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 illustrative tools (videos, demonstration) and geometric methods worked out collaboratively 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:
XXX

Young's Double Slit Experiment
or ... why we use radio interferometry

UNIVERSITY OF OXFORD

Dr. Leah Morabito

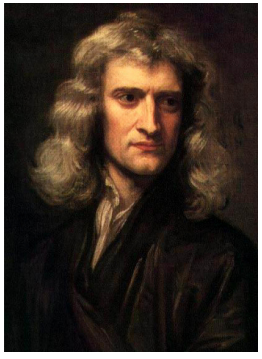
Hintze Fellow

Teaching presentation
Selection process, PHYS19-56
10 April 2019

Overview

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

Background



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

Christian Huygens believed that light behaved like *waves*

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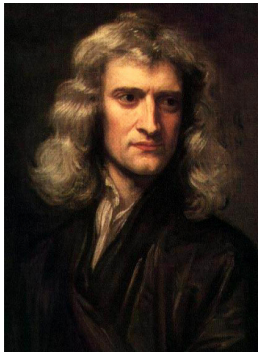

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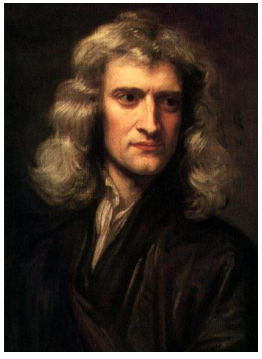
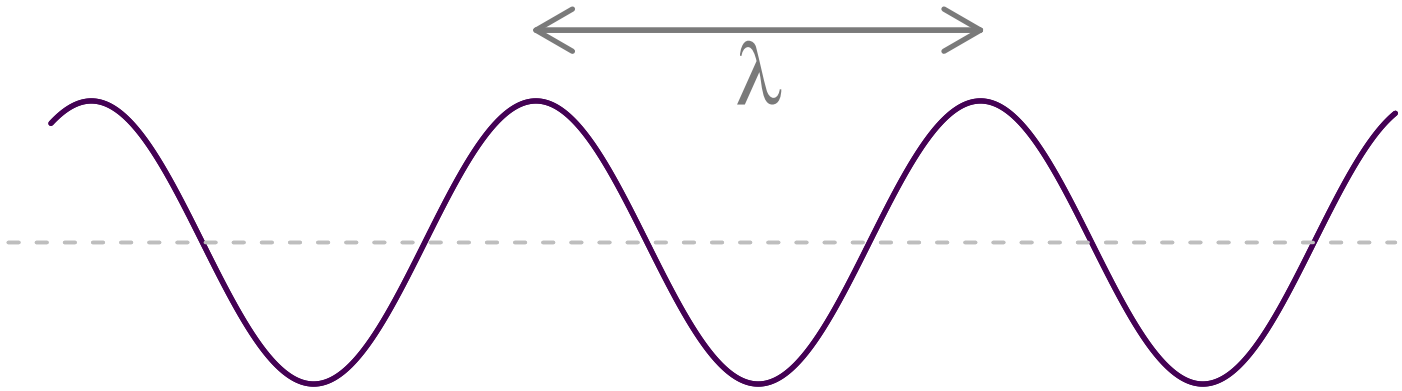


