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1. First ever image of a black hole revealed

- What is a black hole?
- If black holes are invisible, how can we detect or photograph them?
- How big are black holes?
- Where are black holes found?

GS paper 3 (Awareness in space.)

What is the context about?

- The first photograph of a black hole was revealed by scientists recently.

What is a black hole?

- A black hole is an object in space that is so dense and has such strong gravity that no matter or light can escape its pull. Because no light can escape, it is black and invisible.
 - There's a boundary at the edge of a black hole called the event horizon, which is the point of no return — any light or matter that crosses that boundary is sucked into the black hole. It would need to travel faster than the speed of light to escape, which is impossible.
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- Anything that crosses the event horizon is destined to fall to the very centre of the black hole and be squished into a single point with infinite density, called the singularity.

If black holes are invisible, how can we detect or photograph them?

- By looking for the effects of their extreme gravity, which pulls stars and gases toward them.
- Also, while anything past the event horizon is invisible, outside that boundary there is sometimes a spiral disk of gas that the black hole has pulled toward — but not yet into — itself.

The gases in that accretion disk are heated up as they accelerate toward the black hole, causing them to glow extremely brightly. The colours they glow are invisible to us, but are detectable with an X-ray telescope.

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ANALYSIS**How big are black holes?**

- Small black holes are called stellar-mass black holes. They have masses similar to those of larger stars — about five to 20 times the mass of the sun. The other kind is supermassive black holes, which are millions to billions of times more massive than the sun.
- That's the kind the Event Horizon Telescope has been trying to photograph, as bigger objects ought to be easier to see. There is some evidence that black holes between these two sizes exist, but that has yet to be confirmed.
- While black holes are very massive, that doesn't mean they take up a lot of space. Because they're so dense, they're actually quite small. According to NASA, a black hole 20 times the mass of the sun could fit inside a ball 16 kilometres wide — the width of the Island of Montreal at its widest point.

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ANALYSIS**Where are black holes found?**

Supermassive black holes are found at the centre of most galaxies, including our own Milky Way. The one in our galaxy is called Sagittarius A* and is one of those the Event Horizon Telescope has been attempting to photograph.



Sagittarius A* isn't the only black hole in our galaxy, though. Earlier this year, astronomers discovered another 12 within three light-years of it, suggesting there could be upwards of 10,000 black holes around the galactic centre.

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ANALYSIS**Where do black holes come from?**

Supermassive black holes are believed to form at the same time as the galaxy that surrounds them, but astronomers aren't sure exactly how.



Stellar mass black holes form when a star with a mass greater than three times that of our sun runs out of fuel. It explodes into a supernova and collapses into an extremely dense core that we know as a black hole — something predicted by Albert Einstein's general theory of relativity.



Einstein's theory also predicts the size and shape of the black holes that the Event Horizon Telescope is trying to photograph.