

N o l a n L e m



for more information: www.nolanlem.com

I create dynamic acoustic systems that render sound and movement through various forms of mechanical intervention and systems of control. Guided by biologically-inspired forms of self-organization and collective behavior, 'swarms' of distributed sound objects feature prominently in my sculptural work. My compositional process is often influenced by experimental studies related to music cognition and psychoacoustics where I examine human sensorimotor synchronization in the concert hall, public space, and the natural world.

I am interested in the notion of the "technological macabre," a Lynchian juxtaposition of surreal and sinister elements with the everyday, accomplished through the animation of both found and repurposed cultural objects. I frequently engage in the design of kinetic objects at scale, linking them together through a variety of algorithmic approaches to generate output behaviors, rhythmic states, and naturalistic soundscapes that touch on topics such as automata and AI, sound fetish, and movement disorders.

Nolan Lem is an artist and researcher whose work reflects a broad range of influences and mediums particularly those related to sound and kinetic motion. His work focuses on the dynamics of emergent systems, machine intelligence, and the synchronization of auditory phenomena.

He has premiered his work and research at a number of diverse spaces including the Museum of Modern Art Buenos Aires (MAMBA), Pioneer Works (Brooklyn), L'HOSTE Art Contemporain (Arles, FR), and the Danish National Museum of Music (Copenhagen, DK). He has held residencies at IRCAM, MassMoCA, Cité Internationale des Arts, and the Bemis Center for Contemporary Art. As a jazz saxophonist, he has released two albums under the CAM Jazz label with his collective "El Portal".

He holds degrees in saxophone performance, Electrical Engineering, and received his MFA at Columbia University where he studied at the Computer Music Center. In 2020, he was a Danish Fulbright Scholar where he worked with the Sound and Music Computing group at Aalborg University Copenhagen. Nolan received his PhD from Stanford University where he studied at the Center for Computer Research in Music and Acoustics (CCRMA). He is currently a Post-Doctoral fellow at the Department of Applied Acoustics at Chalmers University in Gothenburg, Sweden.



Gallery Riises Landsted. Copenhagen, Denmark

Double-Blind (2023)

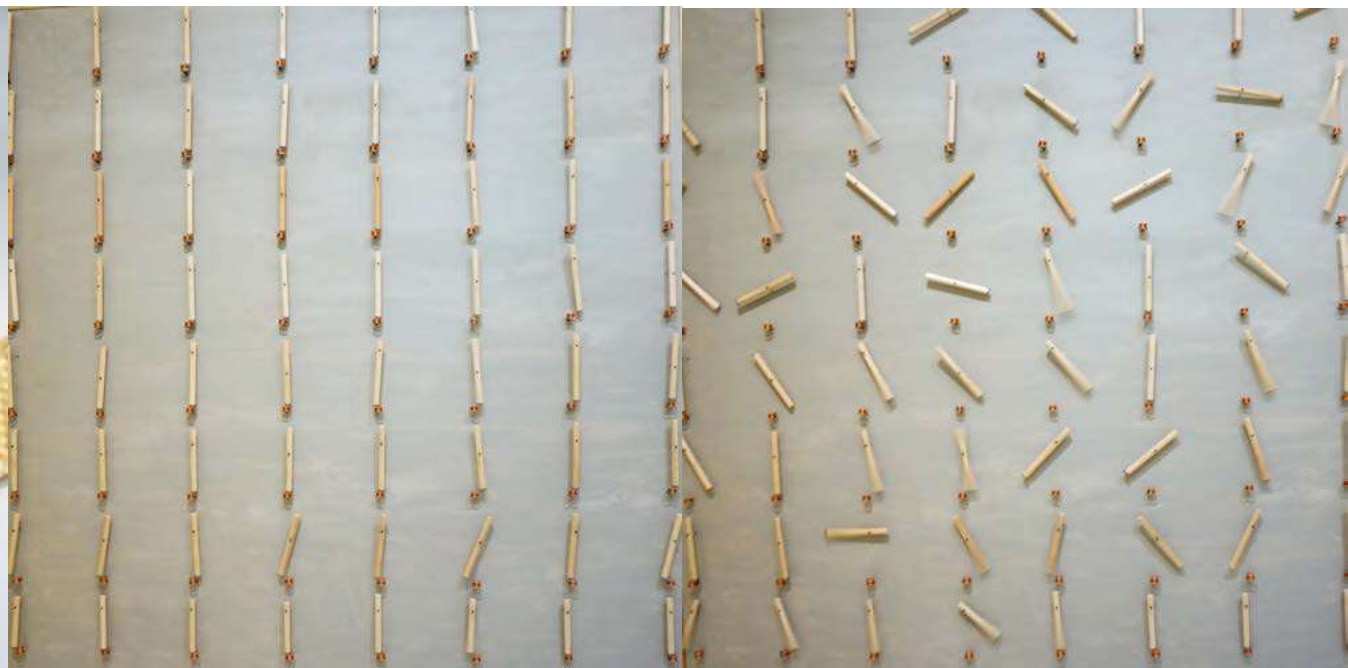
Window blinds, mechanical components, river rocks, sensors, custom electronics, speakers, motors, audio cable

Window blinds oscillate as they respond to the motion of reciprocating offset weights. Their dances seem intelligent and playful, yet at times, they take on a more dramatic and almost agonizing quality. The sound is comprised of (hundreds of) layered sounds of window blinds being gently stroked. Sensors embedded into the base track the movement of the blinds and apply filtering processes to these sound that seem to approximate the sound of splashing water.

