



# Merger of Three Supermassive Black Holes

## Why in News

Recently, the [Department of Science and Technology](#) reported that Indian scientists have discovered the **merger of three supermassive black holes** from as many galaxies to form a triple **Active Galactic Nucleus**.

- Many [Active Galactic Nuclei \(AGN\)](#) pairs have been detected in the past, but **triple AGN are extremely rare**, and only a handful has been detected before using X-ray observations.

## Key Points

### ▪ Current Merger:

- Scientists were studying the **AGN** in the two massive barred spiral galaxies **NGC7733** and **NGC7734** when they **detected unusual emissions from the centre of the latter and a curious movement of a large bright clump within it**, having a different velocity than that of **NGC7733**.
  - As the third one was a separate galaxy, the scientists named it **NGC7733N**.
- All **three merging black holes were part of galaxies in the Toucan constellation**.
  - **Toucan Constellation: It is located in the southern hemisphere of the sky.** It is visible at latitudes south of 15 degrees between August and October. It is completely below the horizon for anyone north of 30 degrees. **It is a small constellation**, occupying an area of 295 square degrees. This **ranks it 48<sup>th</sup> in size among the 88 constellations** in the night sky.
- They are quite far away when compared to the nearest galactic neighbour - the **Andromeda galaxy is 2.5 million light years away**.

### ▪ Active Galactic Nuclei:

- There are **supermassive blackholes, which are several million solar masses in size**, at the centres of galaxies, and these are known as AGN.
- At the center of most galaxies, there's a massive black hole with a **huge mass accumulating gas, dust, and stellar debris around it**. AGN is formed when the gravitational energy of these materials, **being pulled towards the black hole, is converted into light**.
  - Since they "accrete" matter, **they often have a glow around them** which can be observed using light spectroscopy.

### ▪ Collision of Galaxies:

- If two galaxies collide, **their black hole will also come closer by transferring the kinetic energy to the surrounding gas**.
- The **distance between the blackholes decreases** with time until the separation is around a parsec (3.26 light-years).
- The **two black holes are then unable to lose any further kinetic energy** to get even

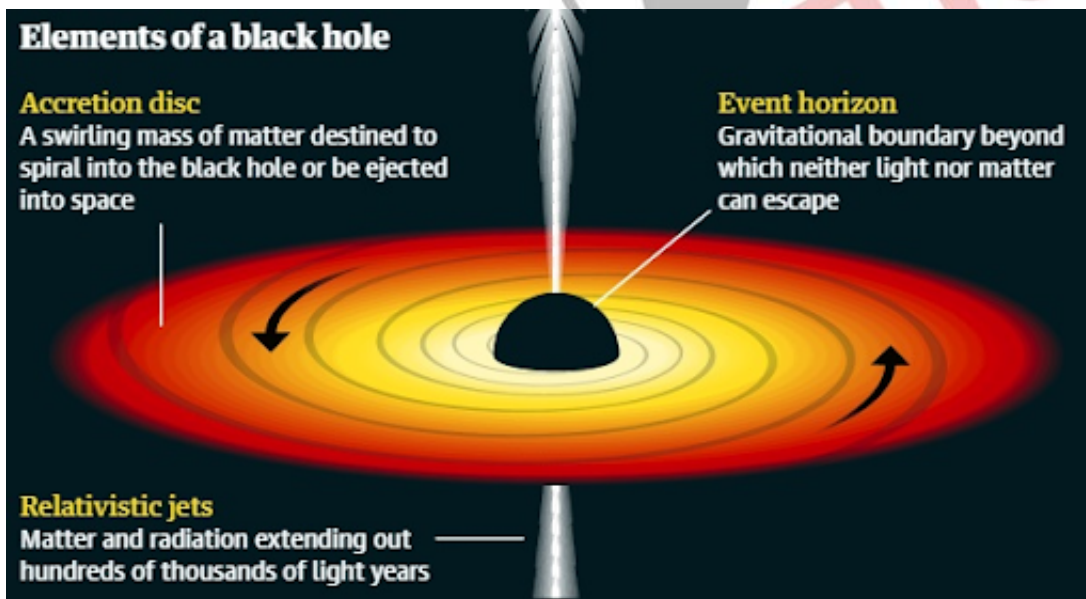
closer and merge. This is known as the **final parsec problem**.

▪ **Significance of the Finding:**

- The presence of a third black hole **can solve the final parsec problem**. The **two galaxies can come closer** when another black hole or a star passes by and takes away some of their combined angular momentum.
- The finding shows that multiple accreting black holes [AGN] may be more common in our universe and especially common in galaxy groups. So the **growth of black holes may be driven by such mergers in groups**.

## Black Hole

- It refers to a point in space where the **matter is so compressed** as to create a gravity field from which even **light cannot escape**.
- The **concept was theorized by Albert Einstein in 1915** and the term 'black hole' was coined in the mid-1960s by American physicist John Archibald Wheeler.
- Usually, the black holes **belong to two categories**:
  - One category **ranges between a few solar masses and tens of solar masses**. These are thought to form when massive stars die.
  - The other category is of **supermassive black holes**. These **range from hundreds of thousands to billions of times that of the sun** from the Solar system to which Earth belongs.
- In April 2019, the scientists at the **Event Horizon Telescope Project** released the **first-ever image of a Black Hole** (more precisely, of its shadow).
- **Gravitational waves** are created when two black holes orbit each other and merge.



[Source: TH](#)