Is the Unicorn Listening?

Which of the unicorns above do you think is listening? As composer Pauline Oliveros points out "Listening is not the same as hearing and hearing is not the same as listening." One unicorn is potentially hearing, her auditory system is translating acoustic vibration into neurological signals—while another is possibly listening, paying close attention to those neurological signals, selecting, interpreting and acting on the surrounding soundscape. Although there is no sound physically associated with either image, there is a connection to the phenomenon of a resonant structure in thinking between the two; beyond the confines of the ink on the page, or the pixels on the screen, is an implied connection to the sonic world.

Sound art, or art which deals with the sonic world, has garnered recent attention with the *Soundings* exhibit at New York MOMA, and the 2010 Turner prize given to a sound installation. In this ever-expanding field the conversation between sonic culture and sounding art is not just visual, but relational. In this show the curators wanted to actively engage the viewer/listener to consider the

fullness of auditory thinking. This survey includes some artists who label their work as sound art, but goes further and engages works which deal with sonic culture and the materiality/physics of sound. Sound art is fluid in definition, practice and form; it is precisely this fluidity that entices artists and curators. Even within an artist's single series some pieces could be considered sound art, while another nearly identical looking work would not. In Ryoki Ikeda's systematics series, an almost archeological presentation of pierced paper in light boxes, the artist used black paint to cover punch cards for computers and player piano rolls and lit them from behind with LEDs, showcasing the pattern of data. Unless the computer punch cards were for Max Mathews *Music N,* they would probably not entirely work in a show about sound art; however the player piano rolls would be easy to include.

The curators of *Resonant Structures* used this fluidity of interpretation (or pictures of unicorns) to expand a show ostensibly about sound art. As David Toop writes in his book about sound in relation to the silent arts, *Sinister Resonance*, "When sound, silence

and other modalities of auditory phenomena are represented through 'silent' media, this association of mediumship becomes more acute. Dwelling in every written text there are voices; within images there is some suggestion of acoustic space. Sound surrounds, yet our relation to its enveloping, intrusive, fleeting nature is fragile rather than decisive." The pieces in this show have resonance beyond their sonic materiality. Melissa F. Clarke comes to sound from an interdisciplinary practice; her work often relies on data from acoustic imaging, the drawing of unseen spaces underwater with sound. In her work data and amplitude narrate paleogeography, a deep time of glacial carving. Sound becomes a reference drawing, a scientific plot, translated into sculpture, prints, installations and occasionally back into sound. Margaret Schedel comes to sound art from a highly trained background in classical music. She creates ferociously interactive works that straddle the line between installation and performance; pieces that can be shown in either a gallery or a concert hall.

In chemistry, resonance structures describe molecules that exist simultaneously in multiple configurations. In order to notate these molecules chemists use double headed arrows (as tattooed on the unicorns' necks) to connect the molecular diagrams. Originally it was thought that in special materials electron bonds were oscillating quickly between transient states, but with the discovery of quantum mechanics, scientists understood that these extraordinary structures inhabit all forms instantaneously. The works in *Resonant Structures* similarly exist in multiple forms at the same time: as art, as sound, as memory, as inspiration—from

the conceptual, a 695 page book detailing the first 10 milliseconds of the computational processes behind a microchip composition, to the rigorously scientifically accurate rendering of a singing dinosaur skull; from the nostalgia of a Gameboy to the futurist complexities of virtual reality; from faux concrete castings of sound treatments to hand painted imagined audio filters; from a 30Hz string to humming crystals; from a videotaped field recording mediated and interrupted by pink noise, to a technological soundscape intimately heard through a 3D printed seashell; from hypersonic speakers to mathematically modeled chimes; from self perpetuating mechanical sound to interactive analog found sound; from intensely personal sound to abstract audio. Any combination of the works creates a compelling dialog and relational narrative. The essays at the back of the catalog capture just a sampling of the conversations between the pieces and by placing them in the written form—they become resonant structures in their own right.

In addition to the exhibits at the Paul W. Zuccaire Gallery, Babycastles and Inter Space Gallery, there are two concerts produced by the Stony Brook Computer Music Studios featuring some of the artists in the show. Special thanks to cDACT, CEWIT, The Simons Center for Geometry and Physics, Karen Levitov, Samantha Clink, Joe Salina, Tricia MacKenzie, Meyer Sound for the 16-channel sound system and our fantastic intern Rebecca Uliasz.

—Curators
Melissa F. Clarke and Margaret Schedel

the chemicals talk arose from an experiment with electrochemistry and dry ice. Carbon dioxide was recorded bubbling through two different supersaturated solutions, while copper was ionized in them, turning liquid blue. Over several months, crystals formed. The recording and resulting crystals are brought into contact once again, resonating across phase boundaries. The different states of matter converse across time.

Erin Sexton is a Canadian artist who grows crystals, builds antennas, and observes events. Her installations and performances are playfully minimal, exploring how we experience matter and space-time. She works with knots, electromagnetics, site, sound, and various physical processes. Her research delves into the origin of the universe, energy politics, neomaterialist philosophy, technological infrastructure, quantum paradox, and the history of science. She also tries to communicate with non-humans and understand their experience. Sexton is a licensed amateur radio operator (VE2SXN) currently studying at KHiB in Bergen, Norway, while transmitting and exhibiting her work internationally.

the chemicals talk, 2015
Sound, Epsom salt/Copper crystals, Glass, Electronics

Rawr! A Study in Sonic Skulls, 2011-15
Outer Skull (CNC-machined foam, plaster, clay, wire-frame, acrylic),
Nasal Passages / Inner Skull (3D-printed FDM model, epoxy), Mechanical
Larynx (balloons, brass tubes, 3D-printed plastic frame, string)

All photos credited to Sharif Razzaque

Rawr! A Study in Sonic Skulls lifts dinosaur sound from disembodied simulation into physical being. Gallery visitors and performers complete this process by blowing into the installation, momentarily becoming the dinosaur. This work imagines the sounds of a lambeosaurine hadrosaur, duck-billed dinosaurs known for their large head crests, which researchers hypothesize were resonators for vocal calls. We use scientific research as a starting point to create a means of sound production and resonator, using a 3D model obtained from Computed Topology (CT) scans of a Corythosaurus skull and an endocast of its crest and nasal passages. Users give voice to the dinosaur by blowing into a mouthpiece, exciting a larynx mechanism and resonating the sound through the hadrosaur's full-scale nasal cavities and skull. This action allows an embodied glimpse into an ancient past. Users know the dinosaur through the controlled exhalation of their breath, how the compression of the lungs leads to a roar or a whisper.
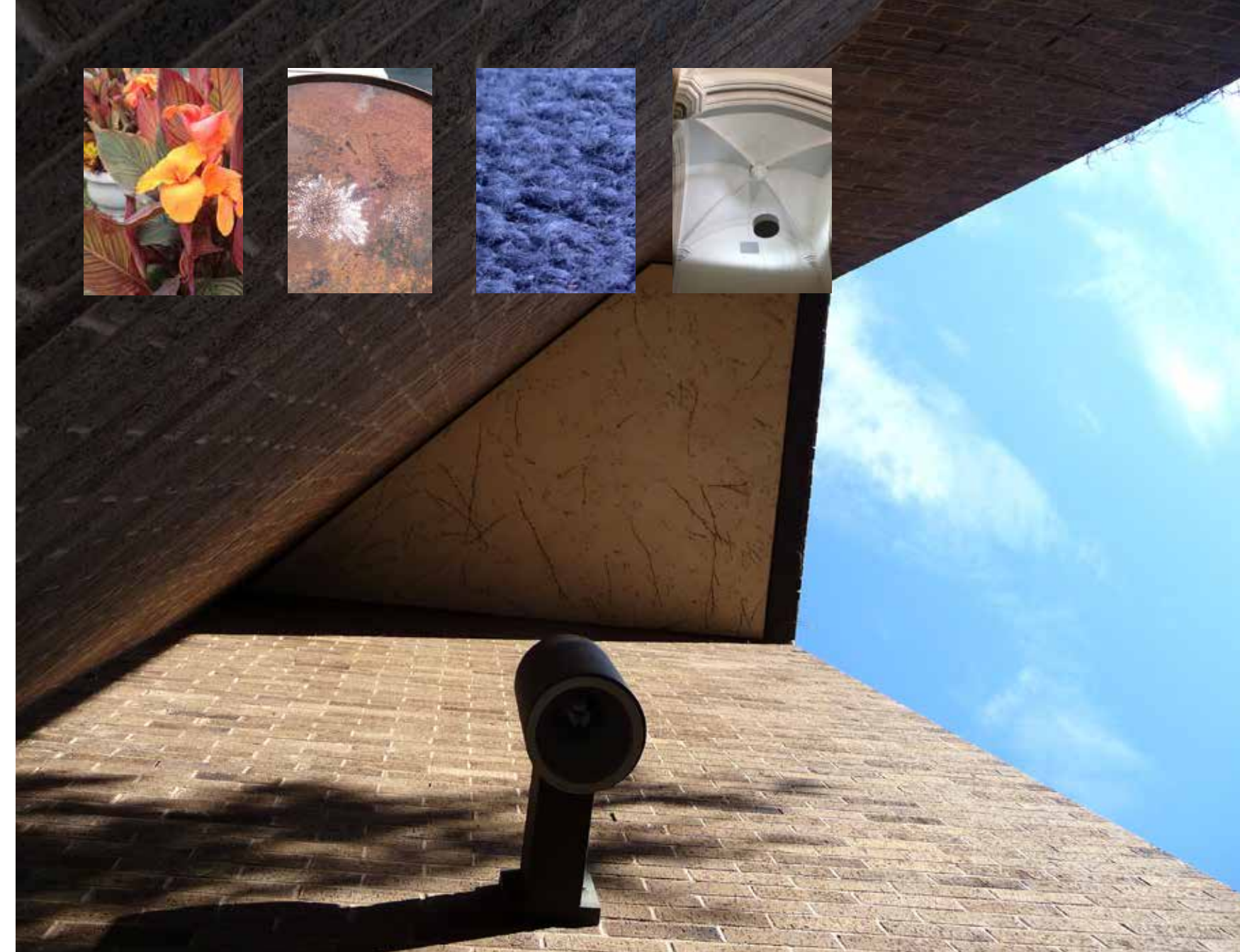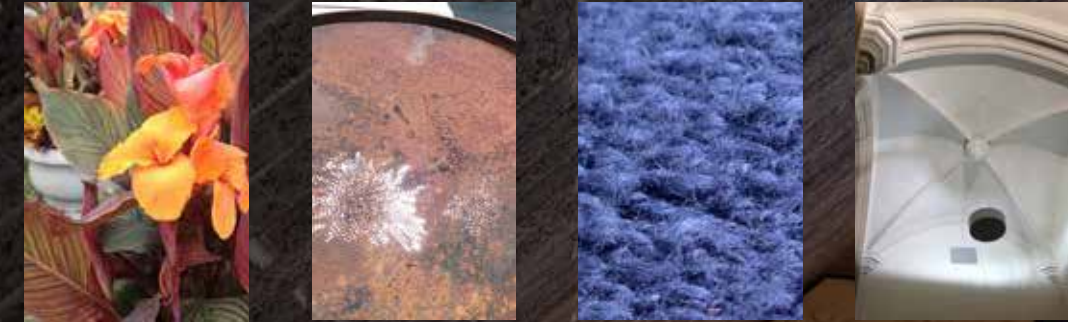
Courtney Brown is an interactive sound artist, composer, Argentine tango dancer, and software developer. She is a doctoral candidate in Interdisciplinary Digital Media and Performance at Arizona State University, and a former Fulbright Fellow, composing interactive Argentine tangos in Buenos Aires, Argentina and a graduate of Dartmouth's Electroacoustic Music Master's Program. More at http://www.courtney-brown.net. **Sharif Razzaque** (US) is an inventor, designer, and computer scientist. He holds a PhD. from UNC-Chapel Hill, in collaboration with Univ. College London and HIT Lab at Univ. Washington in Seattle. As InnerOptic Inc's CTO, he develops surgical devices with 3D virtual reality interfaces. Ultimately, his work is about understanding human perception, and using this to create compelling and effective experiences and tools.

Resonant Structures Soundwalk Sound artist, Andrea Williams, composes immersive sonic environments with field recordings, laptop, small instruments, and room resonance. These electro-acoustic "surrealscapes" can bring urban noise to a meditative level, and they often draw the listener into a visual travelogue of memories. Her compositions evoke her soundwalks, walks based on listening and creatively interacting with the sonic environment. Resonant Structures Soundwalk (2016) is a guided listening tour of the acoustic space of the gallery and beyond for mobile devices in words and photographs. Williams also performs *Architectural Body, Revisited* (2016), an 8-channel installation piece that enlivens the gallery, composed with Andrea's recordings of the Austrian Alps, downtown Alpine cities, and the award-winning museum of bells and singing bowls in the famed Grassmayr Bell Foundry in Innsbruck, Austria. (This is Not the Sound of Music.)

Andrea Williams utilizes site-specific elements and perceptual cues to reveal the unseen connections between people and their environment. Her compositions make use of field recordings, instruments, computer technologies and the sound of the performance space itself. She has led soundwalks in New York City and the San Francisco Bay Area, and has shown and performed both solo and with various musicians and artists at galleries and alternative spaces internationally, such as the Whitney Museum, Eyebeam Art+Technology Center, Observatori Festival, Children's Creativity Museum, NPR, Miami Art Fair, and the Mamori sound artist residency in the Amazon rainforest. She is a board member of the American Society for Acoustic Ecology, a Co-Director at-large of 23five, Inc., but she is currently mostly buried in her studies at Rensselaer Polytechnic Institute in NY for her Ph.D. in Electronic Arts.

Resonant Structures Soundwalk, 2016
Words, Photographs, Mobile Device with Wifi

Field of View, Played by Ear considers a parallel between camera lens and microphone, both of which utilize a field of view to shape the information that they collect. It presents videos of performance scenarios wherein the artist/performer "plays" droning objects against the sound of an environment using the movement of the body and microphone. It explores voice-like qualities of the microphone while generating a dynamic range between the representation of "landscape" vs "portrait."

Byron Westbrook is an artist and musician based in Brooklyn, NY. He works with listening, perception and awareness, often pursuing routes that involve social engagement. His electronic sound interventions explore dynamics of perception of space, sometimes manifesting as multi-channel audio performances or as installation work using video or lighting. His work has been shown at ICA London, Cafe OTO (London), Clocktower Gallery, ISSUE Project Room, Abrons Arts Center, LMAK Projects, Roulette, Diapason Gallery, Eyebeam (NYC), Human Resources (Los Angeles), Disjecta (Portland, OR), Instants Chavirés Art Space (Paris), The LAB (San Francisco), International House (Philadelphia), VIVO (Vancouver), O' (Milan), LOOP Festival (Barcelona), Experimental Sound Studios (Chicago) among others. He holds an MFA from the Milton Avery Graduate School of the Arts at Bard College. He has been an artist in residence at Civitella Ranieri Foundation, Clocktower Gallery, Wassaic Project, Diapason Gallery for Sound and will be a 2016 fellow with Akademie Schloss Solitude. He has audio releases published on Sedimental, Los Discos Enfantasmes, Perfect Wave, Three:Four Records and Root Strata.

