

Rare merger of three jumbo black holes spotted

August 31, 2021

In news– Recently, Indian scientists have discovered three black holes from three galaxies merging to form a triple active galactic nucleus.

About recent merger-

- A team of **researchers from the Indian Institute of Astrophysics (IIA)** detected unusual emissions from the **centre of the NGC7734 galaxy** and a large, bright clump along the **northern arm of the NGC7733 galaxy**.
- Inferring that this was a separate galaxy, the **scientists named it NGC7733N**.
- All three merging black holes were part of galaxies in the Toucan constellation.
- They are quite far away when you think that our nearest galactic neighbour the Andromeda galaxy is 2.5 million light years away.
- **Scientists used data from the Ultra-Violet Imaging Telescope (UVIT)**, the European integral field optical telescope called **MUSE in Chile** and infrared images from the **optical telescope (IRSF) in South Africa**.
- **The UV and H-alpha images also supported the presence of the third galaxy** by revealing star formation along with the tidal tails, which could have formed from the merger of NGC7733N with the larger galaxy.

Active Galactic Nucleus & Supermassive black holes–

- There are supermassive blackholes, which are several million solar masses in size, at the centres of galaxies, and these are known as Active Galactic Nuclei.
- **Since they “accrete” matter, they often have a glow around them** which can be observed using light

spectroscopy.

- **Supermassive black holes** are difficult to detect because **they do not emit any light but they can reveal their presence by interacting with their surroundings.**
- **When the dust and gas from the surroundings fall onto a supermassive black hole,** some of the mass is swallowed by the black hole, but some of it is converted into energy and emitted as electromagnetic radiation that **makes the black hole appear very luminous.**
- They are **called active galactic nuclei (AGN) and release huge amounts of ionized particles** and energy into the galaxy and its environment.
- Both of these ultimately **contribute to the growth of the medium around the galaxy** and ultimately the evolution of the galaxy itself.
- Each of the galaxies hosts an active supermassive black hole in their nucleus and hence form a very rare **triple AGN system.**
- Many 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.

Factors impacting Galaxy evolution-

- According to the researchers, **a major factor impacting galaxy evolution is galaxy interactions,** which happen when galaxies move close to each other and exert tremendous gravitational forces on each other.
- **During such galaxy interactions, the respective supermassive black holes can get near each other.**
- The dual black holes start consuming gas from their surroundings and become **dual AGN.**
- The team explains that 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 in order to get even closer and merge. This is known as the **final parsec problem**.
- **The presence of a third black hole can solve this problem**. The dual merging blackholes can transfer their energy to the third blackhole and merge with each other.

Significance-

This rare occurrence in our nearby Universe indicates that small merging groups are ideal laboratories to detect multiple accreting supermassive black holes and increases the possibility of detecting such rare occurrences.

What are blackholes?

- A black hole is a space where gravity pulls so much that even light is unable to come out. The gravity is so strong due to the squeezing of matter into a small space.
- A black hole is an object with an escape velocity greater than the speed of light – escape velocity is the speed required to escape from its gravitational grip.
- Because no light can escape, black holes are invisible