes sense in the moment when it is spoken. Anytime thereafter, the reference to the *now* is lost forever; similarly, it can only be said to exist in the moment of its utterance. How perfect an example from which to apply to the nature of sound with its inviolable divergence, loss, and intangibility? *I/You* or *Here/Now* can be looked as linguistic proxies for the very thing that it can only signify in the process of speaking or the experience of listening. From a Saussurian perspective, *I* may be the signifier for the person who is *performing* the signified. Or is the signified/signifier perspective itself an endless loop that folds back onto itself to characterize the process?

Douglas Hofstadter in his book, “I am A Strange Loop”, argues that it is precisely this type of paradox that constructs our sense of self from the dense array of “active” symbols (‘neurological patterns’) that characterizes human consciousness (Hofstadter 2007). The *I*, for Hofstadter, is the symbolic representation of the neurological process that constitutes *I*. With this in mind, our linguistic development of an instance of I seems to be a logical consequence of grappling with our own (in)ability to self-identity. Hofstadter’s theory relies on the notion of the “strange loop”. He writes,

And yet when I say "strange loop", I have something else in mind — a less concrete, more elusive notion. What I mean by "strange loop" is [...] an abstract loop in which, in the series of stages that constitute the cycling-around, there is a shift from one level of abstraction (or structure) to another, which feels like an upwards movement in a hierarchy, and yet somehow the successive "upward" shifts turn out to give rise to a closed cycle. That is, despite one's sense of departing ever further from one's origin, one winds up, to one's shock, exactly where one had started out. In short, a strange loop is a paradoxical level-crossing feedback loop. (*I am a Strange Loop* pp. 101-102)

In short, a strange loop is a recursive process; it is not a static entity or object capable of apprehension at some instance. The loops are characterized by their transitive properties, their motion of moving in one direction and ending up where they began. The effect is uncanny and uniquely un-physical, un-intuitive.

Returning to the bowl metaphor, as a small spherical object is placed alongside one of the bowl’s inner walls, the object begins to rotate about the chamber. Due to the topography

of the inner bowl, the object is confined to move about the bowl's shape; the consequence of return is inevitable however the bowl or object is moved<sup>2</sup>. Without friction, Newtonian mechanics would see the object in perpetual motion, the ball being displaced to the opposite wall and returning to the point of its origin. Through this process, one begins to sense an imagined, constructed recurrence that invokes the "strange loop" insofar as it merges a physical analog world with Hofstadter or Benveniste's theoretical one. The bowls are at once a symbol of the recursive loop and a repository for the prospect for one to play out, to instantiate itself.

In this model, sound is only produced via the object's *friction* with the bowls. Friction is itself a type of dampening force that allows physical objects to slow down and eventually settle at rest. In this case, the process of friction literally creates the sound and yet the sound, the oscillation, is implied from the bowl's topology. From one perspective, the bowl's sound is epiphenomenal in the sense that it emerges from the physical reality of the conditions and yet the bowl's sound (in terms of oscillation) is immanent, only capable of being expressed upon this frictive provocation. This duality seems to bear a similar construction as Benveniste's I/You conundrum: the resonance created by this sound is a literal and symbolic instantiation of the bowls' object-ness and is a direct result of the physical loop. To put it another way, the vessels are physical wells of motile and sonic potential and to activate them—for example to sound them by *stridulating* them with some object—constructs this sound object-ness by declaring a "present instance of the discourse containing [them]"(Benveniste 1971). The bowls are therefore a

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<sup>2</sup> For comparison's sake a flat surface would see the ball moving infinitely in one direction away from the point of origin never to return.

placeholder, a proxy for their very meaning, which is only activated from instantiating them sonically. It is from this vantage point that I begin to discuss my own piece, *HiveMind* (2015) and the conceptual framework from which it is grounded.

### **HiveMind (2015): Nested loops as Instantiated Objects**



Figure 1: *HiveMind*(2015) at Pioneer Works - Brooklyn, NY. Please visit <http://www.nolanlem.com/installations/hivemind> to see video, audio, and other documentation of this piece

*HiveMind* (2015) takes the form of a kinetic sound installation whereby hundreds of ceramic bowls resonate in synchronicity by being pushed back and forth by motors at different speeds. As each bowl was handmade and contains a unique resonant frequency (e.g. “pitch”), small marbles are placed inside each vessel and can rotate freely about the

bowl. All of the bowls are placed on two wooden platforms<sup>3</sup> that are affixed to two motors that push the structure, displacing the bowls a length of approximately 0.75". As the motor's speed matches the natural rotational frequency of each bowl (that is, the speed at which the marble wants to rotate inside the bowl), the marble begins to rotate around the rim of the bowl at an increasing velocity, which has the effect of amplifying the output resonant frequency of that particular bowl. Because the bowls vary in size, different sounding bowls (and hence, frequencies) can be brought out to the auditor's perceptual fore by modulating the speed of the applied pushing motion.

Each bowl is constituted by a loop and one hierarchical level up, the platforms another. This system is a simple *coupled oscillator* in that the loops of the bowls are a function of the loops of the platforms. In the visual field, this creates "a shift from one level of abstraction (or structure) to another" and is visually demonstrative of the recursive loops Hofstadter discusses (Hofstadter 2007). Each bowl is a proxy for the sonic and visual loops that instantiates the here/now, I/you, signified/signifier, and inside/outside recursions. Much like the oscillating strings of our universe, each bowl can also be looked at as one agent within a larger, interconnected system from which sound is synergized and (ceramic) matter is instantiated.

