Lesson 50: Standing Waves

Standing waves are just an extension of the concepts of **resonance**, **waves at boundaries**, and **superpositioning**.

Imagine again that you are shaking a slinky, but this time it is attached to a wall at the other end.
- Create a wave (starting with a crest) that travels down the length of the slinky.
    - When it strikes the wall (which is a big density change), most of the wave will be reflected inverted (as a trough) according to the rules for **waves at boundaries**..
- Now, as that reflected inverted trough is traveling back towards you, you have made the trough of the wave and are staring to make the next crest that is traveling away from you.
    - The timing has to be just right (**resonance**), so that your incident crest meets the reflected trough in the middle of the slinky.
    - As the crest and trough meet in the middle, there will be **destructive interference** according to **superpositioning**.
- In some spots along the slinky crests will meet crests, or troughs will meet troughs, causing **constructive interference**.

Overall you will see a wave that just seems to be sitting there bouncing up and down.
- We call these **standing waves** since they don't look like they are actually moving back and forth like regular waves, just like they are standing there bouncing up and down.
- There are two parts of the wave that will be very obvious to see:
    1. **Nodes** are the parts of the wave where destructive interference makes it look like there is no wave at all.
    2. **Antinodes** are parts of the wave where the constructive interference causes the wave to be a really big crest or trough.
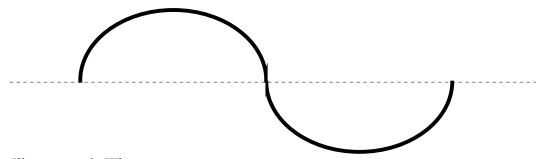

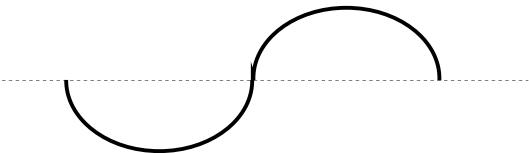*Illustration 1: What you see one moment...*
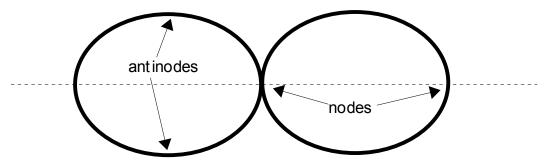

Illustration 2: ...and then a moment later.

Illustration 3: At any moment it will look like this.

Video Killed the Radio Star!
Watch a video of me making standing waves (with a giant spring!) by clicking here. Requires Windows Media Player 9 or later and a broadband connection (dial-up connection not recommended).