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Senior Projects Spring 2017

Bard Undergraduate Senior Projects

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Spring 2017

## The Polyrhythms of the Ear Canal: Investigating the Human Body as an Instrument and Listening Machine Inspired by Hearing, Attention, and Alvin Lucier

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The Polyrhythms of the Ear Canal:  
Investigating the Human Body as an Instrument and Listening Machine  
Inspired by Hearing, Attention, and Alvin Lucier

*A Senior Project submitted to  
The Division of Arts  
of Bard College*

by Philippa Ruthe Kelmenson

Annandale-on-Hudson, New York  
May 2017

*For my Mom:  
With you, I am always listening.*

## Acknowledgements

To Alvin Lucier, Maryanne Amacher, and Steve Reich:  
*for the inspiration.*

To Matt Sargent:  
*for your endless intellect, kindness, and willingness to admit that I just might be a little crazy.*

To Bob Bielecki:  
*for convincing me to love ears as much as you do.*

To John Esposito:  
*for your real-world wisdom and truth.*

To Kyle Gann:  
*for never telling me “no.”*

To Tom Mark, Damien Moffitt, and James Mongan:  
*for making everything work out in the end, every time.*

To Peter O’Brien and Carlos Valdez:  
*for making me the drummer I am today.*

To Gemma Godfrey, Jake Merrell, Paris Watel-Young, and Ken Winfield:  
*for your time, encouragement, and boundless talent.*

To Millie:  
*for loving me, still.*

To Rizzo:  
*for being you, while putting up with me.*

To Dad:  
*for always listening.*

To Mom:  
*for everything.*

“That my ‘ears were emitting sounds’ as well as receiving them, that is hearing other acoustically produced tones at the same time, was incredible to me, a totally unique amazing experience at the time!”

– Maryanne Amacher, *Psychoacoustic Phenomena in Musical Composition*

Halfway into my college career, I was asked if my attention and hearing impairments had ever benefitted me in any way. Although I refused to see it at the time, it is this exact dichotomy between hearing as passive reception and listening as active concentration that informs my musical work. From otoacoustic emissions to tinnitus frequencies, the ear is an active amplifier of its own sounds, acting as an instrument responding to sound information. To distinguish acoustic elements generated outside of the ear from those taking shape within it, we are required to internally perceive all acoustic information. But is concentration enough to determine the origin of each element? Inspired by my own difficulties with attention and hearing, my work strives to accentuate the ear as a musical instrument and emphasize the necessity of focus rhythm requires.

My sound art and electronic music explore the physical phenomena of sound and human auditory perception. In the first semester of my senior project, I built a large-scale ear canal that emitted an aural architecture of ear-borne tones in a sound installation. The parallel division of the Old Gym allowed each architectural space to become a speaker that produced overlapping sounds that swept between the two, intricately joining them to be heard and felt in a rhythmic resonance throughout the body. On one side, tinnitus tones of varied frequency coalesced to form their own, highly pitched and dynamic music. On the other, the acoustic impression of low frequency binaural beats was used to invoke our particularization of rhythm. Sound waves coincided to make beats that occurred at speeds enhanced by the passing waves of sympathetically resonating snare drums. My audience was invited to wander from room to room, the room as a trope of

attention and hearing, both lost and retrieved—as if the listener must reassemble a strayed train of thought.

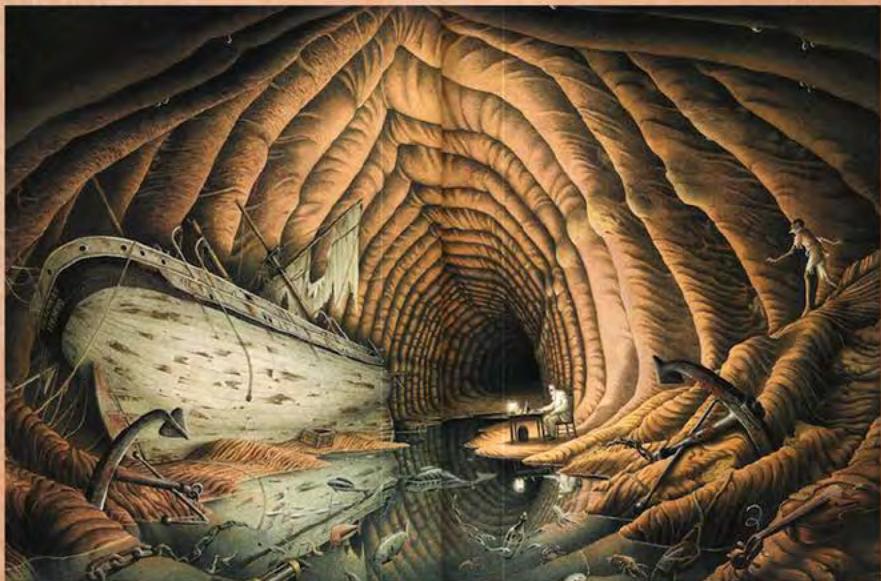
In my second semester senior concert, I produced specific intervals of ear-borne tone melodies, accompanied by other musical instruments and sound spectra to create superpositions and distortion products as well as to emphasize the subtly shifting phase of rhythmic patterns. Not only did the effects of high frequency acoustic information on the ear and brain bring attention to the sonic intervals of the sounds and their polyrhythms, but it also invoked an internal bodily response that the listener was forced to confront. The phasing patterns of my concert acted as psychoacoustic byproducts of repetitive melodies: once interlaced, a rhythmic entrainment was generated throughout the body that resonated with their produced polyrhythms. Rather than act as submissive receivers, the ears of the listener emitted sounds in response to the otoacoustic emission and tinnitus tones presented. Not only was my audience able to hear how I internalize sound information in addition to how their own ears responded to acoustic stimuli, but they could also hear themselves hearing how their response tones assisted in the direction of the piece. These high-pitched melodies induced auditory distortion products and binaural beating that caused the ears of my listeners to act as listening devices. What were left were psychoacoustic illusions, tricking us into perceiving fantastic width and space. Thus, the emphasis of the performance was on the listener's active role, using the ear as an instrument to contribute to the creative process.

