

THE MICHELSON-MORLEY EXPERIMENT

Prior to this experiment, scientists believed in the existence of the **ether**, a substance through which light travelled.

Scientists knew that:

↳ light was a **wave**

↳ light could travel in a **vacuum**

[this contradicted scientific understanding of waves needing a medium to travel → ether]

1880s: Albert Michelson and Edward Morley

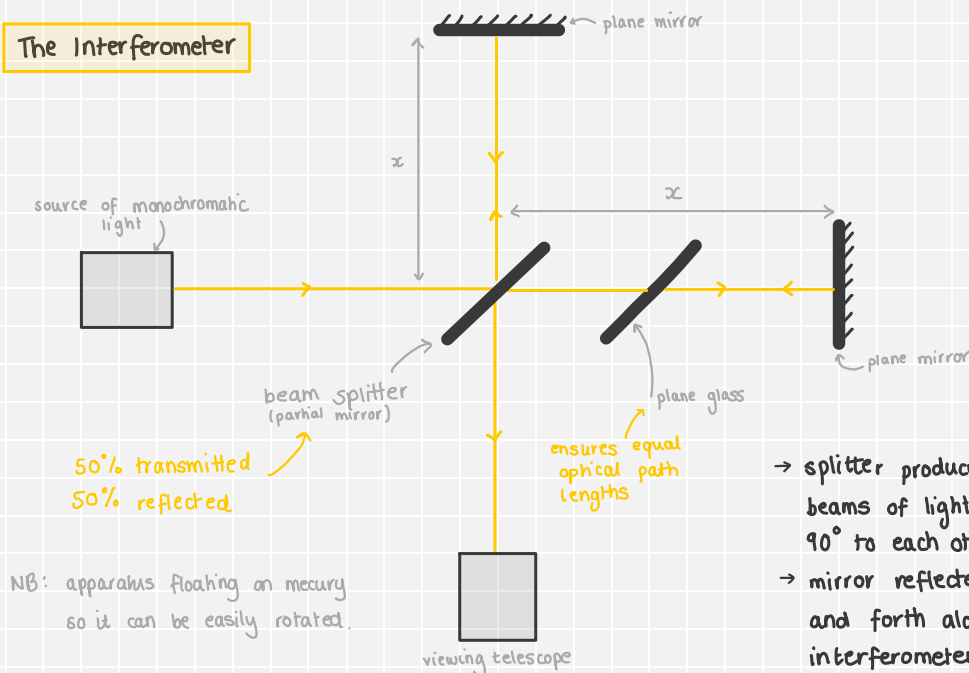
↳ intend to investigate the relative motion of the Earth and the **luminiferous ether**.

↳ hypothesis; as there is relative motion between Earth and ether, the resulting '**ether wind**' will affect the speed of light depending on whether the light was travelling **parallel** or **perpendicular** to the Earth's motion.

The Experiment

↳ show that the speed of parallel and perpendicular light travel at different speeds.

The Interferometer



NB: apparatus floating on mercury so it can be easily rotated.

→ splitter produced 2 identical beams of light travelling at 90° to each other.

→ mirror reflected light back and forth along 'arms' of interferometer

[path length increased to 10m]

→ on returning to beam splitter the 2 waves undergo **superposition** and an interference pattern observed by telescope.

[bright fringe = inphase etc]

Expected observations.

as the device was **rotated** a small shift in the **interference** pattern should be observable.

[due to swapping perpendicular and parallel beams]

Actual observations:

no **fringe shifts** were observed despite extensive, meticulous testing.

Conclusion:

The ether and thus absolute motion **did not exist**. The speed of light was not affected by the movement of the source of the light.