Lab 1: Wave Equations

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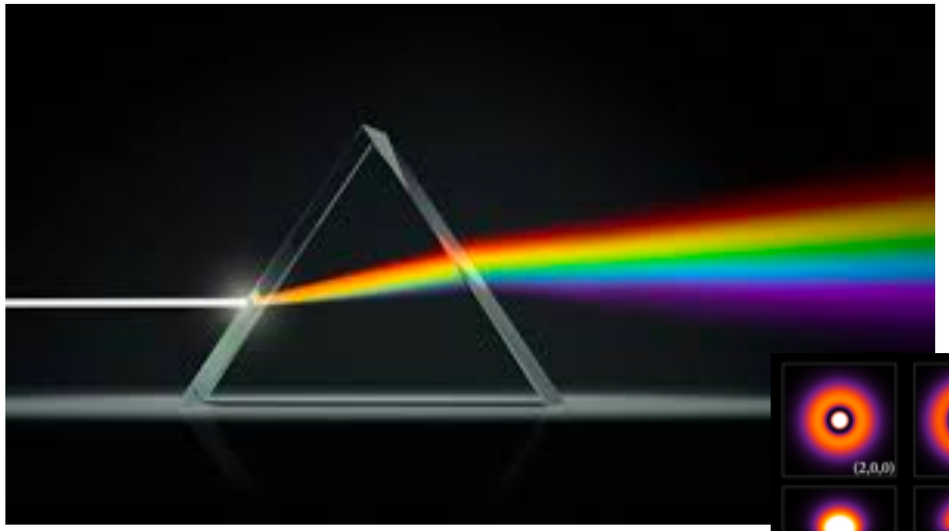

