BLACK HOLES

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WHAT ARE BLACK HOLES AND HOW ARE THEY FORMED?

A black hole is an object of such immense gravity that nothing - not even light - can escape from it. The singularity is a theoretical location in space at the centre of a black hole that has no volume but contains all of the object's mass. Anything that gets too close to a black hole, whether it's a star, a planet, or a spaceship, will be stretched and squished like flexible in a hypothesized process called spaghettification. Some black holes are formed after the collapse of a star. Smaller stars typically turn into a more condensed star upon collapse, such as a white dwarf star. If a larger star collapses, it results in a black hole.

3 types:

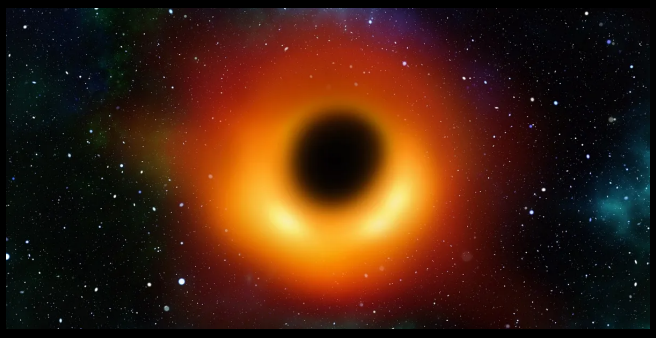
1. **Stellar-mass black holes:**
- formed by the gravitational collapse of a supernova
- 100 times the mass of the sun

2. **Intermediate-mass black holes:**
- an evolutionary stage in the evolution of these cosmic heavyweights
- masses halfway between stellar and supermassive black holes

3. **Supermassive black holes**
- these giants collect mass from the dust and gas that surrounds them

1

2



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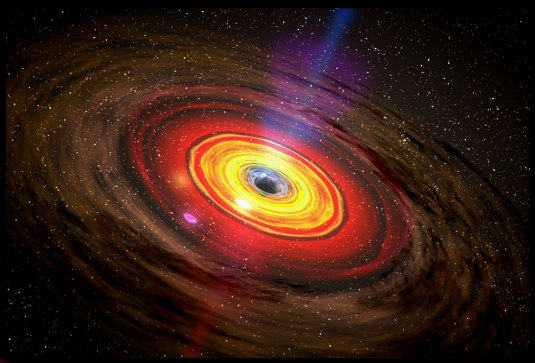
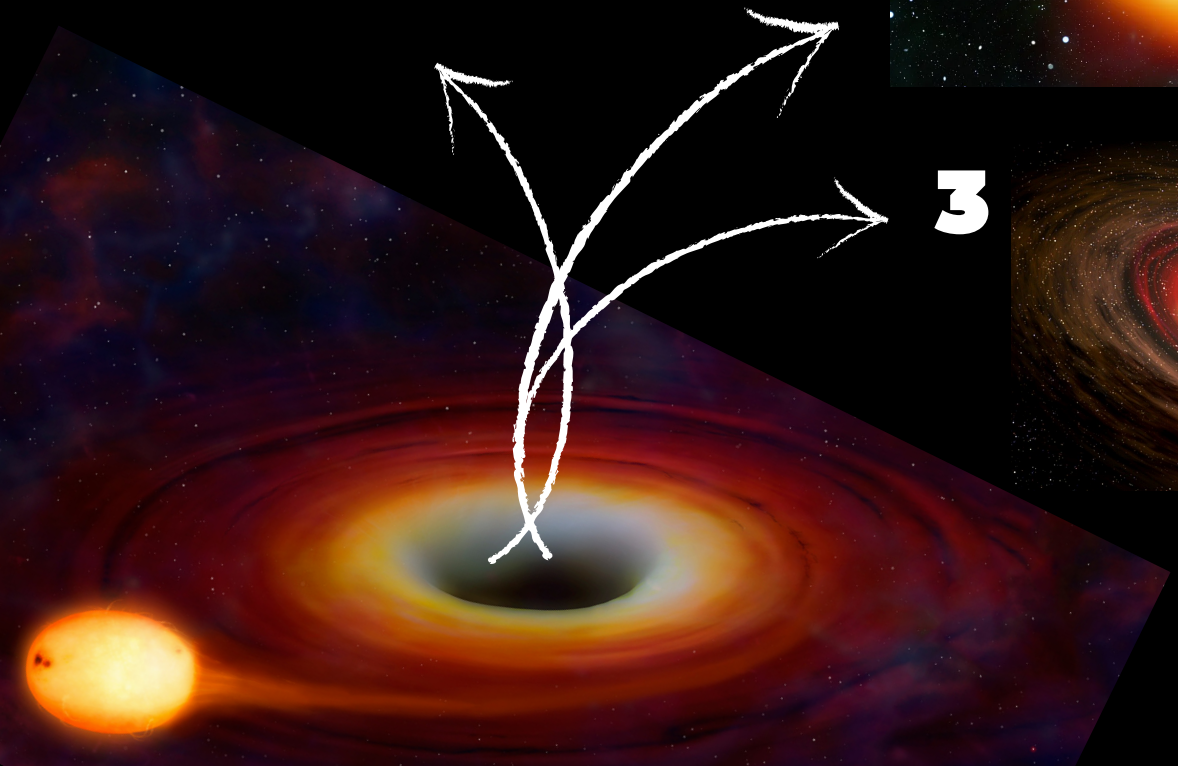




