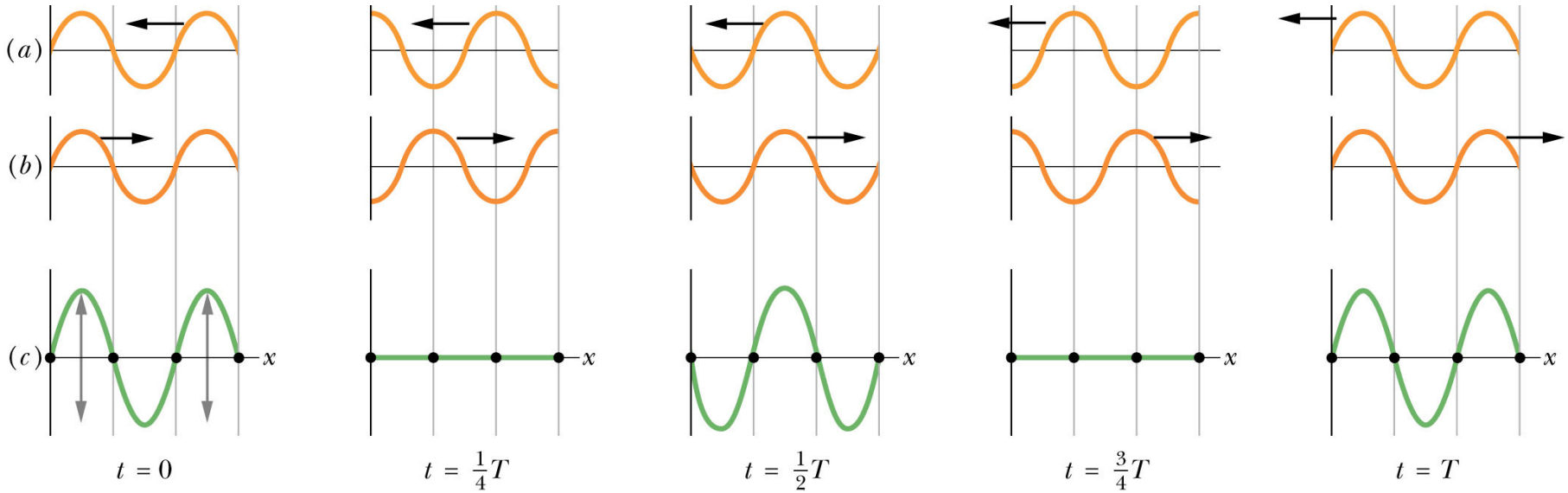
Phys 301 Class 11: Standing Waves, Beats

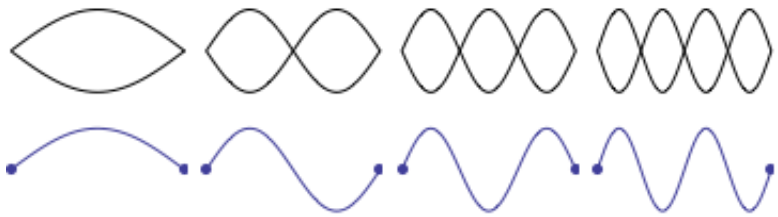
Finish Up Class 10 Handout B

- When we add two identical waves traveling in opposite directions:

$$\underbrace{2Y\sin(kx)}_{\text{Displacement at position } x}\ \underbrace{\cos(\omega t)}_{\text{Oscillating Term}}$$

$$2Y \sin(kx)\ \cos(\omega t)$$





How to make this in real life?

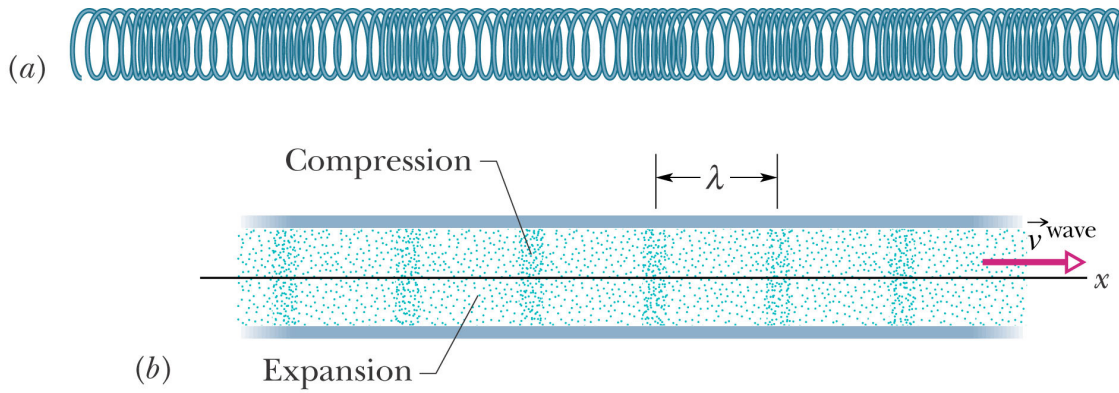
- Boundary conditions.
- So far, we've been working with waves that extend through infinity ("out the window" in PhET).

