

Ask an Astronomer

Question: "How can we see a black hole?"

segment number: 2006-002

Tom Jarrett:

A black hole is one of the strangest objects in outer space. For one thing, a black hole is not really a hole, and it's not empty. It's actually filled with a lot of material crammed into an extremely small space.

Scientists think that black holes are created in places where the force of gravity crushes an enormous amount of matter together, making it incredibly dense. This can happen in the centers of large galaxies or when a giant star collapses and shrinks during the final gasp of its short, yet brilliant life.

Like the tug of gravity on Earth, a black hole exerts the same kind of force on its surroundings. But with these fantastically compact and massive objects, the gravitational pull is so strong that even light can't escape. That is why the object is "black" -- it does not give off any light. It's as if you were looking at a black hole.

So we can't see black holes directly. However, we can see the effect that they have on the region of space around them.

Since black holes have extremely high gravity, the surrounding material (like gas and dust) is funneled into a disk around the black hole. The gas atoms in the disk swirl around the black hole so fast that they heat up and emit X-rays and even higher-energy light. By finding this very hot material which is spiraling into black holes, astronomers can locate them and study their properties.

So astronomers study the motions of objects in space to see where there is material that might be moving as if a black hole were affecting it. The motions of stars would be most unusual if a black hole were nearby.

So far, evidence has been found for the existence of black holes in the centers of several large galaxies and in binary star systems. (That's where two stars orbit each other.)

And yes, there's even a very large black hole at the center of our galaxy, the Milky Way. But don't worry. The black hole in the center of our galaxy is much too far away to be any danger to Earth.

For "Ask an Astronomer," I'm Dr. Tom Jarrett at NASA's Infrared Processing and Analysis Center.