Field of View, Played by Ear (Inversion), 2014
Video with Location Sound

Slight Perturbations is a sound installation that responds to user interaction. It employs a large piece of aluminum foil which is wrinkled/unwrinkled by the movement of servo motors. Surrounding the foil is an ultrasonic feedback system that is sensitive to small amounts of movement of the foil and translates this movement into audible sound.

This feedback system operates above our hearing and uses a small ultrasonic microphone and loudspeakers that create acoustic feedback at around 40khz. As the user manipulates the shape of the foil using a joystick the ultrasonic feedback frequency is modulated up and down. By using a reference tone at 40khz a difference frequency is created between the modulated feedback and the reference tone. This difference tone passes through audio frequencies and is routed to an audio amplifier.

The audio amplifier drives an audio transducer that vibrates a metal resonator, transforming it into a resonant loudspeaker with unique resonant character.

John Driscoll is a composer/sound artist who is a founding member of Composers Inside Electronics and collaborated on David Tudor's Rainforest IV project since its inception in 1973. He has toured extensively in the US and Europe with: CIE, Douglas Dunn & Dancers, David Tudor, and also as a solo performer. His work involves robotic instruments, compositions and sound installations for unique architectural spaces, rotating loudspeakers, and music for dance. He has created music for: Merce Cunningham Dance Co., Douglas Dunn & Dancers, and Maida Withers Dance Construction Co. He has received numerous awards including a Berlin Residency from the DAAD Berliner Künstlerprogram. His recent album "Fishing for Sound (Berlin)" is available on iTunes. In 2014, he was artist-in-residence at Harvestworks Inc. developing a new work for robotic-driven highly focused speakers, and has recently completed a number of new works for ultrasonic instruments. He is working on the revival of David Tudor's Pavilion works in conjunction with CIE, E.A.T. and the David Tudor Trust. He was recently the David Tudor Composer-In-Residence at Mills College.

Slight Perturbations, 2016
Wood, Brass, Plastic, Aluminum foil, Servo motor, Electronics, Speakers, Piezo Pickup

Siphonal N9604Z, 2014
Shell, Lacquer, Electronics

Siphonal N9604Z The acoustic phenomenon produced by the siphonal canal has been molded by its environment over hundreds of millions of years. Over the last century aural by-products of our machines have come to be as ubiquitous, regular, and even as calming as the waves of the sea. *Siphonal N9604Z* begins with the exoskeleton of an ancient species and rapidly evolves it: as if passing it through a worm-hole sound barrier, the bioaccumulation of machine-made noise is suddenly materialized into an unexpected life form.

"for whatever we lose (like a you or a me) it's always ourselves we find in the sea"
 — e.e. cummings, 1958

Nanu Al-Hamad is an artist and industrial designer. He is founder and Director of Design of the Al-Hamad Design Studio, focusing on high-end furniture, lighting, and concept object design that is shaping a new movement in design. Al-Hamad is also a member of the art collective GCC, that adopting the guise of an inter-governmental body makes work that is both inspired by and addresses the contemporary culture of the Arabian Gulf. **Miriam Simun** is a research-based artist interested in implications of socio-technical and environmental change. Working across mediums, much of her practice is based in scientific, historical and ethnographic research.

Tape Translations prompts viewers to take an active role in the audio playback process by manually controlling the tape. As consuming music moves further into the digital realm, our nostalgia for more archaic forms of musical output increases. Tape Translations celebrates the cassette tape while acknowledging the inevitable end of the medium, and ultimately contributing to its destruction.

Genevieve Hoffman is an artist and technologist whose work addresses the planned obsolescence built into the disposable culture of our digital era, as well as the relationship between technology and the natural resources that make it possible. Hoffman received her Master's degree from NYU's Interactive Telecommunications Program, she spent a year there as a researcher, and has been in residence at the Visible Futures Lab at the School of Visual Art and Autodesk's Workshop at Pier 9. **Emily Webster** is an Audio-Visual Technologist working at an Architectural scale. Using technology to express narratives, her work considers the human-digital interaction and explores different methods of communication through the use of technology. Her work has been shown in San Francisco, New York, Paris and Sao Paolo with permanent installations in Pittsburgh, Chicago, Boston and New York. **Juyun Song** is an Interaction Designer whose interactive artworks focus on experimenting with the psychological aspects of various kinds of digital media. She studied Visual Communication Design and Art Education at Seoul National University in Korea and received a Master's degree at NYU's Interactive Telecommunications Program in 2012. She is currently working for Google as a user experience designer in New York focusing on data visualization and productivity application tools.

Tape Translations, 2010
Wood, Cassette tape, Arduino, Lights, Electronics

SELECT A TAPE AND PLACE ON BOLTS

• DETACH KEY

• PLACE KEY IN SPOKES

• TURN CLOCKWISE TO REWIND

PLACE TAPE WITH SIDE A FACING UP

TAPE PATH

30 Cycles of Flux is a sound piece that consists of utilizing the emission of a 30 cycles wave (right below human beings hearing range) to activate speaker cones with white strings attached to the center of each cone. The speakers hang from the ceiling with the cone facing down and with a white string attached to the center of each cone. When the cones become activated by the infrasound wave the strings move in a constant flow subsequently producing a kinetic visualization of the wave.

This is an object construct and time based sound artwork that may be considered both; sound site-specific sculpture and a sound installation. The work may consists of any number of cones. The work also adapts to the exhibiting space in question based on the specifications of the environment, and depending on the number of cones, it may adjust to it by taking shape into various configurations such as square, rectangular, triangular, asymmetrical, or even linear configurations.

Richard Garet interweaves various media including moving image, sound, expanded photography, and multimedia performance. In work ranging from modified environments to installation, with specificity towards media and space, Garet constructs immersive situations that draw attention to the processes of perception, which activate sensorial, physical, and psychological phenomena that reflects on the nature and experience of time.

Garet's pieces, whether conceptual in origin or stemming from his investigation of complex systems and algorithmic translations, are informed by the background noise established not only by mass media culture but also by the collective experience of the world that surrounds him. Garet's reductive process seeks to invert the normative function of this background noise, drawing it up from unconscious status to active presence. He finds further inspiration from observing isolated situations of everyday life and from material interactions that incorporate problems of context, technology, defunctionalization, commodity, and environment.

30 cycles of flux, From the date of creation (exhibition)
30 Hz audio file, Audio amplifier, Speakers, String

0.01s: The First 1/100th Second of 1-Bit Symphony
Perich's companion to *1-Bit Symphony* (2009), is a
synthesis of art and computation in book form, giving
a tangible mass to the code behinds its music. Digging
even deeper into the basic operations of computation,
0.01s captures the inner workings of *1-Bit Symphony* over
the first hundredth of a second after it is switched on.
1-Bit Symphony (which *0.01s* is based on) is an electronic
composition in five movements on a single microchip.
Though housed in a CD jewel case, *1-Bit Symphony* is not a
recording in the traditional sense; it literally "performs" its
music live when turned on. A complete electronic circuit—
programmed by the artist and assembled by hand—plays
the music through a headphone jack mounted into the
case itself.

Tristan Perich's (New York) work is inspired by the
aesthetic simplicity of math, physics and code. *The WIRE*
Magazine describes his compositions as "an austere
meeting of electronic and organic." *1-Bit Music*, his 2004
release, was the first album ever released as a microchip,
programmed to synthesize his electronic composition
live. His latest circuit album, *1-Bit Symphony*, has received
critical acclaim, called "sublime" (*New York Press*), and the
Wall Street Journal said "its oscillations have an intense,
hypnotic force and a surprising emotional depth." He has
received commissions from Rhizome, the LA Philharmonic,
So Percussion and more, and his awardwinning work
coupling 1-bit electronics with traditional forms in both
music (*Surface Image*, *Parallels*) and visual art (*Machine
Drawings*, *Microtonal Wall*) has been presented around
the world, from Sónar and Ars Electronica to MoMA and
bitforms gallery.

0.01s: The First 1/100th Second of 1-Bit Symphony , 2014
Book, 695 pages

I Just Know It..., 2016
2 high frequency 1.3" compression drivers with horn extension, amplifier

I Just Know It, 2016 In this piece, interview recordings are edited then randomly aligned forming the phrase "I just know it ..." Repetition of the letters and words allows pronunciation to separate from the message while drawing attention to hidden sounds that can otherwise be ignored. With the benefit of speaker placement, and audio phasing, each listener explores the sonic potential of the phrase. The piece reminds us that language is a fragile and illogical construct, loosely bound to reality by cultural convention.

Maria Chavez Born in Lima, Peru, Maria Chávez is mainly known as an abstract turntablist, sound artist & DJ influenced by chance, accidents & improvisation in contemporary art.

She has worked with Christian Marclay and the Whitney Museum, performed alongside Pauline Oliveros, Thurston Moore, Phill Niblock and worked with Merce Cunningham prior to his passing as a sound artist in residence with the DIA:Beacon Museum.
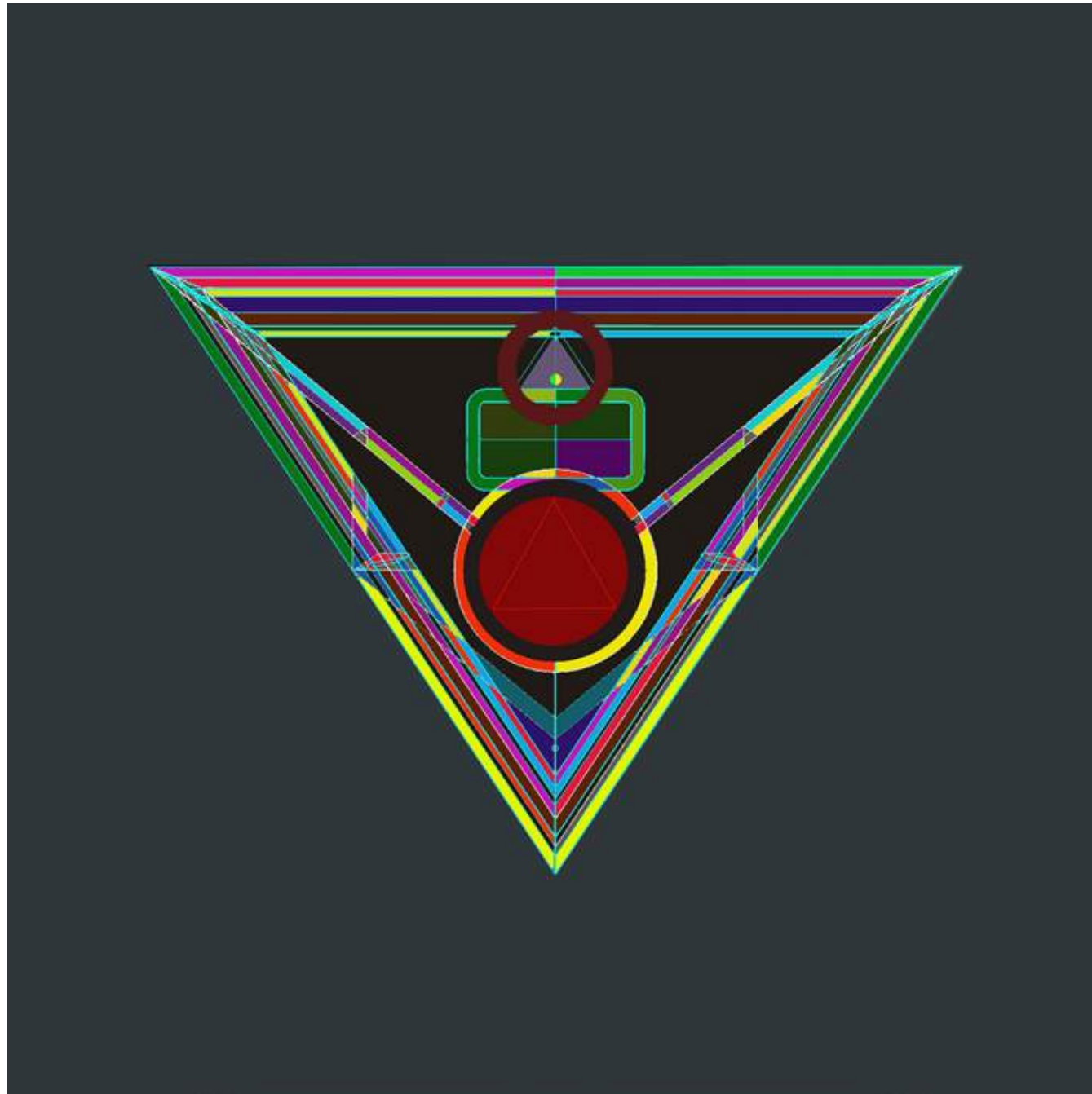
Her sound installations and sculptures have been exhibited for acclaimed art galleries such as BRIC Arts | Media in Brooklyn, the Kitchen in NYC where she presented her large scale multi-channel sound installation, Sound Bleed @ the Kitchen, The Brooklyn Museum, Morgan Library and more.

Maria is currently a research fellow with the Sound Practice Research Department at Goldsmith's University of London and will be composer in residence with the Civitella Ranieri Foundation in Umbria, Italy in late spring 2016.

Downstream is an art game developed for the Game Boy handheld console. It is a simulation and expression of helplessness in the face of overwhelming tragedy. The program is constructed around erratic behaviors the console exhibits when it is confronted with information it does not have the capacity to process.

TM Duplantis Is a Louisiana-born composer of electronic music, designer of artistic systems of play, and performer of assorted instruments both physical and digital. TM has performed as part of the Laptop Orchestra of Louisiana, and their music and installations have been featured at national electronic music conferences such as SEAMUS and N_SEME. They are currently exploring the San Francisco Bay Area while studying electronic music at Mills College.

Downstream, 2015
Gameboy

The Hone The Hone is a sculpture that uses boom sonics to comment on the reuse and customization of music materials for automobility. The piece halts in the intersection of recorded music, technology, and mobile space. It demonstrates how audio creates a space within in a space that can be updated and altered according to the desired effect.

MV Carbon is a New York City based, interdisciplinary artist, and sound composer. Her intention is to provoke an extrasensory awareness through disorienting "reality." Repetitive variations in tone, pulse, frequency, and light, segue the viewer through layers of consciousness. Her work embodies magic, multidimensional travel, interchangeability, the neurological mechanism, and the empirical force of nature.

