**What Is a Black Hole?**

A black hole is a place in space where gravity pulls so much that even light can not get out. The gravity is so strong because matter has been squeezed into a tiny space. This can happen when a star is dying.

Because no light can get out, people can't see black holes. They are invisible. Space telescopes with special tools can help find black holes. The special tools can see how stars that are very close to black holes act differently than other stars.

**How Big Are Black Holes?**

Scientists think the smallest black holes formed when the universe began.

Stellar black holes are made when the center of a very big star falls in upon itself, or collapses. When this happens, it causes a supernova. A supernova is an exploding star that blasts part of the star into space.

Scientists think supermassive black holes were made at the same time as the galaxy they are in.

**If Black Holes Are "Black," How Do Scientists Know They Are There?**  
A black hole can not be seen because strong gravity pulls all of the light into the middle of the black hole. But scientists can see how the strong gravity affects the stars and gas around the black hole. Scientists can study stars to find out if they are flying around, or orbiting, a black hole.

When a black hole and a star are close together, high-energy light is made. This kind of light can not be seen with human eyes. Scientists use satellites and telescopes in space to see the high-energy light.

**Could a Black Hole Destroy Earth?**  
Black holes do not go around in space eating stars, moons and planets. Earth will not fall into a black hole because no black hole is close enough to the solar system for Earth to do that.

Even if a black hole the same mass as the sun were to take the place of the sun, Earth still would not fall in. The black hole would have the same gravity as the sun. Earth and the other planets would orbit the black hole as they orbit the sun now.

The sun will never turn into a black hole. The sun is not a big enough star to make a black hole.

PHOTOGRAPH BY NRAO,AUI,NSF PHOTOGRAPH BY NASA/JPL-CALTECH

**How Many Types of Black Holes Are There?**

According to theory, there might be three types of black holes: stellar, supermassive, and miniature black holes – depending on their mass. These black holes would have formed in different ways.

**Stellar Black Holes**

 is a black hole formed by the gravitational collapse of a massive star. They have masses ranging from about 5 to several tens of solar masses. The process is observed as a hypernova explosion or as a gamma ray burst. These black holes are also referred to as collapsars.

**Supermassive Black Holes**

which can have a mass equivalent to billions of suns, likely exist in the centers of most galaxies, including our own galaxy, the Milky Way. We don't know exactly how supermassive black holes form, but it's likely that they're a byproduct of galaxy formation. Because of their location in the centers of galaxies, close to many tightly packed stars and gas clouds, supermassive black holes continue to grow on a steady diet of matter.

**Miniature Black Hole**

No one has ever discovered a miniature black hole which would have a mass much smaller than that of our Sun. But it's possible that miniature black holes could have formed shortly after the "Big Bang," which is thought to have started the universe 13.7 billion years ago. Very early in the life of the universe the rapid expansion of some matter might have compressed slower-moving matter enough to contract into black holes.

Another division separates black holes that spin (possess angular momentum) from those that don't spin.

**Observational evidence**

By their very nature, black holes do not directly emit any electromagnetic radiation other than the hypothetical [Hawking radiation](https://en.wikipedia.org/wiki/Hawking_radiation), so astrophysicists searching for black holes must generally rely on indirect observations. For example, a black hole's existence can sometimes be inferred by observing its gravitational interactions with its surroundings.

The [Event Horizon Telescope](https://en.wikipedia.org/wiki/Event_Horizon_Telescope) (EHT), however, run by MIT's [Haystack Observatory](https://en.wikipedia.org/wiki/Haystack_Observatory), is an attempt to directly observe the immediate environment of the event horizon of [Sagittarius A\*](https://en.wikipedia.org/wiki/Sagittarius_A*), the black hole at the center of the Milky Way, and to produce a silhouetted image of it. The first such image may appear as early as 2018.In 2015, the EHT managed to detect magnetic fields just outside the event horizon of Sagittarius A\*, and even discern some of their properties. The existence of magnetic fields had been predicted by theoretical studies of black holes

**Detection of gravitational waves from merging black holes**

On 14 September 2015 the [LIGO](https://en.wikipedia.org/wiki/LIGO) gravitational wave observatory made the first-ever successful [direct observation of gravitational waves](https://en.wikipedia.org/wiki/First_observation_of_gravitational_waves). The signal was consistent with theoretical predictions for the gravitational waves produced by the merger of two black holes: one with about 36 [solar masses](https://en.wikipedia.org/wiki/Solar_mass), and the other around 29 solar masses. This observation provides the most concrete evidence for the existence of black holes to date. For instance, the gravitational wave signal suggests that the separation of the two objects prior to the merger was just 350 km (or roughly 4 times the Schwarzschild radius corresponding to the inferred masses). The objects must therefore have been extremely compact, leaving black holes as the most plausible interpretation.