

NAME: _____

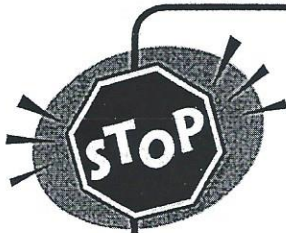


Black Holes

There are many things that we can observe in the universe, and some we cannot. Have you ever wondered how we see all of the things we do in the universe? You can see things because light reflects off them and your eye can pick up that image. **Black holes** are invisible! This is because the force of **gravity** from them is so strong that not even light can escape. They just look like a “black hole” when you see them in the universe.



There are lots of holes on Earth. You can dig a hole in a sandbox or get a hole in your sock. Our holes have nothing in them. They are empty. Black holes are different. They have a great deal of **mass** packed into a very small space. This makes the **gravitational force** (pull) extremely strong. You may remember that the bigger the object, the stronger the pull of gravity on it. The reason black holes are called ‘holes’ is because of how they look to us - like an empty spot in space. They’re not empty, we just cannot see all of the stuff inside of them. It could be that they are like cracks in the universe. Things might slip into them all of the time.



MAKE AN INFERENCE: Why do you think black holes are used in science fiction stories so often?

How do you see a hole in space? Think about the water in your bath draining out of the tub when you pull the plug. If you had any bath toys in the water, what would happen to them? Gravity pulls the water down the drain. The force of the water rushing to the drain pulls the toys along with it. Water is clear, but even if you couldn’t see it, you would know the water is leaving the tub because the toys are floating toward the drain. This happens in space. Astronomers can see stars rushing toward an empty, dark space at the **speed of**



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light. Sometimes the star disappears suddenly, getting 'sucked into' the black hole. That's how they know where the black holes are.

Astronomers think that there are black holes of different sizes all over the universe. They think that there might be a gigantic black hole at the center of every galaxy. There is a black hole at the center of the Milky Way galaxy. It is about 24,000 light years away. Don't worry! That's too far away to be any danger to us.



Black holes can range in size from a few miles across to several million miles across. That would be hard to avoid slipping into! There are two kinds of black holes: **stellar-mass** and **super massive** black holes. The stellar-mass black hole is relatively small. It forms when a single star implodes (explodes inward). The super massive black hole is much bigger, but you probably guessed that from its name. Scientists are not quite sure how these ones are formed, but they contain 100 million stars. The super massive black hole is the one that forms at the center of galaxies, including ours.

Black holes certainly are the most mysterious objects in the entire universe! Scientists are trying to learn more about them all the time. In 1999, NASA launched a special space telescope to try to get a closer view of black holes using x-ray technology. In 2015, NASA plans to launch LISA (Laser Interferometer Space Antenna). This is a set of three spacecraft that will align in a triangle formation to make an antenna. LISA will try to detect **gravitational waves**. This is like that trail that a black hole leaves behind. Scientists have never seen these waves before but are almost certain they exist.

That is what makes science so interesting. Imagine that you believed something existed that no one else could see. You could work and work to prove to others that it is there, but no one could see it. You may get lucky and invent a device that can help others see it so they will believe you. Scientists get ideas like this (theories) all the time, and then work to prove that they are correct. They are not always right, but they always learn something along the way!