Continuing…

1. Handout A: Standing Waves
2. A bit about sound
3. Handout B: Beats
4. 2-Slit Interference Preview – if time

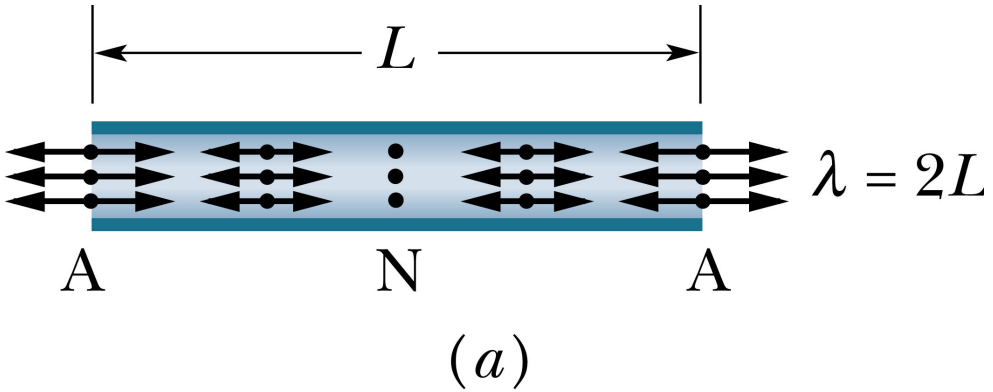
Sound Waves

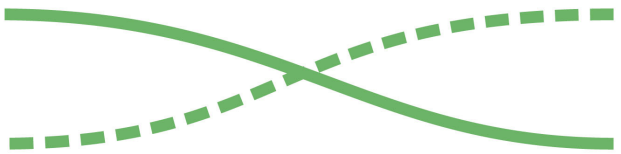
- Longitudinal waves (compression, expansion)



How Related to Standing Waves?

- Air molecule displacements from equilibrium.
- To right: “Two open ends”
- Flute

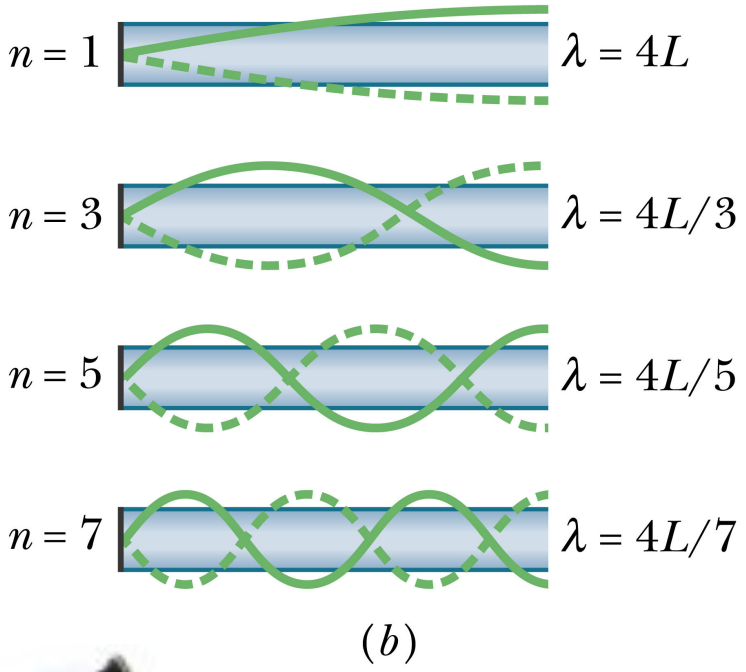


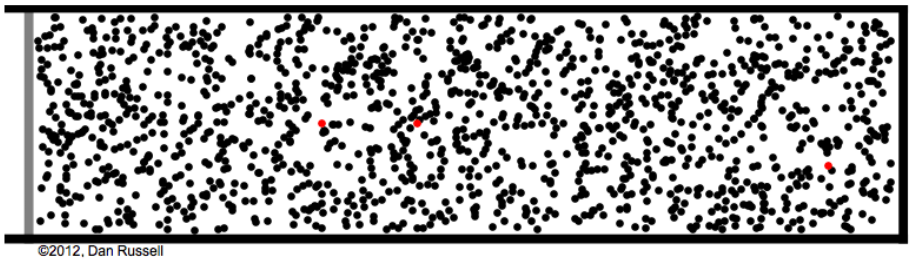


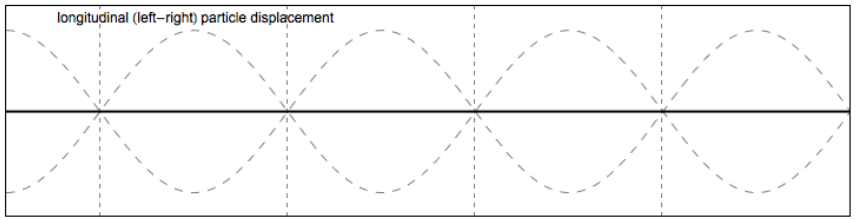
(b)