<https://vimeo.com/8740918>



eks rummet gallery - Copenhagen, Denmark



surface tempi (2022)

1.5 m x 1.5 m

electromagnetic solenoids, magnets, custom designed circuits, wood, paint

A large surface containing 64 electromagnetic pendulums that can be triggered and allowed to self-resonate. Coupling occurs across the magnetic pendulums and visual and auditory patterns synchronize and devolve to create dense swarms of sound that recall flocks of birds or schools of fish in migratory formations. This piece was created in conjunction with other oscillatory pieces in which objects are incited into motion based off of their form and surface deformations.

<https://www.youtube.com/watch?v=IUg8T152WAE>



eks rummet gallery - Copenhagen, Denmark



surface rhythm studies (no.2) (no.3)

1 m x 1 m, 2m x 0.2 m

CNC topographical surfaces, motors, river rocks, marbles, wood, mechanical elements

These series of pieces focus on the expression of rhythm intrinsic to various surfaces and sedimentary objects that often remain latent, dormant, and unvoiced and yet possess evocative power, an idea that touches on many aspects of animism in the classical Chinese folk religions associated with 'Qi'. Wooden platforms designed by the artist using computer aided processes were cut with a CNC machine and were engineered to house the oscillatory motion of round river rocks sourced from the Danish coastline. The rocks' surfaces smoothed and rounded by millions of years of kinetic interaction, are placed on these platforms and reciprocating, their playful dance in many ways a reflection of the ways in which time has shaped their exterior form.

<https://www.youtube.com/watch?v=nhBvGSCv1I>

<https://www.youtube.com/watch?v=AQz69tO3LQw>



surface rhythm studies (no.4)

1 m x 0.5 m

CNC topographical surface, motor, marbles, wood, mechanical elements

Another topographical surface that houses marbles that roll about CNC milled relief wells. This piece examines the *surface rhythms* that emerge when spherical objects are literally resonated in sympathy with external rotary motion from an offset weighted motor located underneath the surface. Auditory and visual motion is induced depending on the pushing frequency and light swarms of sound emerge when this resonance is achieved between the marbles and the reciprocating surface.

<https://www.youtube.com/watch?v=BJgG108Niao&t=2s>



eks rummet gallery - Copenhagen, Denmark



surface rhythm studies (no.1)