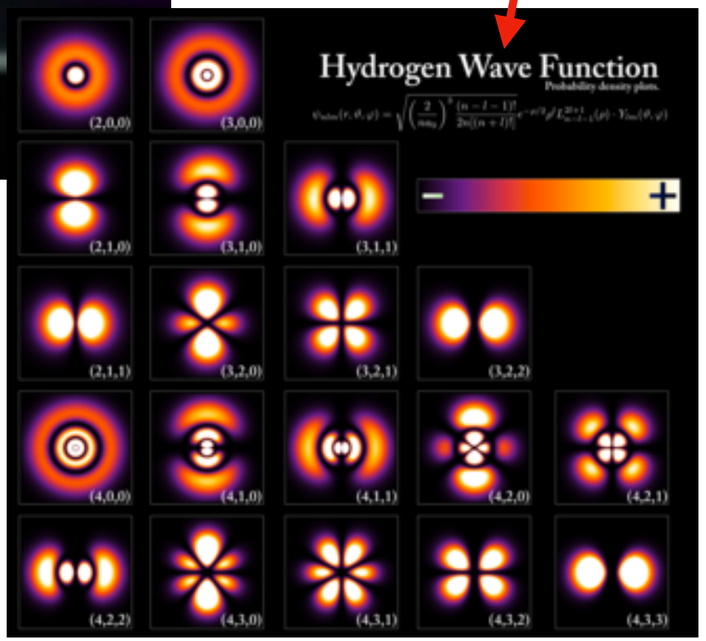

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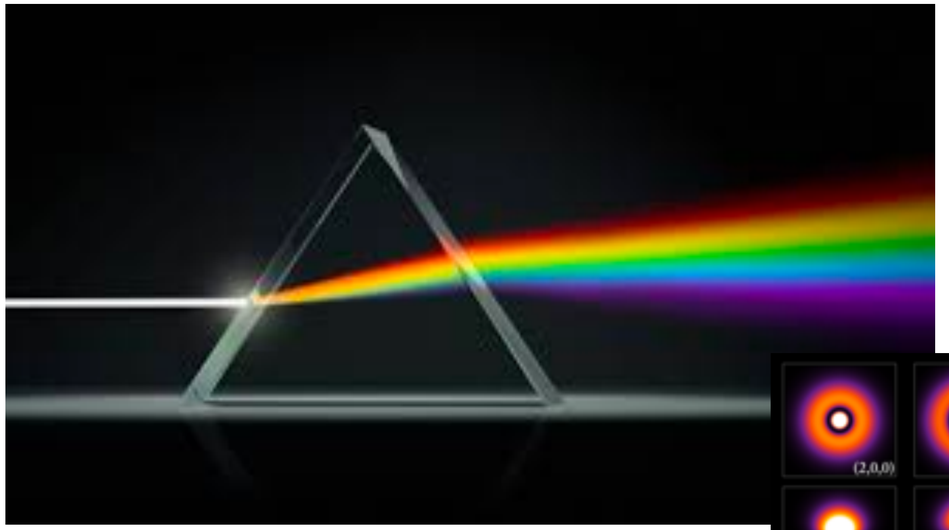
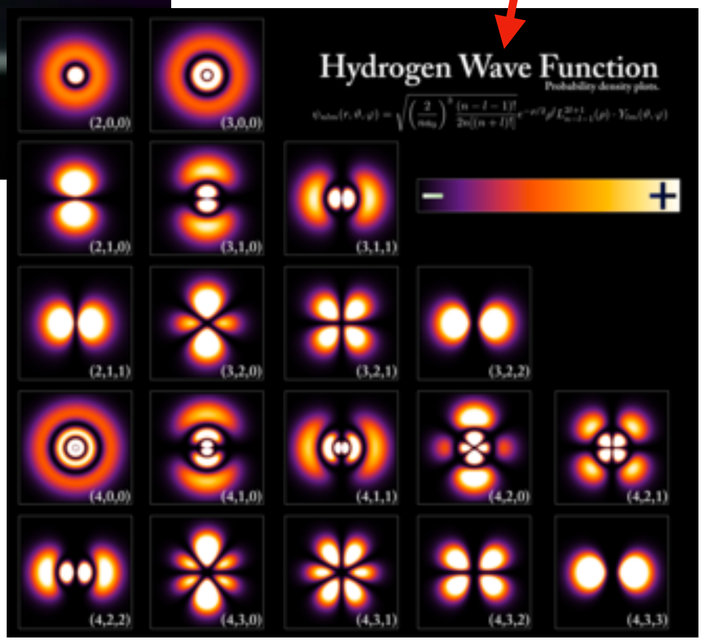
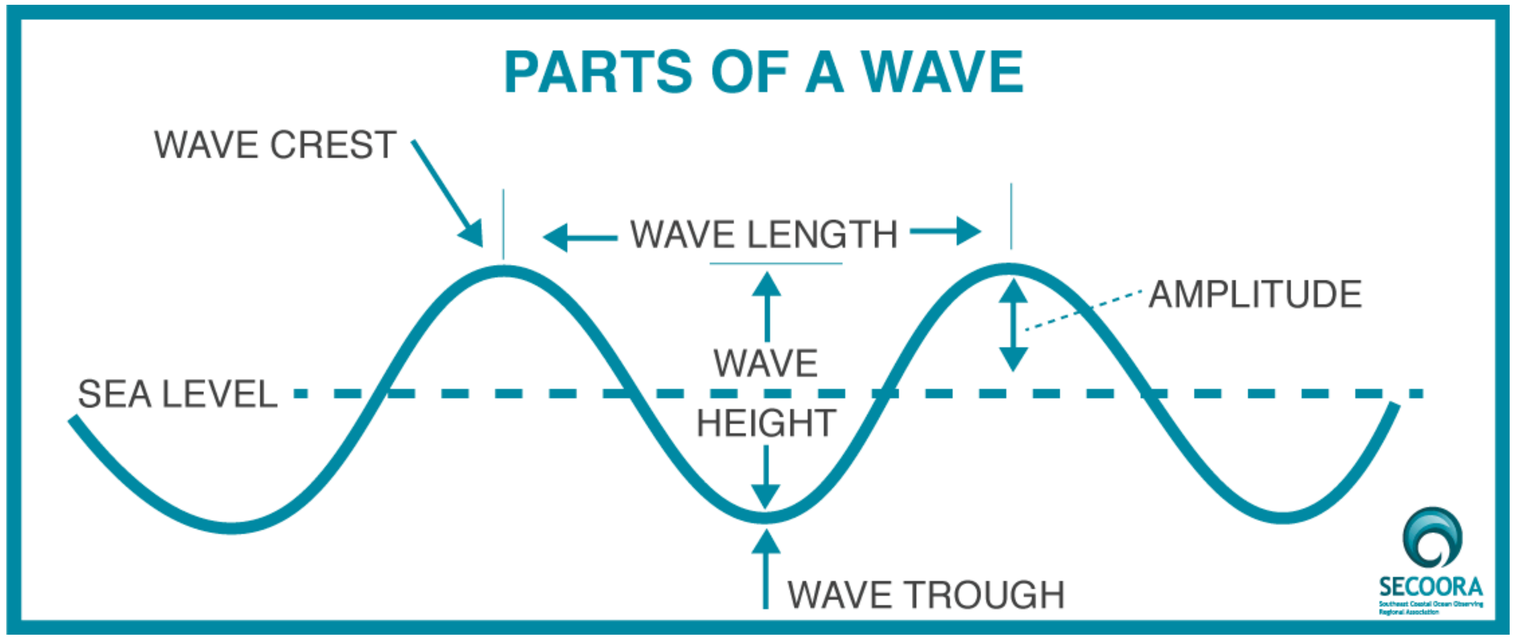




A better question might be: what *isn't* a wave!

