Today:	**16** Waves & Sound 3rd 1/3	HW2 redo,	HW4
Fri:	**17** Interference	HW3 redo,	HW5
Lab:	**Lab2**: Standing Waves & Resonance		

- **Sound Intensity**
  - **Introduction**
    - **Pressure**
    - **Energy**
    - **Sound Intensity**

Example 1: Pr. 48 A typical adult ear has a surface area of 2.1×10^{-3} m^2. The sound intensity during normal conversation is about 3.2×10^{-6} W/m^2. at the listener's ear. Assume the sound strikes the surface of the ear perpendicularly. How much power is intercepted by the ear?

  - **Spherically uniform radiation**

Example 2: Pr. 51 A rocket in a fireworks display explodes high in the air. The sound spreads out uniformly in all directions. The intensity of the sound is 2.0×10^{-6}W/m^2 at a distance of 120m from the explosion. Find the distance from the source at which the intensity is 8.0×10^{-7}W/m^2.

    - **Reflected Sound**

- **Decibels**
  - **Introduction**
  - **Table 16.2.**

Example using this Pr. 59 The bellow of a territorial bull hippopotamus has been measured at 115 dB above the threshold of hearing. What is the sound intensity?

- **Doppler Effect**
- **Introduction:**
  - **Moving Source**
    - **Demo: Wave tank**
    - **Derive Equation for moving source**
    - **Demo: flying speakers**

Example 3 the demo, my speakers are being driven at a frequency of 2 kHz. Then I spin it, with a radius of roughly 1m, and it goes around at $2\pi/t = 4\pi$ rad/s, thus it has a tangential speed of 4π m/s. What is the frequency you hear when it's coming straight at you? What is the frequency you hear when it's going straight away from you?

  - **Moving observer**
    - **Demo: Wave tank**
    - **Derive Equation**

  - **General Case**
  - **Applications**

- **Astronomy**
  - **Source moving toward us**
  - **Source spinning**
  - **Gas temperature**
- **Weather**
  - **Nexrad**

- **Applications of Sound in Medicine**

HW 5

50. The average sound intensity inside a busy restaurant is 3.2×10^{-5} W/m^2 . How much energy goes into each ear (area = 2.1×10^{-3}m^2) during a one-hour meal?

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52. Suppose in Conceptual Example 8 in the text (see figure 16.25) that the person is producing 1.1 mW of sound power. Some of the sound is reflected from the floor and ceiling. The intensity of this reflected sound at a distance of 3.0 m from the source is 4.4×10^{-6}W/m^2. What is the total sound intensity due to both the direct and reflected sounds, at this point?

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62. The equation $\beta = (10\text{dB})\log(I/I_o)$, which defines the decibel, is sometimes written in terms of power P (in watts) rather than intensity I (watts/meter^2). The form $\beta = (10\text{dB})\log(P/P_o)$ can be used to compare two pwer levels in terms of decibels. Suppose that stereo amplifer A is rated at P = 250 Watts per channel, and amplifier B has a rating of P_o = 45 Watts per channel. (a) Expressed in decibels, how much more powerful is A compared to B? (b) Will A sound more than twice as loud as B? Justify your answer.

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75. An aircraft carrier has a speed of 12.0 m/s relative to the water. A jet is catapulted from the deck and has a speed of 67.0 m/s relative to the water. The engines produce a 1550-Hz whine, and the speed of sound is 343 m/s. What is the frequency of the sound heard by the crew on the ship?