The Hone, 2016
Wood, Sound, Sub woofer, Arduino, Electronics, Chain

1 prepared dc-motor, cardboard box 60x20x20cm, 2014
Motor, Cardboard, Metal, MDF, Power supply

1 prepared dc-motor, cardboard box 60x20x20cm With an extreme sensitivity to location and rhythmic potential, Zimoun produces works that evoke control, humor, absence, and nature. Highly ordered systems of movement are derived from simple and low-tech means. His projects can easily be compared with mathematical formulas or a science experiment, as he deploys wit and a keen observation of space and sound. In this spirit, Zimoun mounted three concurrent exhibitions in New York in 2015 in a series called *[KE]* [3], which took artistic license in considering "KE", a notation found in physics equations describing kinetic energy. The Simons Center for Geometry and Physics at Stony Brook University was pleased to host one of the exhibitions, entitled *175 prepared dc-motors, 150 filler wires, 25 cotton balls, 3 screens, 25 cardboard boxes*.

Zimoun Using simple and functional components, Zimoun builds architecturally-minded platforms of sound. Exploring mechanical rhythm and flow in prepared systems, his installations incorporate commonplace industrial objects. A self-taught artist based in Switzerland, Zimoun has been honored by numerous residencies and grants, including Bundesamt für Kultur / BAK and the Aeschlimann Corti Award. Also recognized by Ars Electronica and the Swiss Art Awards, his work has been presented in exhibitions and performances in Europe, North America, Asia, Africa and South America. In 2003, Zimoun and graphic designer Marc Beekhuis founded Leerraum [ ], a platform for creative exchange among artists, designers, and architects– particularly those exploring structures based on reductive principles and careful, yet radical, use of materials. His work has been exhibited and performed on five continents. Past displays have included the National Art Museum of China, Beijing; Vasarely Fondation, Aix-en-Provence; Haus für elektronische Künste, Basel; Nam June Paik Art Museum, Korea; Ringling Museum of Art, Florida; Kuandu Museum of Fine Arts, Taipei; Seoul Museum of Art, Korea; Museum of Contemporary Art, Liechtenstein; Musée des Beaux-Arts, Rennes; Museum Les Champs Libres, Rennes; Harnett Museum of Art, Richmond; Kunsthalle Bern; Museum of Fine Arts, Bern; bitforms gallery, New York; Galerie Denise René, Paris; Oboro Gallery, Montreal; National Museum of Contemporary Art (MNAC), Bucharest; Borusan Contemporary, Istanbul; Beall Art Center, Los Angeles; List Art Center, Brown University, Providence; CUNY Graduate Center, New York; Kunstverein, Mannheim; Metropolitan Arts Center, Belfast; Museum of Contemporary Art (MSUM), Ljubljana; Art Basel, Switzerland; and the Museo d'Art, Lugano; among others.
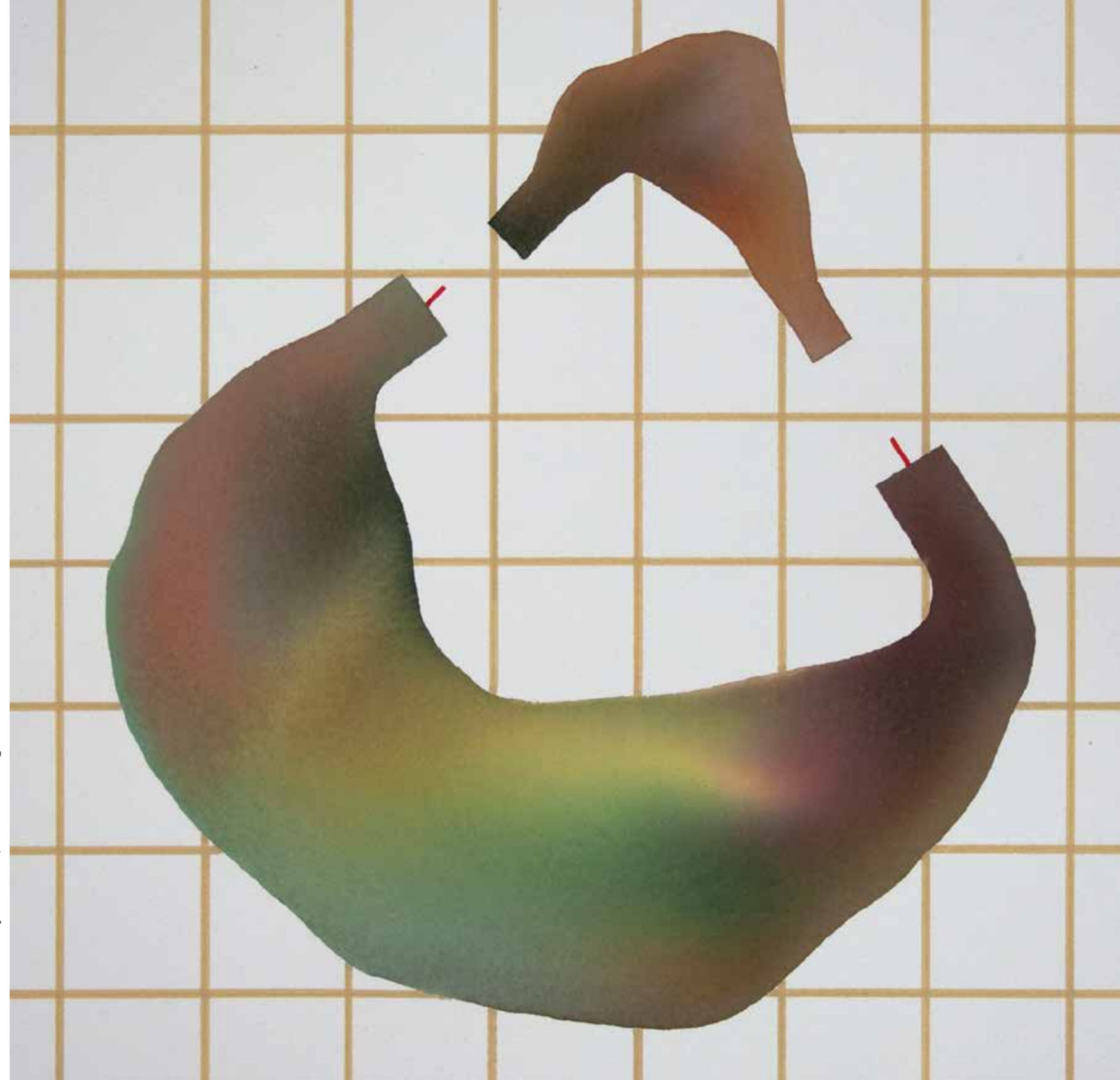
No Touch Gordon's work revolves around questions of control and the role of desire in how we perceive a built environment. In current projects, She reverse engineers an experience by designing for the body, for the audience.

The Filter Resonance drawings are interpretations of audio filters that reference how sound as information might be felt in the body.

Jacqueline Kiyomi Gordon works in sound, installation, sculpture and performance. Her work is devised around audio and spatial feedback systems that manipulate the visitor's awareness of sound and space. Jacqueline received her BFA from the San Francisco Art Institute and an MFA from Stanford University in 2011. She has had recent solo shows at Yerba Buena Center for the Arts, Western Front and Queens Nails Projects. She has exhibited at ICA London, Machine Project and Mills Collage Art Museum. Jacqueline has received a Joan Mitchell Foundation MFA Award, two Center for Cultural Innovation Grants and has participated in residencies at Skowhegan School of Drawing and Painting, The Curtis R. Priem Experimental Media and Performing Arts Center and Bemis Center for Contemporary Art. As a member of the collective, 0th, she has performed at various sound and music festivals and has recently collaborated with Laetitia Sonami and DLS Solutions.

Filter Resonance B14, 2014
Gouache and ink on paper

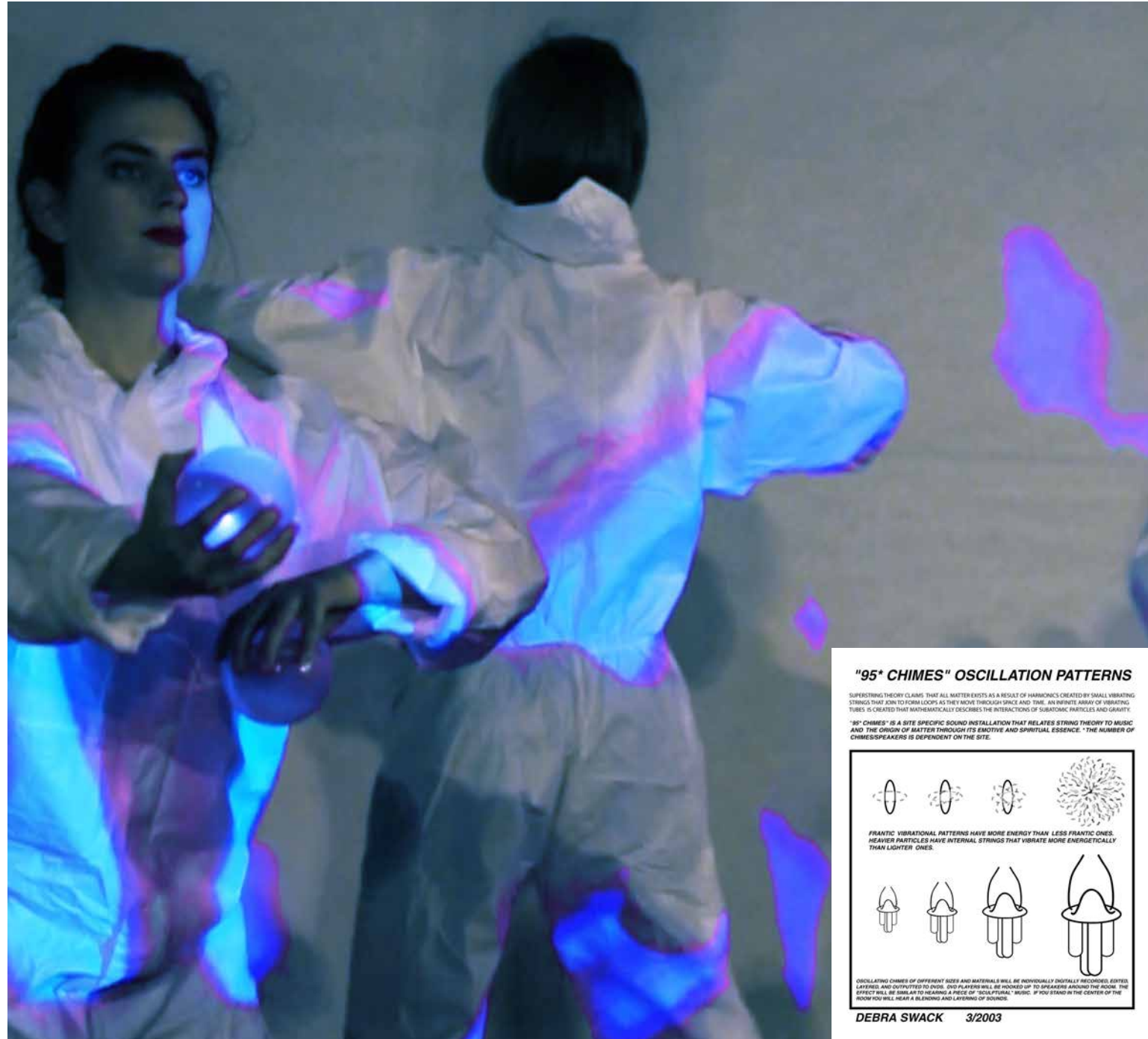Photo courtesy of CULT | Aimee Friberg Exhibitions

Carillon is equal parts interactive musical performance environment and distributed virtual instrument. The core interactions in Carillon focus on the control of spinning gears - the heart of the Carillon itself. By interacting with a set of gears floating in the rendered HUD – grabbing, swiping, etc. – performers speed up, slow down, and rotate each set of rings in three dimensions. The speed and motion of the gears is used to drive musical sounds and instruments, turning the virtual/physical interactions made by the performers into musical gestures. Each performer controls their own sound, and in concert with other performers, that sound is spatialized around the hall.

Carillon was built within the Unreal Engine 4 with support for the Oculus Rift head-mounted display and Leap Motion. Premiered on May 30, 2015 at Stanford University's Bing Concert Hall by the Stanford Laptop Orchestra, Carillon was designed to allow multiple performers to interact with the giant virtual bell-tower across the network, controlling the motion of parts of the instrument that generate sound and music. The environment can be explored using an immersive head mounted display (HMD) like the Oculus Rift and a Leap Motion hand tracking sensor, though the demo can be used without the HMD.

Rob Hamilton explores the converging spaces between sound, music, and interaction. His creative practice includes mixed-reality performance works built within fully rendered, networked game environments, procedural music engines and mobile musical ecosystems. His research focuses on the cognitive implications of sonified musical gesture and motion and the role of perceived space in the creation and enjoyment of sound and music. Dr. Hamilton received his PhD from Stanford University's Center for Computer Research in Music and Acoustics (CCRMA) and currently serves as an Assistant Professor of Music and Media at Rensselaer Polytechnic Institute. **Chris Platz** is a virtual world builder, game designer, entrepreneur, and artist who creates interactive multimedia experiences with both traditional table top and computer based game systems. He has worked in the industry with innovators Smule and Zynga, and created his own games for the iOS, Facebook, and Origins Game Fair. He holds s BA in Business & Biotechnology Management from Menlo College, and an MFA in Computer Animation from Art Institute of CA San Francisco.From 2007-2010 Chris served as an Artist in Residence at Stanford University in Computer Graphics. Chris is currently an Assistant Professor at California College of the Arts.
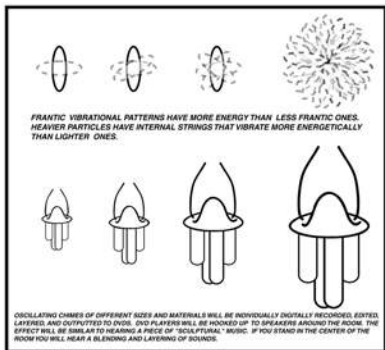

Carillon, 2015
Leap Motion Controller and custom software written in Unreal Engine Pure Data, and ChucK

"95* CHIMES" OSCILLATION PATTERNS

SUPERSTRING THEORY CLAIMS THAT ALL MATTER EXISTS AS A RESULT OF HARMONICS CREATED BY SMALL VIBRATING STRINGS THAT JOIN TO FORM LOOPS AS THEY MOVE THROUGH SPACE AND TIME. AN INFINITE ARRAY OF VIBRATING TUBES IS CREATED THAT MATHEMATICALLY DESCRIBES THE INTERACTIONS OF SUBATOMIC PARTICLES AND GRAVITY.

