

# Combs essentials: What are they? How do they work?

## What are optical frequency combs?

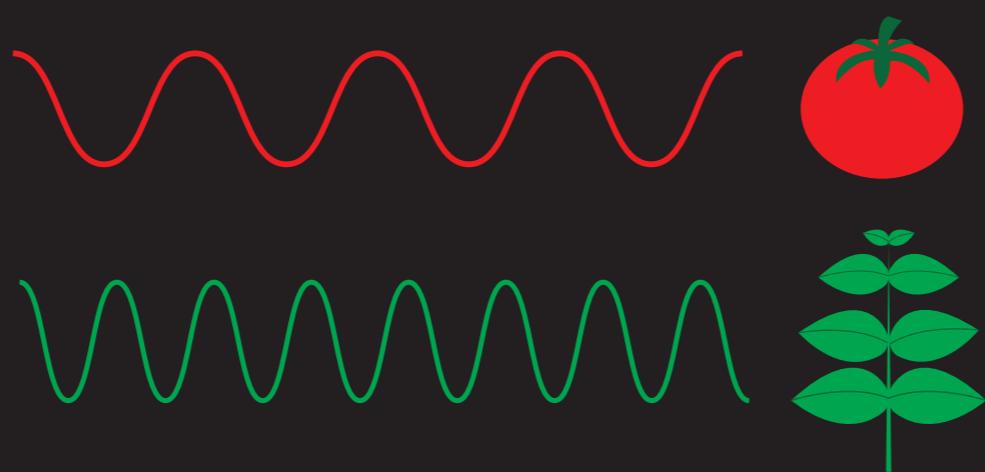
Optical frequency combs are the world's most precise rulers. They use light and can be used to measure position, frequency and time.



## Why light?

Light is made up of a rainbow of colours ranging from very blue to very red. Light moves as waves and each colour oscillates at a different frequency. Frequency is based on how many waves cycle per second. Frequency tells us the energy of the wave and its corresponding colour. Colours with higher frequencies look bluer while colours with lower frequencies look redder.

When we see things, light receptor cells in our eyes detect different light frequencies to tell us what colour something is. It's how we know that leaves look green, and tomatoes look red.



## How do combs work?

Combs generate light at equally spaced frequencies. In a comb, light is shone into a ring-shaped device called a resonator. Light travels around the resonator many, many times which splits it into different, equally spaced frequencies of different colours. Imagine one white-coloured car splitting into many different coloured cars as it goes around and round a racetrack. This split light is then read by a detector which tells scientists what the specific frequencies of light are and how big the spaces are between them.

