

# Poisson's Bright Spot – A History

- Competition for French Academy in 1818
- Fresnel's paper on diffraction won 1st prize
- Poisson, critic of wave description of light, hypothesized a bright spot at the center of shadow of circular obstacle
- Poisson felt this would prove absurdity of Fresnel's treatment
- Experimentally verified by Arago



**Poisson's bright spot**

[http://homepage.mac.com/dtrapp/ePhysics.f/labIV\\_4.html](http://homepage.mac.com/dtrapp/ePhysics.f/labIV_4.html)



**Augustin-Jean Fresnel**

[http://en.wikipedia.org/wiki/Augustin-Jean\\_Fresnel](http://en.wikipedia.org/wiki/Augustin-Jean_Fresnel)

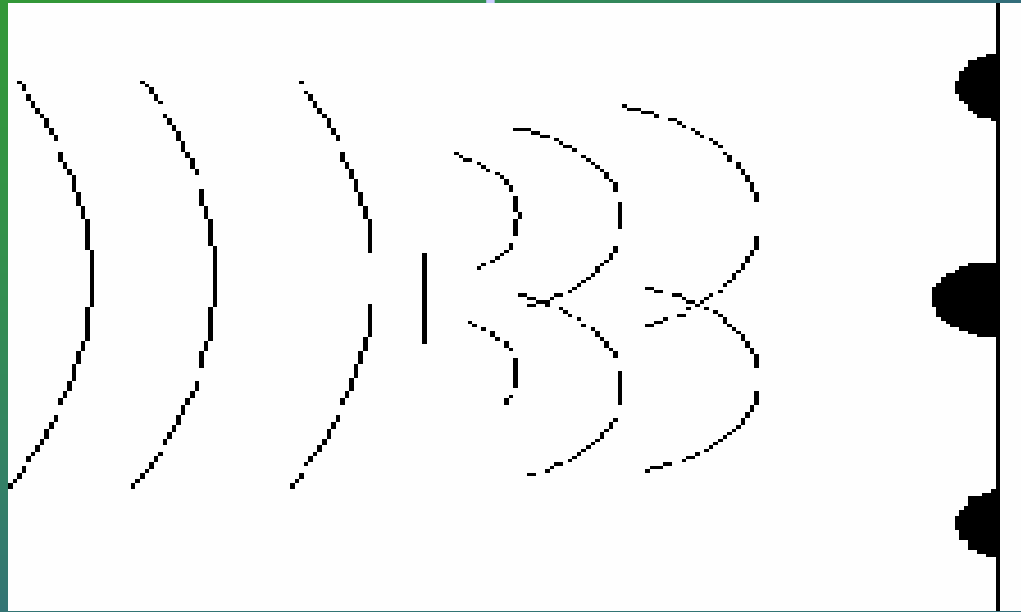
- This *could not* be explained simply with particle theory of light.
- Fresnel's theory, with Huygen's principle, allowed for this constructive interference to occur, even at the center of the shadow.



