Course Description
The world around and within us resonates. Indeed, the audible frequencies are but a tiny component of what William James dubbed the “blooming, buzzing” world. This subject cuts across the pillars of MIT to interrogate sound — via resonance — through approaches in the humanities, arts, sciences and social sciences.

Though the origins of the word resonance attach to sound — “the reinforcement of sound by reflection or by the synchronous vibration of a surrounding space or a neighboring object” (OED) — a wider definition points to any movement that unfolds in sympathetic response, making resonance a term that itself resonates across a range of sites and scales in the sciences, humanities, and arts. This class is dedicated to exploring such zones — zones where resonance prompts us to think about how we hear (or don’t), how we measure or describe phenomena (whether in wavelengths or through artistic evocations, or both), how we record / compress / and distribute resonating materials (whether those are cell walls, phonographs, or catgut), and how (or whether) we can be certain about what we think we know about the world. Though this course has its center in sound as an aesthetic, social, and scientific object, we ask more general questions as well, investigating, to begin, how resonance was created as a term of art and analysis in music theory and in science. We explore how a vibratory account of the universe, social and cosmic, has made it possible to think new things: that reality itself is comprised of oscillating materials, that achieving proper health can be done by getting one’s vibrations in order, that the modern world is suffused with the shock of too many vibrations, or that feedback is cool. We also inquire into how resonance has made it possible to hear new things: sound played or relayed through gramophone or telephone, sound delivered from the underwater world, sound representing the frequencies of the relic radiation of the Big Bang, sound conducted by arm bones, sound newly synthesized from such abstractions as mathematical formulae or data-driven algorithms.

Students are invited, as the syllabus unfolds, to see if they can key readings to particular frequencies, to discern whether revelatory patterns emerge. What kinds of phenomena seem to matter at very low, infrasonic, frequencies? At very high, ultrasonic frequencies? Within the range of so-called “audible” frequencies? For whom? Why? What kinds of science happen at which frequencies? Which kinds of art? How does medium matter? We attend to sound audible and inaudible, resonances measured and induced, sound heard, unheard, and inferred.
Requirements
Attendance at class meetings is essential. The subject introduces materials and speakers across several schools at MIT (SHASS, SA+P, and the School of Science). It requires attention and discussion to clarify the disciplinary origins of claims about resonance, and the fertile areas that lie between or beyond our disciplines of knowledge. There are no prerequisites for this class. Students will engage with the material in the classroom together, but will be required to produce a personal project as a final research product.

Required Reading
The following two books will be ordered for the COOP but are in the MIT Library and can readily be found. In addition, articles and book excerpts listed in the syllabus are posted on Stellar: https://stellar.mit.edu/S/course/4/fa14/4.648/index.html


Recommended


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**THE ELECTROMAGNETIC SPECTRUM**

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**V I S I B L E  L I G H T**

**THE SOUND SPECTRUM**

- infrasonic
- audible human sonic range (1 Hz to 1 kHz)
- ultrasonic (1 MHz)

**THE HUMANLY AUDIBLE SPECTRUM**

An infant's ear is able to perceive frequencies ranging from 20 Hz to 20,000 Hz; the average adult human can hear sounds between 20 Hz and 16,000 Hz.
Assignments

Assess on an index card what you know about resonance. Locate the source of this understanding, particularly if in a current or previous subject (as in 8.03, for example). We will compare self-assessments done at the beginning and toward the end of the class.

listening assignments: 3. September 18 & 10. November 6
Find a space at MIT, locate yourself comfortably, and listen. Attend to the sonic qualities of the space. Are there sounds that at first seemed obvious? Others not audible until further listening? Does your sonic attention function similarly, or different, to “focusing” in the visual domain? Using the Sonic Experience keywords, write up your experience in a 2-3-page report. Offer a speculative conclusion about the auditory characteristics of the Institute – or explain why the space you located was sonically unique. On November 6, you will revisit your site and revise your report.

disciplinary pop quiz (ungraded): 4. September 25
You will be given 4-5 anonymized paragraphs (or sentences) taken from assigned readings – some of which you are not expected to have read yet. You will be asked to attribute each excerpt to a given discipline, if you can, or at least judge whether you are reading “science,” “art,” “anthropology,” etc. We will repeat the exercise with different excerpts in the final week, together with the repeat self-assessment, to examine whether we have expanded your knowledge base and skills in understanding different disciplinary modes of analysis.

symposium report: 5. October 2
Attend the Seeing, Sounding, Sensing symposium, and select two presentations to write up in a 4-5-page essay. Drawing on the readings and class material thus far, imagine you are an Italian futurist (it may help to choose a particular one) who has suddenly been catapulted from Rome 1914 to Cambridge 2014. What surprises you in the two presentations? What do you assume to be a natural continuation from your own activities? And finally, do you agree or disagree with the presenters’ points?

