Teaching presentation, Selection Process for PHYS19-56

Young's Double Slit Experiment

Leah Morabito

Learning goals. Today we will cover Young's Double Slit Experiment to gain a conceptual understanding of the particle / wave duality of light, and how constructive and destructive interference work.

Methods. We will use geometric methods and a practical demonstration to understand the concept during the 30 minute block. Please feel free to use this handout to take notes.

Supplementary Materials.
video showing wave/particle duality:
https://www.youtube.com/watch?v=MbLzh1Y9POQ

slides from this presentation:
https://lmorabit.github.io/teaching/Youngs_double_slit_handout.pdf

Young's Double Slit Experiment
or ... why radio interferometry works

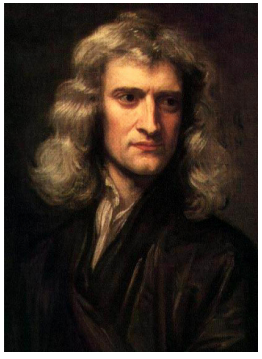
Dr. Leah Morabito
Hintze Fellow

Teaching presentation
Selection process, PHYS19-56
10 April 2019

Overview

- Background
- Review of key definitions
- Single slit diffraction
- Young's Double Slit Experiment *(geometric analysis, demo)*
- So what about radio interferometry?

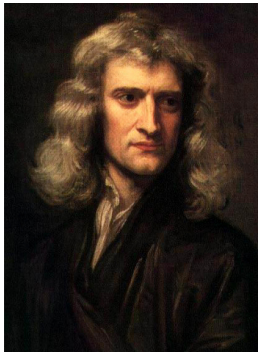
Background



Isaac Newton thought that light was a stream of *particles*

Christian Huygens believed that light behaved like *waves*

Background



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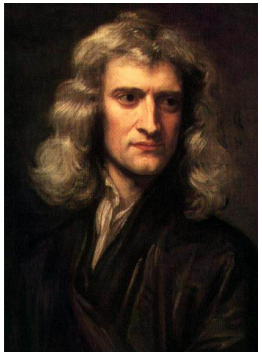

✓ **Isaac Newton** thought that light was a stream of *particles*

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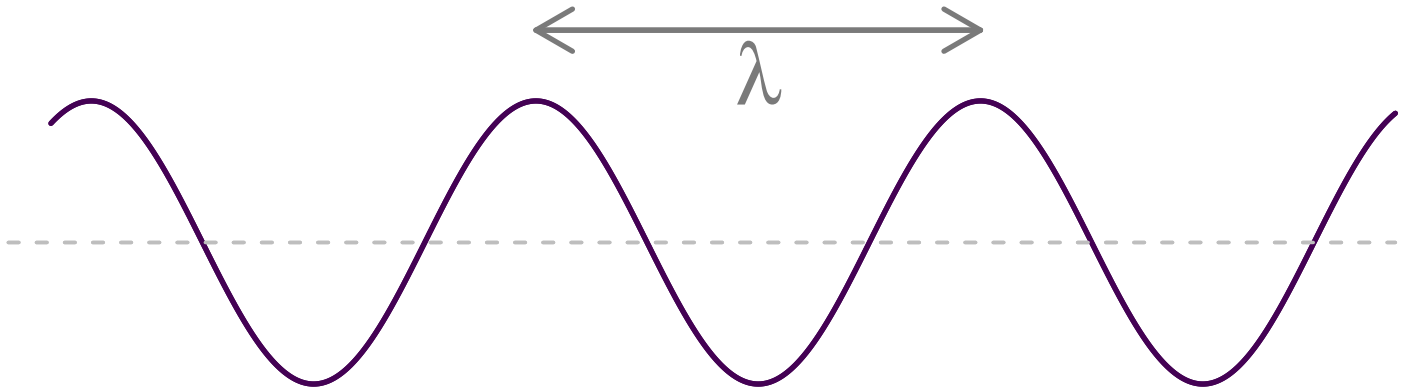
about 100 years later, **Thomas Young** used the *double slit experiment* to show light has wave properties ... but we'll come back to this at the end