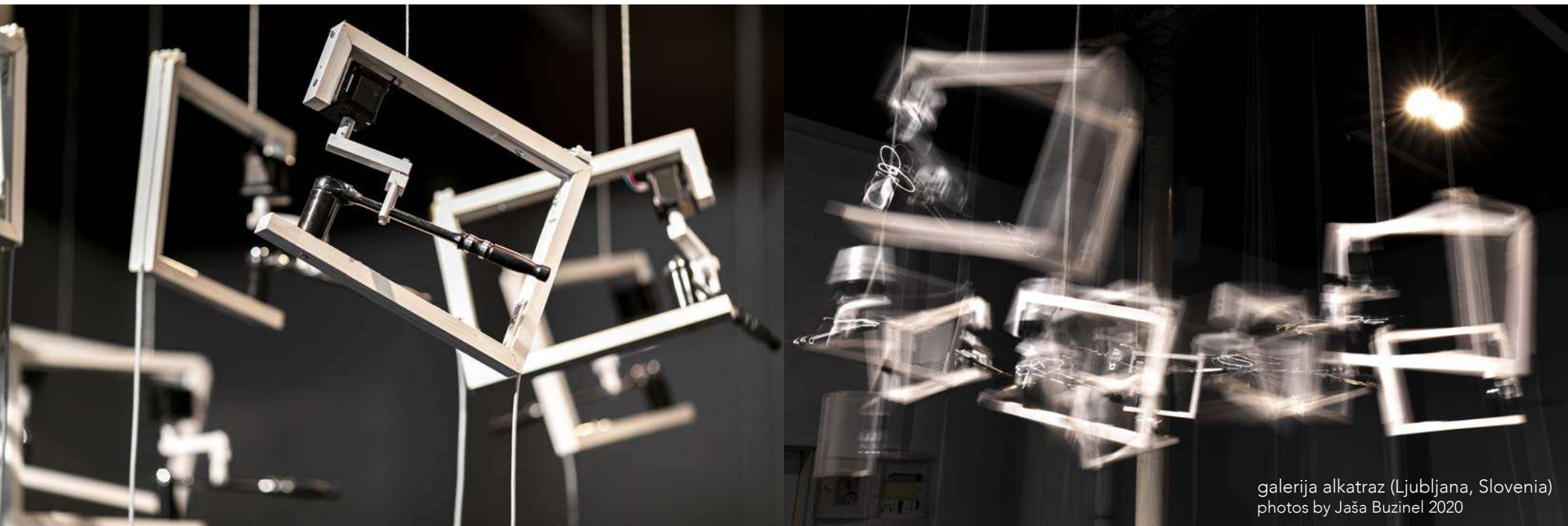
0.25 m x 0.25 m

CNC topographical surface, motor, marbles, wood, mechanical elements

This smaller topographical surface is reciprocated to explore the self-organizing oscillatory motion of ensembles of marbles that roll about its surface. Depending on the day of the installation, this piece featured either a single or multiple marbles to show the complex trajectories of motion induced by simple reciprocating motion from this smooth but uneven topographical map. Sound emerges from the marbles confrontation with one another and the automation and form of the sculpture calls to mind the abstract logic of board games and puzzles.



<https://www.youtube.com/watch?v=T4pFZ113LPY>



galerija alkatraz (Ljubljana, Slovenia)
photos by Jaša Buzinel 2020

in praise of idleness (2020)

socket wrenches, wood, metal, motors, mechanical components, electronics, microcontroller

This site-specific sculpture uses swarm robotics to drive and control the sonic behavior of nineteen large socket wrenches that self-organize and de-evolve to construct various formal configurations and polyrhythmic patterns. Evoking the rich, ambient landscapes of stridulating insects, metronomes, or clocks, the sound of each "tick", "tock", or "click" from each *tourneage mécanique* acts as an audio-visual symbol linking mechanical labour and work with the passage of time.

In order to choreograph this sculpture's output, several behaviorally-intelligent swarming algorithms were used to mimic the collective rhythms of biological swarms, the result being a cooperative and procedural synchronisation of movement and sound that is realized through the wrenches' "sound(s) of their own making", a reference to Robert Morris's seminal piece of a similar title. In this algorithmic form, one that defies facile categorization as determinate or indeterminate, this kinetic sculpture is a sonic realization of physical labour being simultaneously performed by both human and machine. Taken as a whole, these orchestrated behaviors point to the ways in which simple mechanical repetition en masse can create a perceptual continuum of rhythm to noise through a process of constructive accumulation and concatenative aggregation.

https://www.youtube.com/watch?v=68sq2jm_WCw



menagerie (2019)

3D printed parts, plastics, motors, cables, electronics, microcontroller

Inspired by the collective behaviors associated with biological swarms, this piece repurposes the deconstructed gun trigger as an autonomous sound object to evoke the repetitive nature of gun-related violence. Using data taken from occurrences of gun related violence from each US state, the 50 triggers are subject to various self-organizing and behavioral algorithms where they align, synchronize, and devolve to generate highly emergent and polyrhythmic patterns in their wake.

Positioned in the glass enclosure like a flock of birds, the triggers call to mind the taxonomical habitats often displayed in menageries and natural history museums. The kinetic mechanism itself problematizes the nature of intention and premeditated action associated with gun violence where the act of "pulling the trigger" has taken on an autonomous role independent of human engagement and volition. By interrogating the cultural anxieties surrounding firearm ownership, this installation points to a future in which technology, automatization, and a persistent military-industrial complex have created the ideal habitat from which these mechanisms can reproduce, proliferate, and swarm.

<https://vimeo.com/393943856>



tout ce qu'on a construit / everything we constructed (2019)

ratchets, metal, motors, electronics, computer

In this piece, the ratchet is used as a functional sound object where it stands as a symbol of time, work, and physical labor. Time itself is (de)constructed across each ticking tool, interweaving sonic pulses that self-organize, align, and devolve. Recalling the mechanics of a clock, the ratchet can only move in one direction. Arranged in a physical space, the ratchets' rhythms are emergent, each one synchronizing to one another to suggest a physical coupling between disparate senses of temporal duration.

<https://vimeo.com/332528445>



Tentacle (2018)

velcro, plastic, wood, metal, motor, electronics, speakers

Tentacle is a site-specific sound sculpture that examines the sonic materiality of Velcro as it is situated within the ASMR (autonomous sensory meridian response) and BDSM (bondage, dominance, slave, master) communities. This machine houses 10 speakers that are mechanically driven by Velcro extrications that occur on top of the speakers' paper cones. The kinetic dynamics of the velcro becoming hooked and unfastened is transmitted through large plastic tubes that resonate and transfer the acoustic energy into different parts of the space.

This "BDSMR" object complicates our awareness of sound and sensuality by casting materiality as an erotic fetish, one that derives from our darker, more lurid impulses. The imposing cephalopodic presence of the black machine suggests a cyborgian instrument somewhere in between an organ, a music box, and a Luigi Russolo noise machine.