Look ahead to the final research project prompt (see below). Write a 2-3-page preliminary proposal that outlines your idea for a project. Provide a timeline for how you will approach the research and development of your project, together with a budget if you need materials, equipment rental, or anticipate other expenses. Justify the importance of your project as if you were writing to a grant agency and explain what sonic phenomenon your plan will address. Your graded and revised project proposal will serve as the document to be shared in the in-class project development workshop on 11. November 13

final research project assignment
Create a sound-based artifact — a recording, an audio essay, a piece of sound art (installation or object). Alternatively, devise an experiment to test or extend any of the scientific and technical protocols we have been exposed to in this class. Produce a well-researched 5-10-page paper describing your project and giving insight into its disciplinary approach, to hand in with the artifact in the week before exams. For this final research project (whether scientific or artistic), you may use any mode of sound representation/reproduction you like — a wax cylinder, an audiotape, phonograph records, a digital file, sound notation, your own (or someone else’s) voice. You must engage with class readings in your paper. Provide a bibliography (which can of course include discography/ mp3 databases, etc.), formatted in the way you see sources cited here in the syllabus.
final research project presentation in class — 13. December 4 & 14. December 11

Present your work to the class in an effective, 10-minute “sound bite.” Touch on a) the inspiration for your project, b) the assigned readings that contribute to an understanding of it, c) how the project evolved, d) what technical challenges you had to solve, and e) what you consider the results or findings.

A committee of faculty from Architecture, Anthropology, and the center for Art, Culture, and Technology may select some student works to appear on the “Resonating MIT” site, created in Spring 2014 to accompany and document 4.373 Sound Installations and Sonic Interventions, a subject taught by Gediminas Urbonas:
http://resonatingmit.xvm.mit.edu/#/home
1. September 4  
**INTRODUCTION: INTO RESONANCE**  


2. September 11  
**INVENTING RESONANCE AND AUDITORY MEMORY: ORIGINS IN ART & SCIENCE**


**GUEST: EMILY DOLAN**  
Harvard musicologist

**LISTENING:**  
**SEPTEMBER 11 MEMORIAL**

Stephen Vitiello, *Sounds Building in the Fading Light* (Creamgarden Records, 2001)  
Steinski, “Number Three on Flight Eleven,” on *What Does it All Mean?* (Illegal Art, 2006)

3. September 18  
**RESONATING BODIES 1: HEARTS, CELLS, BRAINS**  
**due: listening assignment**


**GUEST: JOSH MCDERMOTT**  
MIT cognitive neuroscientist and participant in CAST symposium

**LISTENING**

Alvin Lucier, "Music for Solo Performer."

http://www.darksideofcell.info/about.html
4. September 25

**disciplinary pop quiz (ungraded)**

**RESONANCE AND NOISE:**
**MODERNITY REVERBERATING, OR, TOWARD A SONIC URBANISM**


**GUEST: DAVID MATHER**
Art History, SUNY Stony Brook

**LISTENING**

Luigi Russolo, excerpts from *Art of Noises*, 1913.

**FILM IN CLASS**

*Theremin*, Steven M. Martin, 1993
*Max Neuhaus: Times Square*, 2002

**CAST SYMPOSIUM “Seeing / Sounding / Sensing”**
**September 26-27**

Students required to attend as much of the symposium as possible

5. October 2

**INFRASOUND:**
**LOW-FREQUENCY VIBRATION, BASS MATERIALISM, KINDS OF DEAF HEARING**


Sophia Roosth, “Nineteen Hertz and Below: An Infrasonic History of the Twentieth Century”

**GUEST: SOPHIA ROOSTH**
Harvard History of Science

**LISTENING**

Stone Love website: [http://www.stonelovejamaica.com/](http://www.stonelovejamaica.com/)


Tara Rodgers, “‘What, For Me, Constitutes Life in a Sound?’: Electronic Sounds as Lively and Differentiated Individuals,” *American Quarterly* 63, no. 3 (2011): 509-530.

**GUEST: RENÉE GREEN**

Artist who uses sound, Director of MIT ACT Program

**LISTENING**


Online: www.earlabs.org/label/LC/LC008.htm


Interview with Dave Tompkins: http://www.npr.org/player/v2/mediaPlayer.html?action=1&t=1&islist=false&id=126781688&m=126791977; also http://howtowreckanicebeach.com/?p=187

**FILM IN CLASS**

Excerpts from *Pygmalion*, Anthony Asquith, 1939

7. October 16
DISSONANCE, IMPROVISATION, SILENCE


John Cage, Silence (Middletown, CT: Wesleyan, 1961), ∞CAJexcerpts.


