Young's Double slit experiment

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Nature of Light

- Corpuscular theory of light by Newton.
- Thomas Young's experiment in 1805 proved the wave nature of light by observing the phenomenon of *interference*.

Thomas Young (1773-1829)

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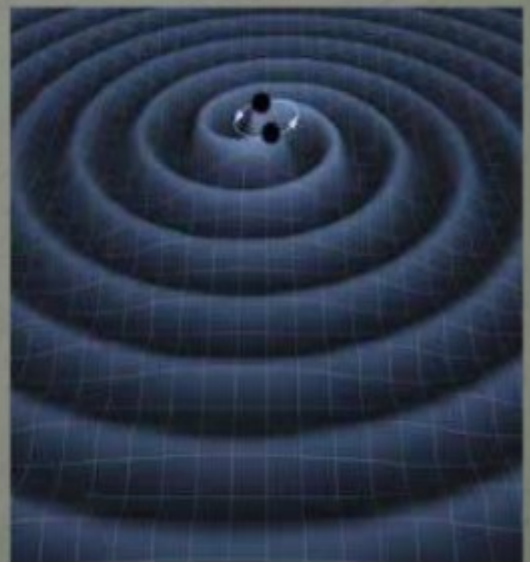
Introduction

- The experiment is named for its inventor, Thomas Young (1773-1829)

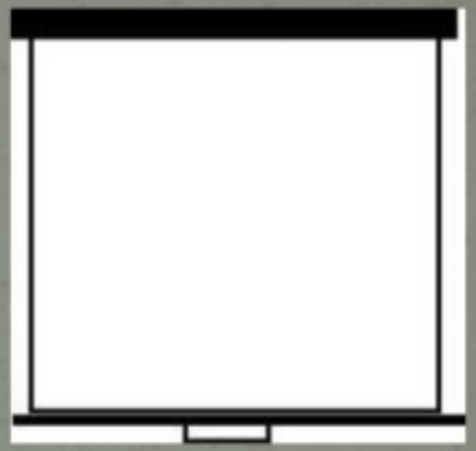
- This experiment strongly demonstrates the wave nature of light.



