Seeing with Sound

It's a Friday night in October; there is a chill in the air and the dull, low rumbling of conversations in the crowd. The marching band, dressed in bright colors, synchronously positions themselves across the field. First, you feel the rhythm of the percussionists, then the brass and woodwinds join in. A familiar melody emerges, and the crowd comes alive, dancing and singing along.

Photo credit: *Our State* (2016)_

Now, imagine the sound of that same field in the wee hours of the morning just before sunrise. No marching band or rhythm, no melody, no chorus of adoring spectators, only the early sounds of a waking city in the background.

Think of band rehearsal. The stadium is no longer quiet, nor is it entirely in sync. Imagine the drummers, exhausted from the heat and weight of their equipment, standing on the sidelines. The trumpets are rehearsing a different song. How would you expect the music to sound? Would it be in harmony? Would it have rhythm? Would it be louder or softer than game night?

Photo credit: Tony Alter (2012)

Through observation, a novice listener can determine when a marching band plays in harmony. With more training, one can identify the instruments producing the sounds, and an expert musician recognizes the precise notes being played. **But can the same thing be true of biological environments?** After a brief discussion with your group, record your thoughts below.

Medical providers rely on sound to assess our health. Using a stethoscope, they can listen to the functioning of a patient's heart and lungs. **Do you think sound can provide insight into the overall health of ecosystems? Why or why not?** Consider your experiences with sound in natural environments then after a brief discussion with your group, record your thoughts below.

Can you really see with sound?

Humans, like most primates, are highly visual animals. We rely on visual cues to guide our behaviors. This is reflected in how we react to, absorb, and manipulate visual information. Humans' visually dedicated brain structures are absent in most non-primate animals; they rely more heavily on other sensory modalities (Kass & Balaram, 2014). However, the brains of humans born with visual impairments resulting in blindness make new connections that produce heightened senses of hearing, smell, and touch and enhanced cognitive functions like memory and language (Bauer et al., 2017).

Think about when you were in a dark room, without vision, what other senses did you use to navigate through the space?

Sound is an especially useful diagnostic tool when trying to assess something that is hidden or difficult to see. Sonographers use ultrasound to safely and efficiently "see" a growing fetus by sending sound waves into the pregnant person's body, where some pass through while others bounce back, creating an image. The sound waves allow medical providers to monitor the health of a fetus without placing it at risk. The same can be true for ecosystems. Can you think of any ecosystems that would be easier and less harmful to see with sound? Explain your answer.

Consider this: The ocean covers about 71% of the Earth's surface, but light only penetrates approximately the first 200 meters of the ocean. The average ocean depth is about 4000 meters, so light is only available for about 5% of the ocean. Therefore, vision plays a more limited role for the majority of sea life when interpreting the world around them.

Of these "hidden" ecosystems, which do you think are most biodiverse? What evidence do you have to support your answer?

Do you think biodiversity could be assessed using sound? Why or why not?