"95* CHIMES" IS A SITE SPECIFIC SOUND INSTALLATION THAT RELATES STRING THEORY TO MUSIC AND THE ORIGIN OF MATTER THROUGH ITS EMOTIVE AND SPIRITUAL ESSENCE. * THE NUMBER OF CHIMES/SPEAKERS IS DEPENDENT ON THE SITE.

FRANTIC VIBRATIONAL PATTERNS HAVE MORE ENERGY THAN LESS FRANTIC ONES. HEAVIER PARTICLES HAVE INTERNAL STRINGS THAT VIBRATE MORE ENERGETICALLY THAN LIGHTER ONES.

OSCILLATING CHIMES OF DIFFERENT SIZES AND MATERIALS WILL BE INDIVIDUALLY DIGITALLY RECORDED, EDITED, LAYERED, AND OUTPUTTED TO DVDS. DVD PLAYERS WILL BE HOOKED UP TO SPEAKERS AROUND THE ROOM. THE EFFECT WILL BE SIMILAR TO HEARING A PIECE OF 'SCULPTURAL' MUSIC. IF YOU STAND IN THE CENTER OF THE ROOM YOU WILL HEAR A BLENDING AND LAYERING OF SOUNDS.

DEBRA SWACK   3/2003

95 Chimes (Chimes Songs), 2002
Video and EEG Data
Digital recordings: Banff-coproduction grant, Luscar Recording Studio, Banff Centre 2005

95 Chimes (the first composition in the series Chimes Songs) is a digital immersive sound art installation that relates string theory to music and the origin of matter. Comprised of 95 digital recordings of physical chimes of different sizes, materials and cultures, it can be outputted to potentially as many speakers. Standing in the center of the room creates a virtual immersive sculptural effect due to the blending and layering of sounds; form evokes sound and sound evokes form. 95 Chimes was first presented at the ASCI (Artists and Scientists Collaborations Inc.) SCI-art symposium at the Museum of Natural History in 2002. Mastered in the Luscar recording studio under a co-production grant at Banff Centre in 2005, it provides a three-dimensional musical metaphor for these smallest particles of matter and the harmonies, vibrations, and energies they produce. New Chimes, a related work relating to Feng Shui, in combination with Animal Patterning Project, a synthetic bio-art interactive animation about the role of the displaced animal in the urban environment was recently commissioned by the West Harlem Art Fund and Pratt Institute in 2015. Adapted for interactive dance, New Chimes is comprised of 8 notes repeated in a graphic pattern (like an animal pattern) and begins and ends with the same configuration.

Debra Swack is a writer, Fulbright Specialist and Phi Theta Kappa in computer science who began exhibiting new media and sound art in the early 90s at Xerox Parc. She is mentioned in Art and Innovation at Xerox Parc, (MIT) and works with immersive and interactive environments. She has received three co-production grants (Carousel, 95 Chimes and Digital Maze Symmetry Project) and a Fulbright grant from Banff Centre. Her last article on The Emotions after Charles Darwin, a project about the universality of emotions on a biological level was published by Leonardo Electronic Almanac/MIT Press in 2013 and featured in Binghamton University Magazine in 2015 in addition to being presented internationally. Animal Patterning Project; a software derived, synthetic bio-art interactive animation was included in Infinite Instances, published by Random House in 2011 and exhibited at the Binghamton University Museum and at Offline at Central Booking Gallery in NYC in 2014. She was a visiting artist at the American Academy in Rome and presented Cloud Mapping Project (an immersive sound-art installation about all manifestations of the cloud from arts to technology) at the Pera Museum in Istanbul for MIT in 2014 and at Banff Centre in 2015 under a Fulbright grant incorporating eye-tracking. She is also collaborating with evolutionary biologist Monica Gagliano on Bloom, a bioacoustics sound-art installation that was presented at NYU for LEA/MIT (Plants and Us, edited by Monica Gagliano and LEA/MIT Press) and as an invited speaker for EvoS at SUNY Binghamton in 2015. Animal Patterning Project was presented outdoors, projected interactively onto dancers with New Chimes (companion piece to 95 Chimes, a sound art installation relating music to String Theory first presented at the Museum of Natural History in 2002 for the ASCI-SCI Art Symposium) in collaboration with Pratt Institute and afterwards at Silicone Harlem in 2015.

The Garden of Laughter and Tears is an installation that investigates the whimsical nature and the sensuality of laughing and crying and the similarity of these emotions. Sometimes, we laugh so hard that we cry. Also, crying can turn into laughter.

My sculptures are fantasy objects that explore cultural stereotypes about beauty, desire and femininity. The forms have reference to the female body and also other associations to sweets, fruit and flowers. I both participate in traditional roles and re-imagine them to create new roles. The forms present ideas of temptation and beauty. They are intended to draw a viewer to get closer to the forms and look as though they could be squeezed or licked.

Nikki Renee Anderson creates ceramic sculptures and installations that explore the feminine experience based on her personal history. Anderson has exhibited extensively including recent solo shows at Northeastern Illinois University, Dubhe Carreño Gallery and the Elmhurst Art Museum. Her work has also been shown at the 59th and 56th Premio Faenza Competition at the International Museum of Ceramics in Faenza, Italy; The Grounds for Sculpture in Hamilton, NJ; The Ukrainian Institute of Modern Art in Chicago, IL; The Urban Institute for Contemporary Art in Grand Rapids, MI; the 2009 NCECA Biennial at the Arizona State University Museum Ceramics Research Center, Tempe, AZ; The 18th San Angelo National Ceramic Competition at the San Angelo Museum of Fine Arts, San Angelo, TX; The Koehnline Museum of Art, Oakton Community College, Skokie, IL; Visualizing TRANS at the University of Wisconsin-Madison Visual Culture Conference; Chicago Sculpture International Biennale at FLATFILE Galleries; SOFA Chicago 2004 with Dubhe Carreño Gallery; The Hillwood Art Museum, Long Island University, Brookville, NY; Art Chicago 2003, Special Project Space, Zolla/Lieberman Gallery, Chicago, IL; Istanbul Museum of Contemporary Art (online exhibition), Istanbul, Turkey; and The Painted Bride Art Center, Philadelphia, PA.

The Garden of Laughter and Tears 20?
Ceramic, Acrylic, Sound

Concrete Sound Based on acoustic foam used in anechoic chambers and sound recording studios, this modular series of cast concrete sculptures explore the physicality of sound through shifts in materiality. Muted objects form silent landscapes. Function is refused and turns to reflection. These objects quietly accumulate to form an echo of weighted presence.

Audra Woloweic is an interdisciplinary artist whose work oscillates between sculpture, installation, text and performance, to produce conceptually driven work with an emphasis on sound and the material qualities of language. Her work has been shown internationally with recent features in Sound American, reductive journal, and Harlequin Creature. Residencies include Bemis Center for Contemporary Art and Complex Systems Art and Physics Residency at the University of Oregon. She is based in New York City and teaches at SUNY Purchase and Dia:Beacon.

Concrete Sound, 2015
Cast concrete with pigment

Beyond Hearing: Engaging with the Ineffable through Motion and Repetition
—Michael S. Boerner

1 prepared dc-motor, cardboard box 60x60x20cm by Zimoun (2014) and *Slight Perturbations* (2016) by John Driscoll are works that channel and compel the audience to consider the means and engagement of sound art in relation to visible moving elements. Both pieces offer examinations on the interplay between seen and heard forces, but more specifically they address how frequencies which fall outside the range of human perception (less than 20 hz or greater than 20 kHz) can be constituted into sound art. Processes of movement in space serve as a canvas on which these structures generate very distinct acoustic palettes; *1 prepared* focuses on rhythmic occurrences, the beat or pattern of the sound, while *Slight Perturbations* emphasizes pitch, the general highness or lowness of sounds produced. The juxtaposition of these works presents us with an opportunity as spectators to analyze our means of contemplating the role of what a "resonant structure" is.

Zimoun is a Swiss artist who works primarily on sound sculptures and sound architecture. He uses common materials (such as cardboard, fiberboard, motors, metal wire, cotton/felt/cork balls, packing peanuts, etc.) to construct elementary geometric structures, often where the motors and wiring are exposed. These arrangements result in dynamic kinetic sound sculptures and architecture. Two hallmarks of Zimoun's work are dc-motors, which present us with a steady means of automatic motion, and repetition, which provides a certain level of consistency in the kinetic and acoustic makeup of the works. The former quality plays out in a number of ways: the repetitive motion of the dc motor is used in many of Zimoun's works to produce circular striking motions for whatever material is affixed to them. The latter manifests in his more monumental works which comprise multiple identical components which are arranged in larger more architectural arrangements, such as *318 prepared dc-motors, cork balls, cardboard boxes 100x100x100cm* (2013). The steady rate of the motors and the multiple usage of them in a single work are not always synchronous; sometimes the striking materials catch, or skip a beat in their mostly consistent rhythms. Multiplied tens or hundreds of times the effect is moving, yet the variation is imperceptibly subtle as the acoustic textures produced by the multiplicity undulate and shift.

1 prepared dc-motor, cardboard box 60x60x20cm (2014) exhibits a sample of Zimoun's often sprawling acoustic sound worlds. The trademark dc-motor strikes the interior of the box in a repetitive, consistent manner, and does so at a slow enough rate (of less than 20 hz) that, rather than generating a discernible pitch, it creates its own rhythm. The work is self-sufficient with the power supply fueling the motion of the dc-motor, mounted within the gyrating box. Zimoun's works often surround or encapsulate (physically and/or acoustically) the audience, but rarely requires any direct interaction. The audience need only listen and view, their interaction with the work is limited to what is produced by the internal strikings and motion of the work. The dc-motor perpetuates a consistent cycle of sound created through the impact of material objects. In many of his works the motors and balls are exposed, allowing viewers to examine how the sounds are produced, but in *1 prepared* the mechanical nature of the work is concealed. Though the motor is enclosed within *1 prepared*, the oscillating of the cardboard box retains the acoustic-kinetic connection.

1 prepared embodies a single iteration of a multipliable process, for Zimoun often uses each single iteration to fill large spaces where each motor's rhythm is meshed to create the overall effect of the work. In *1 prepared*, the audience is faced with a single, active sculpture that nevertheless produces a rhythm which the audience experiences, even in its singular iteration. The repetition of the work sets its own rhythm, both acoustically and kinetically, though the consistency of the rhythm varies based on minimal interference caused by the motor interacting with the motion of the box. What is produced is a piece that is not purely structural, and cannot be received acoustically in their individual components. It is the combined interaction of visible motion and sound that constitutes the work as a whole.
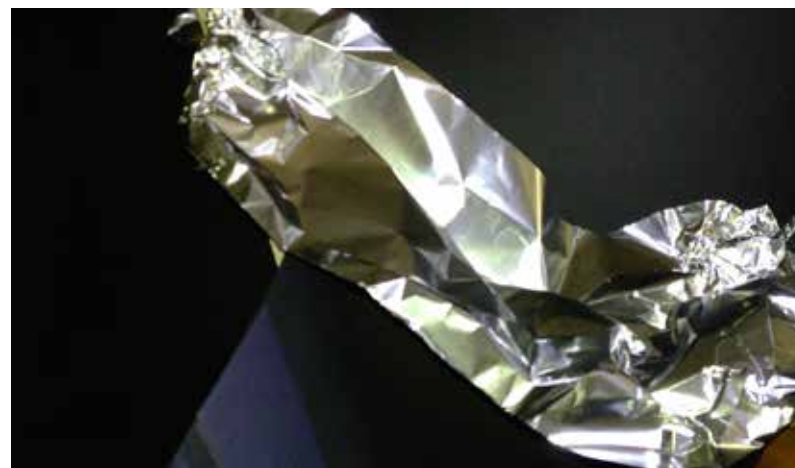
John Driscoll is a composer/sound artist and a founding member for Composers Inside Electronics and collaborated on David Tudor's *Rainforest IV* in 1973. Driscoll's *Slight Perturbations* characterizes the artist's work as a whole, comprising elements of robotics, digital manipulation, translation, autonomy, and control, and how all of these components relate in space. Driscoll says his work "started as an exploration of sonic phenomenon," because he is "fascinated with what happens acoustically in spaces." In comparison to the automated motion of Zimoun's sculpture, Driscoll describes his works as "instruments" that have their own particular voices, which are discovered through the interaction with audience.

Slight Perturbations consists of aluminum foil, servo motors, a series of ultrasonic microphones and loudspeakers, and a joystick controller allowing individuals to interact with the piece. The entirety of the work is predicated on the creation and interaction with an ultrasonic sound field which is produced by the ultrasonic speakers. This sound field contains a reference tone of 40 kHz and a second manipulable variable frequency, both existing well above the threshold of human hearing–the upper threshold is limited at 20 kHz. The variable frequency is manipulated and disrupted by the motion of the aluminum foil, which is repositioned by the servo motors and operated by the Wii joystick controller. The resulting difference in frequency between the reference tone and the variable

frequency is collected by the ultrasonic receivers, creating a feedback loop. This acoustic information is then translated by an audio transducer into a metal resonator, which begins to vibrate and, as the artist describes, "transform[s] it into a resonant loudspeaker with unique resonant character."

Driscoll's work is comparable conceptually to Zimoun's *1 prepared*; rather than passively experience the work, audiences are encourage to actively participate in the production of sound from *Slight Perturbations*. The joystick controller acts as an interface where the audience is able to control the motion of the aluminum foil, and thereby the feedback produced by the acoustic sound field. This allows *Slight Perturbations* to be "played," as Driscoll may have intended, as an instrument of sorts. Also contrasting with *1 prepared*, the primary acoustic element of *Slight Perturbations* comes from the pitches are produced, rather than any rhythmic qualities. The work relies on the processing of imperceptible frequencies via digital means to generate pitches that the audience hears. Repetition is actualized through Driscoll's acoustic feedback, where two ultrasonic frequencies are interpreted over and over again by digital means to produce the sound emanated by the resonator. Accompanying all of this is the motion of both the audience member, controlling the foil, and the foil itself, curving and bending into new shapes as it moves through this high-frequency sound field.

Zimoun and Driscoll highlight imperceptible frequencies as an integral component within their pieces, one operating above the threshold of human hearing, and the other oscillating slowly, generating rhythm rather than pitch. *1 prepared* and *Slight Perturbations* each blend technology into

the structures of the works, giving them material presence while simultaneously accenting the sounds produced. The aim is to reveal not only the acoustic potential around us or within sculptures and architecture, but to give prominence to frequencies that fall outside of human perception.

Play: Sound Art by Maria Chavez, TM Duplantis, Rob Hamilton, and Chris Platz
—Katherine J. Kaiser

In his recent book entitled *Sound Play*, William Cheng meditates on the close kinship between playing video games and playing music: "Both gameplay and musical play involve the apprehension, interpretation, and manipulation of signs and materials within technical constraints and customs."[1] Indeed, his text invites a series of SAT-style homologies, perhaps beginning with code:score::game play:musical performance; hardware:instruments::software:music. When considering digital sound art, the homologies all but disappear, as code supplants score and "laptop orchestras" become established performing groups. The ludic then becomes a liminal space to foreground interactivity that inheres to varying degrees in all sound works. Play lays bare the coaction between art/game and user/listener, technological constraints and cultural frameworks, and the rules and the agency to break them.