Apparatus

- Double slit

- Screen

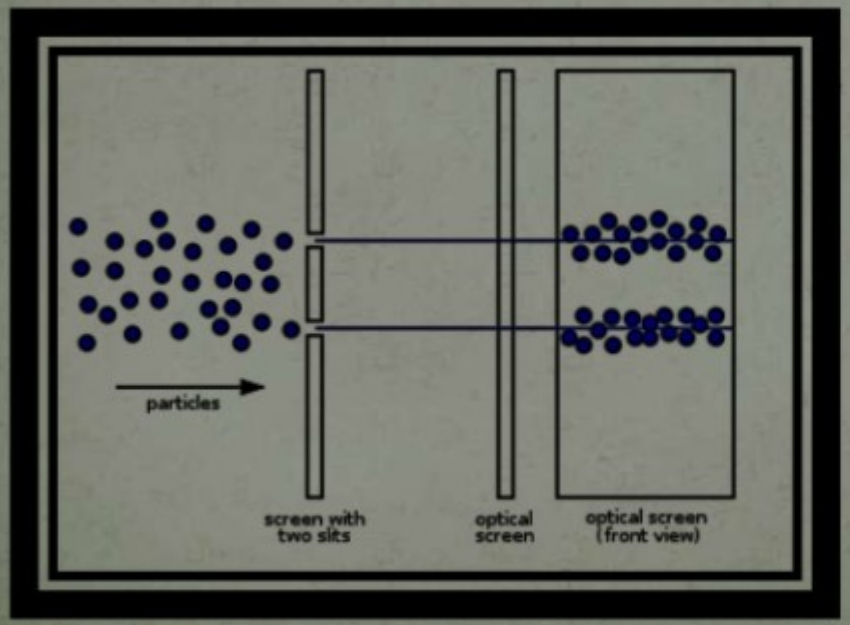


- Light beam

Light: A Particle or Wave

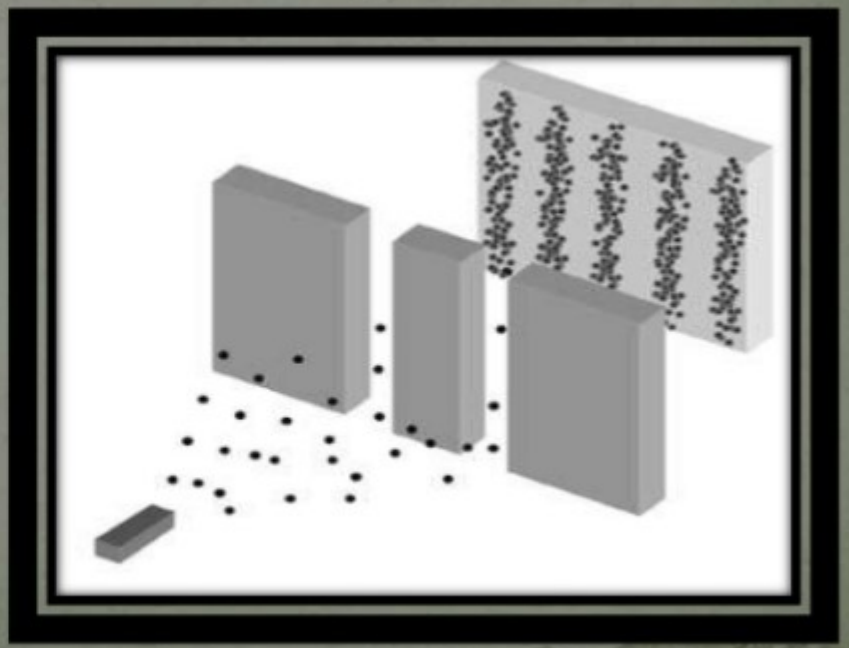
Particle

- If light acts as a particle, only two