<https://vimeo.com/261293688>



rocks in roll (2017)

large river rocks, wood, steel, motors, electronics. dimensions: platforms—4' x 6' each, 16' x 16' total

This piece explores the outcomes of animate motion posed by large rocks, objects typically considered to be symbols of stasis, non-sentience, and mass. Rocks in Roll sets in motion an assortment of large river rocks that roll around surfaces upheld by reciprocating wooden platforms. Because each rock bears a unique deformative shape, they contain a range of unique rolling frequencies. As the reciprocating motion of the platforms change over time, various rocks begin to oscillate with more velocity thereby resonating the sounding wooden platforms. Taken as an ensemble of rolling masses, each rock's kinetic vacillations contributes to the dense buildup of sonic mass over time. This piece was inspired by the notion of 'learnable weights' in machine learning contexts and the chaotic motion exhibited by elementary particles that comprise the biological makeup of the rocks themselves.

<https://vimeo.com/242010661>



activations (2017)

lightswitches, plastic, 3d printed gears, wood, steel, motors, computer-processing
16'x16'

In 'activations', hundreds of light switches are activated en masse in a cryptic communicative interplay. By subverting the conventional function of the switch as a compliant toggle under human control, this piece posits a future where the strange language of intelligent machines has become normalized and quotidian. The switches themselves are represented as neural network weights (aka activations) that are tuned throughout the course of the computer's learning process.

<https://vimeo.com/245809496>

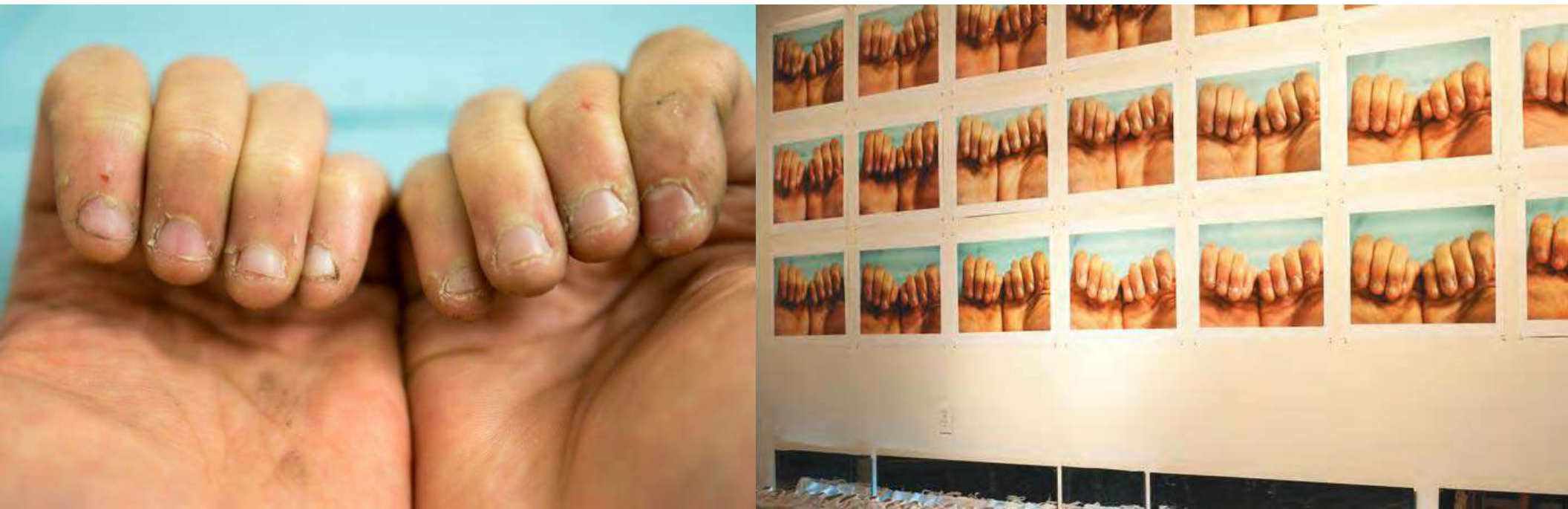


long live the new flesh (2017)

shoes, wood, steel, motors, electronics, lights
24'x2'

The disembodied shoes lining the gallery wall evoke the neurotic polyrhythms that accompany the demands of an increasingly globalized labor production. The frenetic energy expended in this piece is depicted as a pathological byproduct accompanying contemporary life in this 'Age of Anxiety' and shows how different modes of production – both material and technological– keep apace despite shoes not being filled.

<https://vimeo.com/245809965/>



'fingers' (2017)

digital renderings

22 x 17 each, 216' x 51" total

Arranged in chronological sequence, 'fingers' is a photo documentation of my onychophagy and dermatophagia (skin and nail biting) over the course of approximately one month. These sequences of images call attention to the pathological processes of body-focused repetitive behaviors by focusing on the way in which a particular compulsion operates on the skin as a material of the living body and source of self-gratification.



