

A peek into the darkness

The collision of two black holes emitted light for the first time last year and scientists recently published their findings about the same. Today, we tell you more about black holes, how they are formed, and why this finding is a big leap for humans.

What is a black hole?

There are many mysterious things out there in space, and black holes are one of them. A black hole is a place in space where the gravitational pull is so high that even light cannot pass through it. The gravity of a black hole is high because a large amount of matter has been squeezed into a tiny space. Due to its extremely high gravitational pull, black holes can suck anything near them, including gigantic stars.



An optical image from the Digitized Sky Survey shows Cygnus X-1, a so-called stellar-mass black hole. PHOTO: CHANDRA X-RAY OBSERVATORY CENTER; OPTICAL: DSS; ILLUSTRATION: NASA

How is it formed?

Each of the different types of black holes is formed differently. Primordial black holes are believed by scientists to have been formed when the universe began, soon after the big bang.

Stellar black holes form when the centre of a very massive star collapses upon itself.

Meanwhile, scientists think supermassive black holes were created around the same time as the galaxy they are in. The size of a supermassive black hole is related to the size of the galaxy it is in.

How big is it?

Black holes can vary in size. The smallest of the black holes, called "primordial", can be as small as an atom but with the mass of a mountain. The biggest of them, called "supermassive", have masses of more than one million suns put together! There are several black holes found in Earth's galaxy (the Milky Way). These are called "stellar" black holes whose mass can be 20 times that of the sun.

Black holes are invisible to us because no light can get out of it. The best way to know the location of a black hole is through space telescopes with special tools that observe how stars close to black holes act differently from others.



A supermassive black hole with millions to billions times the mass of our sun is seen in an undated NASA artist's concept illustration. PHOTO: REUTERS

ACTIVITY

Imagine you have the power to create a supermassive black hole that can consume everything in the world. What are the things you would like the black hole to take away from Earth and why?

What happens if two black holes collide?

Usually, two black holes that are close by drift closer to each other gravitationally, and start rotating around each other, forming a binary system. Gradually, these black holes will begin to lose their energy to gravitational radiation (produced when massive bodies accelerate), get closer and closer, rotate faster and faster, until they finally merge.

When two black holes collide, you cannot see anything as no light passes through black holes. However, this collision does send out powerful gravitational waves across space, which can be detected using very sensitive and large instruments called gravitational wave detectors.

The black hole captured by the Event Horizon Telescope. PHOTO: AP

Recently, in a study published in the journal *Physical Review Letters*, astronomers stated that they observed a collision between two black holes, back in May 2019. However, this time, the collision gave out light!

Here's what happened – In May 2019, scientists detected a collision of two black holes about four billion light-years away, within the vicinity of a supermassive black hole. Each of the two smaller black holes on collision course was about 150 million times more massive than the sun, while the supermassive black hole was about 100 million times more massive than the sun. The two colliding black holes fell into the supermassive's accretion disk, which is a swirl of stars, gas, and dust that is slowly being sucked into the supermassive's event horizon. A black hole's event horizon is a boundary beyond which even light cannot escape. When the two merged, the gravitational force sent the newly merged black hole out of the accretion disk at a speed of about 700,000 kilometres per hour. As it sped into space, the merged black hole lit up the surrounding gas in the accretion disk, producing light that was trillion times brighter than the sun.

If these findings published in the journal are confirmed, it could mean that black holes can be visualised by observing the surrounding matter they light up, such as the image of the supermassive black hole snapped by the Event Horizon Telescope in April 2019. The image snapped wasn't that of the black hole, but rather the glowing gas and dust bordering its event horizon.