slits will appear on the screen



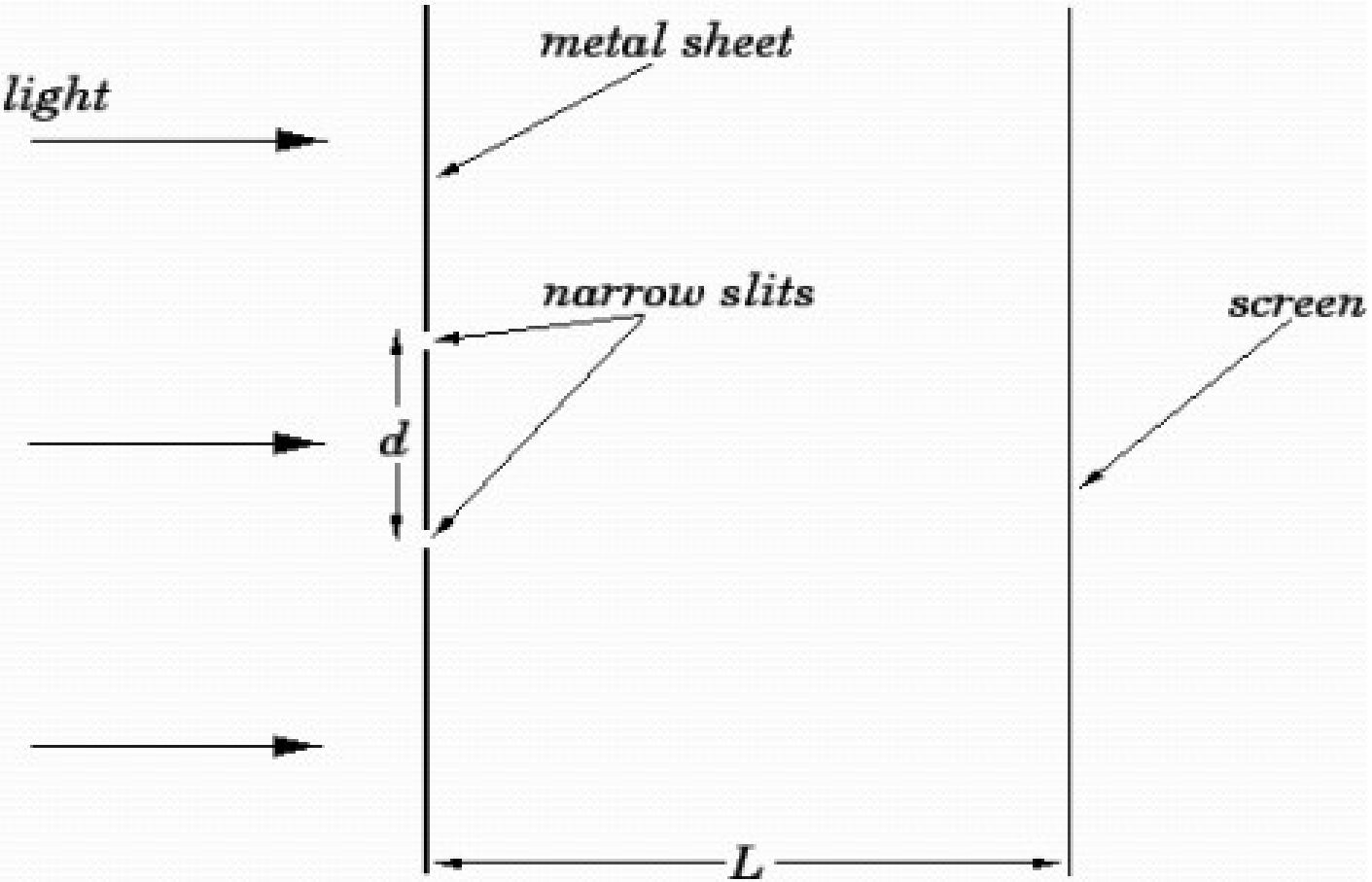
Wave

- The light will diffract and interfere, making many fringes

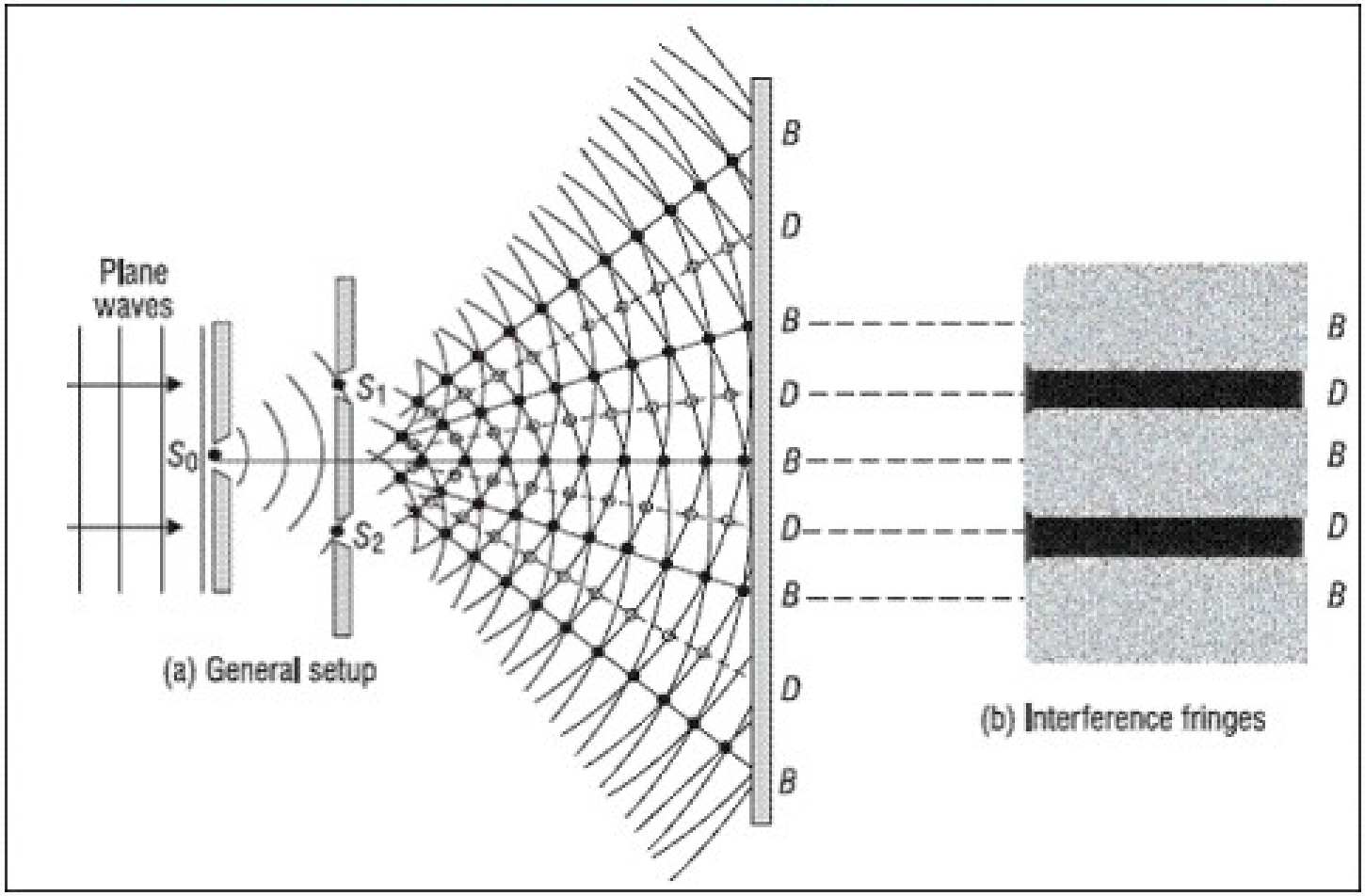


Double Slit Experiment Setup