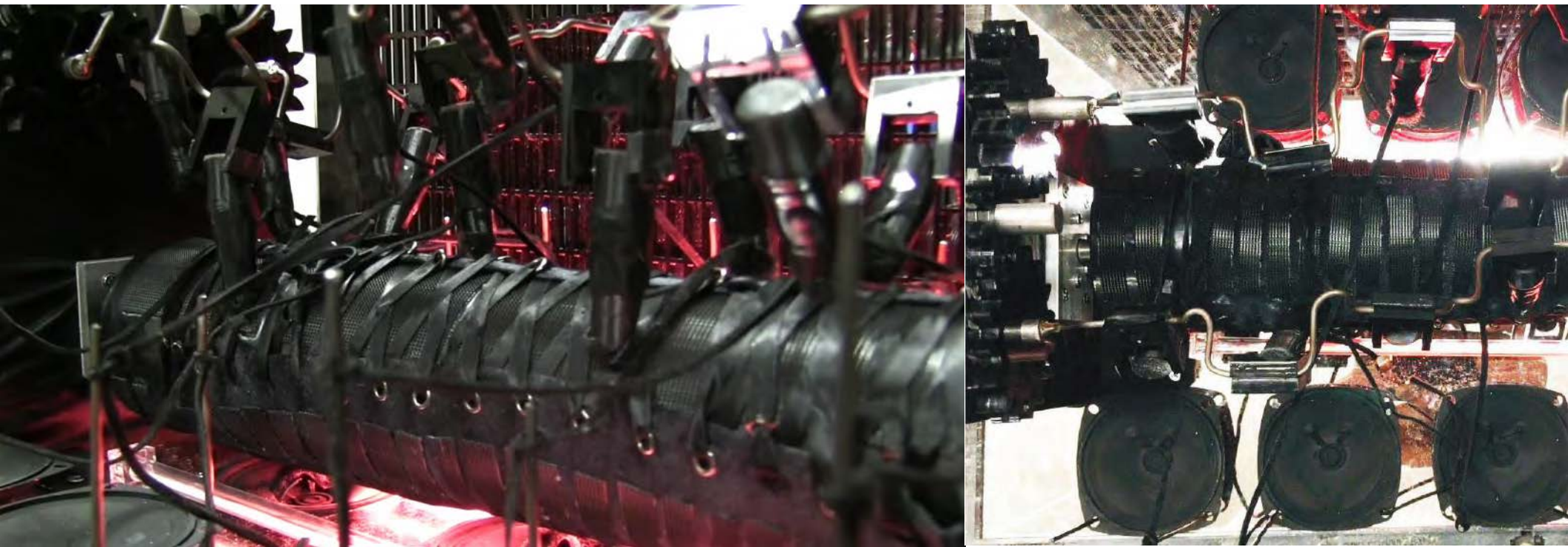
engine errors / self-portrait (2017)

medium: digital prints, video projection

dimensions: 16' x 12'

In this piece, a neural network is trained on a facial images of Chinese engineering students to teach the computer how to dream up artificially-constructed portraits. This piece treats the network's inherent flaws as a medium in itself: by reappropriating the generative blurriness in the facial reconstructions it seeks to illustrate how novel AI technologies can be used as a self-fulfilling form of erasure. In this case, the ghostly images that result reflect society's tendency to dehumanize people of Asian descent often in terms that focus on them as an aggregate or as autonomous laborers devoid of individual identity. Here I impose myself onto these representations by projecting video of my own facial features on top of these images to create a computer-mediated subhuman composited from both the living body and the digitally-imagined.

<https://vimeo.com/249272106>



Autonomous Sense Object (2016)

Materials: Wood, Steel, Acrylic, Velcro, 3D Printed Prosthetic Fingers, Leather, Lace, Speaker Cones, Electronics, Motors

In this piece, an appendage shrouded in leather bondage material is pecked, probed, and poked by a kinetic array of the artist's prosthetic velcro-tipped fingers. Several speakers affixed to the fingers are driven acoustically by the velcro extractions that transfer energy into the speaker cones. This mechanical transduction operating on the speaker cone uses the natural amplification from the materials to create a perpetual ripping sound.

This piece addresses issues related techno-eroticism, automata theory, and casts the body as a cyborgian object of erotic materiality. The BDSMR object complicates our awareness of sound by examining aurality as a fetish, as an agent in sensory arousal that derives from our darker, more lurid impulses.

<https://vimeo.com/243253126>



BANDSWIDTH (2016)

Velcro, wood, steel, pulleys, motors, electronics 4'x3' and 3'x2'

This installation features two kinetic machines that explore the sonic materiality of velcro in the form of a perpetually ripping 'wall of sound'. Between the machines, there exists about 192 sq. inches of velcro-on-velcro contact which requires a significant amount of motor torque. These sound machines explore the psychoacoustic continuum between the delicate fiber-to-fiber extrications that occur at slower ripping speeds and their eventual emergence into perceptual broadband noise. At some threshold the sounds emanating from the machines etch out a flat acoustic space; it spans a larger space than the constraints of the machines' housings.