✓ **Isaac Newton** thought that light was a stream of *particles*

X **Christian Huygens** believed that light behaved like *waves*

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

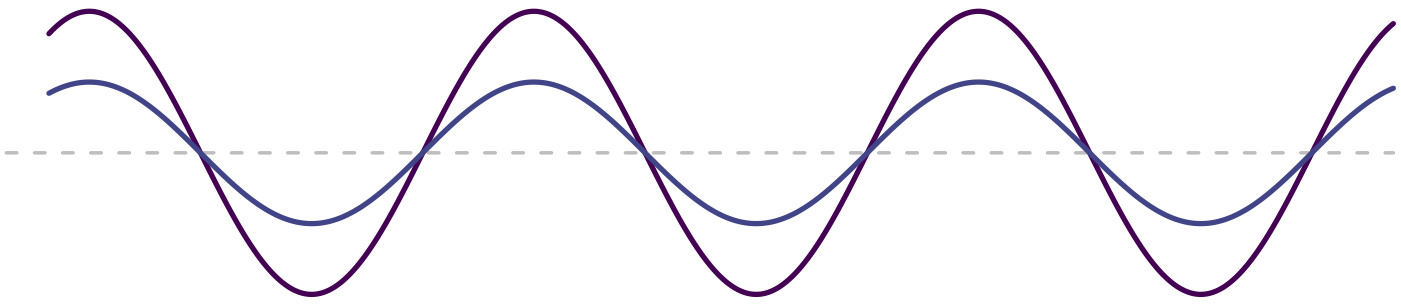
Review of key definitions



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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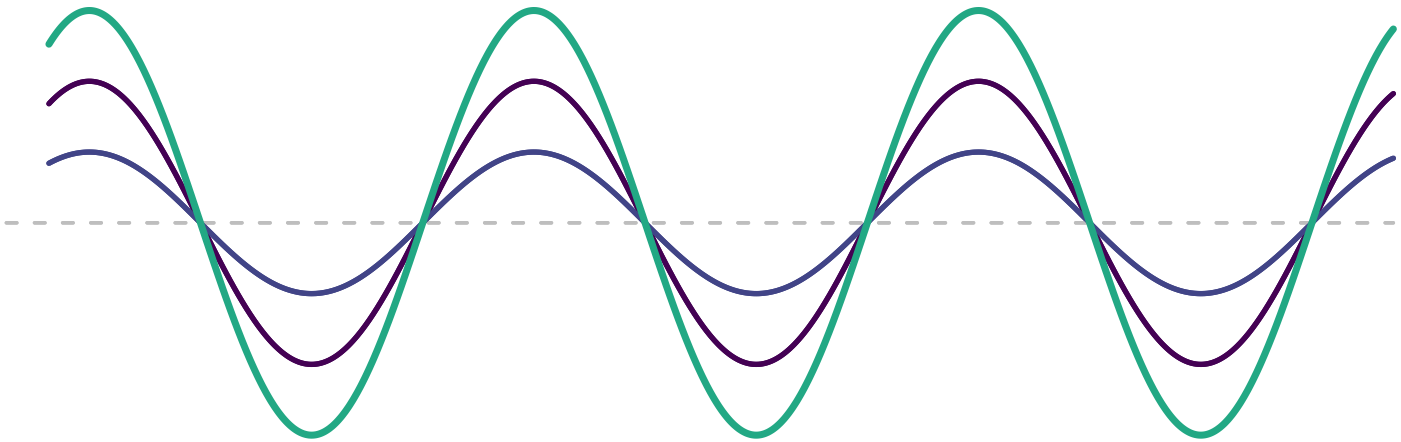

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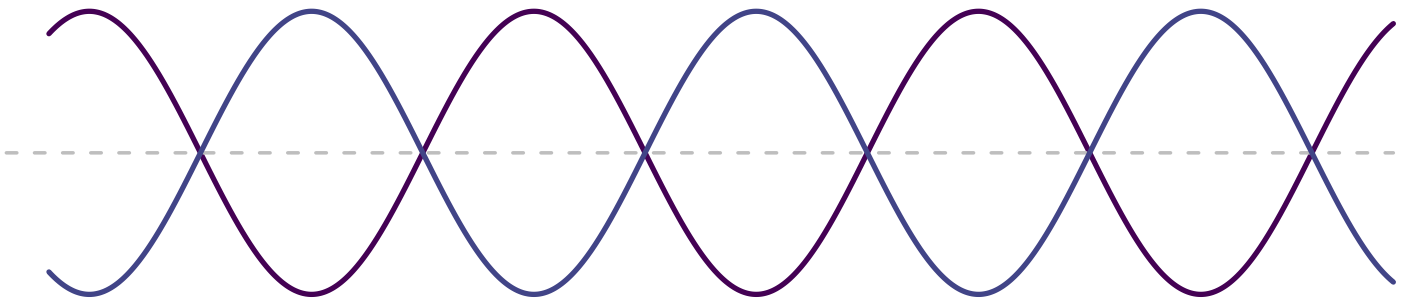

