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1. James Webb Space Telescope spots earliest-known galaxy: What a new study says

Why in News?
NASA's James Webb Space Telescope (JWST) has spotted the earliest-known galaxy, one that is surprisingly bright and big considering it formed during the universe's infancy — at only 2% its current age.

JWST, which by peering across vast cosmic distances is looking way back in time, observed the galaxy as it existed about 290 million years after the Big Bang event that initiated the universe roughly 13.8 billion years ago, the researchers said. This period spanning the universe's first few hundred million years is called cosmic dawn.

The discovery was made by an international team of astronomers, who used JWST to observe galaxies as part of the JWST Advanced Deep Extragalactic Survey (JADES) program. The study was published online last week ahead of formal peer review.

What do we know about the galaxy?
This galaxy, called JADES-GS-z14-0, measures about 1,700-light years across. A light year is the distance light travels in a year, which is 9.5 trillion km. The galaxy has a mass equivalent to 500 million stars the size of our Sun and is rapidly forming new stars — about 20 every year.

Until now, the earliest-known galaxy dated to about 320 million years after the Big Bang, as announced by the JADES team last year.

Why is the galaxy so bright?
Three main hypotheses have been advanced to explain the luminosity of early galaxies. The first attributed it to supermassive black holes in these galaxies gobbling up material. That appears to have been ruled out by the new findings because the light observed is spread over an area wider than would be expected from black hole gluttony.

It remains to be seen whether the other hypotheses —- that these galaxies are populated by more stars than expected or by stars that are brighter than those around today — will hold up.

Relevance: GS Prelims; S&T
Source: Indian Express

2. How Agnibaan rocket launch marks a turning point for India's space sector

Why in News?

A private space company, Agnikul Cosmos, carried out the first successful launch of its indigenously-built rocket last week, opening up a new chapter in India's space sector. The event was significant enough to be noticed by the Indian Space Research Organisation (ISRO) and everyone else in the space sector, in India and abroad. Prime Minister Narendra Modi, Home Minister Amit Shah, and External Affairs Minister S Jaishankar congratulated the company for the achievement.

Not first Private Company

To be sure, this was not the first time that an Indian private company had flown a rocket from Indian soil. In November 2022, Skyroot Aerospace, a young space start-up just like Agnikul, successfully launched a rocket which it has named Vikram, after Vikram Sarabhai, the legendary space leader credited with building ISRO in the initial years. That moment too had been hailed by the President, Prime Minister, and many others.

World's first 3-D printed engine

The inaugural flight of Agnikul's creatively named Agnibaan rocket builds on the success of Skyroot and signals the range of options that are opening up in India's space market. Agnibaan was powered by the world's first 3-D printed engine, and was launched from Agnikul's own launchpad, built at ISRO's Sriharikota launch facility. Both Agnikul and Skyroot hope to begin launching commercial satellites on their rockets within a year.

Small satellites

The Angibaan will eventually have several variants, capable of carrying payloads between 30 kg and 300 kg to lower earth orbits. The Skyroot rocket, Vikram, also has a few variants, with similar capabilities.

Both of these are targeting the small satellite market to cater to a rapidly growing demand for a variety of space-based applications in areas as diverse as communications, broadcasting, disaster management, climate change, earth and ocean observation, urban planning, and surveillance. These satellites are usually not meant for space exploration or scientific experiments.

ISRO itself is developing a new rocket, called SSLV or Small Satellite Launch Vehicle, to serve this demand. SSLV, which has flown twice but only once with success, is slightly more powerful and can carry payloads up to 500 kg.

Agnibaan rocket

The uniqueness of Agnibaan lies in the fact that its semi-cryogenic engine is entirely 3-D printed. The engine does not have any components or moving parts at all. There are no joints, no welding, and no fusing. It is a smooth single piece of hardware. The use of 3-D printing in space hardware is not a novel idea. But no one has used an entire engine that is 3-D printed.

3-D printing can increase efficiency, bring down costs, and reduce the probability of something going wrong. In an engine that is an assembly of several moving points, each joint or wiring is a potential source of error. Agnibaan's engine, named Agnilet, has been an entirely in-house development.

The fact that Agnibaan was launched from a privately owned launch pad is a first for India. Thus far, all space launches were carried out from one of the two ISRO launch pads at Sriharikota. Given the prospect of a sharp rise in the number of space launches, ISRO is in the process of developing a second space port, at Kulasekarapattinam in Thoothukudi district, Tamil Nadu. It is meant to be used mainly for SSLV launches.

Agnikul, the company, has built its own launch pad inside the Sriharikota range with the help of ISRO. It uses a lot of ISRO's facilities, but the separate launchpad gives it the flexibility to schedule its launches whenever it wants. Agnikul is hoping to carry out 35 to 40 launches of its Agnibaan rockets every year.

