Phys 301 Class 08: Types of Waves, Sinusoidal Waves

Simple Harmonic Motion Review

Angular frequency

Initial Phase

$$x(t) = X\cos(\omega t + \Phi_0)$$

Position (displacement) at time t

Amplitude (max. displacement)

Time-dependent phase.

Define $x = 0$ at equilibrium.

Simple Harmonic Motion Review

$$x(t) = X\cos(\underbrace{\omega t + \Phi_0}_{\text{Time-dependent phase.}})$$

Graph time-dependent phase as a function of time.

Simple Harmonic Motion Review

$$x(t) = X\cos(\omega t + \Phi_0)$$

1. What is $v_x(t)$?
2. What is $a_x(t)$?

Describes **position** of a "point **particle**" as a function of **time**.

Waves and Particles

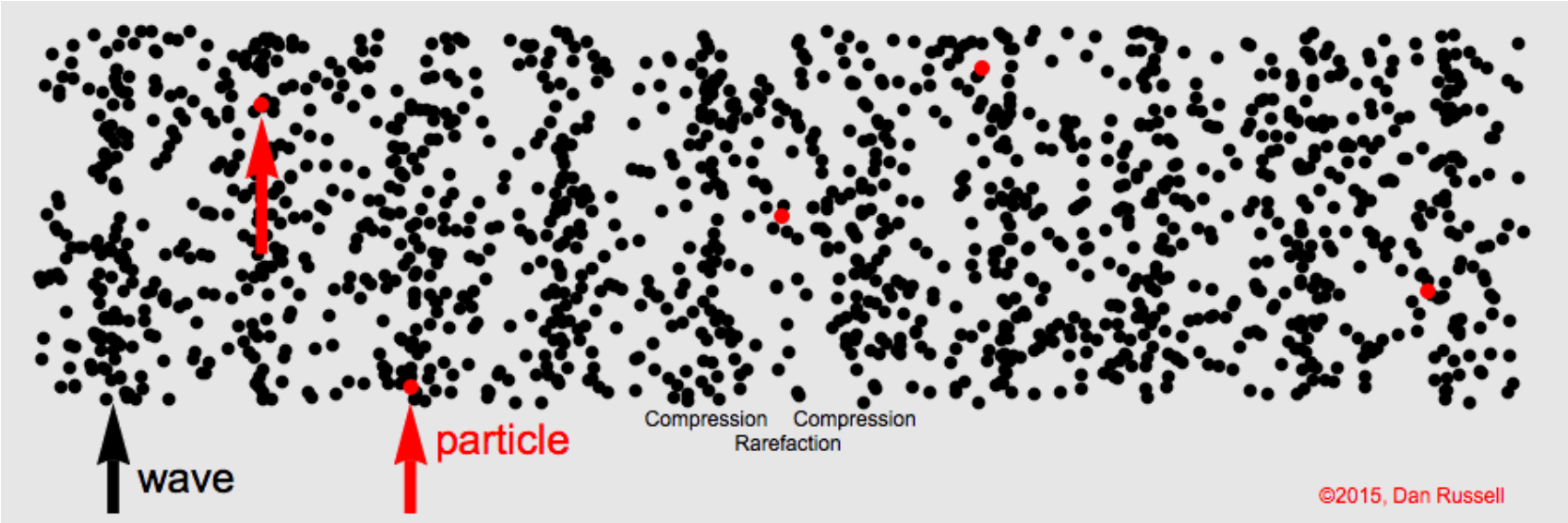
- Particles: material object moves from one point to another.
  - What does it mean to "carry information"?
- Waves: can transmit "information" from one place to another without one individual particle actually moving between those two places.
- Mechanical Waves: apply to others later.

