

## WAVE / PARTICLE CONTROVERSY

In the 1700s, there was a big controversy - was light a particle or a wave. On one side was Sir Isaac Newton. In 1704 he published his “corpuscular” theory of light: light is made of extremely small very light particles that travel in straight lines through space. Since light doesn’t get bent by gravity, it must be going extremely fast.

On the other were Christian Huygens (1655?) and Robert Hooke who said that light was a wave. They objected to particles because light beams can pass through each other without bouncing off each other.

- Huygens came up with a wave principle that is very useful in predicting how various shaped waves will go around various shaped obstacles (see page 464 p680)

Evidence for each side of the argument  
(with page numbers in Nelson for diagrams; see also pages 461-468)

Support for <b>PARTICLES</b>	Support for <b>WAVES</b>
✓ can go through a vacuum	X needs a medium for transmission
✓ <b>rectilinear propagation</b> – light travels in straight lines and casts sharp shadows	X would make blurry shadows because waves diffract
X	✓ light beams can go through each other.
X can’t measure any mass	✓ the wave does not need a mass (the medium does)
✓ <b>reflection</b>	✓ <b>reflection</b> (p446 )
✓ <b>refraction</b> (only if the particles sped up as they entered a more dense medium)	✓ <b>refraction</b> (p447)
X (maybe if the particles were really tiny, but they didn’t even know about space inside atoms!)	✓ light can go through solids
? <b>dispersion</b> (only if different colours have different masses)	✓ <b>dispersion</b> 686
X	✓ partial reflection and transmission (p450)
X	✓ <b>diffraction</b> (p453,454 680) <b>This was the definitive proof! Light must be a wave!</b>