Rise of private players

Agnikul and Skyroot represent the success of India's efforts to open up the space sector for private participation. They are not alone. Dozens of space companies have come up in the last few years, operating in different segments of the space market — satellites, space-based applications, hardware, communications, data centres, and everything else. Many of them have already started to make their mark.

Relevance: GS Prelims & Mains Paper III; Science & Technology
Source: Indian Express

3. Is a future Palestine state possible?

Why in News?

Hamas's October 7, 2023 attack in Israel and the latter's continuing war on Gaza have brought the Palestine question back to the fore of West Asia. As the war has destroyed much of Gaza and killed 36,000 of its people, the world has also seen more countries voicing strong support for a future Palestine state.

Recently, three European countries, Spain, Ireland and Norway, recognised the Palestine state. Arab countries, including Saudi Arabia and Jordan, say there wouldn't be lasting peace in the region unless the Palestine question is resolved. An internationally recognised solution to the crisis is what's called the two-state solution.

What's the two-state solution?

The short answer is simple: divide historical Palestine, the land between the Jordan River on the east and the Mediterranean Sea in the west, into an Arab state and a Jewish state. But the long answer is complicated. Israel, a Jewish state, was created in Palestine in 1948. But a Palestine state is not yet a reality. Palestinian territories have been under Israeli occupation since 1967. So, a two-state solution today means the creation of a legitimate, sovereign Palestine state, which enjoys the full rights like any other nation state under the UN Charter.

What are the origins?

The roots of the two-state solution go back to the 1930s when the British ruled over Palestine. In 1936, the British government appointed a commission headed by Lord William Robert Peel (known as the Peel Commission) to investigate the causes of Arab-Jewish clashes in Palestine. A year later, the commission proposed a partition of Palestine into a Jewish and an Arab state. At that time, Jews accounted for some 28% of Palestine's population. According to the Peel Commission proposal, the West Bank, Gaza and Negev desert would make up the Arab state, while much of Palestine's coast and the fertile Galilee region would be part of the Jewish state. Arabs rejected the proposal.

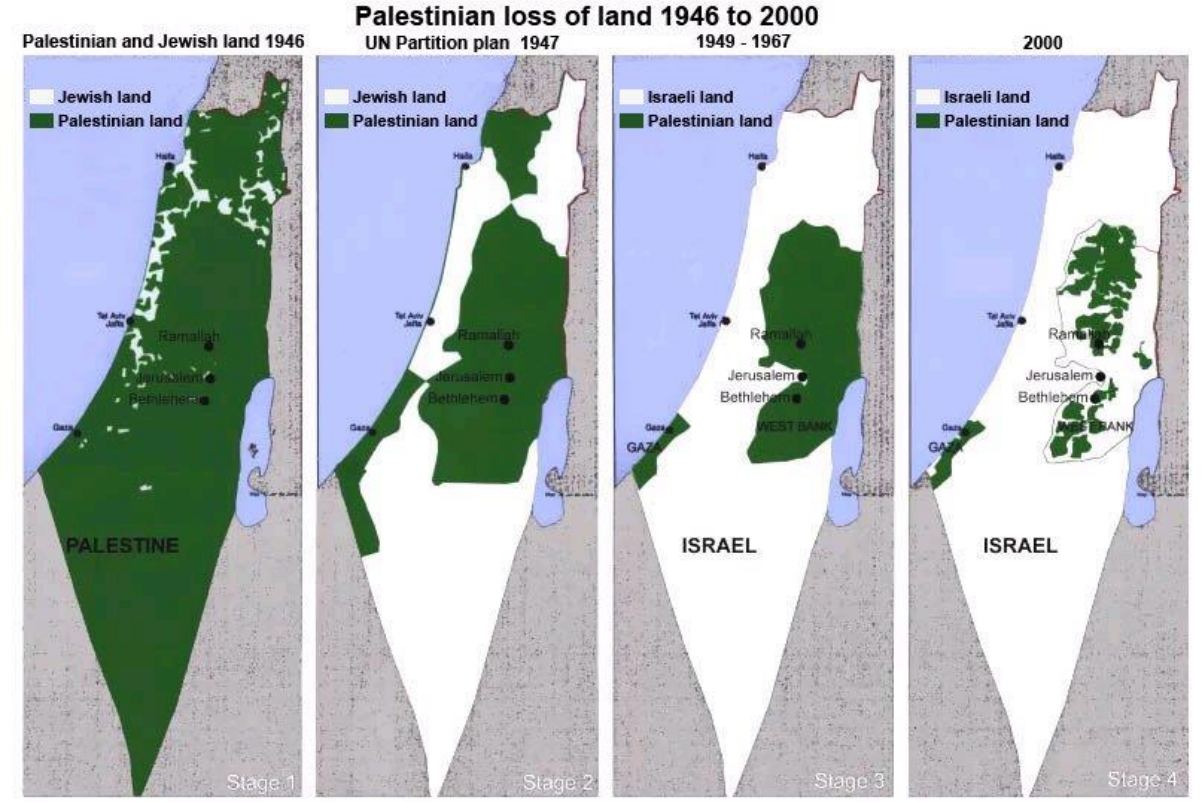
After the Second World War, the UN Special Commission on Palestine (UNSCOP) put forward another partition plan. It proposed that Palestine be divided into three territories — a Jewish state, an Arab state and an international territory (Jerusalem). Jews, who made up roughly 32% of Palestine's population, were to have 56% of the Palestine land as per the UNSCOP plan. The partition plan was adopted in the UN General Assembly (Resolution 181). Arabs rejected the plan (India voted against it), while the Zionist leadership of Israeli settlers in Palestine accepted it. And on May 14, 1948. Zionists unilaterally declared the state of Israel.

