



## Universe's First Molecule

Scientists have detected the **most ancient type** of molecule in our universe in **space for the first time ever**.

- **Helium hydride ion ( $\text{HeH}^+$ )** was the **first molecule** that formed when, almost 14 billion years ago, the **falling temperatures allowed recombination of the light elements (hydrogen, helium, deuterium and traces of lithium) produced in the Big Bang**.
  - It is the **first type of molecule (first molecular bond)** that formed in the universe after the Big Bang.
- At that time, **ionised hydrogen** and **neutral helium** atoms **reacted to form  $\text{HeH}^+$** .
  - Once the universe cooled down, **hydrogen atoms** started to **interact with helium hydride**, creating molecular hydrogen, which set the **stage for star formation**.
  - From that point on, **stars created the other elements of the cosmos**.
- Despite its importance in the history of the early Universe,  **$\text{HeH}^+$  has so far escaped detection in astrophysical nebulae** — cloud of gas and dust in outer space.
- Helium hydride — a combination of helium and hydrogen — was detected roughly 3,000 light-years from Earth by NASA's **Stratospheric Observatory for Infrared Astronomy (SOFIA)**.

### Stratospheric Observatory for Infrared Astronomy

- **Stratospheric Observatory for Infrared Astronomy (SOFIA)** is a **Boeing 747SP jetliner** modified to carry a 100-inch diameter telescope. It is a joint project of **NASA and the German Aerospace Centre**.
- It is flown at approx 45,000 feet, where its observations are **not impacted by interference from Earth's atmosphere**.
- SOFIA returns to Earth after every flight, allowing scientists to regularly update the instrument with the latest technology. One of the most recent upgrades **included adding a specific channel to detect signatures of helium hydride**, which previous telescopes did not have.
- The molecule was found in a **planetary nebula, NGC 7027**, which is the **dusty remnant of a sun-like star**.
- While helium hydride has been produced and tested in a laboratory setting, this discovery marks the **first time that this molecule has been detected in space** — which sheds light on the **chemistry of the early universe**.