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Scientific Description

Black Holes and their Effect on Objects

One of the most interesting phenomena in the universe is the black hole. These massive titans of science are renowned for their incredible effect on anything around them, including light. While many people believe that they are an unrealistic element exaggerated by Sci-Fi, this is far from the truth. Black holes are truly a magnificent example of the marvels of space.

Black holes exhibit extreme amounts of gravity around them, which pulls all matter nearby as well as dilating time. This gravity is so powerful that it can even trap light within its proximity. Due to the light being trapped inside the singularity, or center, of the blackhole, they appear as pitch-black spheres to the human eye. There is a small white border around the black hole known as the event horizon. Around the event horizon, there is typically a massive collection of Hawking radiation, usually expelled from the blackhole when it consumes stars or other massive entities, appearing as a sunset-colored cloud.

A black hole is formed when matter is compressed to such a small point that it no longer has a volume. This typically happens when enormous stars implode

and collapse onto themselves. Black holes are generally classified into three categories, being stellar-mass, supermassive, and intermediate mass.[1] There is technically another class, being incredibly rare and not commonly recognized. This is an ultramassive black hole, larger than most galaxies with the power to reduce anything in the universe to nothing.

When an object comes close to a black hole, it will begin to be drawn toward it with increasing force as it nears. In addition, time slows greatly. To an observer, time freezes to a halt for the object. Most small pieces of debris are obliterated by the massive amount of radiation, but for those strong enough to pass through it, an entirely different fate awaits. Due to the extreme gravity, objects will start to stretch out as they get near. This begins slowly, but the rate increases incredibly fast. Soon, it will be stretched out into a very thin strand, hence the process being nicknamed "spaghettification." Then the strand is sucked into the black hole, past the event horizon. Once crossing the horizon, there is no possible way of turning back. From the observer's point of view, the strand will vanish into the abyss of the black hole.

Once inside the black hole's larger body, the laws of physics no longer apply. Both time and space will change and swap roles. (according to Einstein's theories)[2] At this point, time is the only force pulling objects closer to the singularity, which

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[1] "*Types of Black Holes*," accessed November 20, 2024, https://science.nasa.gov/universe/black-holes/types/.
[2] Chelsea Gohd, "*What Happens When Something Gets 'Too Close' To A Black Hole,"* accessed November 20, 2024, https://science.nasa.gov/universe/what-happens-when-something-gets-too-close-to-a-black-hole/.

is why the event horizon is the point of no return. There is no force in the universe strong enough to contradict this pull, meaning anything drawn in is truly lost forever.

The singularity of the black hole is positioned perfectly in the center, and is the source from which it is born. It is both infinitely dense as well as infinitely small, meaning that even atoms and quarks are larger. The immeasurable density is due to all of the matter sucked into the blackhole. The gravity is so strong, in fact, that it can merge objects into one another, creating a sensation of it devouring mass. As more matter is drawn in, the density increases, strengthening the pull of gravity around the black hole and expanding the visual area of it, allowing black holes to "grow."

Black holes "die" very slowly, over hundreds of billions of years. They typically just fizzle out from emitting too much hawking radiation and causing them to lose their mass. This, however, rarely ever happens. Black holes can also merge with each other, with the larger typically absorbing the smaller to add to its collective mass.

When it comes to black holes, we don't know very much for certain. We really have no way of testing theories as anything sent to a black hole would be destroyed. As a matter of fact, we can't even see most black holes with a telescope. They are usually discovered by observing strange effects on nearby planets and

stars. This, of course, sparks many theories. Some scientists even theorize that we are living inside a black hole, and while this may seem far-fetched, we currently have no way to disprove this theory.

Black holes are one of the most incredible and awe-inspiring things in the universe. We may never understand them in their entirety, which contributes an amazing sense of wonder. However, one question still left in my mind is what would happen if a black hole came to Earth.

Works Cited

Gohd, Chelsea. "*What Happens When Something Gets 'Too Close' To A Black Hole.*" NASA. Accessed November 20, 2024. https://science.nasa.gov/universe/what-happens-when-something-gets-too-close-to-a-black-hole/

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