Hearing has generally been imagined as a percussive affair: the sounds of the outside world beating on eardrums. It is once the sounds of the ear are amplified, however, that listeners may realize that the eardrum is an active instrument, creating

polyrhythms by responding to acoustic information from the inside, out. The concentration is dependent on which sound is listened to, and why. Throughout my work, I ask that my audience not simply hear, but listen to and internalize the human body's innate response to the sonic information I create. Utilizing sound as both a form of art and media, my immersive installations and performances benefit from sonic distraction to investigate the body as an instrument and listening device.

# The Polyrhythms of the Ear Canal:

Investigating the Human Body as an Instrument  
and Listening Device Inspired by  
Attention, Hearing, and Alvin Lucier



What do your ears sound like?

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November 17–19, 2016  
7–9pm

The ear is an active amplifier of its own sounds. From otoacoustic emissions to tinnitus frequencies, our ears act as instruments responding to sound information. To distinguish acoustic elements generated outside of the ear from those taking shape in the inner ear, we are required to internally perceive all acoustic information. But is concentration enough to determine the origin of each sonic element? This sonic distraction accentuates the focus of my work: the dichotomy between the theory of hearing as passive reception and listening as active concentration. Inspired by my own difficulties with attention and hearing, my work strives to emphasize the necessity of focus rhythm requires. The parallel division of the Old Gym allows each architectural space to become a speaker producing sounds that sweep between the two, intricately joining them to be heard and felt in a rhythmic resonance throughout the body. On one side, tinnitus tones of varied frequency coalesce to form their own, highly pitched and dynamic music. On the other, the acoustic impression of low frequency binaural beats invokes our particularization of rhythm, in which sound waves coincide to make beats that occur at speeds, enhanced by the passing waves of sympathetically resonating snare drums. The effects of this acoustic information on our ears and brain bring attention to the sonic intervals and their polyrhythms, leaving us with illusions that induce prominent distortion tones in our ears, tricking us into perceiving fantastic width and space. I invite you to wander from room to room as if reassembling a strayed train of thought, in which the room itself is a trope where attention and hearing are both lost and retrieved. I only ask, however, that you not hear, but listen to the sounds as well as to the human body's innate responses to them.

"It's an extension of what you do when you're a little child at the beach and you put a seashell up to your ear, and you hear the ocean... You hear the sounds around you resonating in the interior of the shell... Then you stop. You don't do that as you grow older. Your ear stops doing that because you've got to think about other things, how to make a living, and how to speak to people, how to communicate verbally... I started to think of those shells as small rooms that had special resonant characteristics... I guess I'm trying to help people hold up shells to their ears and listen to the ocean again."

— Alvin Lucier

47'-0"

form 5R

form 5L

52

Plus 1

R

4P

Plus 1

A

80'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

10'-0"

32'-0" x 38'

pool, nat  
CONTROL BOOTH  
PLUS 2

UP 14' R of 60'

Defining height - 8'-0"  
Beam height - 8'-0"  
Grid height - 10'-0"

