Nergis Mavalvala

Nergis Mavalvala is an astrophysicist who was one of the first to observe gravitational waves in space.

As part of the LIGO project, Nergis uses lasers to detect gravitational waves. These waves are created by catastrophic cosmic events, such as collisions between stars or black holes, which cause ripples in space-time. These ripples travel at the speed of light, stretching and squeezing anything they pass through. Detecting gravitational waves has helped scientists to study things like black holes, which are notoriously tricky to see.

The LIGO detector site in Livingston, Louisiana

Nergis was born in Lahore, Pakistan and moved to America to study Physics and Astronomy at university. After university, Nergis came to the realisation that she was a lesbian and now proudly identifies as an "out, queer person of colour." She is widely supported by communities in Pakistan for breaking out of stereotypical gender roles and credits her family for raising her in a way that supported her interests and talents.

She is quoted as saying: "Anybody should be able to succeed — whether you're a woman, a religious minority or whether you're gay. It just doesn't matter."

Learn more about Black Holes

The work of scientists like Nergis has massively increased our understanding of black holes, although there is still lots to learn!

In 2019, scientists working on the Event Horizon Telescope managed to capture a photo of a black hole in a galaxy 55 million light years away; we are learning more all the time!

The first ever direct image of a black hole, taken in 2019
Image credit: Event Horizon Telescope

Black holes are areas in space where the gravity is so strong that nothing can escape it, not even light!

Black holes can form when a star 'dies' and collapses in on itself, causing the star's matter to become very compressed and dense. This causes an increase in its gravitational force.

Black holes can grow by absorbing the mass of other nearby stars and black holes (sucking things in). This results in the gravity becoming even stronger!

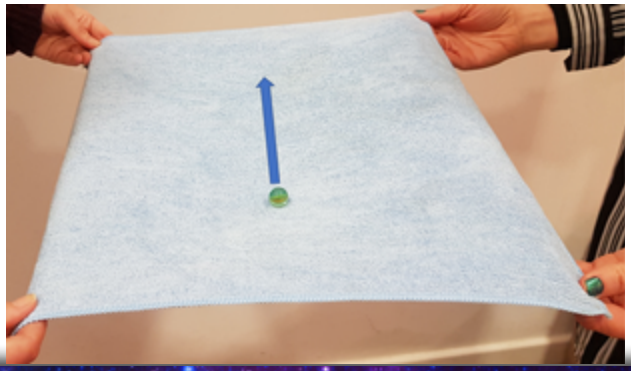
Try our experiment below to see how black holes can affect nearby objects and cause ripples in space-time.

What you need:

- A stretchy blanket or cloth (a dishcloth would work well!). This represents space.
- An apple (or a ball of equivalent weight!). This represents a dense object in space, such as a black hole.
- A marble (or equivalent size lump of blu-tac!) This represents a ray of light in space
- 2 people to help with the experiment!

What to do:

1. Two people start by stretching out the dishcloth horizontally between them and holding it by the corners. The dishcloth should be pulled tight and held as still as possible, this represents space!
2. Roll your marble or small blu-tac lump across the dishcloth in a straight line, think of this like a ray of light travelling in a straight line through space.



3. Next, swap the marble for your apple. When you place it on the dishcloth, you should see how it changes the fabric of 'space' much more than the marble did. Can you see how the dishcloth becomes curved around the heavier object? This is what a black hole does to space.

4. Add the marble back in to space by rolling it close to the apple. Its route should now be altered by the change in shape of the dishcloth. This is similar to what happens to light passing close to a massive object that deforms the space surrounding it. Try rolling the marble faster and slower to see how its path changes.
5. To see an even more exaggerated effect, you could try this with a blanket and a football! The ball is heavier and so bends the blanket (the fabric of space!) even more and will have an even greater effect on smaller objects (and on the blanket!).

Did you see? As the marble passes close to the apple, you may spot it start to revolve around the 'black hole' and eventually falls in. From this, you can see how things may easily fall into a black hole but can't get back out. The gravity of black holes change the fabric of space so that light and other objects fall in and cannot get back out!