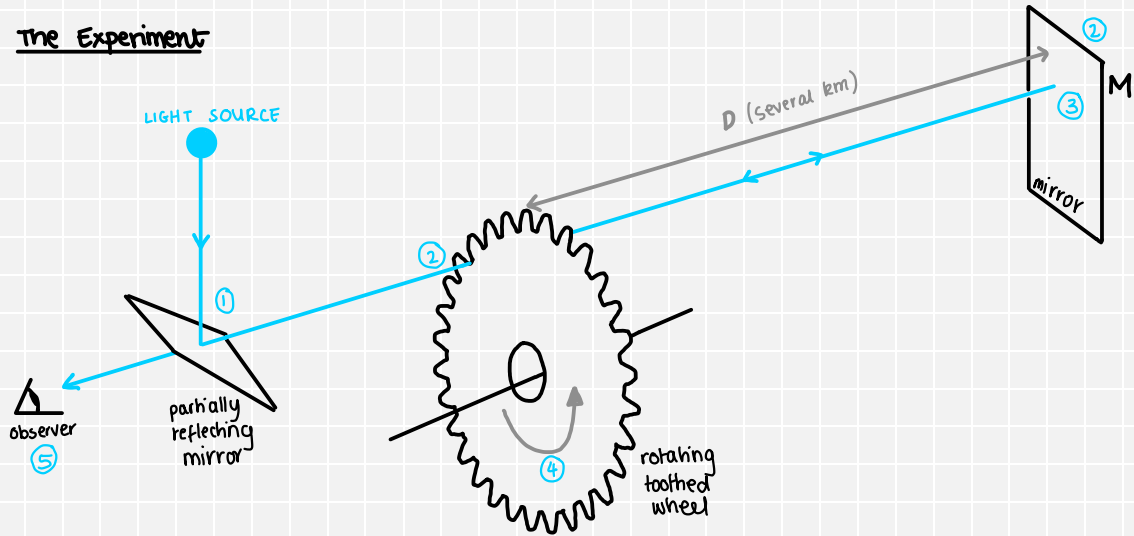


DETERMINING THE SPEED OF LIGHT

1849 - Fizeau designs an experiment to measure the **speed of light**
 → achieved a value just **5%** away from the current accepted value!

The Experiment



- ① Light beam is shone at partially reflecting mirror.
- ② Beam directed between teeth of a rotating, toothed wheel towards a mirror several km away.
- ③ mirror reflects beam back towards observer.
- ④ Toothed wheel was then rotated at varying frequencies, f .
- ⑤ → when stationary, reflected light would pass through same gap
 ↳ continuous light observed.
 → as wheel began to rotate, pulses / flashes observed instead (reflected light hitting teeth)
 → at a certain frequency, pulse of light leaving through one gap, returned to wheel @ the instant the next tooth blocked its passage
 ↳ no longer able to see any light pulses returning from mirror.

what is going on?

Time for wheel to turn through a distance = width of a tooth is:

$$t = \frac{T}{2N}$$

← time for one complete revolution
← number of teeth / gaps.

Since $f = \frac{1}{T}$

$$t = \frac{1}{2Nf}$$

← frequency of wheel rotation

Since light will travel a distance of $2D$ in this time (case of no visible pulses)

$$\text{speed of light } \rightarrow c = \frac{2D}{t}$$

← distance to mirror

$$c = 4DNf$$