Properties of a wave



- **Waves are periodic (sinusoidal) oscillations in a medium over space and time. If something is point-like (a particle) this might be something that "isn't a wave"**

- **As we will see, fundamental quantum particles exhibit *wave-particle duality*, so they have *both* particle and wave properties. Quantum physics is weird!**

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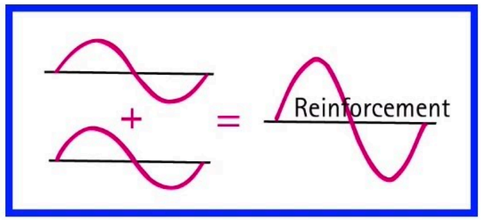
- Later this week, we will study the equation for a *quantum* wave function.
- To get there, we first need to study these *classical* waves in more detail.

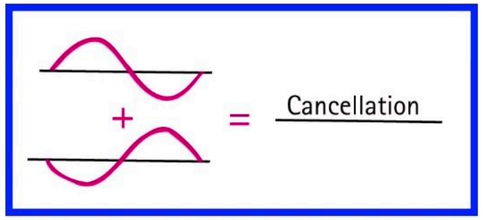
Linear Superposition

- **Waves can exhibit *linear superposition*, which just means that you can add together two waves.**

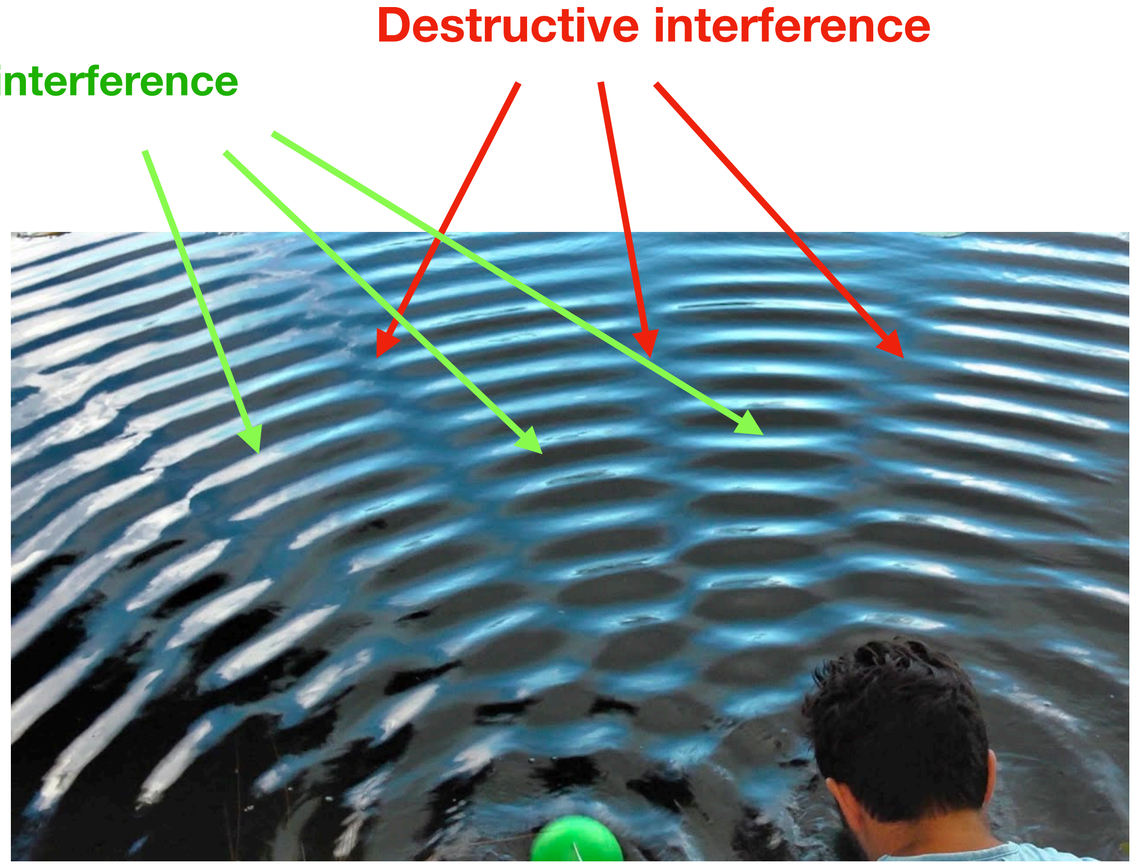
- **The resulting *interference* can be *constructive* or *destructive*.**