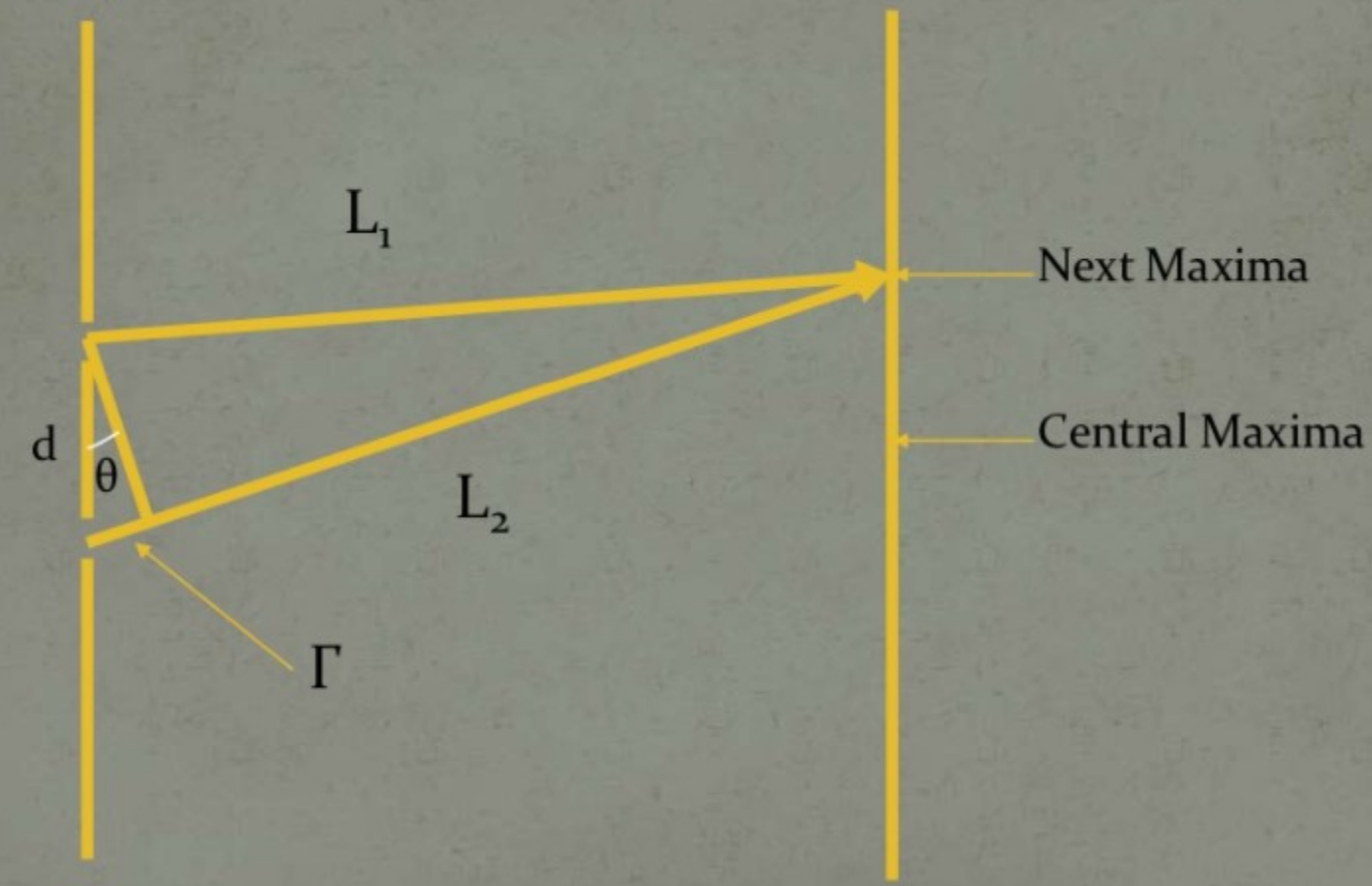
Monochromatic Source



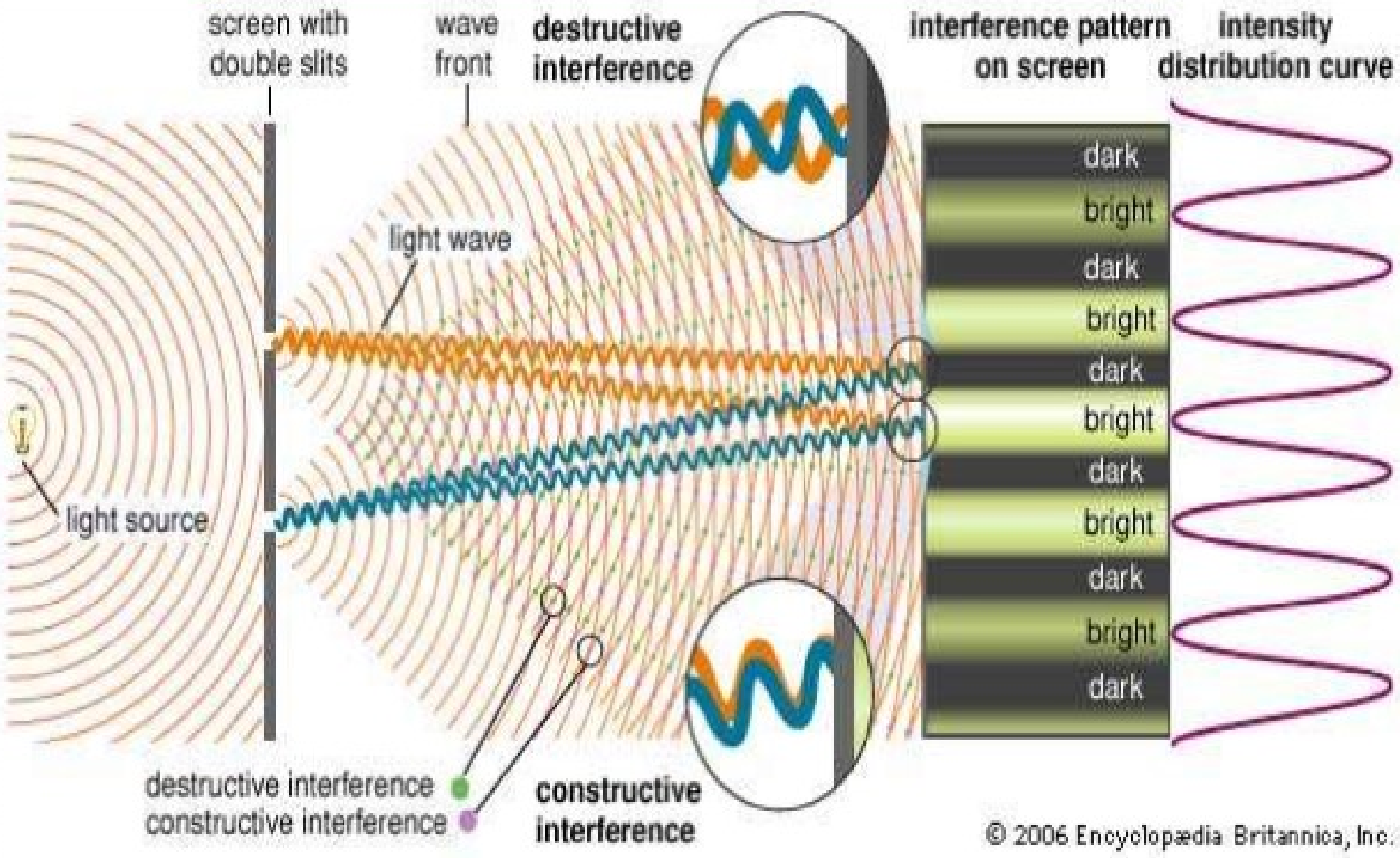
Double Slit Experiment



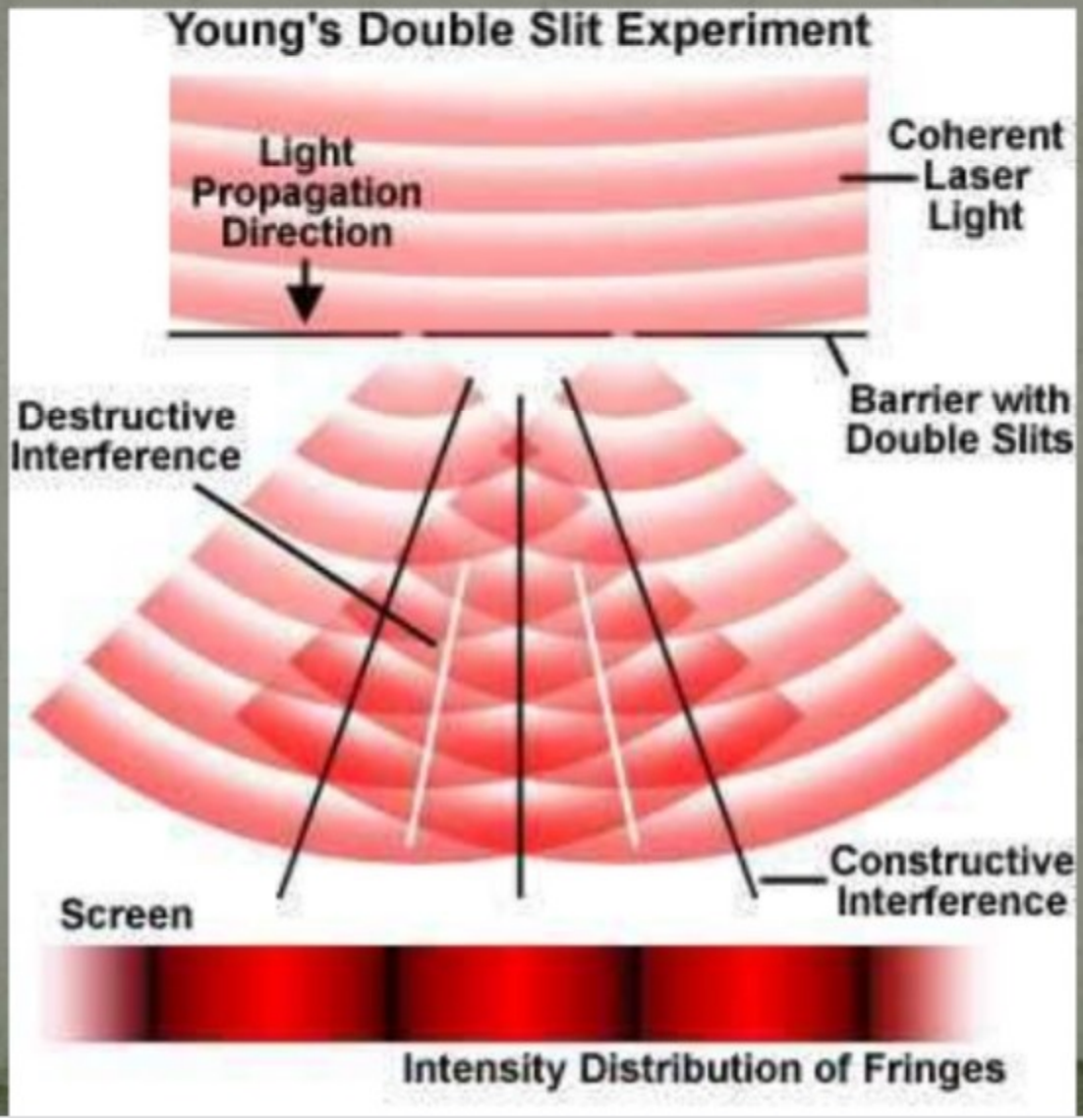
Theory



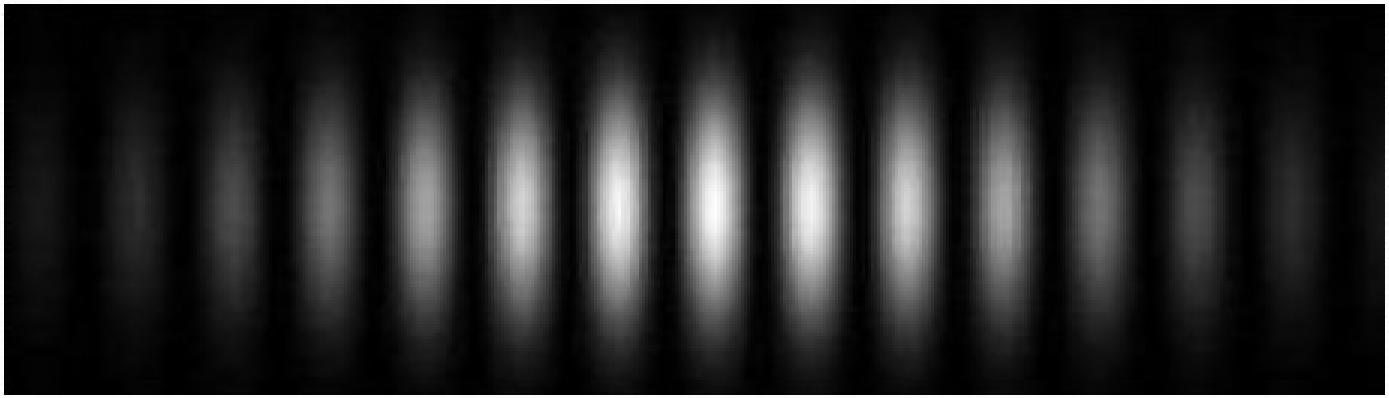