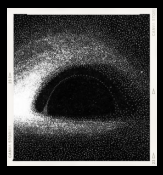
DIRECTLY AND INDIRECTLY OBSERVATION OF BLACK HOLES

We can't talk about a perfect direct observation of this physic phenomenon, but we can observe the influences that it exerts on its surroundings.

Indirect observation

Explorers can measure the **movement** of stars and clouds of gas

This way, they can calculate the mass of the object



If the mass is very **large** and there is **no radiation**, it must be a black hole

If there's a disc of extremely hot temperature, it must be the **accretion disc**

Useful to find black holes & to study their behaviour in relation to other objects

Direct observation

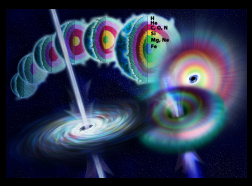
Researches linked up radio telescopes located all around the world to create a **virtual** telescope

They had to analyse every single bit of information they reached to create a series of images functional to their study

Useful in the future to study themselves out of their context

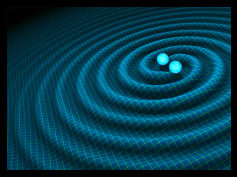
Theoretical evidence of the existence of black holes

Gamma ray-bursts



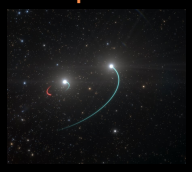
If the star is massive enough, its dense core will collapse into a balck hole

Gravitational waves



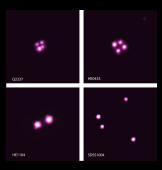
When two black holes collide, the gravitational interaction causes gravitational waves

Invisible companion



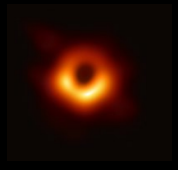
If the motion of the stars is strange, between them there is a black hole that modifies it

X-ray vision



When a gas enters a black hole, it release energy, that can be seen as a X-rays

Supermassive black holes

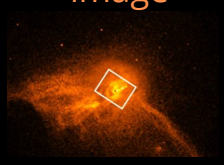


Their existence explain the high orbital velocities of stars

Spaghettification

The gravitational force stretches the object vertically and compress horizontally

A direct image



At the heart of the galaxy Messier 87, in April 2019

A direct image

Scientists succeeded in taking a picture by using a global network of radio telescopes (The Event Horizon Telescope) and by using a technique known as Very Long Baseline Interferometry. Scientists photographed it by combining a few smaller telescopes into a huge virtual telescope that can be synchronized to concentrate on the same target at the same time. Smaller telescopes can be an array of numerous telescopes in some instances.This method has been used to follow spacecraft and view faraway cosmic radio objects like quasars.