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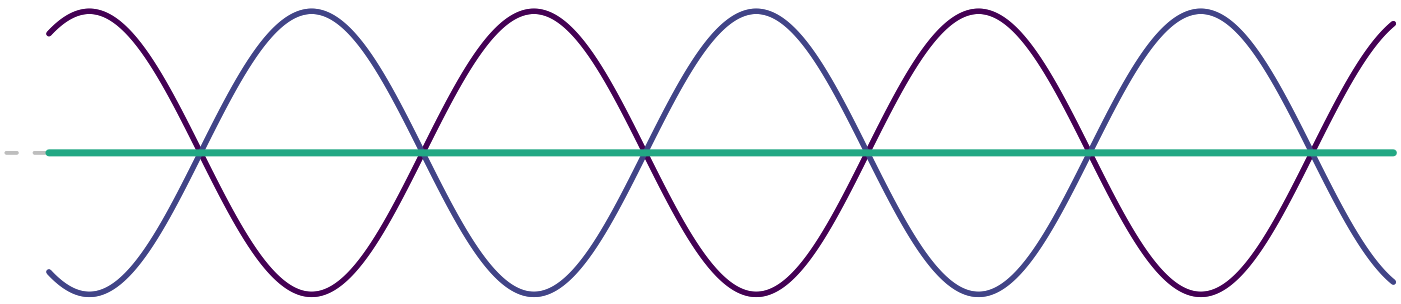

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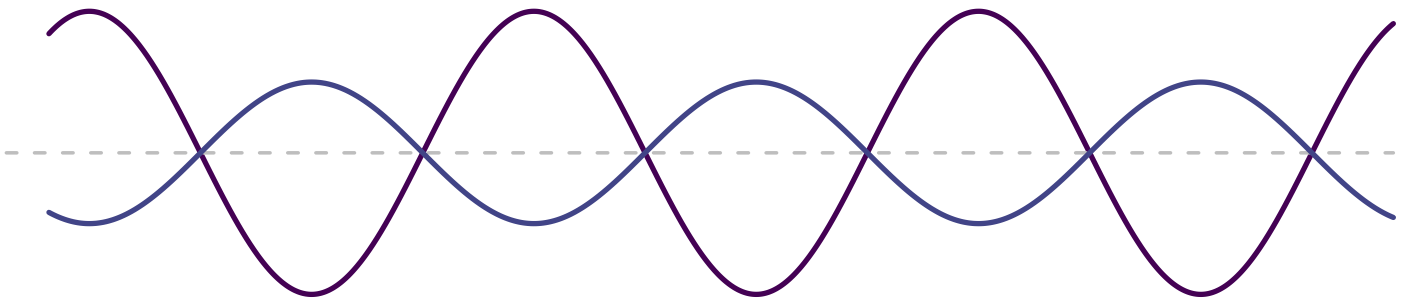

in between constructive and destructive

Review of key definitions

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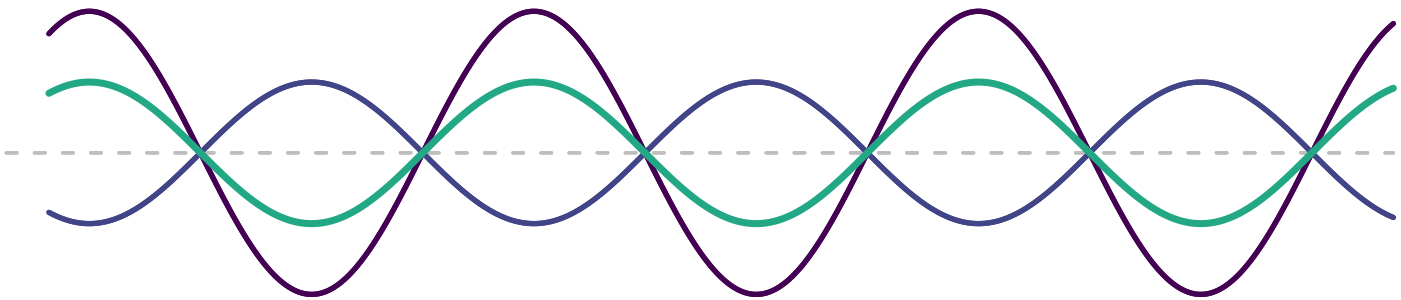
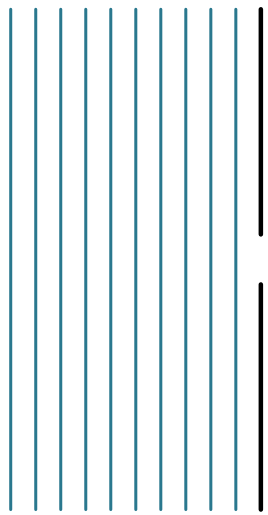