Double Slit Experiment

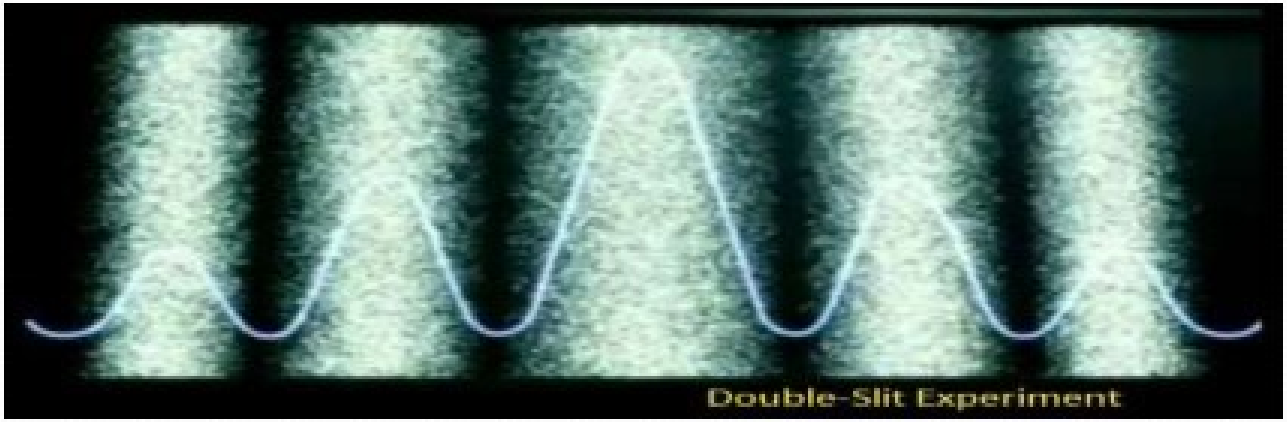


Result


Young's Double Slit Experiment
Light Propagation Direction
Coherent Laser Light
Barrier with Double Slits