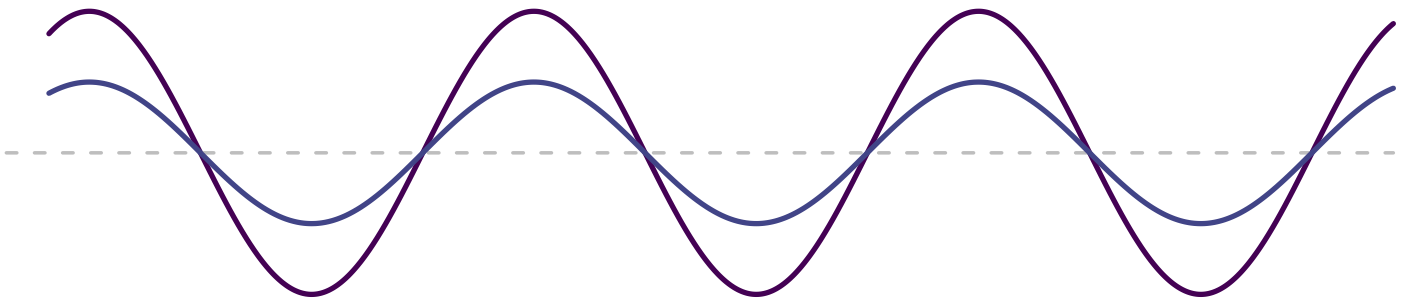
Review of key definitions



λ = wavelength, units of **distance**
ν = frequency, units of **1 / time**
$c = \lambda\nu$ = speed of light, units of **distance / time**

Review of key definitions

superposition of waves can be added algebraically



constructive interference

Review of key definitions

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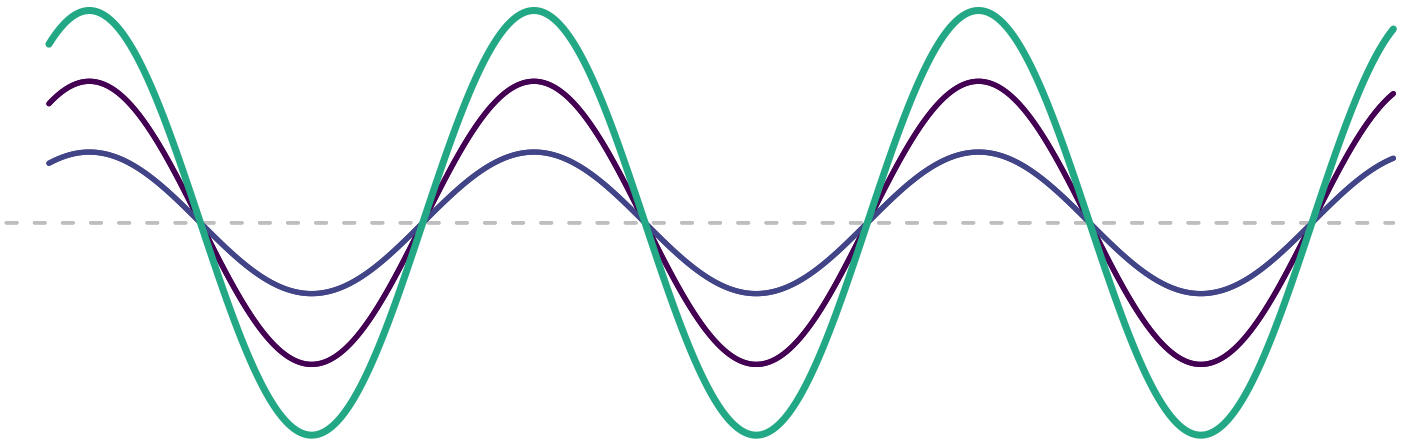

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Review of key definitions

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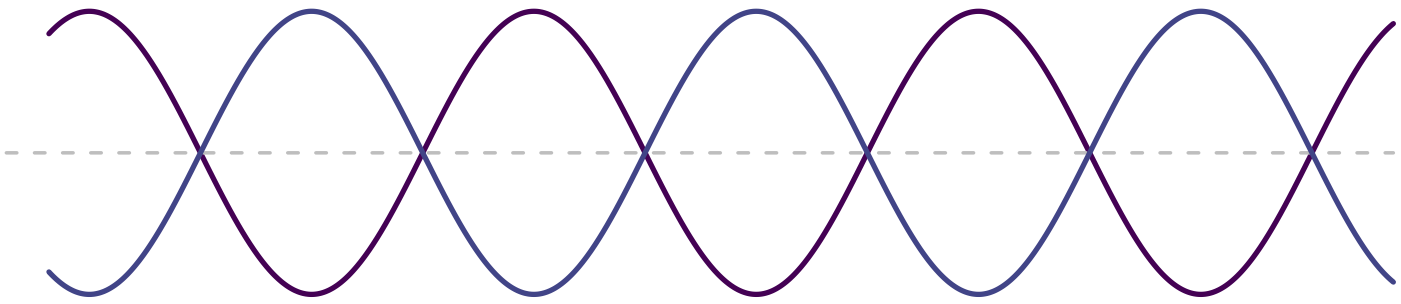