Artridge (2015) by sound artist and Mills College graduate student TM Duplantis allows the user to explore a series of simple audio-visual pieces on a Game Boy console. The unabashedly glitchy 8-bit graphics and the noisy square-wave audio situate the piece in the sonic and visual language of early video games. The work is interactive, and the piece emerges as the user explores the controls and manipulates the sonic and visual output. Karen Collins describes the centrality of play to the ontology of video games, "Without a player—without the act of play—[the game] is just code, lying in wait."[2] *Artridge* is nothing without the action of the gallery user.

Duplantis's art fuses two aesthetic worlds: glitch and chiptune. Chiptuners-- frequently DJs video, and sound artists-- appropriate and manipulate the sound available on video consoles. In hacking the game hardware or by using software simulating the hardware of early video games, these DIYers embrace the radical simplicity of the limited sonic resources available and invoke the nostalgia of their audiences who grew up playing simple games like Breakout, Frogger, Super Mario Brothers, and Pac Man.[3]

Duplantis's games use the Game Boy console, beloved of chiptuners and circuit benders for its cheap and readily available hardware.[4] The overlapping lines of Artridge recall the 1990 Game Boy game, Serpent, echoed in Artridge's sub-game "Serpedelic," a seeming portmanteau of "serpent" and "psychedelic."

The evocation of the Game Boy worlds is not straightforward. It is overlaid with a veil of glitch. Sonic and visual glitch art revels in digital artifacts or data errors. As described by sound artist Rosa Menkman, "glitch" is "a wonderful interruption that shifts an object away from its ordinary form

and discourse, towards the ruin of destroyed meaning."[5] By placing the audience as the video game player, Duplantis plays with glitch, not just in the graphics and the sound but in gameplay itself. Its simplicity and disorientation afforded by this glitchverse invites questions: What are the functions of sounds in a video game? What motions, spaces, or figures do they adhere to? What is a game without a "Game Over," an adversary to evade or thwart, a goal to achieve, or game pieces to acquire?

The end of the game is determined entirely by the user: perhaps the user-determined endpoint is filling the screen with the path traced by the cursor, or perhaps it is when the user has fully explored the range sounds triggered by positions on the screen. For example, in Artridge's experience titled "Serpedelic," lower rounder sounds are on the bottom, higher sounds rise towards the top right of the screen. "Draw Circles" begins with a constant siren-like drone that seemingly urges the user to move the

controls to get relief from the constant sound. If Artridge both revels and reveals in its lo-fi glitch aesthetics, the high-fi, multi-player Carillon (2015), a collaboration between composer Rob Hamilton and game designer Chris Platz, is its diametrical opposite. Using virtual reality headsets, players in Carillon encounter a futuristic and intricate bell carillon emerging from an otherwise desolate mountainous landscape. The players alter the delicate and ethereal musical sound by changing the tilt of the cogs in the virtual carillon's mechanism with subtle hand gestures. This piece builds on their 2013 collaboration Echo::Canyon, which similarly created a fantasy game in which a player's motions and interaction with the game world generated the sonic experience.

At Carillon's premiere as a concerted performance with the Stanford University Laptop orchestra, the audience watched and listened to the gameplay video, while its two players altered video and audio with small gestures in the shadow of the big screen. In this performance configuration, the game play most closely resembled conventional orchestral artists performing music in ways only partly understood by its viewers. In the installation version, as displayed in the Resonant Structures show, the gallery visitor is the player, and the game's structures and technological constraints (to borrow from William Cheng) are slowly revealed. Game play becomes musical play and physical action is transformed to musical action.

Carillon relies on first-person viewpoint typically used for first-person shooter games, here deployed in a peaceful virtual-reality fantasy

world. The user is fully immersed into the game world, and learns about their surroundings, their fellow players, and their role in and through exploration of the three-dimensional game space via an avatar. Such exploration requires careful attention to both the visual components and auditory cues from the game, a sense of the three-dimensional world digitally conjured in front of the player, and how motion allows them to explore it.

The game's premise of a fanciful virtual carillon cleverly plays on the history of musical automata, or instruments that play themselves. A carillon, or bell tower with enough bells to play the chromatic pitches required for most conventional Western melodies, is either played by a keyboardist from an organ-like console or as an automaton through mechanical means that look like a giant music box. Because the mechanism or the player is hidden in the structure of the bell tower, the carillon poses the questions raised by the uncanny automata: who generates the sound and how? Is it human or the machine? If the machine can do it, what does that mean for the nature of humanly produced sound? Carillon as a sonic game renders the mechanism visible by placing the user in the center of it. Rather than making music on a fantasy carillon from a keyboard console, the avatar moves gears, a kind of symbol of the hidden code that governs the game play. The user can only subtly manipulate the virtual gears, but not dispense with them, or replace them with something else.

While Artridge and Carrillon use games interactively to foreground the element

of play in their sound art, internationally-renown sound artist Maria Chavez's fixed media musique concrète piece I Just Know It (2016) plays with language behind the acousmatic veil. Made of tiny fragments of multiple recordings of human voices from a series of interviews, each sample less than a second long forms the repeated sentence "I just know it." The work ruthlessly plays on listener's expectations of the sentence's smooth unfolding, as the sutured fragmentary glottals, breaths, and repeated phonemes slowly fit themselves into and against the sense pattern indicated in title.

As a DJ from the age of 16 who developed her craft as an experimental turntablist, Chavez has explored the limits of vinyl and potential the sonic fragments from grooves, to scratches, to vinyl shards. In her analog work, she prefers to operate with a single turntable to direct the focus of her actions, rather than juggling the equipment.[6] The same laser-like focus on a single layer of sound is evident in this digital work. Accidents and failures are themes that unite her work as an abstract turntablist, as she manipulates glitch, the surface noise, and the technological accident. As she describes in her artist statement, I Just Know It works with the incidental and accidental sounds of speech brought to the fore through repetition.

I Just Know It is situated within a long history of speech in musique concrète and pushes at the sonic boundaries between expectations of both language and the music. Luciano Berio's Ommagio a Joyce (1958) takes as its sound source recordings of Cathy Berberian reading James Joyce's Ulysses; however, unlike

Chavez's piece, Berio makes heavy use of the electroacoustical manipulation of the recording. Alvin Lucier's famous 1969 piece *I Am Sitting In A Room* and Steve Reich's *Come Out* (1966) begin with a speech recording that is gradually devolves in to abstract rhythms and harmonies. In his source recording, Lucier even speaks of "smoothing out the irregularities" of his speech. *I Just Know It*, however, consistently reminds the listener of these. Through repetitions, it even engineers stutter. By keeping retaining overall ordering of the sentence, and recognizable phonemes, Chavez preserves the expectation of speech, so that the listener is still aware of the glottals' and stutters' accidental and ancillary nature, even while these become the objects of artistic play.

By selecting sounds from recordings of multiple individuals this digital mix, Chavez's samples have a kind of experimental documentary effect. Unlike the tiny vocal samples Paul Lansky weaves together in his polyphonic synthesized and musicalized *Idle Chatter* (1994), *I Just Know* It's unadulterated short samples are just long enough and just isolated enough to activate a listener's cultural frameworks to give a sense of the gender and age of the speakers, and perhaps a bit of the speakers' paralinguistic meanings as projected in the sound of their speech: apprehension, confidence, sarcasm, curiosity. While pushing at the linguistic boundary of sense, new meanings of the phrase "I just know it" may emerge.

Considered against the radical interactivity in the game art of Duplantis, Hamilton, and Platz, the listener in Chavez's sound art might seem a passive consumer and the only play present in

Chavez's manipulation of linguistic signs. Yet in considering the different auditory choices (such as volume level, speaker placement, mode of attention) and cultural frameworks each listener brings to the piece in the act of listening, the listener plays too.

Footnotes:

1 William Cheng, Sound Play: Video Games and the Musical Imagination (New York: Oxford
2 Karen Collins, Playing with Sound: A Theory of Interacting with Sound and Music in Video Games (Cambridge, MA: MIT Press, 2013), accessed 10 January 2016, ProQuest ebrary.
3 See Israel Márquez, "Playing new music with old games: The chiptune subculture" Game: Games as Art Media Entertainment 1, no 3 (2014): 67-80, accessed 9 January 2016, gamejournal.it.
4 Karen Collins describes the phenomenon of making music with videogames including ciruit-hacking, chiptune composition. Karen Collins, Playing with Sound, 111-118.
5 Rosa Menkman, "Glitch Studies Manifesto," Video Vortex Reader II: Moving images beyond YouTube, eds. Geert Lovink and Rachel Somers Miles, 336-347 (Amsterdam: Institute of Network Cultures, 2011), accessed 10 January 2016, http://www.networkcultures.org/publications.
6 Chavez describes her choice to use just one turntable in an interview: Kristin Iverson, "The Language of Sound: An Interview with Maria Chavez," Brooklyn Magazine, 3 March 2015, accessed 13 January 2016, http://www.bkmag.com/2015/03/03/the-language-of-sound-an-interview-with-

Simple Complexity; Complex Simplicity
—Hayley Roud

The history of the relationship between music or sound and science is long. Debra Swack's *95* chimes* and Tristan Perich's *1-Bit Symphony* and *0.01s: The First 1/100th Second of 1-Bit Symphony* continue the relationship into the twenty-first century in different ways. Swack's sonification of science continues a thread of history that stretches from Pythagoras's discovery of harmonious ratios through the harmony of the spheres to the harmonics of string theory. Perich's sonification of data is a particularly contemporary twist, but his sound world is a clear successor to the post war minimalists, and the drive to compose a symphony has been a staple of the canon-concerned for a couple of centuries.

For the vast majority of human history sound has had a highly spiritual significance, and consonant whole number ratios of 2:1 (octave), 3:2

(perfect fifth), and 4:3 (perfect fourth) were said to be re-created in the motions of the planets and give form and order to everything in the universe from at least Pythagoras (6th century B.C.) until Johannes Kepler (1571-1630). The industrial revolution and the anthropocentrism of the Romantics saw the decisive shift in perspective to the earthly and the tangible. In *The Music of the Spheres* (1993) Jamie James claims "As society came to demand ever more ingenious machines, the search for the transcendental harmonies atrophied." For over a century it seemed that "Educated people will never again be able to face the universe, now unimaginably complex, with anything like the serenity and certitude that existed for most of our history." The assurance that the logic of the universe was founded in the serene order of geometric theorems governing sublime harmony gave way to the pursuits of unities as a purely theoretical goal. James's 1993 publication just precedes the conjecture of M-theory in 1995. In *The Elegant Universe* (1999) Brian Greene observes that "With the discovery of superstring theory, musical metaphors take on a startling reality, for the theory suggests that the microscopic landscape is suffused with tiny strings whose vibrational patterns orchestrate the evolution of the cosmos and that the loops in string theory can vibrate in resonance patterns similar to those of violin strings." M-theory unifies all consistent versions of superstring theory, so once again at the close of the twentieth century scientific understanding offered a unifying theory based in vibrations and harmonics promoting the intimate connection of science and music. But the twenty-first century relationship of music and science is of a different nature. With the degree of

specialization required to be an expert in any field there is not an expectation that a well educated person will have a working knowledge of current theory in multiple disciplines.

Debra Swack's *95* chimes* is a digital sound sculpture/installation that relates string theory to music. String theory claims that all matter exists as a result of the harmonics created by subatomic vibrating strings. The mass of an elementary particle is determined by the energy of the vibrational pattern of its internal string, so the more energetically the internal strings vibrate the heavier the particle, and the lightest particles have the least energetically vibrating strings. The gravitational properties are then determined by the mass. Therefore it is the resonant vibrational pattern of internal string that generates the observed properties of elementary particles.

95 Chimes* sonifies a three-dimensional metaphor for these smallest particles of matter and the harmonics, vibrations, and energies they produce. The recorded, edited, layered, and amplified chimes of different sizes and materials explore the overtone properties of chimes. Overtones are frequencies higher than a sounding fundamental that create an entire spectrum of sound. When two or more fundamentals related by whole number ratios sound together they are heard as overtones in the harmonic series of a missing fundamental that doesn't exist but is created in the ear. Chimes are tuned in the whole note ratios that were first codified as consonances by Pythagoras, for many centuries in Western music history were the only consonant intervals, and to this day are the 'perfect' intervals of the fourth, fifth, and octave (as oppose to the major or minor seconds, thirds, sixths, and sevenths).

In equal temperament, the tuning system that has been the practical standard since the beginning of the Romantic era the octave remains the whole number ratio 2:1, but the divisions within the octave are equalized, so the intonation of the other perfect intervals are compromised. The change is small enough that the intervals are not heard as out of tune, and the benefit of this system is that modulations between keys is possible without some keys sounding more out of tune than others and this roaming through distant tonal centers was essential to the anthropocentric narratives of Romantic music. Having become used to what Timothy Morton calls the "sepia fudge" of equal temperament the use of chimes only in whole note ratios animates the harmonic series. In Hyperobjects (2013) Morton claims that in the current age we know too much: we know "We only hear a limited amount of the piano string. We only see a constrained amount of the electromagnetic spectrum. We know that the sounds and the lights tower into our perceptual realm through depths and heights immeasurable to our everyday experience." *95* chimes* affords the opportunity for attunement to the dizzying height of higher harmonics and the aural hallucinations of lower fundamentals as a metaphor for both the knowledge of what any one of us does not know, and the general knowledge of existences at scales far larger (geological time and the cosmos) and smaller (string) than our human experience.

Both *95* chimes* and *1-Bit Symphony* are preoccupied with hearing materiality. For Swack, this is through the engulfing, spatial interactions of the harmonic series, and the materials of the chimes. Perich presents the materiality of the hardware. *1-Bit Symphony* is presented in a regular CD jewel case, but it houses a microchip and circuitry to perform his five movement symphony when turned on, audible through headphones attached to the jack mounted into the case itself. Electricity is the sonic medium, and the assembly code programmed on the microchip is limited to on and off electrical pulses. On at least two levels there is an intimate relationship between materiality and the abstract: the materiality of the hardware and the abstract logic of the software; and the materiality of the sound and the abstract logic of the forms of a symphony.

Perich's works carves out a niche as an intersection of many traditions. The tradition of 1-bit music dates back to music for 1980s computer games with composers such as Ben Daglish, Jonathan Dunn, and Tim Follin. The symphonic tradition that he continues is first recognizable in the eighteenth century. Referents for the influence of technology as aesthetic are works like Steve Reich's *Pendulum Music* (1968) and Alvin Lucier's *I am sitting in a room* (1969).
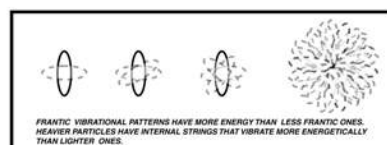
Finally, the sound world of the performed assembly code is reminiscent of late-1960s –1970s minimalism.