<https://vimeo.com/167484822>

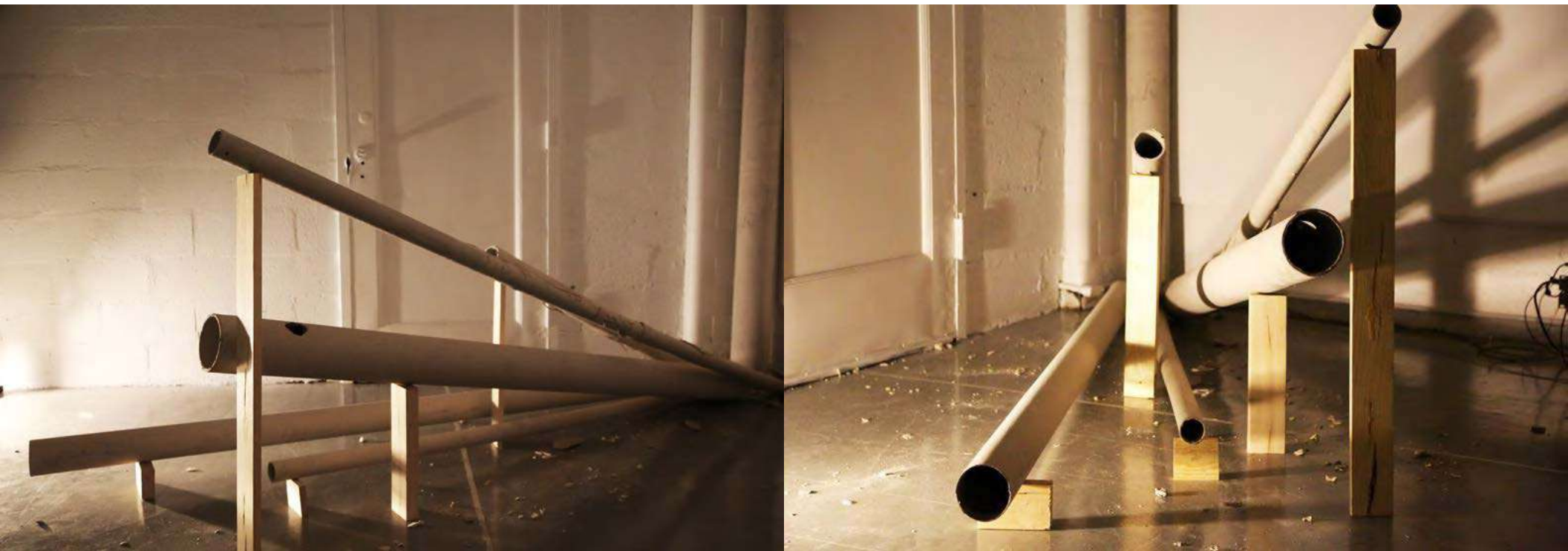


hiveMind (2015)

wood, steel, ceramics, ceramic marbles, electronics, fabrics, lights. 15'x4'

hiveMind explores the sonic potentials latent in ceramic vessels as a site from which to convey a visual and auditory resonance. In doing so, it exposes the emergent acoustic properties of clay bowls as a sensory synchronicity between movement and sound. Two platforms, populated by hundreds of clay vessels, are pushed back and forth at different speeds to incite and sound ceramic marbles housed inside the bowls. As the platforms' motion change speed over time, different bowls rotate and loop with more velocity thereby amplifying their characteristic resonance in concert with the others. *hiveMind* was conceived as a site-specific installation for a stairwell landing at the Pioneer Works Center for Art and Technology in Red Hook, Brooklyn.