destructive interference

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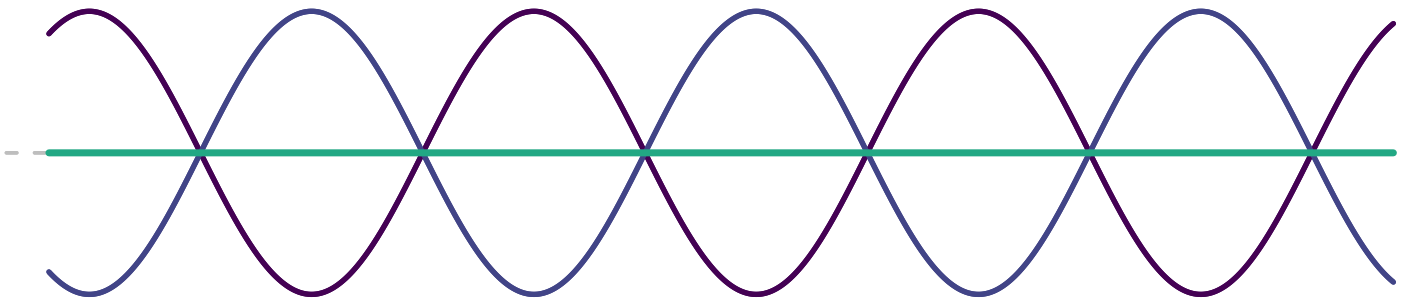

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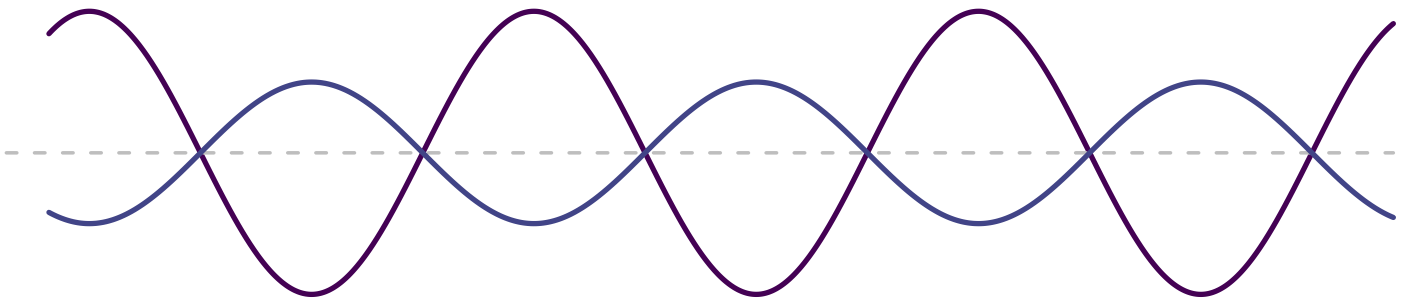

