3.2 Particle vs. Wave Motion

PRE-LECTURE READING 3.2

- *Astronomy Today*, 8th Edition (Chaisson & McMillan)
- *Astronomy Today*, 7th Edition (Chaisson & McMillan)
- *Astronomy Today*, 6th Edition (Chaisson & McMillan)

VIDEO LECTURE

- Particle vs. Wave Motion[1] (13:34)

SUPPLEMENTARY NOTES

Particles

- See Particles[2].
- Carry energy and information
- Do not require a medium

Waves

- See Waves[3].
- Carry energy and information
- **Do** require a medium

Wave Properties

Wavelength (λ—Greek letter "lambda")

- Distance from wave crest to wave crest (or from wave trough to wave trough)
- MKS unit: meter (m)

Period (P)

- Time for wave to cycle once (or for wave pattern to move one wavelength)
- MKS unit: second (s)

[1] http://youtu.be/45Ys5-1jFcI
[2] http://en.wikipedia.org/wiki/Particles
[3] http://en.wikipedia.org/wiki/Waves

Frequency (ν—Greek letter "nu")

- Number of wave cycles per unit time

$$\nu = \frac{1}{P} \tag{1}$$

- MKS unit: Hertz ($\text{Hz} = \text{s}^{-1}$)

Energy (E)

$$E \propto \nu \tag{2}$$

EXAMPLE:

If you double a wave's frequency, you double its energy.

Wave Speed (v)

$$v = \frac{\text{distance}}{\text{time}} \tag{3}$$

$$v = \frac{\lambda}{P} \tag{4}$$

$$v = \lambda \times \nu \tag{5}$$