The designation of 1-bit music refers to the sample bit depth. In digital audio playback the sampling rate gives the intervals at which the amplitude is sampled, and the audio bit depth gives the resolution of the sample. The resolution increases exponentially with the addition of every bit, according to the formula 2n where n is the bit depth. Standard CDs are 16-bit, and DVDs have the capability of being up to 24-bit. In *1-bit* the amplitude is simply either on or off. Even operating in this most elemental digital restriction the volume of data necessary to create this multi movement work is massive. The publication of *0.01s* visually and physically impresses the complexity, in contrast with the simplicity of the option of 0 or 1. The same kinds of computational processes printed in 0.01s are the building blocks of all the digital pieces in *Resonant Structures*, and this physical object reveals the awe inspiring volume of data behind this exhibit.

Swack's *95* chimes* returns to an ancient them of a unifying theory of the universe replicated in music, dormant for a couple of centuries, now updated with sound and science for today. Perich's *1-Bit Symphony* folds many time periods together, applying 1980s technology to a current trend to sonify data, in a musical form that dates back to the eighteenth century. Perich realizes abstract simplicity via complex computational processes, in contrast to Swack, whose abstract reference to the complexity of string theory is realized with the comparatively simple medium of chimes tuned in whole number ratios.

"95" CHIMES" OSCILLATION PATTERNS

SUPERSTRING THEORY CLAIMS THAT ALL MATTER EXISTS AS A RESULT OF HARMONICS CREATED BY SMALL VIBRATING STRINGS THAT JOIN TO FORM LOOPS AS THEY MOVE THROUGH SPACE AND TIME. AN INFINITE ARRAY OF VIBRATING TUBES IS CREATED THAT MATHEMATICALLY DESCRIBES THE INTERACTIONS OF SUBATOMIC PARTICLES AND GRAVITY

"95" CHIMES" IS A SITE SPECIFIC SOUND INSTALLATION THAT RELATES STRING THEORY TO MUSIC AND THE ORIGIN OF MATTER THROUGH ITS CREATIVE AND SPIRITUAL ESSENCE. * THE NUMBER OF CHIMES/SPEAKERS IS DEPENDENT ON THE SITE.

FRANTIC VIBRATIONAL PATTERNS HAVE MORE ENERGY THAN LESS FRANTIC ONES. HEAVIER PARTICLES HAVE INTERNAL STRINGS THAT VIBRATE MORE ENERGETICALLY THAN LIGHTER ONES.

OSCILLATING CHIMES OF DIFFERENT SIZES AND MATERIALS WILL BE INDIVIDUALLY DIGITALLY RECORDED, EDITED, LAYERED, AND OUTPUTTED TO DVDS. DVD PLAYERS WILL BE HOOKED UP TO SPEAKERS AROUND THE ROOM. THE EFFECT WILL BE SIMILAR TO HEARING A PIECE OF "SCULPTURAL" MUSIC. IF YOU STAND IN THE CENTER OF THE ROOM YOU WILL HEAR A BLENDING AND LAYERING OF SOUNDS.

DEBRA SWACK   3/2003

Perceptual Limits: Expanded Reality in *the chemicals talk* and *30 Cycles of Flux*
—Flannery Cunningham

In their installations *the chemicals talk* (2015) and *30 Cycles of Flux* (2013), artists Erin Sexton and Richard Garet both investigate the relationship of the visual and sonic aspects of their media, the audience's experience of time, and the limits of our human perception. Though the two pieces create distinctly different experiences for their audiences, both Sexton and Garet create a meditative space for viewers/listeners to consider the relationship of their observation of the works and the pieces' fuller realities.

Sexton's *the chemicals talk* explores time and states of matter through the interaction of the sonic process of a chemical reaction and its final result. To produce the piece, Sexton used contact microphones to record the sounds of dry ice bubbling through two different chemical solutions. The resulting audio presents a sonification of the dry ice carbonizing the solutions, adding both turbulence and impurities. This process slowly produced the striking crystal formations that form the visual basis of the piece. As the particularities of the growth environment affect crystal formation, this finished form also provides a record of the unique set of events which produced it. These events are replayed sonically for the audience through speakers placed beneath each petri dish, which also vibrate the crystals. Though this vibration is not acoustically obvious to the listener, it places temporally separated material forms—a liquid past and a solid present—in physical contact with each other in a way that encourages a sense of intimate dialogue.

Though Sexton looks hard at the unique chemical process of the work, the universality of the forces that create the bonds of *the chemicals talk* is also clearly an artistic preoccupation for her. In a discussion of another experimentally-based 2015 work, *Electromagnetic Dimension*, she writes that "the electromagnetic field extends its influence to all possible scales, creating a continuum from radio waves and chemical bonds to the oscillations of thought—experience itself." If we engage with the history of the materials and the forces that changed them—forces which also affect us as humans—it is a relatively short step to imagining the aspects of a material's past which might have resonances in our own. Indeed, for Sexton a work such as this represents a sincere attempt to grasp the nature of her materials' existence; she writes that she seeks to "communicate with non-humans and understand their experience."

Yet *the chemicals talk* is also somewhat mysterious. Unlike earlier work such as *phase space*, a performance piece that Sexton calls something "between alchemical ritual and lab experiment" and which displays a similar interest in electricity, phase change, and our perception of time in a process, *the chemicals talk* does not fully open its history to us. *phase space* focuses on our immediate experience of a chemical process. *the chemicals talk*, on the other hand, presents a fascinating interaction between materials and their "physical memories," allowing us to imagine both the continuity and change of the materials' experience.

While Garet's *30 Cycles of Flux* also features a process of conversion, Garet presents his transformation in a decidedly different manner than that of *the chemicals talk*. For *30 Cycles of Flux*, Garet mounts a number of speaker cones on the ceiling of the exhibition space. In keeping with Garet's interest in site-specific work, the number and arrangement of the speakers may vary from space to space, but each hangs with the cone facing downward and is activated by an oscillator at the low frequency of 30 hertz. A white string hanging from each cone creates a visual representation of the almost inaudible wave. Thus, Garet translates the kinetic energy of his source material to a new sensory pathway for his audience, allowing us to experience it both more obviously and with fresh awareness.

Such elevation of elements of sound that are usually not perceptually dominant is a feature of much of Garet's work. Garet often seeks to heighten the "background noise" of mass media to a position of primary importance; by foregrounding sound that is usually below the level of our conscious attention, Garet explores both the nature of perception and the processes of our thought. This deliberate inversion of the sonic hierarchies we usually experience is a powerful artistic tool for Garet. Here, Garet seems to take this technique to its logical extreme: calling his 30 hertz wave "infrasound" below the level of human hearing, his intent seems to make us aware of sound that is not just hidden, but is actually beyond the limits of our perception. For Garet—who considers the work both a site-specific sculpture and a sound installation—the inherent contradiction of a silent sound piece is a productive challenge.

Such a visual experience of sonic phenomenon is a long-term interest for Garet; in work such as his perceptual *sonic landscape/midnight blink* for the 2015 Times Square Midnight Moment, Garet has used visualizations of fundamentally sonic features of the world. In this work, Garet used the properties of sound recordings of Times Square to both create and drive the movement of a pulsating visual display, stripped of audio for its viewers. In *30 Cycles of Flux*, however, something more subtle is at work. Despite Garet's statement, 30 hertz is within the range of most people's hearing (though far outside our area of greatest perception). Though there is substantial variation between individuals, most audience members will be able to hear the wave that Garet employs. However, they may experience it as vibration as much as sound: a kind of dull roar that fills the exhibiting space. This creates a far more immersive, affective experience for a viewer--

a deeply worthwhile loosening of the piece's conception. Instead of presenting us with a truly silent visualization, Garet plays with the edges of our perception, heightening what is already present and inviting us to imagine the energy we cannot observe.

In fact, this kind of invitation is at the core of both the *chemicals talk* and *30 Cycles of Flux*. In these works, Sexton and Garet provoke us as viewers/listeners to consider aspects of the world that we cannot immediately perceive or imagine. For Sexton, the limits of our perception are temporal: we cannot see, hear, or otherwise perceive the entirety of a process or all of the possible states of matter at once. We are limited to a moment-to-moment experience in each sensory dimension, which she subverts by presenting different moments visually and sonically. Though Garet is also deeply concerned with our experience of time, in *30 Cycles of Flux* the most important perceptual limitation is sensory. Only through augmenting an experience through an extra means of perception can we fully appreciate a phenomenon.

Finally, though both pieces are fundamentally sound installations—sonically driven, at least philosophically—both Sexton and Garet also create strongly affective visual experiences. The lacy shapes of Sexton's crystals, delicately colored by copper, strike the viewer with their structural eloquence. They cast shadows that appear organic, forest-like: a kind of fairytale woods in which the whispered dialogue between past and present states seems both natural and revealing. It would be easy to get lost in the

alluring visual end state the crystals represent. Luckily, the counterpoint of the liquid bubbling we hear and the solid form we see reminds us that the present incarnation of the chemicals is not their full story. *30 Cycles of Flux* is just as visually striking; especially in larger spaces, the stark field of white strings moving in unison is both ghostly and arresting. And that, at the end of the day, is what Sexton and Garet seem to be after: an artistic experience with the capacity to stop us in our tracks and cajole us into listening, watching, and experiencing the world around us more fully.

The Possibilities of Porosity: *Rawr! A Study in Sonic Skulls, The Hone,* and *Tape Translations*
—Heather Contant and Corinna Kirsch

In a sonic environment, it's difficult to determine where "interiority" ends and "exteriority" begins. Take the human voice, for example: where does the internal resonance of the body stop, and the echo and reverberation of the exterior environment start? The bones of the face? The tip of a hair? The room you are sitting in? Or the valley that room was built in? Given this situation of indeterminate thresholds, we can call sonic experiences "porous" since they ecologically link internal and external realms, both materially and conceptually. When Frances Dyson discusses the gravitas of the people's microphone, she points out that "it may be helpful to make a temporary distinction between the metaphors of echo and resonance: whereas echo always introduces the environment (ecology), resonance can be an internal operation that also flows, logically almost, into culture."[1] The power of the people's mic comes from its facilitation of an interplay between the internal and external through its combining of echo and resonance to permeate urban spaces.

Walter Benjamin and Asja Lacis examined urban porosity in 1925 when they reflected back on travels to Naples, Italy. The city's dilapidated architecture inspired them to discuss the breakdowns between interior rooms and exterior facades, which caused "a theater of new unforeseen constellations" to emerge.[2] This permeable structure seeped into urban life as well, transforming Naples into a "construction site" for new possibilities.[3]

Porosity results ... above all, from the passion for improvisation, which demands that space and opportunity be at any price preserved. Buildings are used as a popular stage. They are all divided into innumerable simultaneously animated theaters. Balcony, courtyard, window, gateway, staircase, roof are at the same time stage and boxes.[4]

Upon these stages citizens continually experimented with new ways of relating to one another and their environment, becoming both actors and spectators. The same porosity that dissolved distinctions between inner domestic and outer public life also opened up possibilities for creating new modes of existence.

A similarly porous environment materializes in the gallery during this exhibition when the multiple works of art shown become stages, allowing visitors to improvise and experiment. Playing with the echoes and resonances emitted by these works forces an individual's inner world to confront its surroundings; in doing so, visitors can test out new alternatives for relating to elements inside and outside the gallery. We will focus on three artworks that contribute to this feeling of porosity in this exhibition. *Rawr! A Study in Sonic Skulls*, *Tape Translations*, and *The Hone* each create a different stage upon which more ecological relationships between interior and exterior worlds can be improvised and experimented with in terms of spirituality, technology, and embodiment.

The spiritual, or esoteric, is made evident in the types of sonic transmissions proposed by MV Carbon's *The Hone*, a floating, black sculpture,

like a mysterious helmet, that showers visitors standing underneath with four channels of diverse electronic music loops and field recordings that can be manipulated by turning knobs on a console. Once under/inside this object where sound pours down, a visitor can manipulate those four channels of separate, looping sounds both distant and faraway as it infiltrates their pores. You are a cosmic DJ, hosting a one-person rave under this wormhole-like space where "spooky action" is real.

Within MV Carbon's practice, which also includes live performance, improvisation takes on a spiritual level bordering on transcendence. This work in particular uses sound to take you elsewhere, although you might not know its final destination.

This is where the work's instructions come into play. All actors need some form of script in order to construct a stage, especially

- Stand beneath the speaker.
- Orient yourself with the knobs on the dash in front of you.
- Adjust the knobs to your liking until you discover a desired pulse and frequency.
- Turn up the volume.
- Focus on your immediate environment.
- Turn up the volume more.
- Ignore any influences or demands beyond this contained environment that you are controlling.
- Close your eyes and let the sound shower around you.
- After you have been sufficiently drenched by the sonics, turn down the volume. —MV Carbon *The Hone*

given the dual paths suggested by this artwork, which offers both the opportunity for a spiritual, aural transformation and a material, sonic experience. In this sense, every time one goes under *The Hone,* they stage their own power play: choosing the spiritual or material, or some blend of the two.

Car culture is materially apparent in *The Hone*. Carbon mentioned that one idea for this sculpture came from "the booming bass in the trunk" of car culture with its infinitely customizable stereo options. Adding to this, individuals underneath this sculpture find themselves showered with thick, heavy sounds emitted by a subwoofer that wall them off into their own private world, as if shutting the doors and rolling the windows up.

Improvisation is not unstructured within this interior; like in a video game, guidance is always around. On the exterior, *The Hone* looks quite low-fi; it is just painted wood that mysteriously floats within the gallery. It resembles, in functionality and shape, a "plumbob," the glowing diamond that became well-known from *The Sims* as an in-game icon revealing other players' moods. As a marker for clarifying indeterministic play/action, the plumbob relays relevant information about how to advance in an often unpredictable gameworld. In the case of "The Hone," where one is not quite sure what type of sound to make, the iconic shape provides an external entry point, and thus guidance, to shaping how one interacts with the work.