A letter

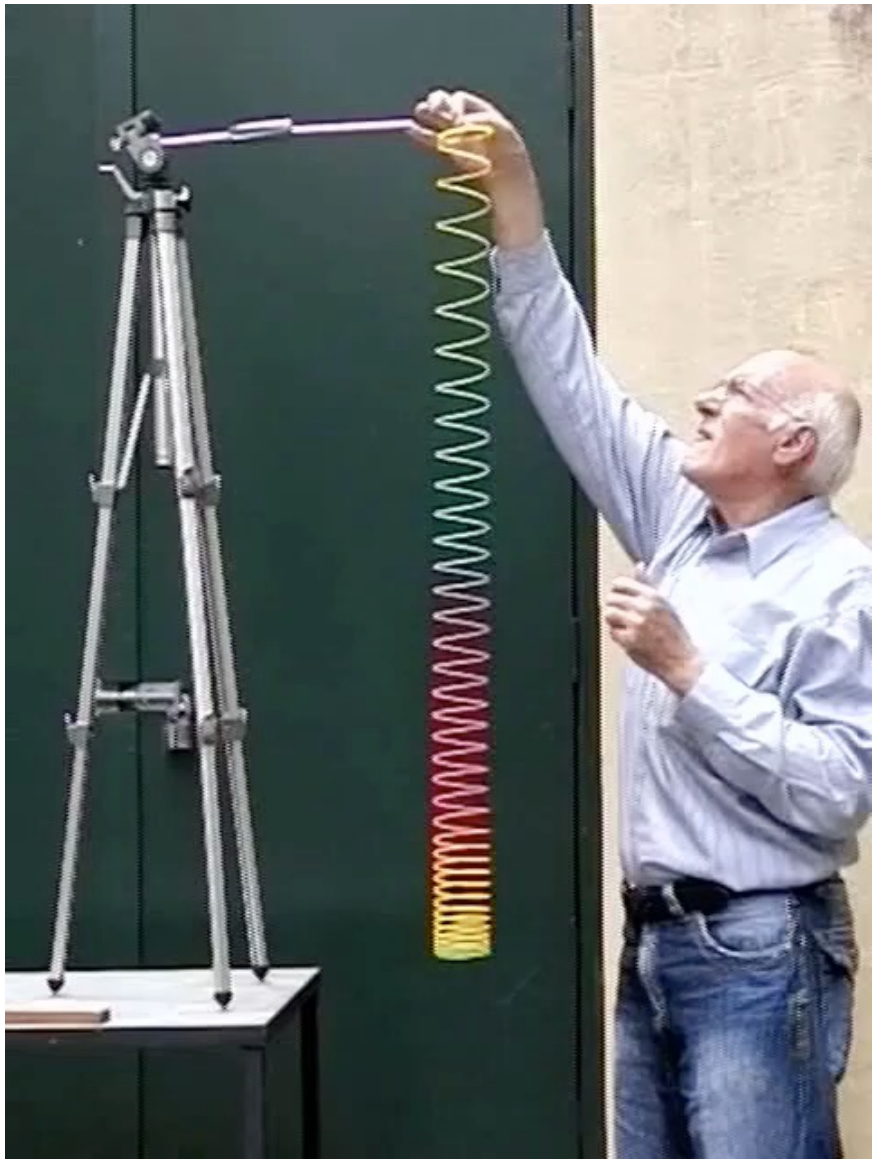
A phone call

Longitudinal Waves

- Sound waves, slinky
- Particles move parallel to disturbance: compression/expansion.



What will happen when the top of the slinky is let go?