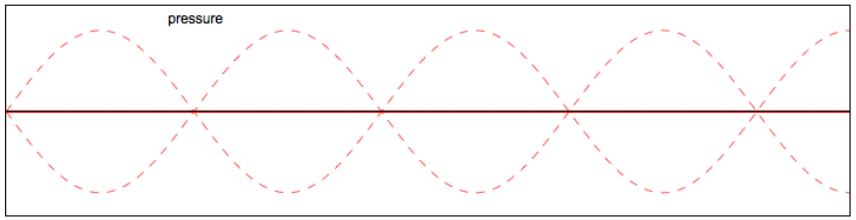
Your PhET Example

- One closed end, one open end.
- Clarinet
- Your $n = 1$ is the "fundamental mode" or "first harmonic."



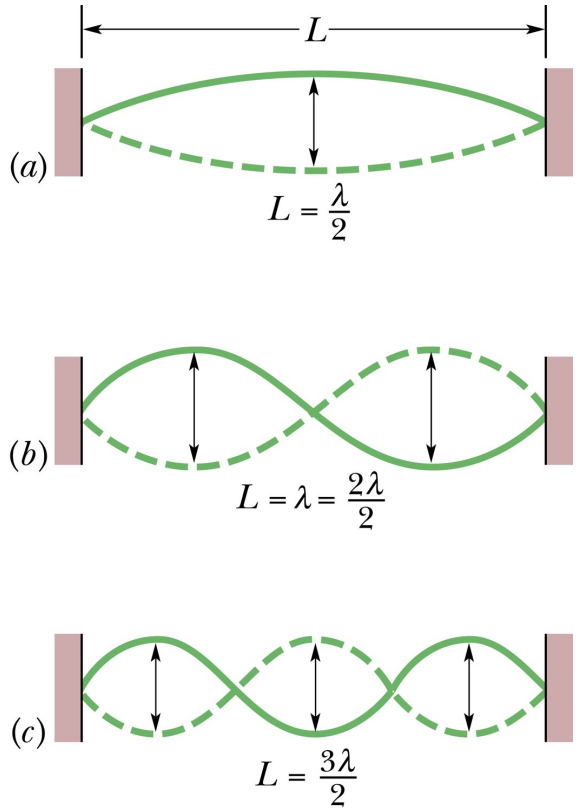






Two Fixed Boundaries

- Violin, piano
- Guitar
  - Which string will produce the lowest note? Look but don't touch!



Beats Handout

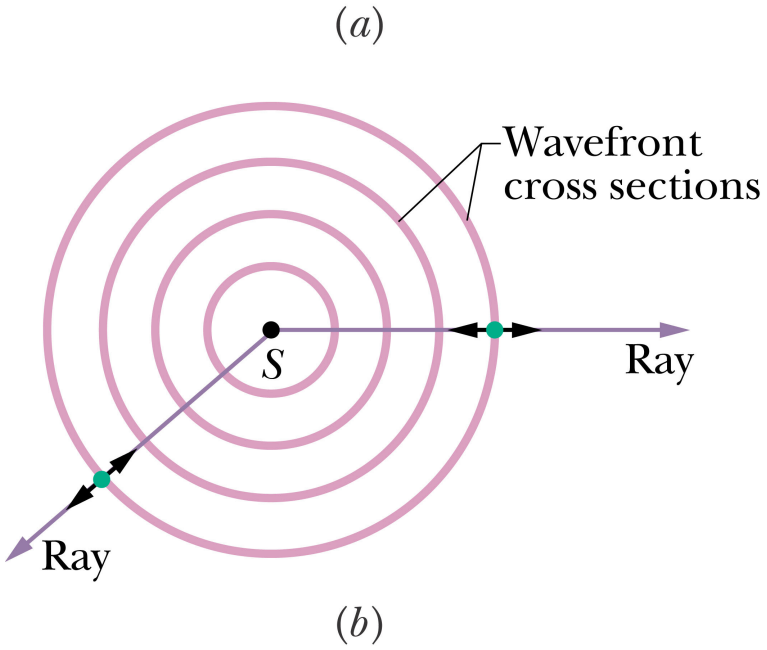
340 Hz  + 341 Hz  = 

350 Hz  = 

370 Hz  = 

A New Way to Visualize Waves

Overhead View:



Sound Interference Demonstration