Meanwhile "*Tape Translations*" by Emily Webster, Genevieve Hoffman, and Ju Yun Song offers an opportunity to participate in a guided improvisation and experimentation with technology. A hacked tape player built into a wooden panel redirects the internal and external energy flows of this outmoded apparatus, allowing us to reimagine its sonic possibilities. Visitors are confronted with diagrammatic instructions etched into the artwork: browse through the artists' collection of old cassettes, select one, and open it. This is where the 1980's ritual of music listening ends and a new one begins. Instead of popping the tape into the deck, one must cut the tape, and pull it through a series of bobbins and across a tape head. It's a cut that severs the playback technology from tradition and, as Caleb Kelly explains, "folds the flow of production and consumption back on itself." It continues to unwind the old and creates something new, a "tape salad" on the gallery floor, which will be recycled in future projects by the artists.[7]

After setting the stage, visitors explore the acoustic possibilities of this new apparatus—an essentially ruined version of the old—as they pull down and begin to resemble a puppet

master. Their movements change the speed of the magnetically coated plastic film over the tape head, which is transduced and internally translated in order to animate the machine's two synaesthetic outputs. A light bulb flashes according to changes in signal voltage, and the whole system chatters with distorted prattle. These silly noises supply a whole new auditory palette, which visitors can alter through their continued experimentation and improvisatory gestures.

Although the sonic possibilities of this piece are somewhat limited by the contents of the tape on deck, Hoffman has noticed diverse results from the work.

I remember someone doing a really good job of scratching with tape, similar to how DJs do with turntables and records. I liked that instead of being an instrument for playback, the installation became more of an instrument itself.

The possibilities of this sonic play are sustained because they demonstrate tactics for repurposing other obsolete technologies as well. By turning this mounting pile of trash into treasure, "Tape Translations" proposes techniques for building instruments of creation amid an era of ecological and economic destruction.

The ability to re-imagine more sustainable ways of living continues in "*Rawr! A Study in Sonic Skulls*," which offers visitors an opportunity to become the lungs of a dinosaur, inhabiting a prehistoric stage with an entirely new, yet

ecologically ancient instrument of a dinosaur's call. In 2011, artist, composer, and engineer Courtney Brown and others began the process to digitally fabricate the resonating nasal passages of the Corythosaurus, a duck-billed dinosaur that lived about 75 million years ago. Paleontologists speculate that these were social animals due to the footprints they left behind, which suggest that they traveled as a herd. Therefore, the well-developed cochleae, complex nasal passages, and prominent crests of these animals are thought by some to have produced a call in order to communicate, attracting or warning other beings.

Brown recalls going to a museum in New Mexico where she could "press a button and then hear a disembodied call" of a Lambeosaurine Hadrosaur, another crested dino related to Corythosaurus. She thought that in contrast to this relatively uni-directional mediated experience, she might build an opportunity that let people "become part of the dinosaur in some way" and "embody

the sound." Brown and Razzaque used data from Corythosaurus CT scans to create a sculptural replica that could resonate the vibrations of a mechanical larynx made of brass pipes and balloons. Visitors can blow this larynx to get an idea of what these Cretaceous creatures might have sounded like.

Instructions illustrate how the visitor's internal breath gives power to this artifact. By exhaling "as hard as you can" into the internal crevices of this object, vibrations are attenuated by the chambers of the sculpture, producing into a haunting deep call. But no matter how hard you try, your human-sized lungs can only produce a ghostly echo of this once mighty roar. As Brown admits, sounds emanating from this sculpture are still speculative, since the soft tissue of the original Corythosaurus has eluded fossilization and decomposed, leaving it to art to reenact this historical reality.

In addition to the exhilaration of embodying this unique beast, a deeper ecological connection is revealed by the artwork's materiality—its petrochemical composition. When visitors exhale into the cranial cavities of this extinct species, a sense of foreboding is expelled from the resulting chimeric character. Plastic is, after all, one of the most mysteriously fecund man-made objects— which could very well outlast human existence. Roland Barthes elaborated on this, writing that "more than a substance, plastic is the very idea of its infinite transformation," and through its constant displacement of form, "it is less a thing than a trace of a movement."[10]

Indeed, the petrochemicals that make up this form are themselves derived from other fossilized organic materials (algae and phytoplankton) that have, similar to the Corythosaurus, been excavated from the Earth's crust. Therefore, *Rawr!* presents an aporia—an insoluble impasse that is a-poros. It collapses eco-time into an emblematic death's head that the visitor dons like a mask in order, it seems, to vitalize and alert others of humanity's fate and the likelihood of its extinction if it does not reconsider its ecological relationships with the Earth—its internal connections to the outside world.

"*Rawr! A Study in Sonic Skulls*," "*Tape Translations*," and "*The Hone*" each create a different stage upon which more ecological relationships between interior and exterior worlds can be improvised and experimented with in terms of spirituality, technology, and embodiment. By experiencing these works, visitors become active participants in an ongoing production that rehearses new possibilities for sonic action and ecological relationships in the 21st Century.

Footnotes:

1 Frances Dyson, *The Tone of Our Times: Sound, Sense, Economy, and Ecology* (Cambridge, Massachusetts: MIT Press, 2014), 152-153.
2 Walter Benjamin and Asja Lacis, "Naples," in *Walter Benjamin: Selected Writings: 1913-1926, Volume 1*, edited by Marcus Bullock, Michael Jennings, Howard Eiland (Cambridge, Massachusetts: Harvard University Press, 1996), 416.
3 Walter Benjamin, "One-Way Street," in *Walter Benjamin: Selected Writings: 1913-1926, Volume 1*, edited by Marcus Bullock, Michael Jennings, Howard Eiland (Cambridge, Massachusetts: Harvard University Press, 1996), 449-450.
4 Benjamin and Lacis, "Naples," 416-417.
5. MV Carbon in discussion with the authors, January 2016.
6. Caleb Kelly, *Cracked Media: The Sound of Malfunction* (Cambridge, Mass: MIT Press, 2009), 59.

7 Genevieve Hoffman in discussion with the authors, January 2016.
8 This project exemplifies that way that artist-led research involves input from diverse fields. It also included expertise from Carlo Sammarco, who helped with digital fabrication, composer Garth Paine, who advised the project, and Lawrence Witmer, who provided the 3D model of a hadrosaur skull. The skull that will be shown was completed in 2013. A second skull has been produced with a variation upon the resonant nasal passages.
9 Courtney Brown in discussion with the authors, January 2016.
10 Roland Barthes, "Plastic," in *Mythologies*, trans. Annette Lavers (London: Vintage Classics, 2000), 97.

Embedded Narrative: Remembering through Soundwalking
—Rebecca Uliasz

Our sonic environments are immersive and ever-present, yet most often subconsciously ignored by us as we go about daily life in a modern society. Ecologists and artists alike have utilized the technique of "soundwalking" to bring back focused attention to our environment where it has been lost. "Soundwalking" is a term used to describe an immersive and embodied guided listening experience. Coined by Canadia composer R Murray Schafer in the early 1970's as part his development of the idea of "soundscapes", soundwalks were the preferred research method of Schafer and other researchers at the *World Soundscape Project* used to collect empirical data and information on the quickly changing acoustic environment of the city of Vancouver at the time. Occurring simultaneously with the environmental movement of the 1970's, a soundwalk became recognized as any acoustic listening and learning from an environment in which one is physically present. The use of soundwalking as an artistic technique became particularly notable through Janet Cardiff's "*audio walks*" in the 1990's. Cardiff used cassette tapes and CD players to create audio experiences that layered sounds pre-recorded in an environment on top of sounds that were experienced within the same environment during the walk. By layering the sounds, along with her own voice giving directions to the walker, Cardiff's walks bring together two sonic worlds in a way that gives rise to a new experiential space and traces a narrative left behind.

Andrea Williams' guided soundwalks utilize multi-media and multi-sensory elements in order to encourage deep listening, or listening with a heightened awareness, to one's environmental surroundings. Williams is a board member for the American Society for Acoustic Ecology, which bases its ideologies on the work of Hildegard Westerkamp. While Westerkamp advocates for the use of the "naked ear" as a tool for understanding the physically present surroundings, Williams often utilizes readily available technology, like the participants' smart phones, in order to add another layer to the ephemeral soundwalking experience, one in which the artist is able to guide, but never completely pre-determine the course and outcome of the walk. Williams' soundwalks place the viewer in an environment and provoke them to reconsider it in a new context, one in which they are a participant in the sonic atmosphere that surrounds them. The experience is one that is at once both intimately personal and collectively felt and encourages one to connect and understand their surrounding environment and their role within it on a deeper level.

Williams' work incorporates field recordings, but also utilizes site specific and ephemeral elements like guided touch, taste, smell, and the natural sounds of the environment at the time of the walk. Her walks encourage the participant to switch mental gears, away from the frenzied and over stimulated mindset through which we usually unconsciously experience our sensory environments, and towards one of mindful and

deep consideration of ones surroundings, almost akin to a sort of meditation experience. Even the most mundane of urban settings, such as a busy city street, is transformed for the participant into an atmosphere ripe with information that allows for further reflection and connection. The walks often go beyond a neutral sensory experience however, and morph into one in which Williams uses the intimate connections the participant has just made with their surroundings in order to address environmental concerns. Her ongoing *Troy Waterways* Soundwalk project uses site specific guided soundwalk experiences in order to imbue the participants with a sense of space by both physically immersing them in the present while simultaneously leading them to understand the past, and consider the future.

"What is our connection to the Hudson River in Troy today? Can we swim in the river still? Can we eat the fish? Currently the answer is no," Andrea states in her *Riverfront Park Soundwalk* following an instruction for participants to gaze out over the Troy riverbank. The participant is at once presented with the setting and the facts in a way that aims to strike in them a greater sense of empathy towards the space, and bring to light the immanency of the various impacts that human activities have had on this environment. Andrea will conduct a similar soundwalk experience at Stony Brook University but through written words and photographs for mobile device as part of *Resonant Structures*.

The emphasis on the historical narrative frequently found in Williams' work can also be experienced in the form of recalled memory. Her 8-channel audio installation, *Architectural Bodies, Revisited* (2016), immerses the audience into a so called "surrealscape" in which sounds from a different culture, in this case the mountains and down town life of Innsbruck, Austria, are woven together with sounds from the environment in which the work is experienced, in this case the gallery. Andrea composes these sounds live, along with other instruments she plays into the mic at the time of the performance, to the effect that the listener is taken on a sonic space and time traveling experience, one in which they are able to temporarily but physically re-experience a mingling of two spaces in one moment, the physical and the ephemeral.

Sound Aside: Dislocating Selfhood through Noise and Silence
—Paul Rubery

In the late hours of the evening, when the din of traffic calms outside, sounds attached to objects around my apartment disrupt the nighttime silence. As with many prewar structures, the baseboards of my home buckle beneath the slightest pressure, emitting a drawn-out groan as my cat relocates from one room to the next. With falling temperatures that suggest an impending winter, the cast-iron radiators of this building sigh intermittently, at times in concert with the rattle of the struggling pipes, as I rest my eyes here and listen to some nameless machine whirl in the dark. Somewhere else, another object offers to the night a regular, if not frequent beeping noise that, in perhaps emanating from the furthest room, carries throughout this space with the unintentional effect of inexpensive radar or maybe even of echolocation. Such inconsequential sounds, however incidental to my awareness during the day, inscribe themselves violently on my consciousness as it borders on sleep. In spite of its intimate familiarity, the patterned unfolding behind this nocturnal symphony of object noises affords my present circumstances neither the space for, nor the possibility of, the silence demanded by the hour. A subtle metallic ping resounding in another room invariably directs my attention to the doorway, or possibly to the wall against which I pressed my bed, and in doing so evokes a mental image of my living space. From here, my mind not only perceives the spatial relationships that characterize the surrounding environment, but also furnishes me

with an image of myself enmeshed in that extended tableau. These nocturnal sounds, oscillating between the registers of noise and silence, consign me to an unnerving self-awareness. They compel me to acknowledge that my subjectivity yields under pressure to the unexceptional position of being just one additional body among the many that contribute to the acoustic fabric of the world.

Feelings of alienation arising from this encounter with nocturnal sounds reinforce the material and spatial dimensions of acoustic phenomena. In my bedroom, these sounds not only insinuate themselves into a space where they were not consciously admitted, but they also unsettle my privileged relation to that space under alternative circumstances. Once an area of control, where the mind's attentive faculties focused selectively on the environment, the room now stands independent and transformed. It demands my attention as it exercises its agency over my cognitive processes. This phenomenological effect, or the sensation of being dislocated from oneself by the imposition of external phenomena, attests to the materiality of sound inasmuch as the sonic realm operates like a motile force. According to contemporary sound artists and theorists invested in materialist philosophies, this capacity of the acoustic to affect the listening body problematizes the received categories of thought about an individual's relationship with any auditive environment, not least my bedroom or the gallery space. Sonic materials vibrate and condense, disperse and solidify in erratic ways. They travel outside and beyond our intentions for them. In contradistinction to a regulated auditive environment, whereby a human

auditor transmits and receives information through controlled acoustic frequencies and architectural devices, the qualities of the everyday spaces in which listeners most often encounter sonic phenomena tend to be unpredictable. As illustrated by the insidious sounds we hear late in the evening, acoustic phenomena comprise unruly systems with violent feedback loops, noncommunicative tendencies, and total disregard for our cultural investment in the symbolic.

Artworks by Audra Wolowiec, Nanu Al-Hmad and Miriam Simun, and Jacqueline Kiyomi Gordon thematize the complex material and social structures that support auditory perception while emphasizing the ways in which a materialist conception of sound might disclose the mechanics hidden behind those structures. More specifically, select works by these artists, such as those included in *Resonant Structures*, explore the relation of sonic materiality to a listener's imperfect apperception of and control over a universe which exceeds the phenomenal limits of human perception. These sonic resonances function as a line of flight outside the immediate and the cultural, the rational and the symbolic. However, unlike a certain tendency witnessed in critical interpretations of acoustic materiality—namely, the desire to demonstrate or to defend the value of a renewed interest in ontological thought—the arguments posited by these artworks address more broadly human and social concerns. For instance, all three works induce an awareness of embodied listening toward the appreciation of material systems, sonic or otherwise, that evade description in an instrumental worldview. Although specific concerns might vary

from artist to artist, this general investment in the logic behind systems of interaction, suffused with a strong materialist bent, invites us to situate these works in conversation with the artistic experiments of 1960s as we interpret the contemporary. Across the works included in this exhibition, these four artists most clearly appropriate postwar aesthetic strategies, traversing and combining poetic forms native to a fertile moment in the history of music, sculpture, and conceptual art. Such a recuperative practice provides a generative lens through which to envision the political merits of a sound art beyond the auditive. Moreover, it presents the opportunity to reflect on the possible structure of such a critical aesthetic in our increasingly networked and systems-dependent society that employs sonic metaphors to describe its channels of relationality, from noisy to silent.

