



# What are galaxies?

KS2

KS3

Ages 7-14 ⌚ 3 min read

A galaxy is a massive system of stars, gas, dust, and dark matter, all bound together by gravity. Our galaxy — the Milky Way — contains between 100 and 400 billion stars, is about 100,000 light-years across, and takes the solar system about 225 million years to orbit its centre once. We're about 26,000 light-years from the galactic core.

## What does the Milky Way look like?

From a bird's-eye view (we'll never actually have one), the Milky Way is a barred spiral galaxy — a central bulge with a bar-shaped structure, from which spiral arms curve outward. Our Solar System sits in one of the minor arms (the Orion Arm). On a dark, clear night, you can see the edge-on view of the Milky Way as a faint band of light crossing the sky — that's the combined light of billions of distant stars in the disc you're looking along.

Imagine a fried egg viewed from the side — a bulging centre and a flat, thin disc spreading out around it. Sprinkle billions of glitter particles across the disc and a dense cluster of them in the yolk. That's roughly the Milky Way. We're living in the white of the egg, about halfway between the edge and the yolk, looking towards the centre at night and outwards towards emptiness in other directions.

## How do galaxies form?

In the early universe, gravity caused matter to clump together. Dense regions attracted more matter, growing into the first stars and proto-galaxies. Over billions of years, galaxies merged and grew, gaining mass through collisions. The Milky Way itself has absorbed many smaller galaxies throughout its history. In about 4-5 billion years, it will merge with the Andromeda Galaxy — another vast spiral heading towards us at about 110km per second. Despite the scale, the collision will likely produce more a kind of swirling dance than a violent crash, as the space between stars is so vast that direct stellar collisions will be rare.

## What's at the centre?

A **supermassive black hole**, called Sagittarius A\* (pronounced "Sagittarius A-star"). It's about 4 million times the mass of the Sun. In 2022, the Event Horizon Telescope captured the first actual image of it — a glowing ring of superheated gas surrounding the black hole's shadow. Almost all large galaxies appear to have a supermassive black hole at their centre.