During certain cycles of the installation, the motors will stop and the marbles within the bowls will come to rest along with the sound. The bowls become once again proxies for the sound potential of their being. As the motors start up again, the bowls' sound object-

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<sup>3</sup> The installation and 'reciprocating trays' were designed for a particular landing in the PioneerWorks gallery's stairwell.



ness is physically constructed in real-time as they begin to resonate and composite sonic mass. The title of the piece, *HiveMind*, recalls nested groups of cellular, neuronal formations such as the structures that comprise our brain's circuitry. One of Hofstadter's key points in his theory is his notion that "active symbols" are infinitely extensible (Hofstadter 2007). We seem to have an unparalleled ability to encapsulate, abstract, and recur preexisting symbols into ever more complex representations of those symbols. This concept not only mirrors the bowls as a coupled oscillator system but also is indicative of the perceptual model that the installation explores.

### **Textural Densification and Perceptual Stratification**

"The rainforest is like a world of coordinated sound clocks, an intersection of millions of simultaneous cycles all refusing to ever start or stop at the same point..."There are no discrete sounds to be heard. Everything is mixed into an interlocking soundscape"  
-Steven Feld "*Lift-Up Over Sounding*"

Anthropologist Steven Feld has devoted much of his research on the Kaluli tribe in Papua New Guinea. As a people, the Kaluli are highly attuned to their sonic environment in the rainforests they inhabit: much of their language, customs, rituals etc. identify with the sonic world more readily than their visual one. One aspect of their sound epistemology (their *acoustemology* as Feld has coined) is their "lift up over sounding" cosmology. In some ways, Feld's notion of an acoustemology was borne out of the Kaluli's need to survive in an area that is dominated by sound. Given that to navigate or make use of the forest, one must understand, locate, and interpret the sounds emanating from them, the "lift-up-over sounding" cosmology seems to be mediated by an overarching necessity to

survive. It is an understanding of sound that is grounded in the visceral physicality of their environment. As such the “lift-up over sounding” phrase uniquely describes both the ascription of sound into the visual (the temporal to the spatial) and vice versa. Feld describes two major components of the “lift-up over sounding” aesthetic:

1) One is part-relations that are simultaneously in synchrony while out of phase. “In synchrony” means that the overall feeling is of togetherness, of consistently cohesive part coordination in sonic motion and participatory experience. Yet the parts are also “out of phase” that is at distinctly different and shifting points of the same cycle of phrase structure at any moment with each of the parts continually changing (even competing) in degree of displacement from a hypothetical unison.

2) “ A second component concerns timbre, the building blocks of sound quality, and texture, the composite, realized experiential feel of the sound mass in motion. Timbre and texture are not mere ornaments; a stylistic core of “lift-up-over sounding” is found in nuances of textural densification — of attacks and final sounds; decays and fades, changes in intensity, depth and presence; voice coloration and grain; interaction of patterned and random sounds; playful accelerations, lengthenings, shortenings, and the fission and fusion of sound shapes and phrases (Feld 1997).

*HiveMind* can also be looked at as a large sonic system comprised of individual, synchronous sounding elements. Component 1 describes the out-of-phase/in-phase duality of the resonating bowls’ loops rather well by linking the distinct sounds produced by the individual bowls to the composite sound they invoke in tandem with one another. This is at the heart of what Feld describes when he relates the Kaluli notion of soundmaking as, “a constant textural densification constructed from a “lift-up-over

sounding” that is simultaneously in synchrony yet out of phase.”(Feld 1997). Even as individual sound elements ‘lift up’ over the environment’s canopy of sound, their acoustic territory is still demarcated against a backdrop of continuous sounding textures.

Within this *textural densification*, each bowl is a repository for sound that emanates its sound potential to the chamber of the bowl, which in turn is projected into the chamber of the stairwell in which it is housed. In this system there is a transfer of sound energy from within the vessel to the outer enclosed chamber of the stairwell to the chamber of the auditor’s inner ear. The effect is an amalgamation of hundreds of resonant bowl sounds that create a *stratification* of perceptual levels. The auditor is presented with changing densities of sound and can latch on to these different perceptual ‘strata’, which include micro and macro levels of awareness that point to multi-modal planes of directed attention. At the macro-level extreme, one hears the bowls’ sound as one continuous texture, perhaps as one instantiated sound object. On the other hand, the auditor can make out individual bowls’ sounds within the sonic field of all the others. These two extremes demarcate the boundaries that comprise this piece’s perceptual continuum, one that allows the auditor to traverse different acoustic thresholds.

Here we return once again to Planck and String theory and the universe’s fundamental tone. One of the more interesting implications of a “tuned” world is the notion that sound constructs the material world. If the universe is indeed comprised of a seemingly endless amount of loops, each contributing its tiny mix to the tone, then perhaps matter itself is synthesized by sound. Here we see the sound of the universe as “infinitely extensible” as Hofstadter’s theory of human consciousness, as existing on a seemingly endless array of

perceptual strata, micro-levels that mirror larger structures, structures that recur and fold back into endless loops (Hofstadter 2007). We have access to them insofar as we are mindful and maintain a distance, a curious attention to their “soundscape”—acoustically and otherwise—in which we live. As the 432 Hz drone continues to pervade our universe, always propagating outward, it sheds light on the way in which we as a culture understand sound. It reflects our constantly shifting *acoustemology*, one that sees an interplay of divergent fields of discourse. As these ideas continue to influence my own work, I’m interested in the ways in which sound-based art can reflect sound’s immanence on this level, one that merges our personal awareness with alternative modes of sonic cognition, attention, and perception.

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