Unit 9: Waves
Content Outline: Interacting Sound Waves (9.3)

I. **Interactions of Sound Waves**
   A. When two *differing waves* interact, the original properties of each change.

II. **Reflection**
   A. A *reflected* sound wave is called an echo. Sometimes referenced as "echolation".
   B. The harder and smoother the surface, the stronger the reflection/echo.

III. **Diffraction**
   A. Sound waves can diffract, or bend, around corners, when they hit *solid* structures, and then spread out in an angle different from the original.

IV. **Interference**
   A. When sound waves meet and interact with each other.
   B. The *interaction* can be either **constructive** or **destructive**.
      1. **Constructive Interference**: produces a louder sound as waves *combine.*
      2. **Destructive Interference**: produces silence as the interacting waves were "destroyed/neutralized".

V. **The Doppler Effect (Doppler Shift)**
   A. This principle of sound waves was proposed by the Austrian Physicist, Christian Doppler, in 1842.
   B. This principle states: "The change in *frequency* of a wave for an observer *moving* relative to the sounds source. (This is most events with the sound associated with ambulance sirens.)
      1. *Increasing wave Frequency and increasing pitch* as the source approaches. (The siren gets louder as it gets closer because more waves hit you.)
         Frequency increases = Pitch Increases = Sound gets *louder*
      2. *Highest frequency and pitch* at you are *equal* with source. (The siren is loudest as it is equal to you because you have maximum waves hitting you.)
         Highest Frequency = Highest Pitch = Sound *is loudest*.
      3. *Decreasing wave frequency and decreasing pitch* as the source has passed you and the *projection* of the wave is in the *opposite direction from you.* (The siren quickly gets softer because fewer waves hit you, but it takes longer for the waves, waves stretch out so pitch decreases, to reach you as they are being projected in the opposite direction of you.)
         Frequency decreases = pitch decreases = sound *fades away*
   C. Sound waves are affected by temperature.
      1. Sound waves move *faster* in warm air. (Air molecules are *less dense*.)
      2. Sound waves move slower in cold air. (Air molecules are *denser.)*