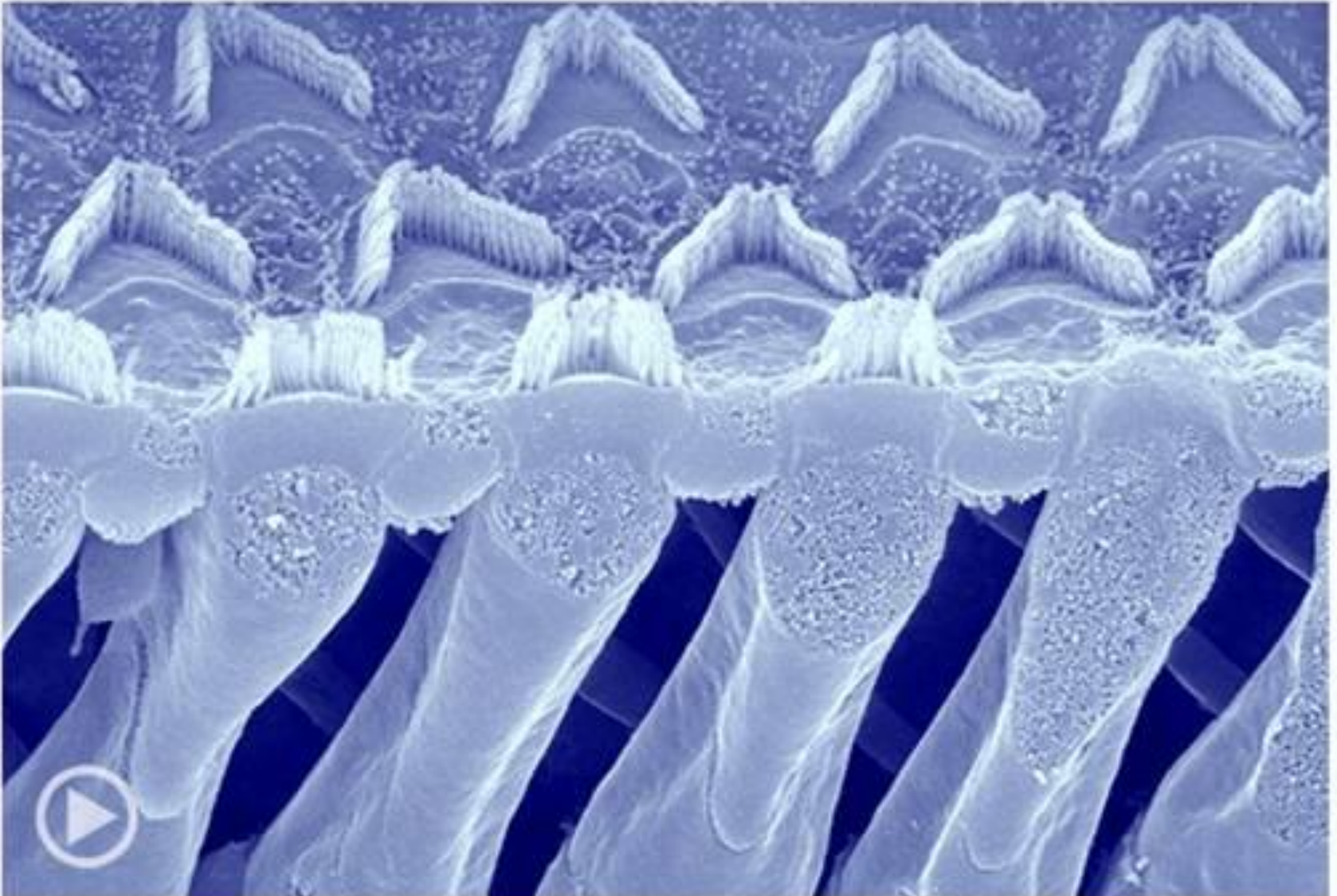


# **Animal Senses**

9/8/14

# Fly Hair Cells



# Animal hearing

- Elephants can hear lower frequencies than humans
  - 10 Hz (humans 20 Hz)
- But not as high
  - 12,000 Hz (humans 20,000 Hz)

# Elephant Ears

Ears are bigger & tougher

– Ear canal, ossicles, ear drum and cochlea

Why might this be?