OLD GYM

scale 1/4"

revised 2/14/3

# Thank You

Mindy Abovitz

Matt Aiken

Bob Bielecki

Kate Brashear

Emmet Dotan

Annie Garrett-Larsen

Kyle Gann

Brynn Gilchrist

Gayle Kelmenson

Izzy Leung

Tom Mark

Dave McKenzie

James Mongan

Peter O'Brien

Daniel Risdon

Matt Rulison

Matt Sargent

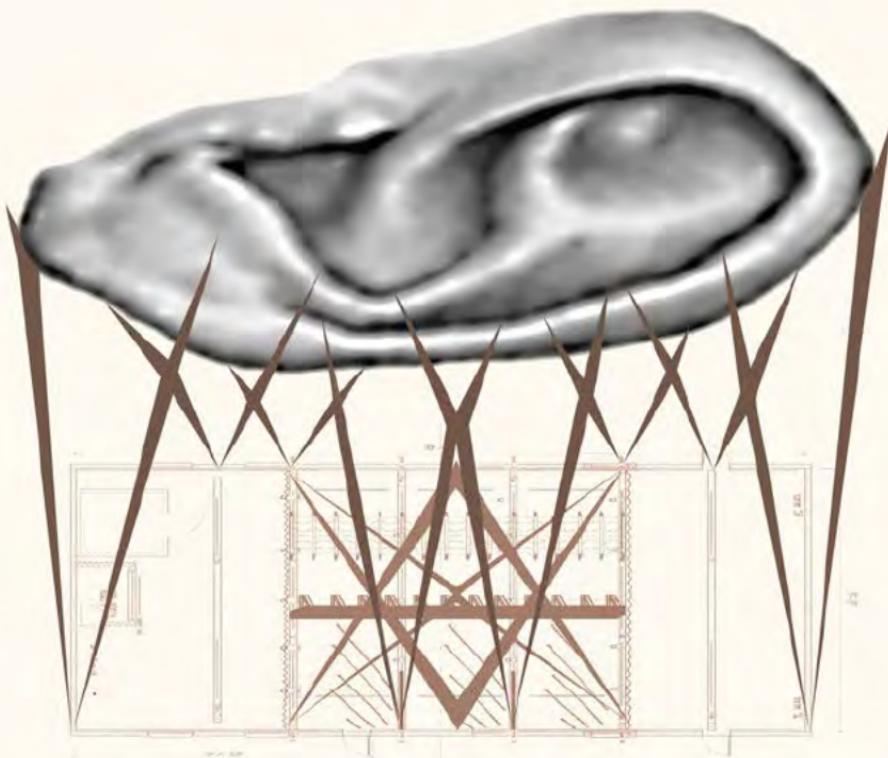
Carlos Valdes

Volunteers

The Old Gym

# THE POLYRHYTHMS OF THE EAR CANAL II

# INVESTIGATING THE HUMAN BODY AS AN INSTRUMENT AND LISTENING DEVICE INSPIRED BY ATTENTION, HEARING, AND ALVIN LUCIER



# A SENIOR CONCERT BY PIPPA KELMENSON

**MAY 11, 2017 | BLUM CANOPY | 8PM**

AGAIN  
PROCESS, ILLUSION  
WHAT DO YOUR EARS SOUND LIKE?  
UNPHASED  
REAL HUMAN LIPS

THE EAR IS AN ACTIVE AMPLIFIER OF ITS OWN SOUNDS. FROM OTOACOUSTIC EMISSIONS TO TINNITUS TONES, OUR EARS ACT AS INSTRUMENTS RESPONDING TO SOUND INFORMATION. TO DISTINGUISH ACOUSTIC ELEMENTS GENERATED OUTSIDE OF THE EAR FROM THOSE TAKING SHAPE WITHIN IT, WE ARE REQUIRED TO INTERNALLY PERCEIVE ALL ACOUSTIC INFORMATION. BUT IS CONCENTRATION ENOUGH TO DETERMINE THE ORIGIN OF EACH ELEMENT? THIS SONIC DISTRACTION ACCENTUATES THE FOCUS OF MY WORK: THE DICHOTOMY BETWEEN HEARING AS PASSIVE RECEPTION AND LISTENING AS ACTIVE CONCENTRATION. INSPIRED BY MY OWN DIFFICULTIES WITH ATTENTION AND HEARING, MY WORK STRIVES TO EMPHASIZE THE NECESSITY OF FOCUS RHYTHM  
R E Q U I R E S .

THANK YOU

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|          |           |                  |             |
|----------|-----------|------------------|-------------|
| MINDY    | ABOVITZ   | GEMMA            | GODFREY     |
| MATT     | AIKEN     | MOOG/ELECTRONICS |             |
| BOB      | BIELECKI  | JAKE             | MERRELL     |
| JOHN     | ESPOSITO  | LIVE             | MIXING      |
| KYLE     | GANN      | DANIEL           | RISDON      |
| GAYLE    | KELMENSON | D R U M S        |             |
| TOM      | MARK      | PARIS            | WATEL-YOUNG |
| DAMIEN   | MOFFITT   | G U I T A R      |             |
| JAMES    | MONGAN    | KEN              | WINFIELD    |
| PETER    | O'BRIEN   | G U I T A R      |             |
| MATT     | SARGENT   |                  |             |
| JULIANNE | SWARTZ    |                  |             |
| CARLOS   | VALDEZ    |                  |             |