



Phosphine on Venus: A Sign of Life

Why in News

Scientists have detected the presence of phosphine in the atmosphere of Venus.

- The detection indicates the possibility of the presence of lifeforms on Venus.

Key Points

- The international scientific team first spotted the phosphine using the **James Clerk Maxwell Telescope (JCMT) in Hawaii** and confirmed it using the **Atacama Large Millimeter/submillimeter Array (ALMA)** radio telescope in **Chile**.
 - JCMT is the largest astronomical telescope in the world designed specifically to operate in the submillimetre wavelength region of the spectrum.
 - ALMA is currently the largest radio telescope in the world.
- The researchers **did not discover actual life forms**, but noted that, on Earth, phosphine is produced by bacteria thriving in oxygen-starved environments.
- **Biosignatures:** Scientists have used probes and telescopes to seek “**biosignatures**” - **indirect signs of life** - on other planets and moons in the solar system and beyond.
 - **Phosphine** was seen at **20 parts-per-billion** in the **Venus atmosphere** which is a trace concentration. However, Venus is considered to be **hostile to phosphine** as its surface and atmosphere are **rich in oxygen compounds** that would rapidly react with and destroy phosphine.
 - Phosphine acts as a biosignature because it is known to be produced **mainly through biological processes**, and not through any naturally occurring chemical process.
 - Earlier in 2011, the **European Space Agency’s mission, Venus Express**, found signs of ozone, a biomarker, in the upper atmosphere of Venus.
- **Acid Test:**
 - Scientists have suspected that the **Venusian high clouds**, with **mild temperatures around 86 degrees Fahrenheit**, could harbour aerial microbes that could endure extreme acidity.
 - These clouds are around **90% sulphuric acid** and Earth microbes could not survive that acidity.

Phosphine

- **Phosphine** is a **phosphorus atom with three hydrogen atoms attached (PH₃)** - is **highly toxic** to people.
- On rocky planets such as Venus and Earth, phosphine can only be made by life—whether human or microbe.
- Phosphine is made naturally by some species of **anaerobic bacteria**—organisms that live in the

oxygen-starved environments of landfills, marshlands, and even **animal guts**.

- To produce phosphine, **Earth bacteria take up phosphate from minerals** or biological material and add hydrogen.

▪ **Phosphine also arises non-biologically in certain industrial settings.**

- Used as a **chemical weapon during World War I**.
- Phosphine is still manufactured as an **agricultural fumigant**, is used in the semiconductor industry, and is a by-product of **meth labs**.

Venus

- Venus is Earth's **closest** planetary neighbour. It is also known as **earth's twin**.
- Similar in structure but **slightly smaller than Earth**, it is the **second planet from the sun**.
- Early science observations of Venus revealed that it is a menace of a world that could kill life in multiple ways. Venus is wrapped in a **thick and toxic** atmosphere that traps in heat.
- **High Temperature:** Surface temperatures reach a scorching 880 degrees Fahrenheit, hot enough to melt lead. It is the hottest planet in the solar system.
- **High Pressure:** Highly dense, 65 miles of cloud and haze, puts atmospheric pressure more than 90 times what's felt on Earth's surface.
- Also, the planet's atmosphere is **primarily suffocating carbon dioxide** and sulfuric acid clouds.

Way Forward

- The finding can further **ignite interest in space missions to Venus**. Missions to Venus are not new. Spacecraft have been going near the planet since the 1960s, and some of them have even made a landing.
- All future missions to Venus would now be attuned to investigating further evidence of the presence of life. This can now only be taken further by making in situ measurements in the atmosphere of Venus. This poses its own challenges. Apart from the high surface temperature and dense atmosphere, the presence of sulphuric acid in the atmosphere of Venus makes it a highly corrosive environment. The Indian Space Research Organisation (ISRO) is also planning a mission to Venus, tentatively called **Shukrayaan**, in the near future.

[Source: IE](#)

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