What is evolution?

KS2 KS3 Ages 7-14 ⏰ 5 min read

Evolution is the process by which living things change over generations. It's the explanation for why there are so many different species on Earth, why they're all so perfectly suited to where they live, and why all life — despite being so different — shares the same basic genetic code.

The key idea was worked out by Charles Darwin in the 1850s, and it's built on three simple observations that, together, produce something remarkable.

The three ingredients

1. Variation. Individuals within a species aren't identical. Some rabbits are slightly faster, some slightly slower. Some bacteria are slightly more resistant to antibiotics, some less so. This variation comes mostly from small random changes (mutations) in DNA.

2. Inheritance. Offspring tend to resemble their parents. If a rabbit is fast, its babies are more likely to be fast too. Traits are passed down through genes.

3. Selection. Some traits help survival and reproduction; others hinder it. A faster rabbit is more likely to escape foxes, survive longer, and have more babies — babies that inherit the speed gene. A slower rabbit gets eaten earlier and has fewer offspring. Over many generations, the population gradually becomes faster.

Imagine a factory making biscuits, but the recipe changes very slightly at random each batch. Most changes make worse biscuits — those recipes get thrown away. Occasionally a change makes a better biscuit — that recipe gets kept and copied. Over thousands of batches, the biscuit keeps improving, not because anyone planned it, but just because the good versions got selected and the bad ones didn't. Evolution works the same way with living things, except "better" just means "better at surviving long enough to reproduce in this specific environment."

How long does it take?

For large, complex animals, millions of years. But we can watch it happen in real time with fast-reproducing organisms. Bacteria can evolve resistance to a new antibiotic

within weeks. The peppered moth famously evolved darker colouring in industrial Britain within decades as pollution darkened tree bark. Darwin's finches in the Galápagos Islands have been observed evolving visibly different beak shapes within a human lifetime in response to food availability changes.

Are humans still evolving?

Yes, though modern medicine and technology have changed which traits are "selected for." Lactose tolerance (the ability to digest milk as an adult) evolved in some human populations within the last 10,000 years as those people domesticated cattle. Evolution hasn't stopped — it's just slower to notice in a species that lives for 80 years and has children late.

What about the eye? Isn't it too complex to evolve?

This is a classic objection, and Darwin addressed it himself. The eye didn't appear all at once. It evolved in tiny steps over hundreds of millions of years — starting with a simple patch of light-sensitive cells (which exists in simple organisms today), through a cup shape that helped detect direction, through to a pinhole camera structure, and eventually to the complex eye. Each step was a small improvement on the last, each step useful in itself. We can trace most of these steps through existing species.