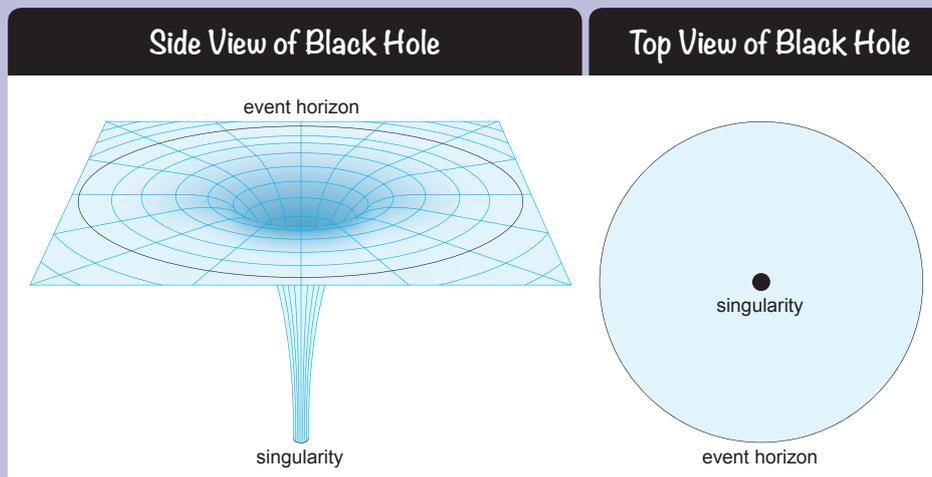




Black Holes



How do you know something exists if you can't see it? Black holes are invisible to the human eye because they have such strong **gravity** that they pull nearby objects into them, even light. Because the light can't escape, they can't be seen. To see a black hole, scientists use specially designed telescopes to look at how stars (and the gases that make up stars) around them behave. They survey the skies by looking at stars and working out if the stars are **orbiting** a black hole. It often looks as though the matter of a nearby star is being sucked into nothing. Think of it as being like watching a large soft pillow being sucked up a vacuum cleaner pipe.



There are three main types of black holes:

- **Primordial** – formed when the Universe formed.
- **Stellar** – formed from a collapsing and exploding star at the end of its life.
- **Supermassive** – formed as the galaxy that they are at the centre of formed. Their size is relative to the size of the galaxy.

Black holes can be created when a star dies. As the star runs out of energy, it collapses in on itself, resulting in a huge explosion called a **supernova**. The remains of the explosion (and this is a massive amount of **matter** – even more than the **mass** of our Sun) collapse together into a single point called a **gravitational singularity** where the amount of gravity is said to be **infinite**. This is essentially the centre of the black hole, the part doing the pulling. Around this point is a region called the **event horizon**. Within this zone, gravity is so immense that anything entering it cannot escape the pull. If an object like a spacecraft or piece of space debris reaches the event horizon, it undergoes **spaghettification** (or the noodle effect). The gravity is so much stronger nearer the singularity than the edge of the event horizon that the object is stretched into a thin shape like a piece of spaghetti. A black hole resembles a plug hole in a bath of water. The plug hole itself is like the singularity and the area around it pulls any floating objects in (maybe a rubber ducky or bar of soap), is like the event horizon.

Black holes can vary in size, from a very small pinhead size, to supermassive black holes like the one in the centre of the Milky Way. This black hole is estimated to have a mass four million times that of the Sun and is called Sagittarius A. No matter the size of the black hole, they all have an enormous amount of mass in common. Even a black hole the size of one atom would contain as much matter (have as much mass) as a mountain. Black holes can grow by 'sucking' in matter from around them. The more matter a black hole contains, the greater its mass and the greater the gravity it will have.

You might be thinking "oh no Earth is doomed, it's just a matter of time before we are sucked into a black hole and everything becomes spaghetti". But don't worry, this is almost impossible. Black holes don't move around space, they are fixed in one position, so a stray black hole won't pass by and suck Earth in. Also, new ones aren't expected to pop up over night near Earth and **consume** it. If the Sun reached the end of its life and started to die, it wouldn't form a black hole. This is because the Sun is becoming a red giant star so it isn't big enough or energetic enough, instead it would become a white dwarf. Even if the Sun did form a black hole, it would only have as much gravitational pull as the Sun so Earth would continue to orbit it without being pulled in.