A. Lower frequencies are longer

B. Lower frequencies are shorter

C. Does not affect how the ear works.

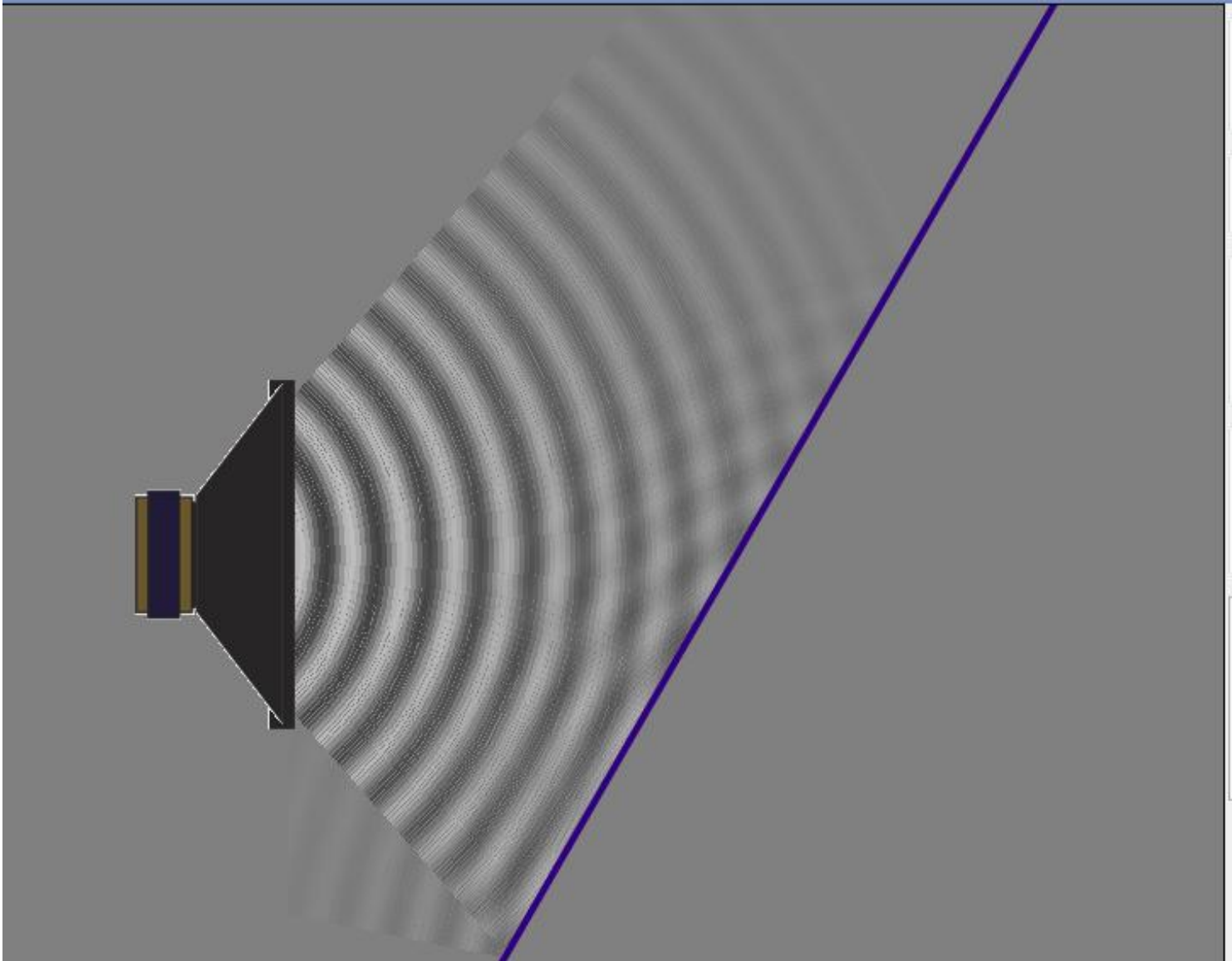


# Animal Hearing

- Bats can hear higher frequencies than humans
  - 114,000 Hz (humans 20,000 Hz)  
Ultrasound (defined by human ears)
- But not as low
  - 10,300 Hz (humans 20Hz)