Constructive Interference

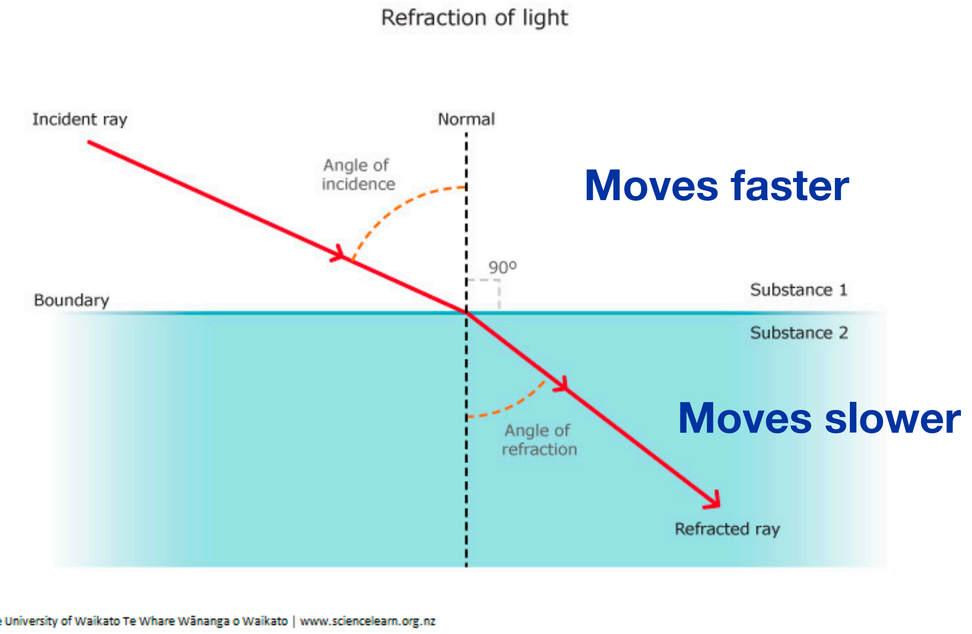


Destructive Interference



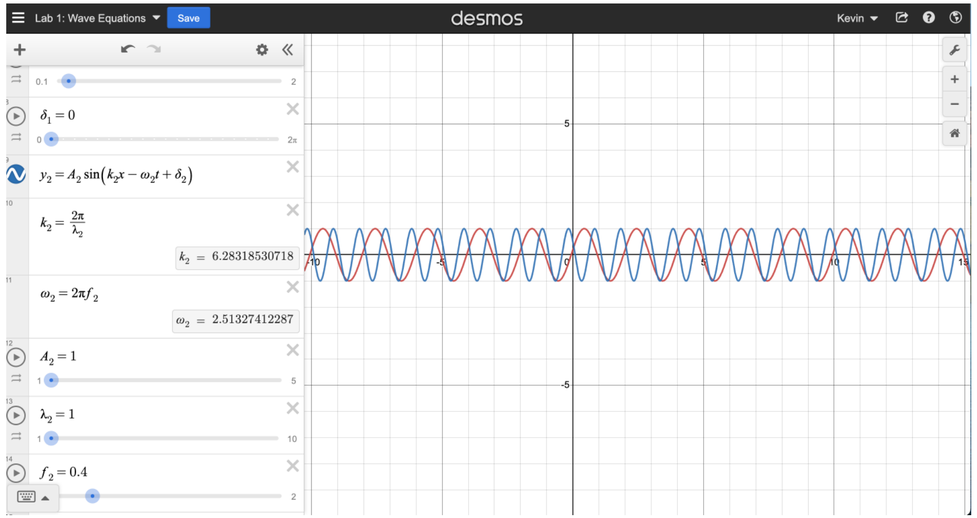
Wave Speed

- In most cases, the wave speed is determined by the medium
- You may have heard that the speed of light is a constant. This is the speed of light in a vacuum (like the vacuum of space)
- Light moves more slowly through air or water, for example.



Today's lab

- **In today's lab you will study wave equations in an interactive animation.**
  - You will learn about the properties of a wave:
    - Amplitude
    - Wavelength
    - Frequency
    - Phase



- **You will answer the questions**
  - What determines the speed of a wave?
  - What are the mathematical relationships between wave properties?

- **Today you will also use a mechanical wave generator setup**
  - You will verify the mathematical relationships between the wave properties