Destructive Interference
Constructive Interference
Screen
Intensity Distribution of Fringes

Result





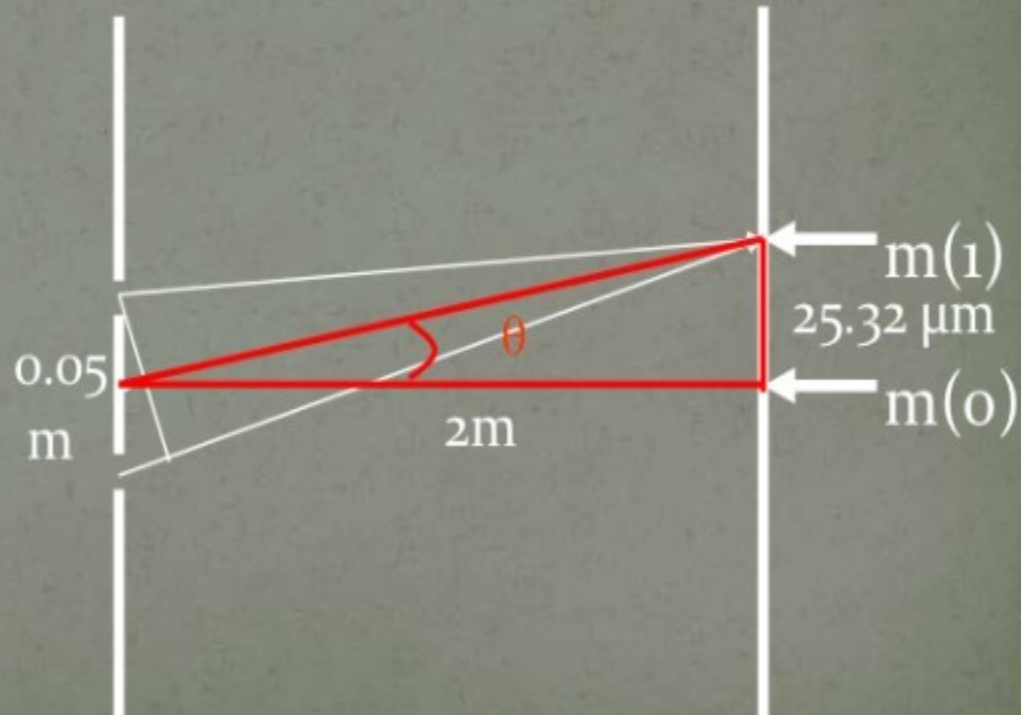
Example

- Light hits two slits separated by 0.05 m. If 25.32 μm separates the bright fringes on the screen that is 2m distant, what is the wavelength of light being used?

$$D \sin\theta = m\lambda$$

$$0.05 \quad \frac{25.32}{2} = 1 \quad \lambda$$

$$\lambda = 633\text{nm}$$



Conclusion

- Light behaves like a wave; interference
- We used this property to calculate the wavelength of light
- Light also behaves like a particle
- This behavior is described in the dual wave/particle theory