# Sound bounces off of solid objects



# Listen for echoes

- Echo locators listen for the sounds bouncing back

**Have you heard of active SONAR?**

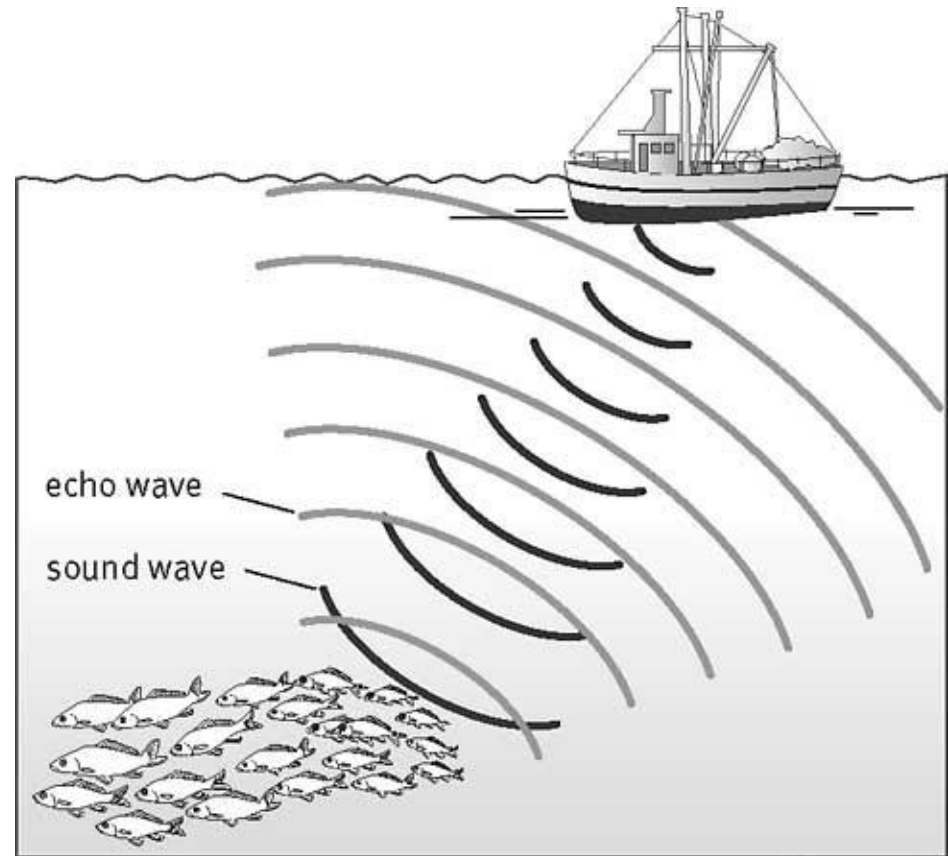
- A. Yes, I know what it is
- B. Yes, I think I have some idea
- C. Yes, I have no idea what it is
- D. No, never heard of it



# SONAR

(SOund Navigation and Ranging)

- Uses the idea of sound bouncing back.
  - Use speed of sound in (salt) water and delay to calculate distance.



Elizabeth Morales

Echolocation is Nature's SONAR



# Listen for echoes

- Most produce their own sounds (such as clicks) and listen for them to come back.

They are active echo locators

*Active* SONAR – sends out beeps

Passive SONAR – listens for sounds but does not produce beeps, have to listen to what's already out there.

# Human Echolocation

- All Humans do this subconsciously

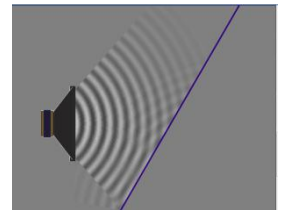
Does that make them active or passive echo locators? (not the folks on the videos, average humans like you and me)

- A. Active
- B. Passive
- C. Both

# Listen for the delay

- The delay tells the brain how far away an object is.

This is how dolphins and bats know how far away their prey is!



# Speed of Sound

- 4.8 seconds to travel a mile in air
- 1.1 seconds to travel through water
- 0.25 or  $\frac{1}{4}$  of a second to travel through solids!

# What did you hear?

How was the sound in the railing different from the sound you heard through the air?

- A. In Railing sound was a high pitched tink
- B. In railing sound was like a gong
- C. In railing sound was the same

# Ear Buds

- If you listen to an ear bud 1 inch from your ear, it sounds lame.
- If you put it in your ear, you get full range beautiful sound.



**How does this work??**

# Ear Buds

- Vibrations go directly from speaker to your solid flesh and bone so low frequencies not lost.
- Uses your skull to amplify the sound via *sympathetic vibration*