in between constructive and destructive

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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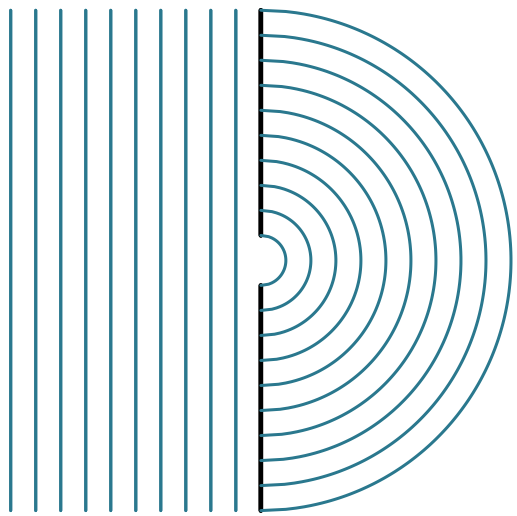
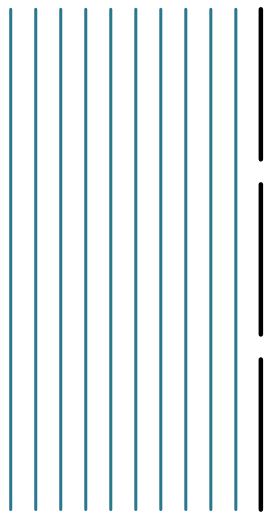


Young's Double Slit Experiment

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



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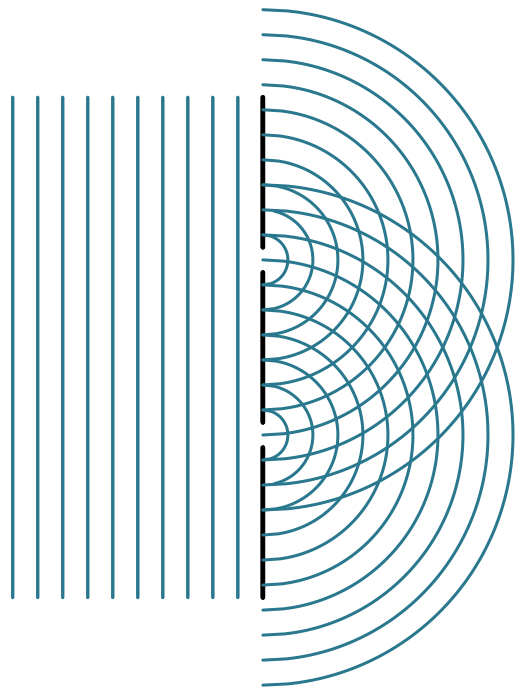

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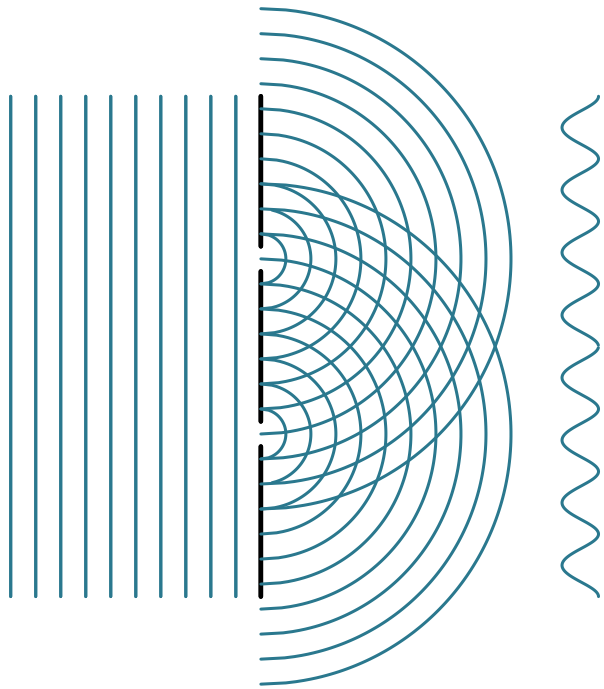