This triggered the first Arab-Israeli war. And by the time an armistice agreement was achieved in 1949, Israel had captured some 22% more territories than what the UN had proposed.

How did it get international legitimacy?

In the 1967 Six-Day War, Israel captured the West Bank and East Jerusalem from Jordan, the Gaza Strip and the Sinai Peninsula from Egypt and the Golan Heights from Syria (Israel continues to control all territories except the Sinai which it returned to Egypt after the 1978 Camp David Accords). Palestine nationalism emerged stronger in the 1960s, under the leadership of the Palestine Liberation Organization (PLO).

The PLO initially demanded the "liberation" of the whole of Palestine, but later recognised the two-state solution based on the 1967 border. Israel initially rejected any Palestinian claim to the land and continued to term the PLO as a "terrorist" organisation. But in the Camp David Accords, which followed the 1973 Yom Kippur War in which Egypt and Syria surprised Israel with an attack, it agreed to the Framework for Peace in the Middle East agreement.



As part of the Framework, Israel agreed to establish an autonomous self-governing Palestinian authority in the West Bank and Gaza Strip and implement the UN Resolution 242, which has demanded Israel pull back from all the territories it captured in 1967. The Framework laid the foundation for the Oslo Accords, which, signed in 1993 and 1995, formalised the two-state solution. As part of the Oslo process, a Palestinian National Authority, a self-governing body, was formed in the West Bank and Gaza and the PLO was internationally recognised as a representative body of the Palestinians. The promise of Oslo was the creation of a sovereign Palestinian state which would live next to the Israeli state in peace. However, this promise has never been materialised.

What are the hurdles to achieving the two-state solution?

The first setback for the Oslo process was the assassination of Yitzhak Rabin, the Israeli Prime Minister who signed the accords, in November 1995 by a Jewish extremist. Rabin's Labour party was defeated in the subsequent elections and the right-wing Likud, under Benjamin

Netanyahu's leadership, came to power. The rise of Hamas, the Islamist militant group that opposed the Oslo Accords saying the PLO made huge concessions to the Israelis, also contributed to the derailment of the peace process. After the collapse of the Oslo process in the 1990s, there were multiple diplomatic efforts to revive the two-state plan, but none of these made progress towards achieving the goal.

Multiple reasons could be identified for this failure. But there are specific structural factors that make the two-state solution unachievable, at least for now. One is the boundary. Israel doesn't have a clearly demarcated border. It is essentially an expansionist state. In 1948, it captured more territories than it was promised by the UN. In 1967, it expanded further by taking the whole of historical Palestine under its control. From the 1970s, Israel has been building illegal Jewish settlements in Palestinian territories. While Palestinians say their future state should be based on the 1967 border, Israel is not willing to make any commitments.

Two, the status of settlers. Roughly 7,00,000 Jewish settlers are now living in the West Bank and East Jerusalem. If Israel is to withdraw to the 1967 border, they will have to pull back the settlers. The settlers are now a powerful political class in Israeli society and no Prime Minister can pull them back without facing political consequences. Three, the status of Jerusalem. Palestinians say East Jerusalem, which hosts Al Aqsa, Islam's third holiest mosque, should be the capital of their future Palestinian state, while Israel says the whole of Jerusalem, which hosts the Western Wall, the holiest place in Judaism, is Israel's "eternal capital". Four, the right of refugees to return to their homes. Some 7,00,000 Palestinians were displaced from their homes in 1948 when the state of Israel was declared. According to international law, they have a right to return to their homes. Israel says it won't allow the Palestinian refugees to return.

While these are the structural factors that make the two-state solution complicated, on the ground, Israel's rightwing leadership shows no willingness to make any concessions. Israel wants to continue the status quo — the status quo of occupation. The Palestinians want to break that status quo.

Relevance: GS Prelims & Mains Paper II; International Relations
Source: The Hindu

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