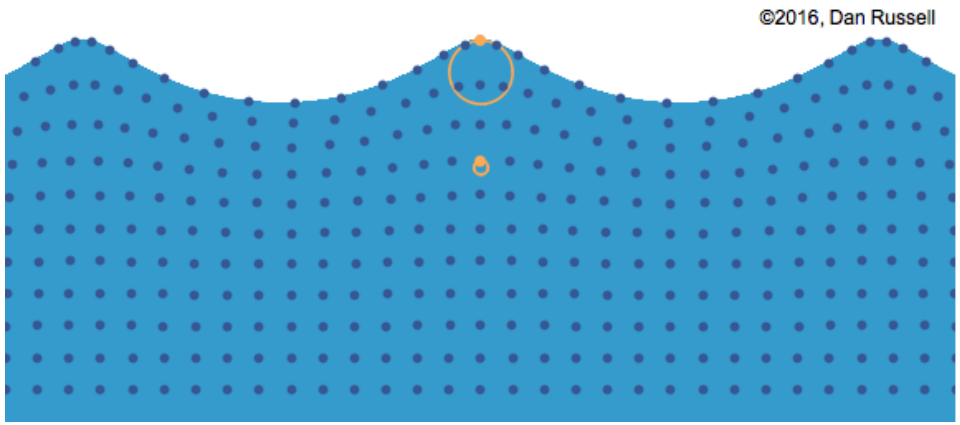


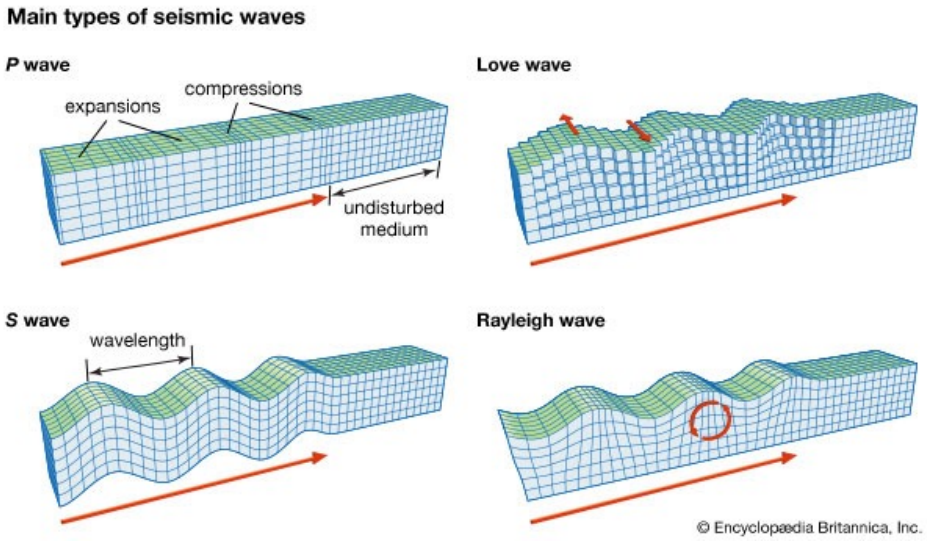
Transverse Waves

- Demonstration w/ phone cord.
- Particles move perpendicular to disturbance.
- Our focus.