in between constructive and destructive

Review of key definitions

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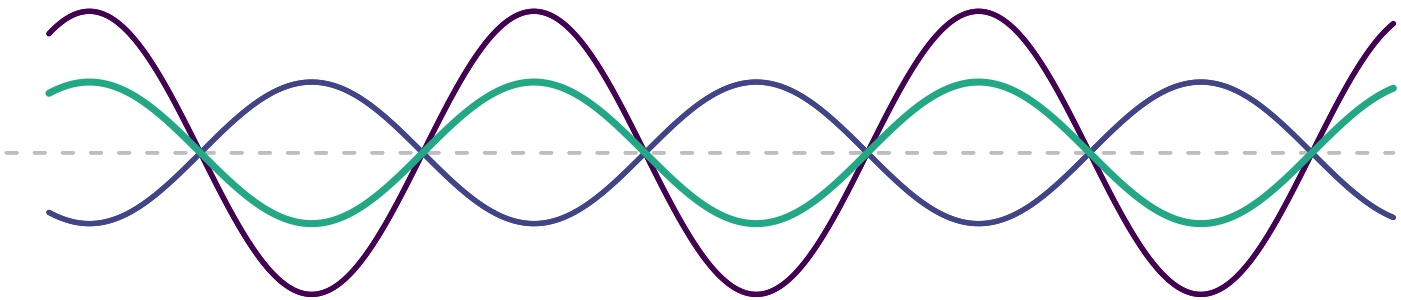
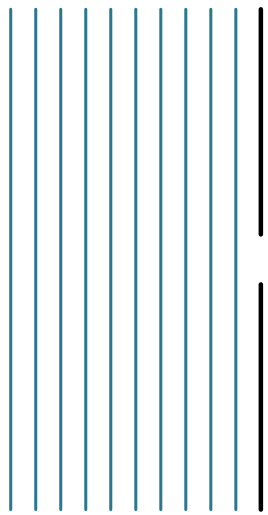


in between constructive and destructive

Single slit diffraction

When light passes through an opening that is of similar size to the wavelength, it bends around the corners



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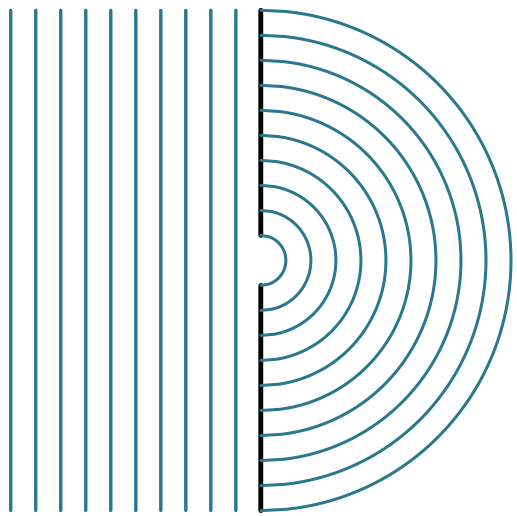
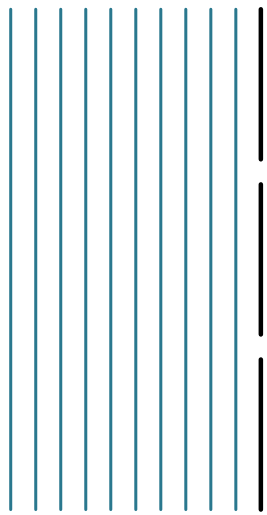


Young's Double Slit Experiment

what happens when you have two slits a distance d apart from each other?



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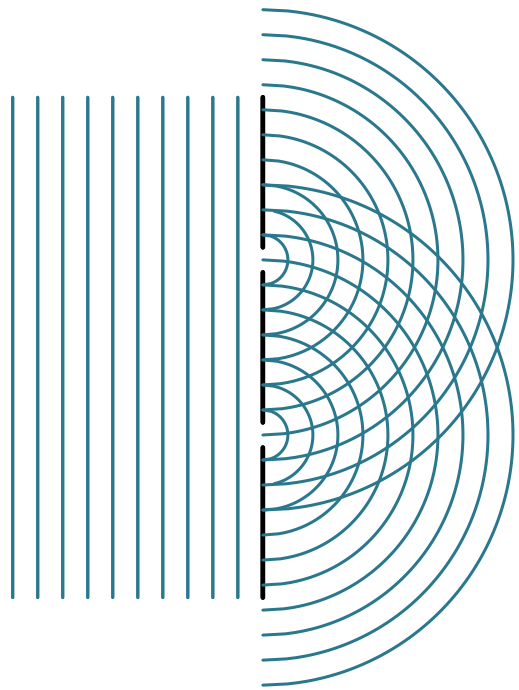

