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Most Distant Quasar P172+18

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Why in News

Recently, an international team of astronomers has discovered the most distant **'Radio-Loud' Quasar** with the help of **European Southern Observatory's Very Large Telescope (ESO's VLT)**.

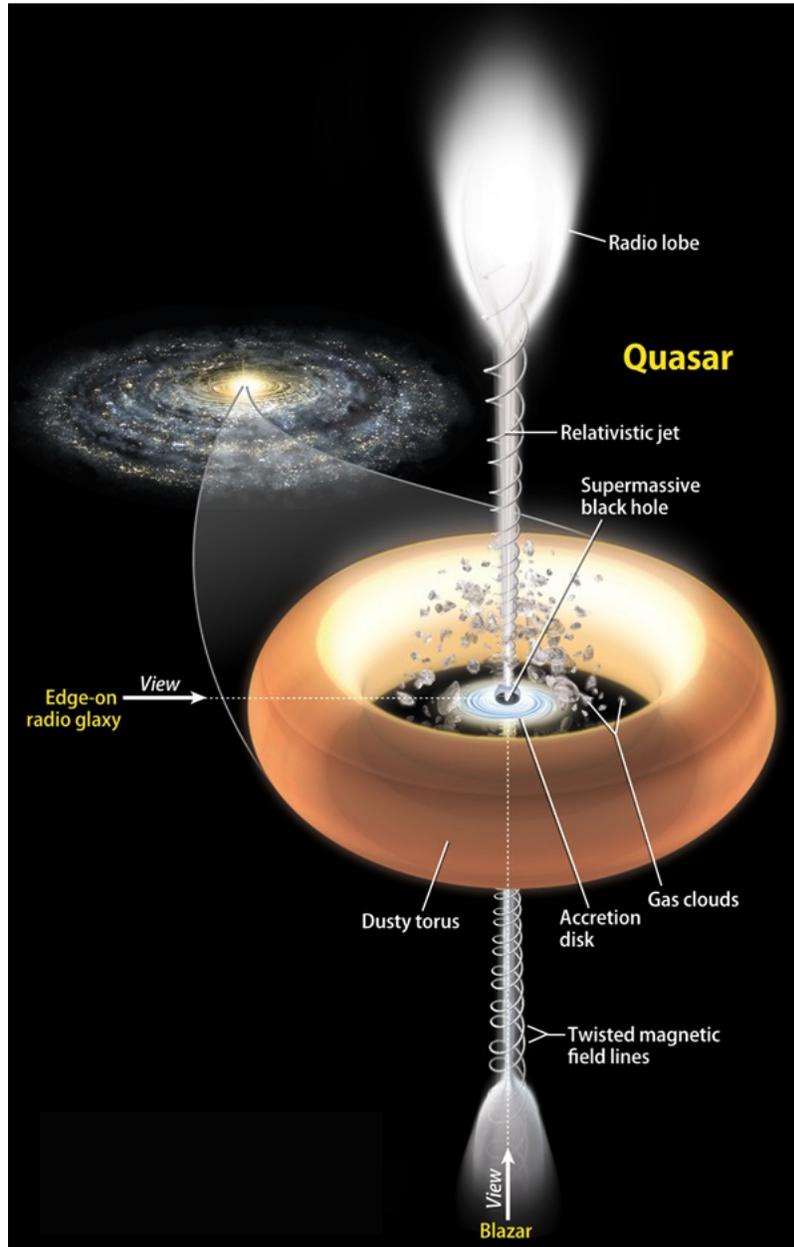
Key Points

- **Quasars:**

- Quasars are very **luminous objects** in faraway galaxies that **emit jets at radio frequencies**.
- The word quasar is short for "**quasi-stellar radio source**".
 - The name, which means star-like emitters of radio waves, was given in the 1960s when quasars were first detected.
 - The name is retained today, even though astronomers now know most quasars are faint radio emitters. In addition to radio waves and visible light, quasars also emit ultraviolet rays, infrared waves, X-rays, and gamma-rays.
- Most quasars are larger than our solar system. A quasar is **approximately 1 kiloparsec in width**.

- They are **only found in galaxies that have supermassive blackholes** which power these bright discs.

Black hole refers to a point in space where **matter is so compressed** as to create a **gravity field** from which **even light cannot escape**.



- Most **active galaxies** have a **supermassive black hole** at the centre which sucks in surrounding objects.
- Quasars are **formed by the energy emitted by materials swirling around a **blackhole**** right before being sucked into it.

- They are further categorised into the "**radio-loud**" and the "**radio-quiet**" classes.
 - **Radio-loud:**
 - They are with powerful jets that are **strong sources of radio-wavelength emission.**
 - These make up about **10%** of the overall quasar population.
 - **Radio-quiet :**
 - They are those quasars lacking powerful jets, with relatively **weaker radio emission** than the radio-loud population.
 - The majority of quasars (about 90%) are radio-quiet.
- **Recently Discovered Quasar/P172+18:**
 - Named P172+18, the quasar emitted wavelengths which had a **redshift** of 6.8. It took **13 billion years** for the quasar's light to reach earth.
 - This particular quasar appears to the scientists as it was when the universe was just around **780 million years old.**
 - The glowing disc around a blackhole is **300 million times more massive than our Sun.**
 - It is also **one of the fastest accreting quasars**, which means it is accumulating objects from the galaxy at an enormous speed.
 - Only **three other 'radio-loud' sources with redshift greater than six have been discovered** so far and the **most distant one had a redshift of 6.18.**
 - The **higher the redshift** of the radio wavelength, the **farther away is the source.**
- **Inference:**
 - The **blackhole at its centre is consuming from its galaxy** at a stunning rate.
- **Significance:**
 - A detailed study of these 'radio-loud' super bright objects can lead astronomers to **understanding how the supermassive blackholes in their core grew to be as big** so rapidly since the Big Bang.
 - It also **holds clues about the ancient star systems and astronomical bodies.**
- **About the ESO's VLT:**
 - The **Very Large Telescope** used to observe the **P172+18** is located at Paranal Observatory in the **Atacama Desert.**
 - The four Unit Telescopes boast 8.2-meter (27 feet) mirrors.
 - Just one of these instruments **can spot objects that are 4 billion times fainter than what can be seen with the unaided eye.**
 - According to the **European Southern Observatory**, the **Very Large Telescope** is the **world's most advanced optical telescope.**

Redshift

- Gravitational redshift **occurs as particles of light (photons) climb out of a gravitational well like a black hole** and the light's wavelength gets drawn out. This **shifts the wavelength to the red part** of the light spectrum - hence "**redshift**".

- In order **to escape intense gravity, particles of light (photons) must expend energy.**
- However, at the same time, these photons **must travel at a constant speed** - the speed of light.
- Therefore, the **photons can't lose energy by slowing down but must expend** it in another way.
- This lost energy **manifests itself as a shift towards the red end of the light spectrum.**

Source: DTE