**Siméon Denis Poisson**

<http://en.wikipedia.org/wiki/Poisson>

# Poisson's Spot – How It Works



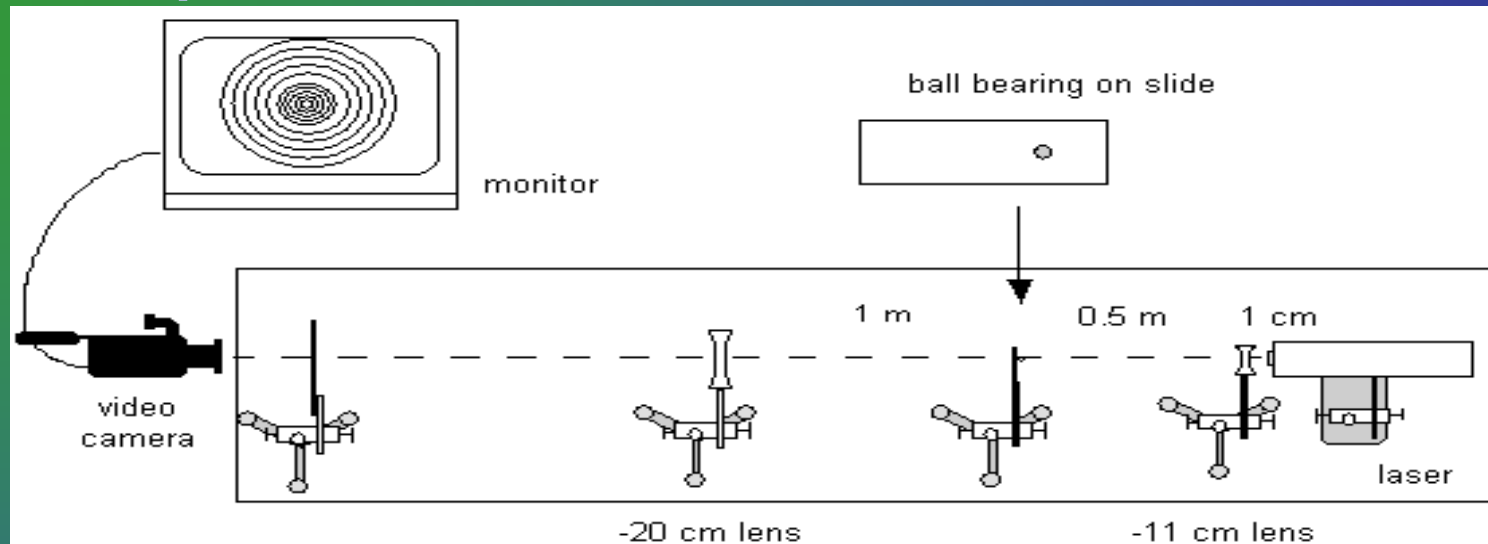
- Think of it like double-slit interference, except not point sources.
- Similar pattern, just “spun” around z-axis

[http://theory.uwinnipeg.ca/mod\\_tech/node127.html](http://theory.uwinnipeg.ca/mod_tech/node127.html)

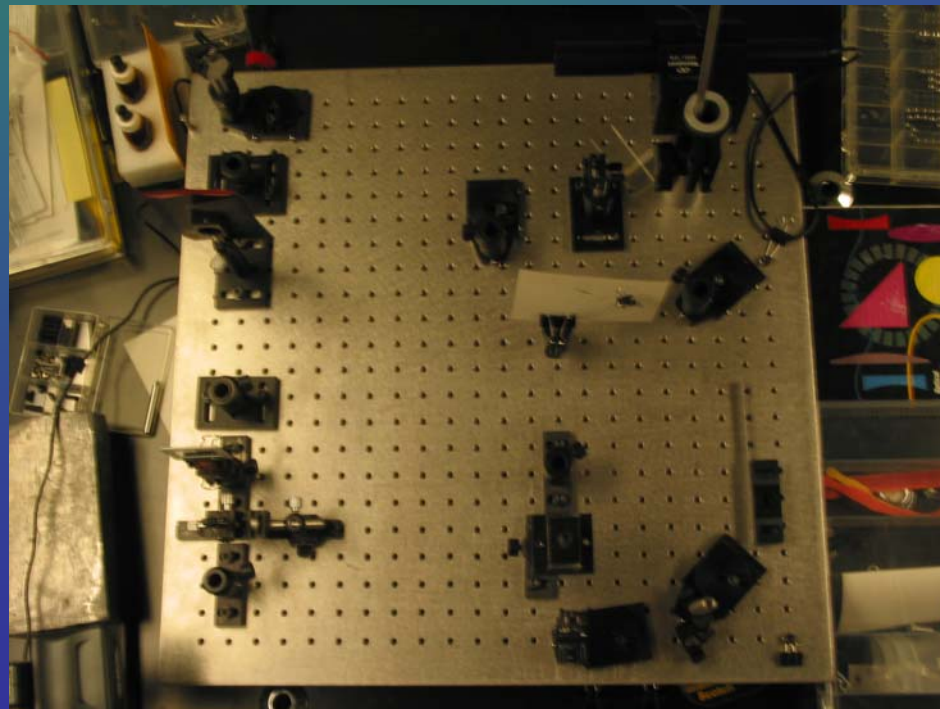
- Spherical obstruction is placed in the beam
- Plane parallel wavefront splits at object
- Divided wavefronts diffract around
  - Become spherical again
- Wavefronts interfere
  - Constructive = Poisson's spot
  - Destructive: alternates with bright spots at varying distances (Fresnel Zones)

Fresnel zones

# Lab Setup



<http://www.oberlin.edu/physics/catalog/demonstrations/optics/poisson.html>

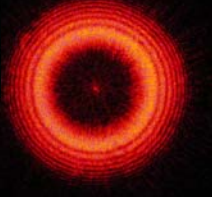




8 Seconds



4 Seconds



2 Seconds



10 inches



1 Second



0.5 Seconds

