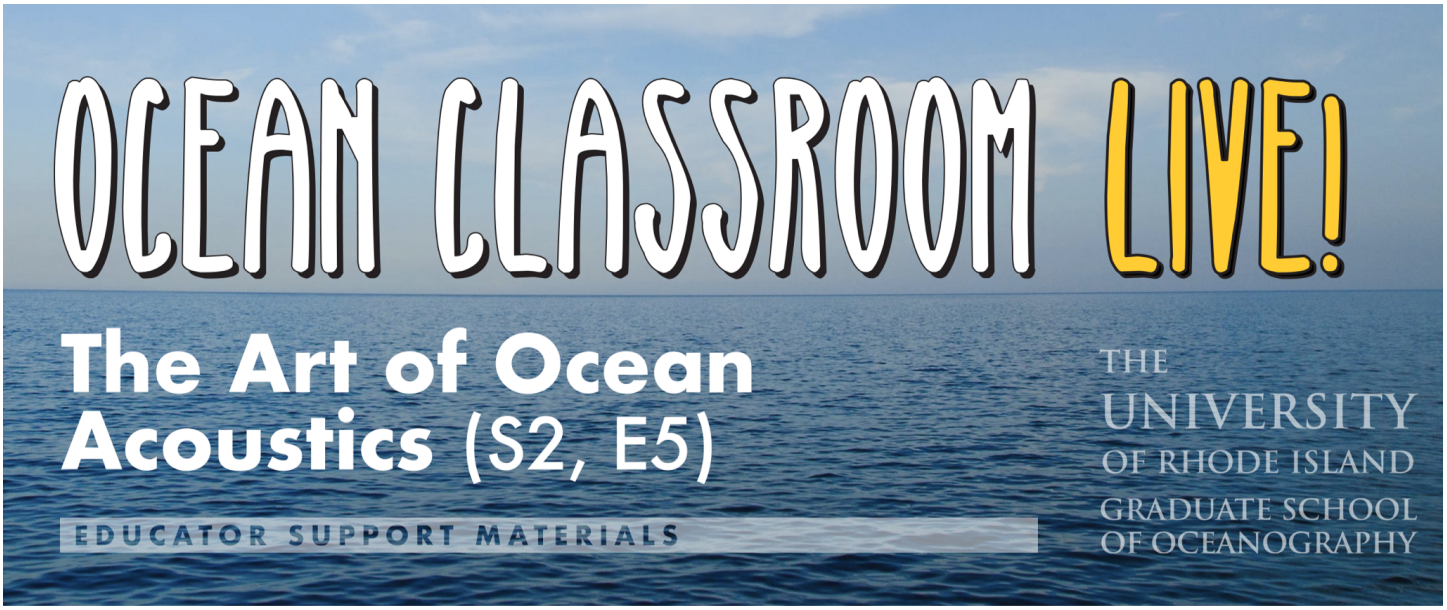

Whether created by people, ocean life, or other natural sources, the sea is full of sound. Scientists are just beginning to uncover the mysteries of underwater sound using acoustic analysis, and now artists are working to make this growing field more accessible to everyone. Join Jennifer L. Miksis-Olds, Director of the Center for Acoustics Research and Education at the University of New Hampshire, and science based artist Lindsay Olson for a conversation about bridging the worlds of art and underwater sound.

Discussion Questions

- What tools are used to study underwater sound?
- How can underwater sound be visualized?
- What animals use sound and why?

Resources

Graduate School of Oceanography
As one of the nation's premier academic oceanographic institutions, the University of Rhode Island's Graduate School of Oceanography (GSO) educates marine scientists, students, policymakers, business leaders and citizens and helps develop the knowledge and skills necessary to address present and future marine challenges.

- GSO: https://web.uri.edu/gso/
- Inner Space Center: http://innerspacecenter.org/
- Rhode Island Teachers At Sea: https://web.uri.edu/gso/research/outreach/rhode-island-teachers-at-sea-program/
- GSO Ocean Classroom: https://web.uri.edu/gso/outreach/ocean-classroom/
- GSO Facebook: https://www.facebook.com/URIGSO/
- GSO YouTube: https://www.youtube.com/c/URIGraduateSchoolofOceanography
- GSO Twitter: https://twitter.com/urigso

Other Resources

- Lindsay Olson:
  - https://www.lindsayolsonart.com/
  - Lindsay Olson on Instagram: https://www.instagram.com/lindsayolson816/
  - Lindsay Olson on Facebook: https://www.facebook.com/lindsayolsonart
  - The Art and Science of Sound in the Sea: https://www.sciartmagazine.com/research-sound-in-the-sea.html
  - Lindsay's current project: https://www.lindsayolsonart.com/portfolio/land-and-sea-intimate-connections
- Jennifer Miskis-Olds
  - Atlantic Deep Water Ecosystem Observatory Network: https://adeon.unh.edu/
  - ADEON audio gallery: https://adeon.unh.edu/audiogallery
  - UNH CCOM: https://ccom.unh.edu/
  - Researchers develop software to monitor ocean soundscape especially during COVID-19: https://www.unh.edu/unhtoday/2021/04/covid-ocean-hush
- Discovery of Sound in the Sea: https://dosits.org/
  - DOSITS Audio Gallery: https://dosits.org/galleries/audio-gallery/

Suggested Standards

Next Generation Science Standards K-12 Performance Expectations relating to Underwater Sound.

Elementary School

Grade 1: Waves and their Applications in Technologies for Information Transfer

- 1-PS4-1. Plan and conduct investigations to provide evidence that vibrating materials can make sound and that sound can make materials vibrate
- 1-PS4-4. Use tools and materials to design and build a device that uses light or sound to solve the problem of communicating over a distance

Grade 4: Waves and their Applications in Technologies for Information Transfer

- 4-PS4-1. Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move.

Grade 4: From Molecules to Organisms: Structures and Processes

- 4-LS1-1. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
- 4-LS1-2. Use a model to describe that animals receive different types of information through their senses, process the information in their brain, and respond to the information in different ways.

Middle School

MS: Energy

- MS-PS3-1. Construct and interpret graphical displays of data to describe the relationship of kinetic energy to the mass of an object and to the speed of an object.

MS: Waves and Their Applications in Technologies for Information Transfer

- MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
- MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

MS: Ecosystems: Interactions, Energy, and Dynamics

- MS-LS2-2. Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems

High School

HS: Waves and Their Applications in Technologies for Information Transfer

- HS-PS4-1. Use mathematical representations to support a claim regarding relationships among the frequency, wavelength and speed of waves traveling in various media.
- HS-PS4-5. Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with. Matter to transmit and capture information and energy.

Ocean Literacy Principles

OLP5: The ocean supports a great diversity of life and ecosystems.

OLP6: The ocean and humans are inextricably interconnected.

OLP7: The ocean is largely unexplored.