<https://vimeo.com/127874298>

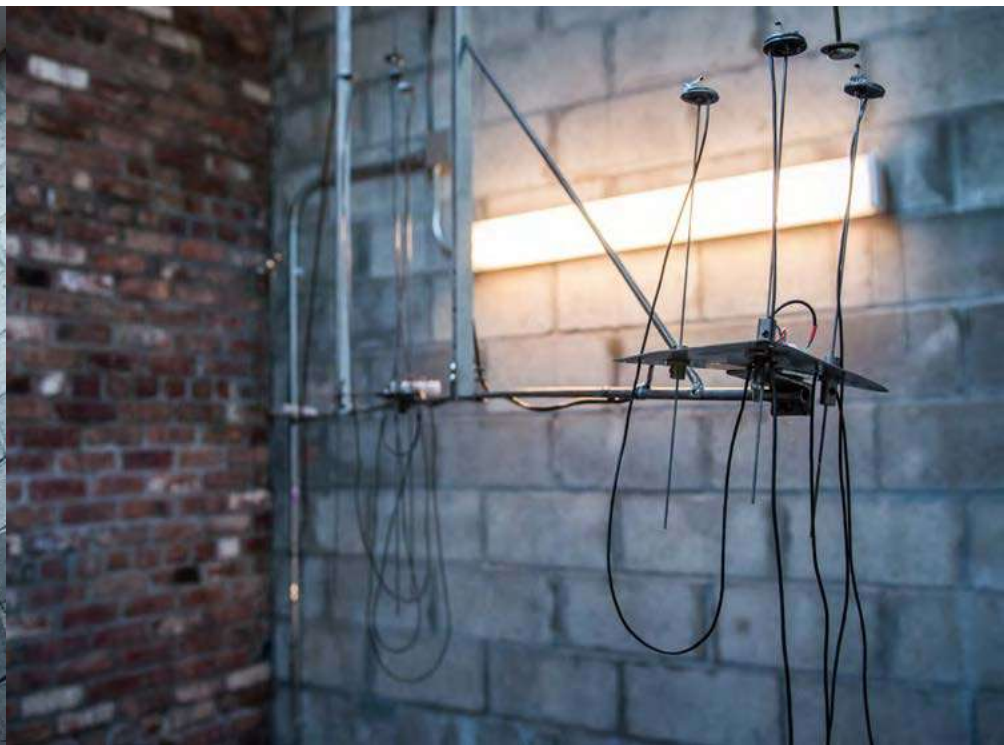
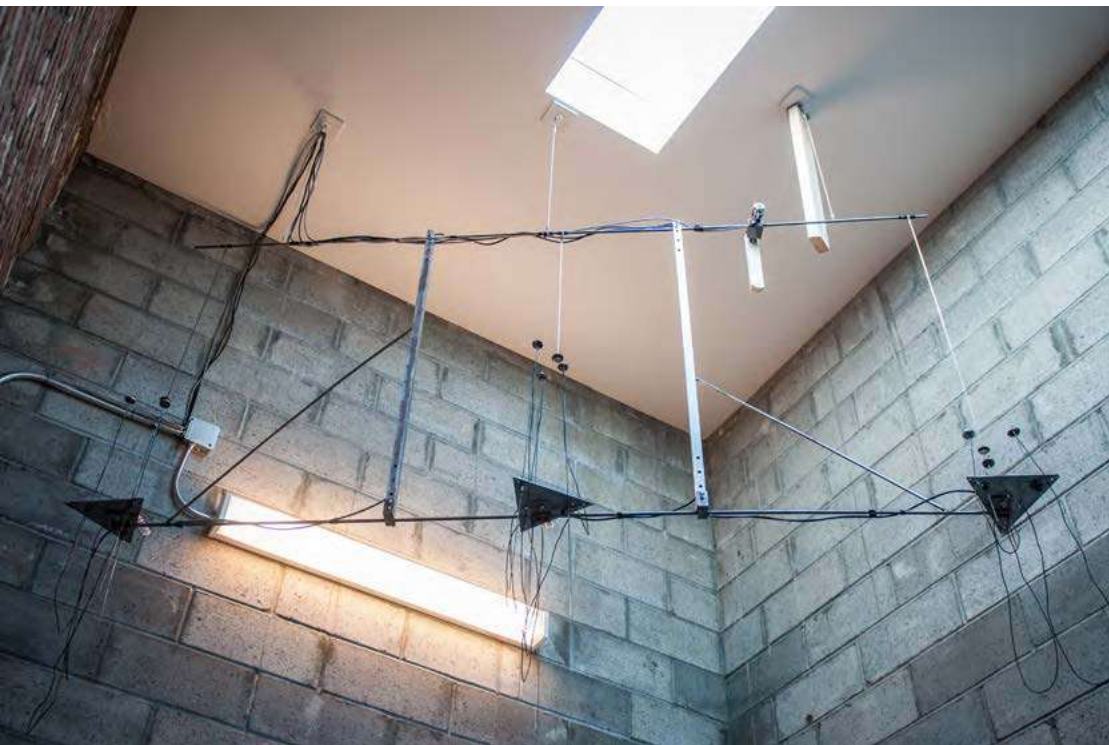


(six channels (six channels)) (2015)

ceramics, paper, wood, speakers, 6 channel audio. 20' x 12'

(six channels(six channels)) broadcasts the sounds taken from various server farms (massive internet data centers) through six large ceramic cylinders. Treating the transmission of data as a sonic medium in itself, the ceramics act as a physical and acoustic conduit through which we are able to listen in on the massive flow of information being packed and parceled through our world's complex information networks. Because the clay cylinders impart their own characteristic resonance onto the server sounds, the sonic result is an ethereal hybrid that is at once palpable, organic, latent, and subterranean – a physical channel merged with a digital one.

please see <https://vimeo.com/126652315> for video documentation



triadic attractor (2015)

steel, wood, magnets, motor, sensors, custom electronics, nine speakers. 8'x1'

triadic attractor explores the notion of momentum as a restoring force and sonifies the invisible waves in the ether of free space. This installation is an extension of the *push-pole* (2014) structures and was designed for a site-specific stairwell space. Three magnets are affixed to steel rods that are provoked to swing in the vicinity of nine magnetic-field sensors. The entire structure also acts as a physical antenna that picks up spurious radio frequencies, disrupting and interfering with the custom electrical circuitry. Specific frequencies were chosen that align with the resonant frequencies of the chamber of the stairwell space in which it is housed. The resultant sound of each sensor is distributed onto one of nine channels located throughout the vertical space.