GUEST: EVAN ZIPORYN
Clarinetist, composer, musical producer, and Director of MIT’s Center for Art, Science, and Technology

LISTENING
Charlie Parker live at Birdland, 1950
Score for Jackson Pollock, Morton Feldman, 1950
Bernard Herrmann, “The Shower Scene” from Psycho, 1960
Ziporyn, Hive, 2007
George Lewis, The Will to Adorn, 2011: http://vimeo.com/33061529

FILM IN CLASS
Jackson Pollock, Hans Namuth, 1951, excerpt

GUEST: RICHARD CYTOWIC, MD

LISTENING
Kandinsky’s two synaesthesia prompts: Wagner vs. Schoenberg
Alexander Scriabin, Prometheus (selection), 1910
Oliver Messiaen, second movement of Quatuor pour la fin du temps, 1941

8. October 23
VISUALIZING SOUND AND SYNESTHESIA  due: preliminary project proposal

Wassily Kandinsky, ∞CAJexcerpts from the writings.

Richard Cytowic and David M. Eagleman, “See with your Ears,” and “Inside a Synesthete’s brain,” in Wednesday is Indigo Blue: Discovering the Brain of Synesthesia (Cambridge: MIT Press, 2009), 87-108.

Selections from See This Sound: Audiovisuology Compendium, eds. Dieter Daniels and Sandra Naumann (Cologne: Ludwig Boltzmann Institute, 2010), excerpts “Architecture” (43–49), “Color Organ” (77–87), and “Sound Art” (297–301).

GUEST: RICHARD CYTOWIC, MD

LISTENING
Kandinsky’s two synaesthesia prompts: Wagner vs. Schoenberg
Alexander Scriabin, Prometheus (selection), 1910
Oliver Messiaen, second movement of Quatuor pour la fin du temps, 1941
9. October 30
REPRODUCING / RIFFING ON RESONANCE:
PIANO ROLLS, PHONOGRAPHS, TAPES, CDS, MP3s, AND BEYOND


GUEST: TOD MACHOVER
Cellist, composer, Opera of the Future group, MIT Media Lab

LISTENING
Éduoard-Léon Scott de Martinville and David Giovannoni. “Au Claire de la Lune,” 1860
Pierre Schaeffer, Etude au chemin de fer (musique concret), 1948
Jimi Hendrix, The Star Spangled Banner, performed live 1970
Maryanne Amacher, Synaptic Island from Sound Characters: Making the Third Ear, 1999
Tod Machover, Death and the Powers, 2011

FILM IN CLASS
Scratch, Doug Pray, 2001

due: listening assignment

10. November 6
ULTRASOUND AND SONIFIED DATA


GUEST: DAVID MINDELL
Professor of Aero-Astro and historian of engineering

LISTENING
my own recordings, audio and visual, from Alvin

Hydrophonia Sound Art Contest - Turn Ocean Noise into Sound Art
http://synth.me/music-gear/hydrophonia-sound-art-contest-turn-ocean-noise-sound-art


11. November 13  
**due: preliminary project proposal revised**

**POLITICAL RESONANCE: ORGANIZING SONIC AND ELECTROMAGNETIC SPACE**


CAJ excerpt on RCA and the bandwidth wars.


**IN CLASS**

Half-hour workshop on final project

**HANDOUT**


**FILM IN CLASS**

Excerpt from *Spectres of the Spectrum* (1999; dir. Craig Baldwin)

12. November 20  
**in class self-assessment**

**BIOACOUSTICS AND SONIC ENVIRONMENTS**


**LISTENING**

R. Murray Schafer, *Five Village Soundscapes*, 1977  
David Dunn, *Mimus Polyglottos*, 1976

Earth Ear Records; http://www.acousticecology.org/dunn/solit.html

David Dunn, *Chaos and the Emergent Mind of the Pond*, 1990

Bernie Krauss, “Biophony – Algonquin Wolves” (ca. 2007)

Global Sustainable Soundscapes Network (see also [www.wildsanctuary.com](http://www.wildsanctuary.com))

Andrea Polli, *Sonic Antarctica*, 2009  
([www.gruenrekorder.de](http://www.gruenrekorder.de))
November 27: Thanksgiving
Over break prepare your presentation and final research project
(see project presentation as described in Assignments, pp. 3 + 4)

13. December 4
CLASS PROJECTS

14. December 11
CLASS PROJECTS

15. Exam week:
The assigned exam slot will be used for subject evaluation, self-assessment exercises, and
a final review of your instructors!