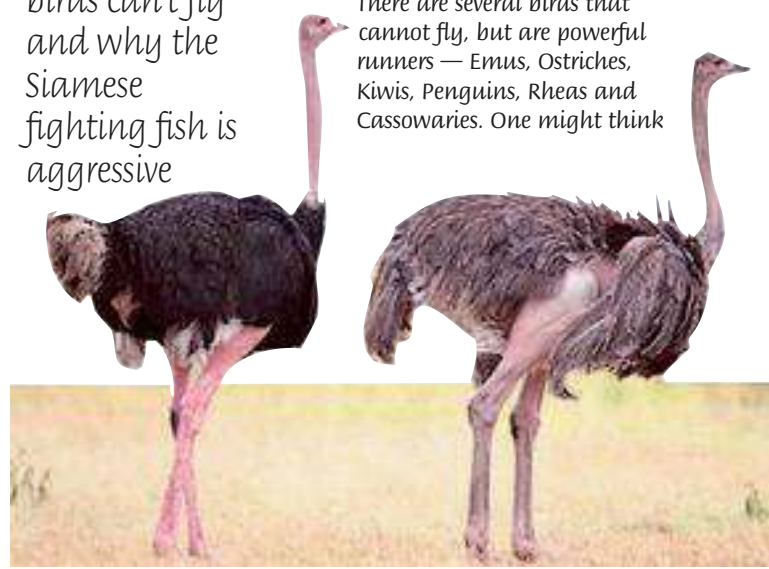
QUEST

Find answers to some oft-asked questions

Today, let's see why some birds can't fly and why the Siamese fighting fish is aggressive

Why can't some birds fly?

There are several birds that cannot fly, but are powerful runners — Emus, Ostriches, Kiwis, Penguins, Rheas and Cassowaries. One might think



that these birds are too enormous to lift themselves into the air. This is partially true, but is not the real reason why they cannot fly. Earlier it was thought that the modern flightless, or running, birds evolved separately from the animals which eventually became flying birds. But this theory is no longer held. It has now been realized that running birds had the same ancestors as flying birds.

Living as they did in areas free from predators, there was no need for these birds to fly away from danger. Their wings therefore, remained tiny and became incapable of lifting them into the air. But these birds did develop powerful legs and bodies and thus they became excellent runners.

Siamese Fighting Fish

For sheer savagery and belligerence, none of the large species of fish, including the shark, can compare with the two-and-a-half-inch-long Siamese fighting fish. These little fishes live in streams, lakes, rivers and canals throughout Southeast Asia, from Thailand to Borneo.

In the wild, Siamese fighting fish are not very fierce or predatory, perhaps because of their tiny size. They feed on minute aquatic animals like mosquito larvae and water fleas. In the mating season, the males do display aggressiveness, but combats between rival fishes last less than 15 minutes.

Bred in the captive confines of aquaria, the story is quite different. Here the varieties of fighting fish developed after decades of selective breeding are far more aggressive and will fight for as long as six hours at a stretch! In fact, in some Southeast



Asian countries, fights between rival fishes are formally staged and there is enthusiastic betting during the event.

Siamese fighting fish come in brilliant colours and present a spectacular sight as they size each other up, with their large fins outspread and gill covers open. Then they attack, leaping forward and trying to tear each other's fins out. At the end of the battle, the beautiful fins may be reduced to ragged stumps and the fish sport deep gashes around the

jaws and sides. The fights often result in serious injuries or death.

The courtship of Siamese fighting fish is equally fascinating to watch. The male, who sports brilliant colours at this time, prepares a large floating nest of bubbles which he expels from his mouth. He then fertilises the eggs the female lays, collects them in his mouth and spits them into the bubble nest. The male does this to the hundreds of eggs produced by the female.

Finally, the male chases the female fish away and incubates the eggs alone for the next two days! When the eggs hatch, he swims away, leaving the young to fend for themselves.

Like the climbing perch, the Siamese fighting fish has an extra breathing organ which enables it to survive in water with little oxygen.

(Content provided by Amrita Bharati)

NEWS IN PICTURE

HONG KONG IN TURMOIL



Protests marked the annual handover march in Hong Kong on July 1, 2020. Photo shows a woman bowing down to cops during a protest. Hong Kong marked the 23rd anniversary of its handover to China in 1997. China has enacted a national security law that cracks down on protests in the territory. The law was imposed Tuesday, six weeks after it was first announced, in a bid by China to end huge and often violent pro-democracy protests in the semi-autonomous city. PHOTO: AP

TECH BYTES

What is an activity tracker?

Also known as a fitness tracker, an activity tracker is an electronic device which helps monitor some type of human activity such as walking, sleep and heart rate. This is usually a wearable device such as a smartwatch. The activity tracker uses sensors to continuously track data such as steps taken, calories burned or the pulse of the user and transfers this data to a smartphone or computer using Bluetooth.

Data collected by activity trackers are interpreted using applications that help users analyse their activity and take decisions accordingly.

Activity trackers come with different functionalities. Some track just your fitness-related activity, while others allow you to take or make calls, read messages received or even play songs!

Their designs are constantly improving, with certain activity trackers resembling a regular watch, making it difficult for people to spot any difference.

