1.3 Wave Optics

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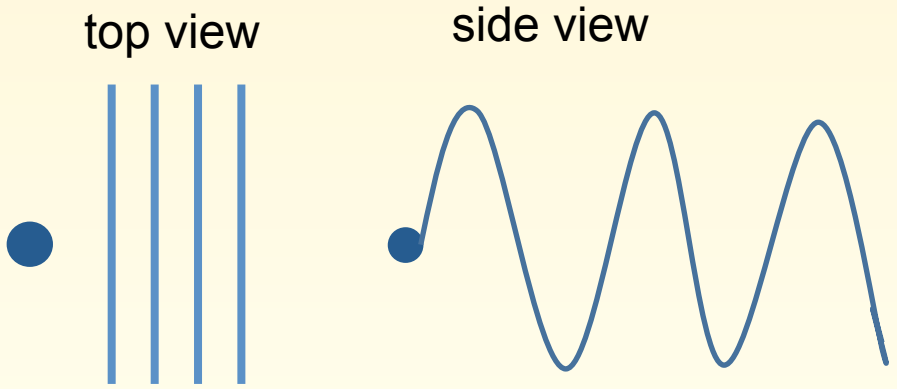
Light as a wave

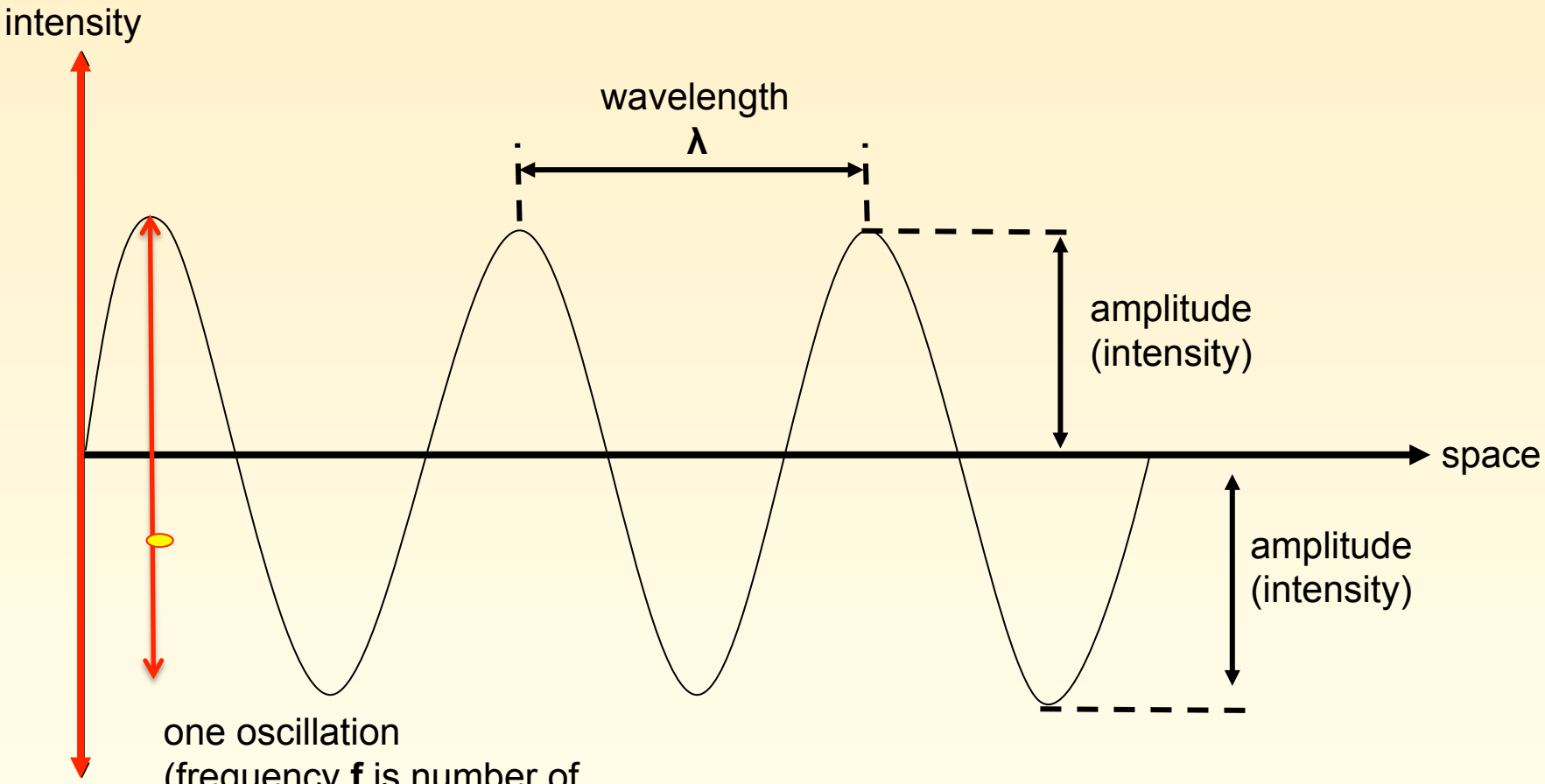
Already in the 17th century Christiaan Huygens, a dutch physicist, proposed that light consists of waves (similiar to sound waves).

In the 19th century, the physicist James Clerk Maxwell supported Huygens theory by proposing that light is travelling as an electromagnetic wave.