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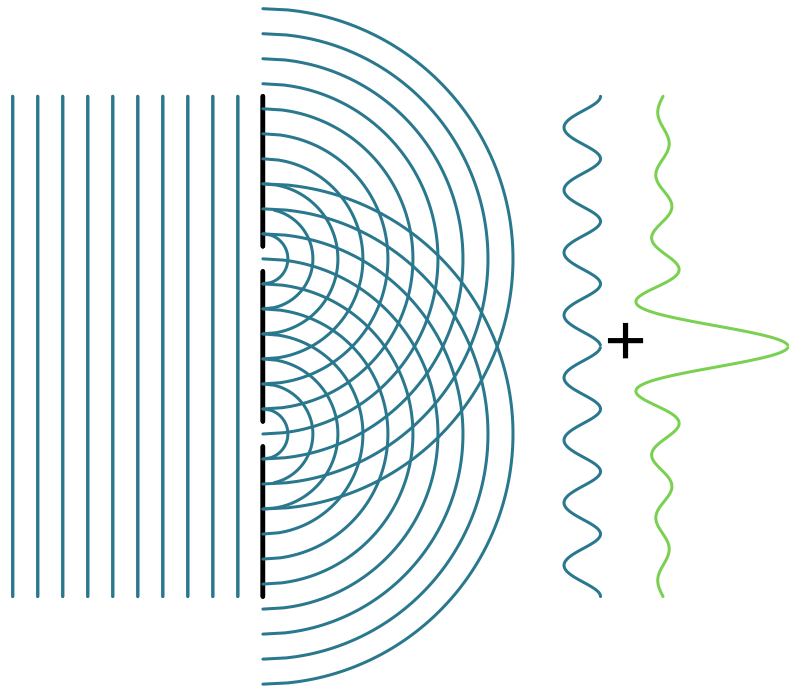

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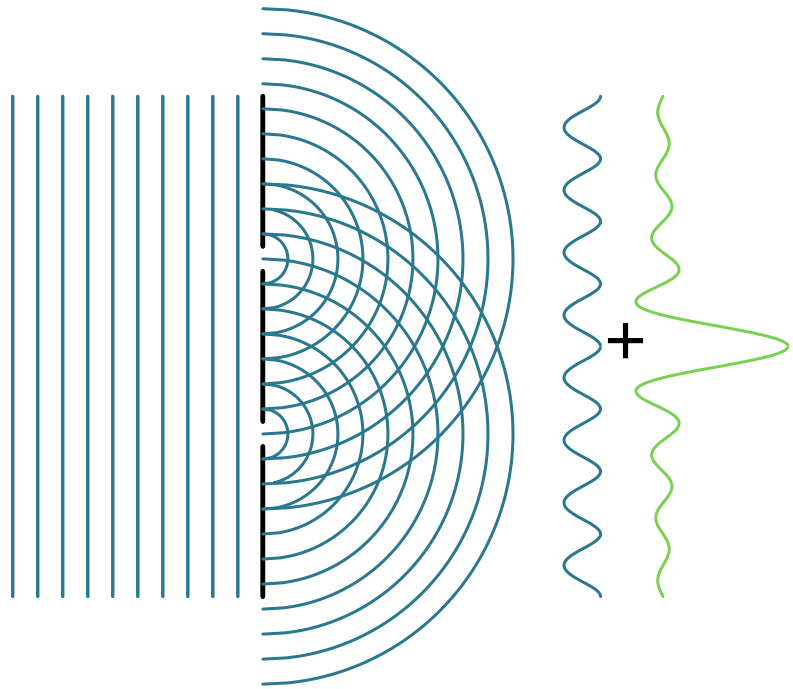

now that we have an idea of the concept,
let's do some calculations!

Radio interferometry