In Audra Wolowiec's *Concrete Sound* (2013-2015), modular concrete casts, modeled on the noise-dampening foam used to line the interior surfaces of an anechoic chamber, hang on the gallery walls in a formation suggestive of soundproof paneling or the traditional shape of a canvas. The pieces are angular and pitched, and when pressed together, the composition recalls the shale geological deposits often found on the Atlantic coast. An experience
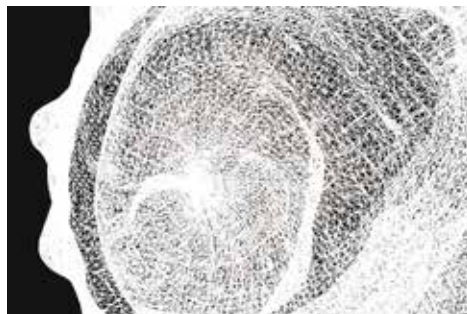
of the work, however, departs from an associative logic of this kind, which imposes symbolic meaning onto the form, and encourages instead a phenomenological encounter with the neglected physical and spatial relations that sustain everyday acts of perception. Such an encounter unsettles the privileged space we routinely accord to the subject when viewing or listening to the material world. In *Concrete Sound*, Wolowiec deploys a range of midcentury aesthetic conventions borrowed from minimalist sculpture and concrete poetry to instigate a corporeal engagement with the artwork's exhibitionary context, and in doing so establishes the parameters for the productive confrontation with the mechanics of material systems hidden underneath symbolic realm. For instance, the minimalist formal logic behind Concrete Sound positions the observer against not only an acoustic environment characterized by sonic materiality, as the presence of anechoic materials would imply, but also against the architectural layout of the exhibition space. The resulting effect recalls what Michael Fried denounced as the theatricality of "literalist art," or loosely defined, the sensation one feels when coming into an awareness of material relations outside the art object. In the physical presence of Concrete Sound, this effect is intentional and the gestalt sensations before the work echo the confused, late night experience of noise and silence. The silence of the anechoic materials becomes quite noisy once the minimalist material form problematizes our orthodox relationship to space. *Concrete Sound's* muted topography resonates in the sounds it withholds from us. Where anechoic foam previously granted John Cage access to the acoustic world of the body's internal functioning, Wolowiec's sculpture invites the audience to look outside of selfhood to the materiality of sound.

Nanu Al-Hmad and Miriam Simun's *Simphonal N9604Z* (2015) also regulates the auditive position of its audience to foreground the relationship between the subjectivity implied by contemporary listening practices and a neglected sonic materiality. Appealing to childhood wonderment at the sounds contained within a conch shell, the artists combine the exoskeleton of an extinct mollusk with the recorded sounds of modernity, exchanging machine noise for those murmurings once associated with the sea. For listeners, this juxtaposition provokes an uncanny set of mental associations, with the misalignment of expectation and experience inviting them to analyze or pursue whatever structural similarities might validate the pairing. On the one hand, both the physical form of the shell and the composition of the soundscape represent the outcomes of accretive processes. The siphonal canal of the conch repurposed by Al-Hmad and Simun evolved over hundreds of millions of years, through natural changes in the environment and natural selection, before developing the acoustic properties it presently contributes to the work. Likewise, the machine noises heard in *Simphonal N9604Z's* soundscape reference the extended history of industrial and technological progress as much as they provide listeners with a sonic record of our contemporary acoustic environment. By drawing attention to the history of these systems and the processes indirectly responsible for our material artifacts, Al-Hmad and Simun gesture to the legacy of conceptual works by Hans Haacke, Mel Bochner, and others. Yet the materiality of sound, combined with the way we listen to conch shells, differentiates the sculpture from other works indebted to the conceptual moment. Where most conceptualist projects advance knowledge claims on the basis of the symbolic, *Simphonal N9604Z* manages to communicate without language not only the temporality and scale of these systems, but also the human position relative to them. As a listener brings the conch next to an ear, the agency of the listening body gives way to force of sound.

Jacqueline Kiyomi Gordon's series of drawings and watercolors entitled Filter Resonances (2013) continues this thematic interest in sonic materiality and its relation to the listening body. Using a muted palette of greens, purples, and browns, Gordon paints an array of geometrical abstractions imposed over grids. At fist take, these works have ostensibly little to do with a materialist conception of sound and more to say about figuration or scientific notation. From the two ends of each abstract figure a thin red line emerges to connect its spatial poles or, perhaps if the line is cut abruptly short, to ensure the possibility of such a connection in the future. Although these works are potentially legible within the context of psychedelic illustration and Op art, the nonrepresentational qualities of these images also sanction a variety of interpretations ranging from anatomical drawings to topographical studies of imaginary landscapes. In the limited parameters of sound recording, however, the use of the name "filter resonance" hints at the rationale that supports certain aesthetic decisions. The term designates the character of a sound as it approaches the limits designated by an audio filter, which is a device that excludes sonic frequencies outside of a desirable threshold. On the borders of this threshold, sounds acquire a greater degree of filter resonance and begin to resemble the phasing audio effects associated with older science fiction films. Filter resonances capture Gordon's interest in dynamic environmental systems, particularly forms of feedback and the sound diffusion, and can be viewed as the contemporary correlate to her interest in the cybernetic discourse of the 1950s and 1960s. When examining these drawings in the context of a sonic materiality, the color variation and undulating lines impact the viewer with an almost synesthetic effect. But what other artworks perform phenomenologically, Gordon's Filter Resonances also enact graphically by rendering visible the unobservable material shifts to an acoustic frequency when it is run through a filter.

But what does the return to materiality and systems thinking hold for sound art in the 21st century? And what kinds of critical practices meaningfully engage with the material conditions of the sonic without succumbing to the ontological enthusiasm of contemporary critical theory? Artworks by Audra Wolowiec, Nanu Al-Hmad and Miriam Simun, and Jacqueline Kiyomi.

Gordon suggest aesthetic strategies for the use of an acoustic materiality toward social and political ends. In doing so, they revisit artistic movements from the postwar period in order to study how previous cultural moments negotiated the sometimes antagonistic principles of subjectivity and systems theory. Most importantly, however, they together demonstrate the infinite possibilities afforded by the sonic even in the absence of sound.

Perception, Spatiality and Affect: Intimacy in the Sound Art of Nikki Renee Anderson and Byron Westbrook
—Jay Loomis

While some sound art is purely sonic, both Nikki Renee Anderson and Byron Westbrook create balanced auditory and visual experiences with their work. Anderson's *Garden of Laughter and Tears*, and Westbrook's *Field of View, Played by Ear / Pink Noise Inversion* invite audiences to intimately consider sound and its connection to the visual aspects of their pieces. Westbrook and Anderson both incorporate small speakers into their works; the small scale of these speakers fosters an intimate interaction between the artist and the audience as they experience the sonic and visual elements in these pieces. In the video by Byron Westbrook, the viewer sees the sound artist in his own footage holding a small, round, custom designed, wireless speaker in his hand. He wields his speaker as a tool to create audio effects noise masking. The audience sees and hears him interact with sound and space throughout the video. Anderson, on the other hand, imbeds small speakers into her stationary ceramic sculptures, which are mounted on the wall. As the [listener/viewer] draws near, they hear a dynamic mixture of voices that are both weeping and laughing. These artists offer an opportunity for the audience to become intimately immersed into the artists' personal, audio-visual microcosms.

In *Garden of Laughter and Tears,* Anderson places smooth, ceramic, pastel, multicolored,

cloud shaped and spherical forms on the wall. Some of these voluptuous, round ceramic forms have small speakers inside them, and if the listener draws near enough to these ceramic pieces, they can hear the combined sounds of laughter and weeping. In her artist statement on her website Anderson says, "In my artwork, I explore the nuances of the feminine experience from reflections of childhood and adolescence... The intertwining of sculpture and voices is important in my expression of femininity." As a feminist artist Anderson uses her art to comment on the feminine from her own experience and from a variety of perspectives. In *Garden of Tears and Laughter* the ceramic sculptures reference gender related clichés and she refers to the pieces as "fantasy objects [that] explore cultural stereotypes about beauty, desire and femininity." The crying and laughing voices that the listener can hear when they approach the pieces can create a visceral, conflicted sensation; Anderson dives into this liminal space where expressions of sadness and joy overlap. The result of listening to this combination creates a feeling that is absurd, playful, eerie, and ridiculous all at the same time. It unsettles the audience to hear the combination of laughter

and weeping which generates a kaleidoscope of reactions. In this context, Anderson describes *Garden of Laughter and Tears* as "an installation that investigates the whimsical nature and the sensuality of laughing and crying and the similarity of these emotions. Sometimes, we laugh so hard that we cry. Also, crying can turn into laughter." Anderson is clear in her intentions to bring attention to the power of the human voice in her art. She creates atmospheres of intimacy that require up close listening practice where the audience is often pushed to experience sound and art in ways that can be disconcerting or uncomfortable. Her combination of ceramic structures and audio recordings are a true sound sculpture.
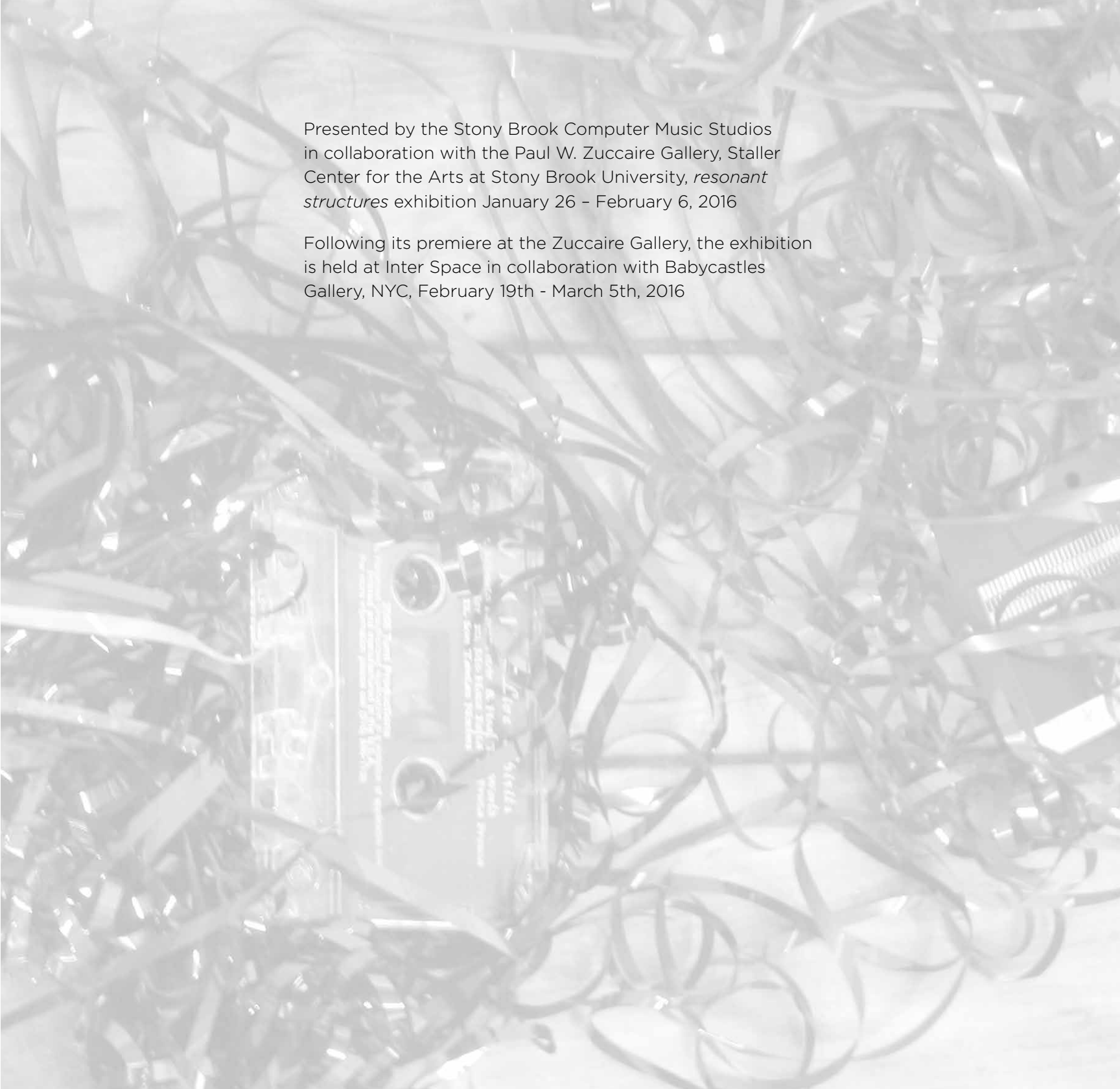
Anderson uses concrete sounds and abstract visuals in her work, while Westbrook uses abstract noise and concrete visuals. Theorists, sound artists, scientists, and politicians often debate the topic of noise. Definitions abound. Is it merely an unwanted sound? Or a random signal? Or an urban plague to the ears that needs to be controlled by noise abatement policies?

Westbrook's work goes beyond these debates and treats noise as a tool for expression. As described earlier, the role of pink noise in *Field of View, Played by Ear* is to occlude and reveal the ambient sounds of a variety of soundscapes; his choice of contexts to record in reminds the audience that sound and noise both have profound effects on how we perceive and interact with our surroundings.

In *Field of View, Played by Ear* (2014), Byron Westbrook invites the viewer to experience the artist's exploration of several sound atmospheres. He uses a stereo shotgun microphone to record the ambient sounds of a number of different locations that are also recorded on video. Westbrook then creates a seamless sonic flow from one context to the next by using pink noise to create an auditory fade-in and fade-out between each scene. These audio fades are juxtaposed with the sharp, immediate visual transitions that occur instantly from one scene to the next throughout the video. In his footage the audience can see and hear how the artist uses pink noise emitted from his hand-held speaker like a sonic curtain that covers and uncovers the ambient sounds of each field of view that Westbrook inhabits during the shot. This "masking" covers audibility on one sound, the natural environment, with the presence of another masking sound, the pink noise. Each scene presents Westbrook as the curator of the sounds that are recorded in each place, while the camera acts more as neutral documentation maintaining the same angle and focus throughout the shot. With his headphones firmly in place, the sound artist moves around

the scene, and carefully measures how close he should be to the microphone, to deliver just the right amount of pink noise into the mix, thus controlling the amount of masking of the ambient sounds. Westbrook's movements also take into account the directionality of the microphone. He suggests that the audience use headphones or a spatialized hi-fi system to fully appreciate the interaction in of noise and ambient sounds all around the space that the microphone is recording.

The works of both Anderson and Westbrook are intimate, enticing invitations for the audience to engage in the personal experience of how the artists approach sound. Anderson focuses on the ambiguity and intensity of affect in her recordings of laughter and crying. When experiencing this piece the audience can question stereotypes and marvel at the complex interactions of human emotions. Westbrook, presents himself as a stoic with, with an acute interest in the interaction of noise and ambient sounds in his footage. Despite their differences in medium and execution, both of these pieces prompt an intimate interaction with sound that requires the audience to consider the effects of sound on psychological and emotional states.

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Following its premiere at the Zuccaire Gallery, the exhibition is held at Inter Space in collaboration with Babycastles Gallery, NYC, February 19th - March 5th, 2016