1.3. Wave optics - Wave

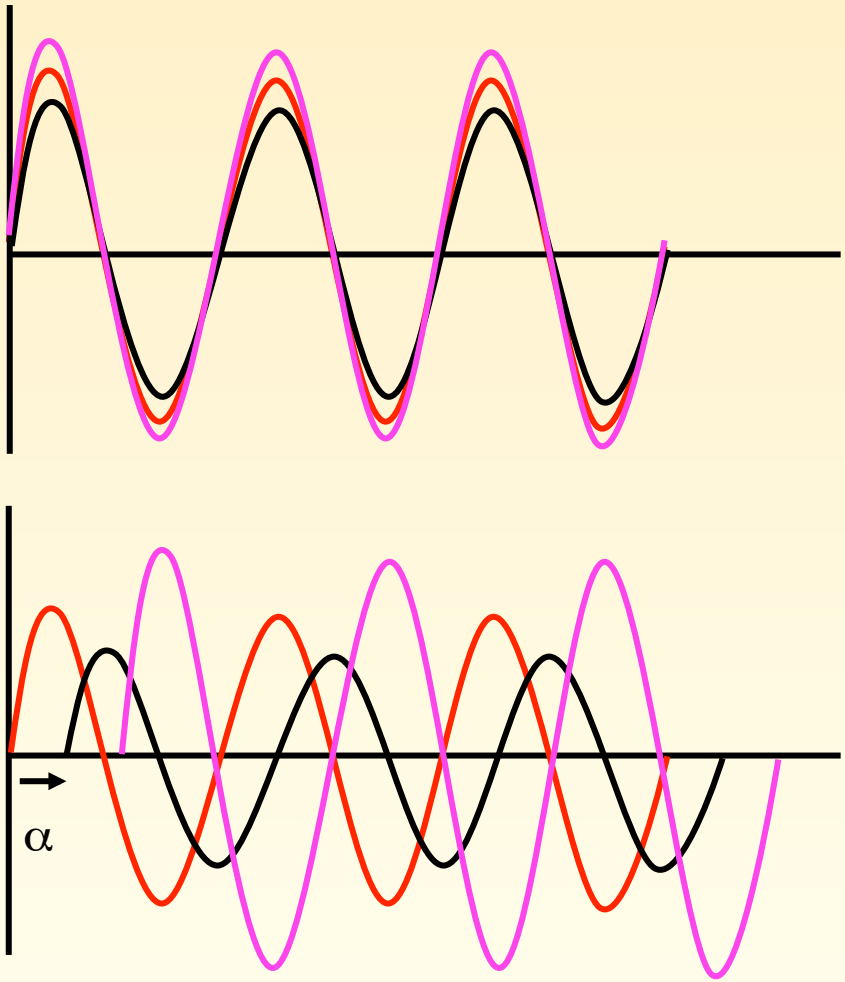
Important properties



speed **c** = λ· f

speed c_n in medium $c_n = \lambda/n \cdot f$

1.3. Wave optics - Wave



The **phase** of a wave determines the positioning of the peaks and troughs at a given time point.

in phase

out of phase

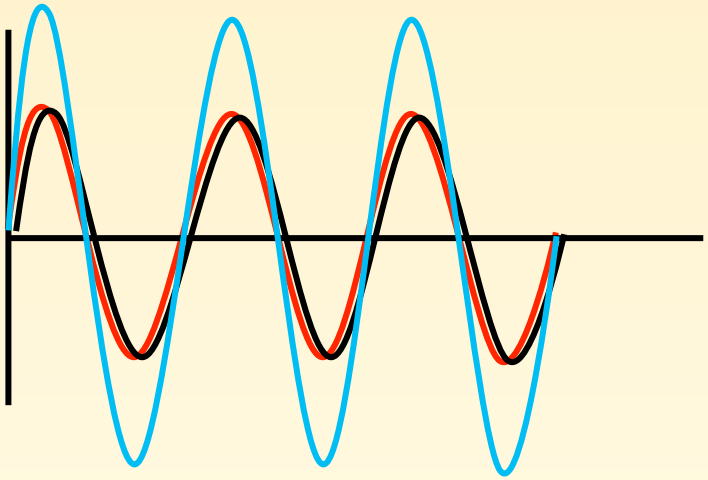
phase shift α

or given in parts of λ

(e.g. α is about $\lambda/3$)

1.3. Wave optics - Interference

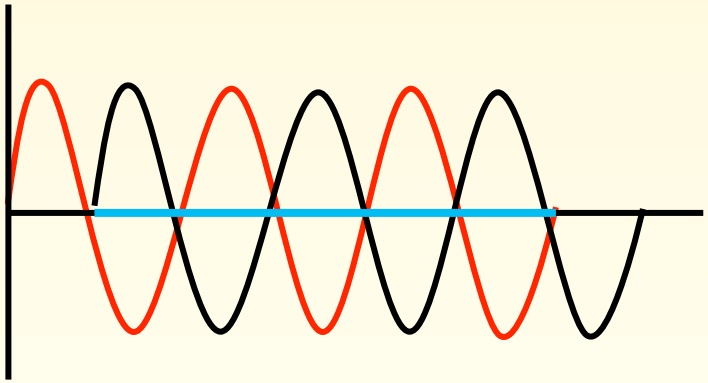
Waves can interfere (adding together): amplitude of the resulting wave depends on the phase relation of the interfering waves



constructive interference -

peaks correspond

(phase shift is 0 or λ)



destructive interference –

peaks and troughs

(phase shift is $\lambda/2$ or $3\lambda/2$)

1.3. Wave Optics

Regular, ordered, repetitive structures give nice interference effects.
For example when looking through a grid, a sieve, a mesh ...