please see <https://vimeo.com/128743201> for video documentation

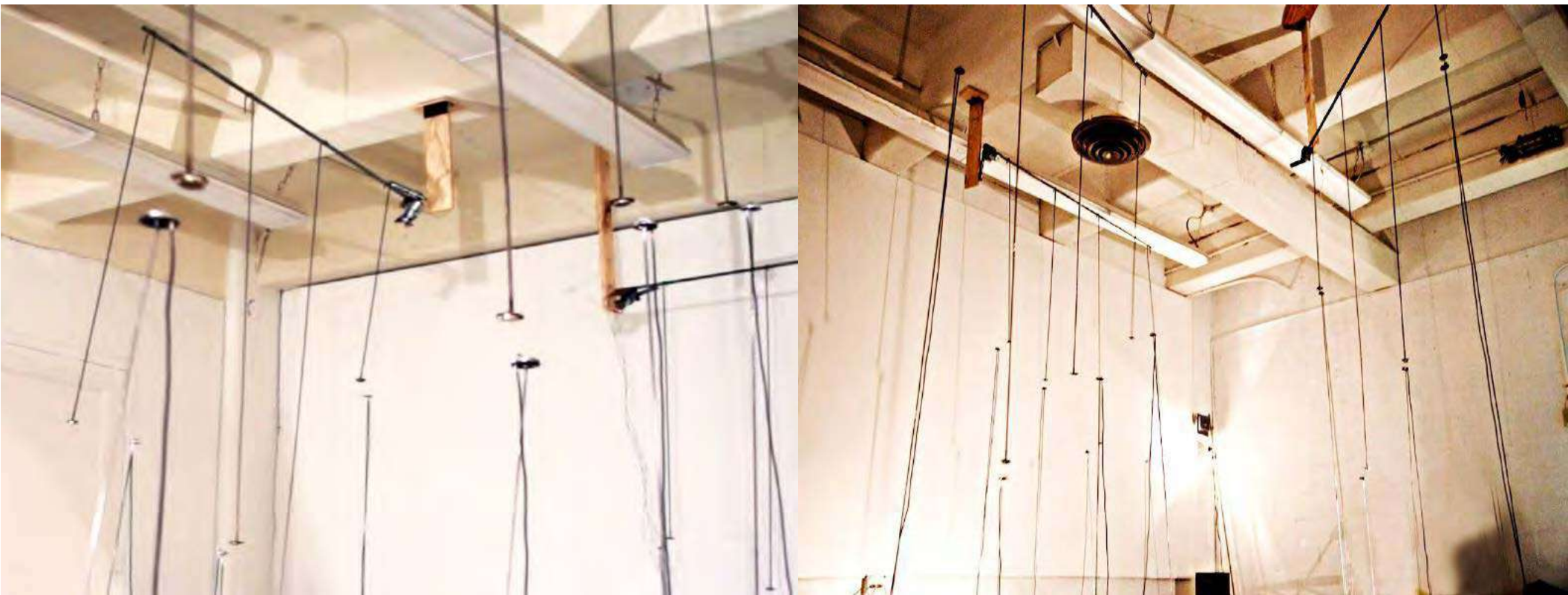


dice roll (2014)

wood blocks, dice, steel, motors, electronics, lights. 20'x15'

dice roll is a study in acoustic density that reveals a kinetic network of hundreds of rolling dice. The dice, as a multiplicitous sound object, incite the resonance inherent to the wood's material and topological orientation. The dice themselves are at once fixed and random, each tethered to the structures from which they hang. As the dice are rolled at different speeds, they occasionally self-organize into periodic rhythms and patterns. This installation seeks to merge the objects' cultural significations with their sounding gestures as signifiers of chance and probability. The emergence of the dice's sonic presence—in sheer volume and continuity—pervades the enclosing space, demarcating the auditory thresholds between order and chaos, pattern and noise, equilibrium and entropy.

<https://vimeo.com/96156680>



push-pole (2014)

steel, magnets, wood, motors, electronics, custom analog circuits, 16 speakers. 16'x12'

push-pole is a kinetic system that focuses on the mediating forces involved in the transduction of energy into movement, movement into sound. This installation reveals the elegant dynamics involved in the physics of 'coupled oscillator systems'. It is comprised of sixteen high-powered magnets affixed to steel rods that are linked together and provoked into pendulum-like motion. As they swing, sensors hover below the pendula (attracting the rods and picking up the induced magnetic fields) and relay their signals to electrical circuits that produce sound. As such, the pendula partake in a type of dance with the conflicting agonistic forces, enlivening the system with a hypnotic, playful intelligence. This installation points to the ways in which we delimit boundaries between human, machine, cognition, and intentionality.

<https://vimeo.com/113036008>



mutatis mutandis (2012)

ice block, aluminum and vinyl prints, speakers, 16 channel audio, video projectors

mutatis mutandis is a multi-sensory installation that uses glaciological data to control an audio and visual environment. This installation visualized and sonified data taken from a variety of glaciological research centers. Several computer algorithms specifically programmed for this installation control, modify, or synthesize glacial sounds through a variety of means. As the computer interprets streams of glacial data, we perceive glacial rates of change through the medium of sound. Different computational procedures enable the listener to experience thousands of years of recorded data in perceivable ways. A large 300 lb ice block, slowly melting in the center of the space, symbolizes our glaciological reference point in the present moment. From this vantage point, the glacial sounds form a living, breathing acoustic ecology dependent on time and reflective of the expansive contours of their history.

please see www.nolanlem.com/mutatis_mutandis/ for more information