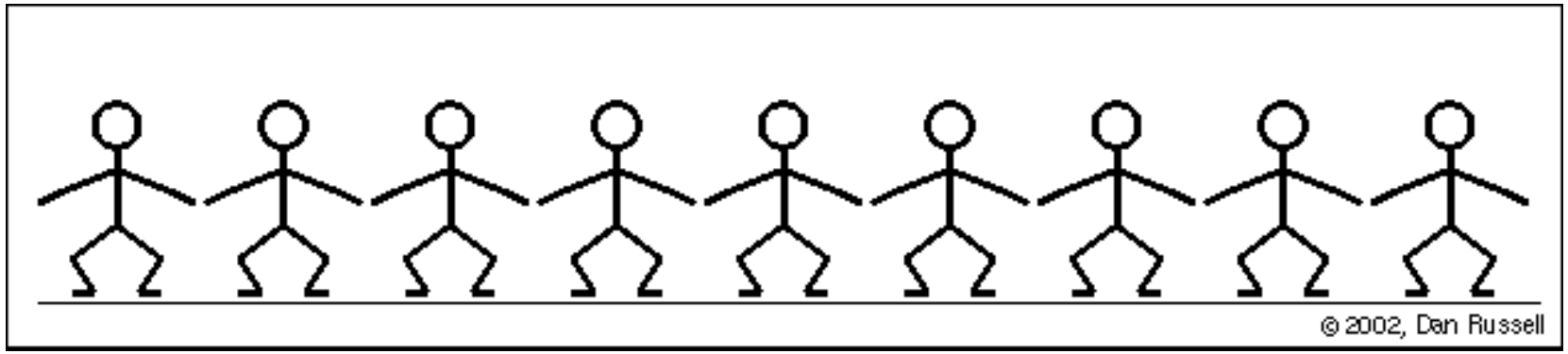
Combinations of Wave Types

- Water waves
- Earthquakes





What type of wave is "The Wave" in a stadium?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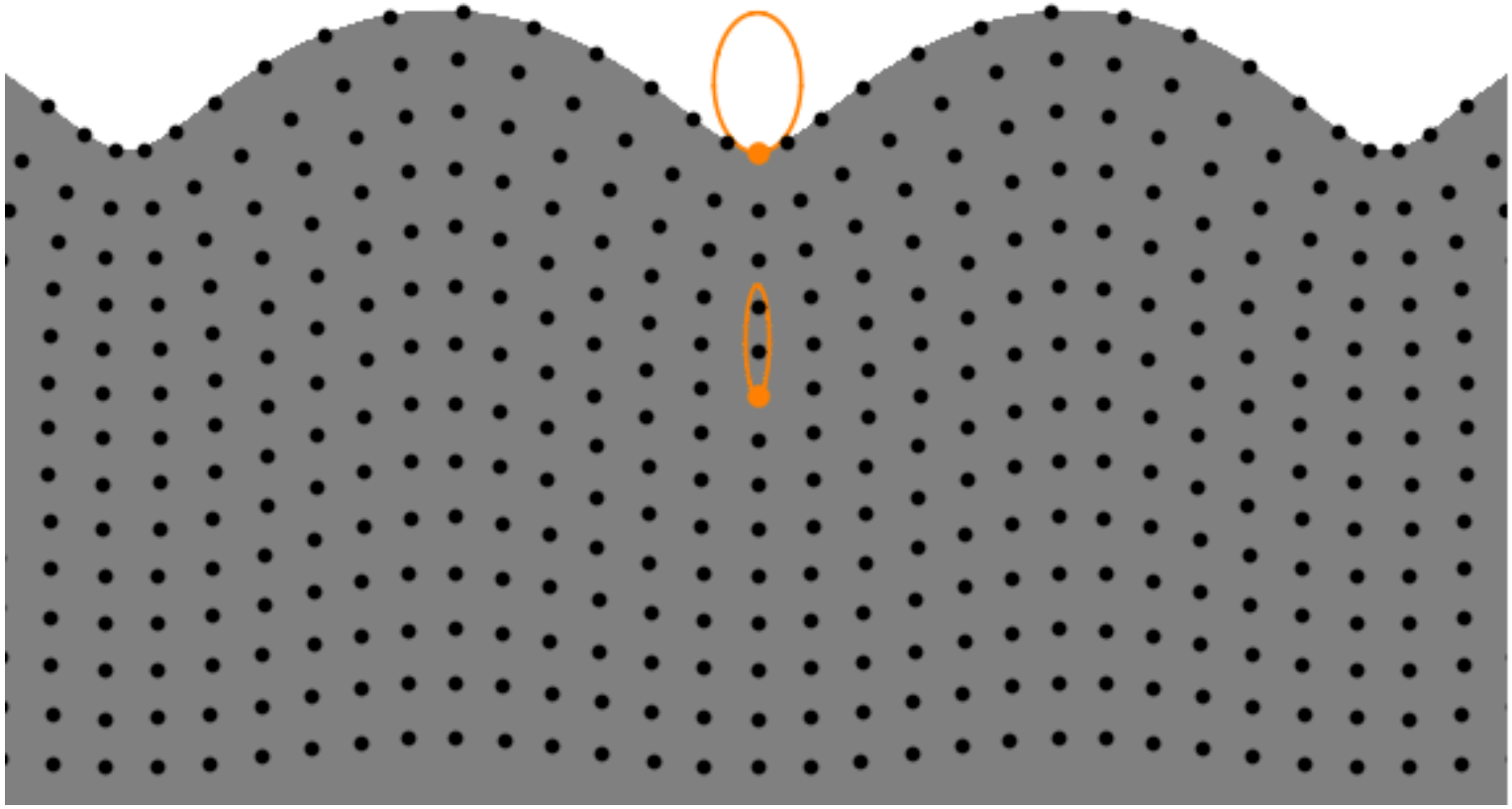

Activities

- Video analysis of wave pulse
- Excel analysis of continuous traveling wave
- All files are on the Class Resources page
- 7 pages! Time yourselves well.

Wrap-Up

- **Any function with the argument ($x \pm vt$) that is twice differentiable (in both x and t) can represent a traveling wave.**
- $kx - \omega t = x - \left(\frac{\omega}{k}\right)t = x - vt$
- Speed $|v|$ to the right.
- Recall: $\omega = \frac{2\pi}{T} = 2\pi f$