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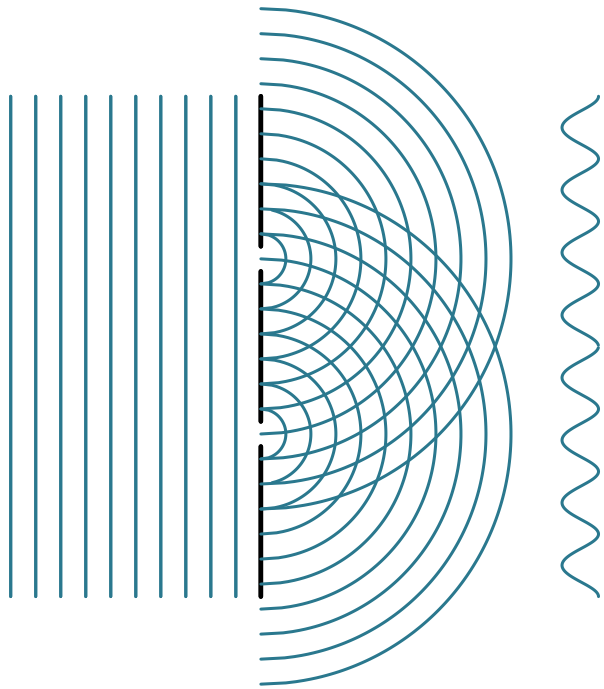

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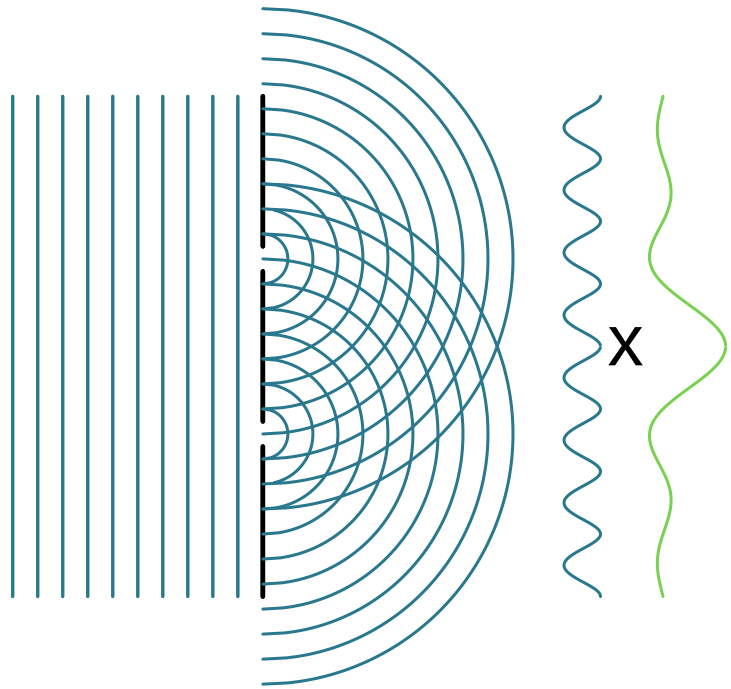

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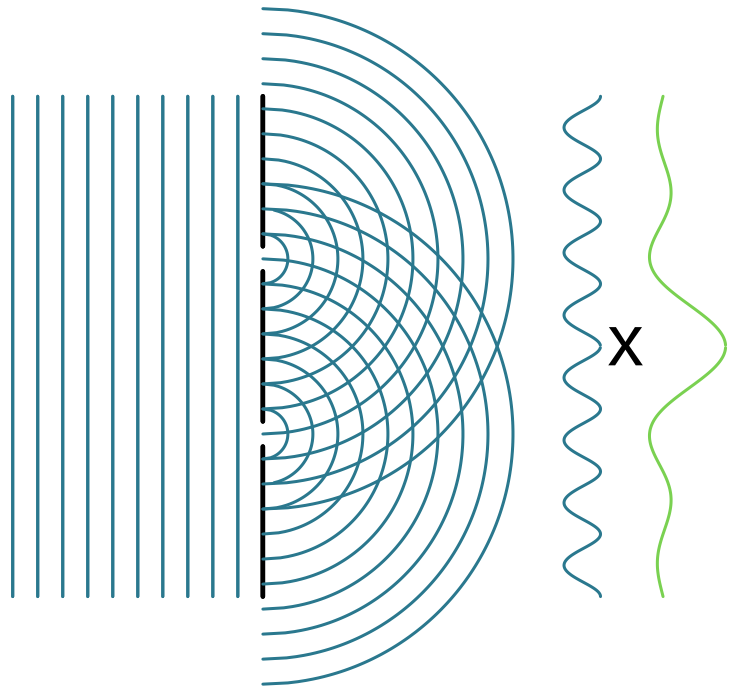

now that we have an idea of the concept,
let's do some calculations!

Radio interferometry