Currently – 19th November 2026

Voyager 1: Humanity's Farthest Reach — The Indian Express — GS III: Science & Technology

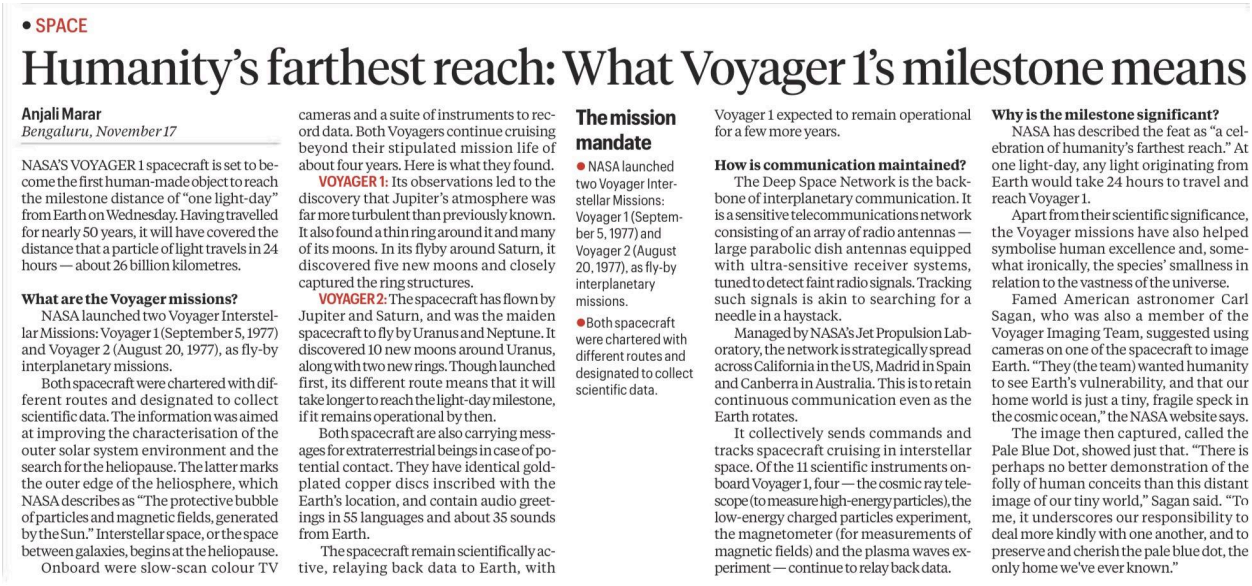
Trump–Xi–Putin Meeting: Global Power Equations — The Indian Express — GS II: International Relations

11 States/UTs Declared Fully Literate under ULLAS — The Indian Express — GS II: Education, Social Justice

Purana Qila: Tracing 2,000 Years of Delhi's History — The Indian Express — GS I: Ancient History, Art & Culture

Saraiki: Language of Folk Song Witnessing a Surge in Popularity — The Indian Express — GS I: Indian Culture, Languages

AI-Based Blood Test for Early Detection of Multiple Cancers — The Hindu — GS III: Science & Technology, Health



• SPACE

Humanity's farthest reach: What Voyager 1's milestone means

Anjali Marar
Bengaluru, November 17

NASA'S VOYAGER 1 spacecraft is set to become the first human-made object to reach the milestone distance of "one light-day" from Earth on Wednesday. Having travelled for nearly 50 years, it will have covered the distance that a particle of light travels in 24 hours — about 26 billion kilometres.

What are the Voyager missions?

NASA launched two Voyager Interstellar Missions: Voyager 1 (September 5, 1977) and Voyager 2 (August 20, 1977), as fly-by interplanetary missions.

Both spacecraft were chartered with different routes and designated to collect scientific data. The information was aimed at improving the characterisation of the outer solar system environment and the search for the heliopause. The latter marks the outer edge of the heliosphere, which NASA describes as "The protective bubble of particles and magnetic fields, generated by the Sun." Interstellar space, or the space between galaxies, begins at the heliopause.

Onboard were slow-scan colour TV cameras and a suite of instruments to record data. Both Voyagers continue cruising beyond their stipulated mission life of about four years. Here is what they found.

VOYAGER 1: Its observations led to the discovery that Jupiter's atmosphere was far more turbulent than previously known. It also found a thin ring around it and many of its moons. In its flyby around Saturn, it discovered five new moons and closely captured the ring structures.

VOYAGER 2: The spacecraft has flown by Jupiter and Saturn, and was the maiden spacecraft to fly by Uranus and Neptune. It discovered 10 new moons around Uranus, along with two new rings. Though launched first, its different route means that it will take longer to reach the light-day milestone, if it remains operational by then.

Both spacecraft are also carrying messages for extraterrestrial beings in case of potential contact. They have identical gold-plated copper discs inscribed with the Earth's location, and contain audio greetings in 55 languages and about 35 sounds from Earth.

The spacecraft remain scientifically active, relaying back data to Earth, with Voyager 1 expected to remain operational for a few more years.

The mission mandate

- NASA launched two Voyager Interstellar Missions: Voyager 1 (September 5, 1977) and Voyager 2 (August 20, 1977), as fly-by interplanetary missions.
- Both spacecraft were chartered with different routes and designated to collect scientific data.

How is communication maintained?

The Deep Space Network is the backbone of interplanetary communication. It is a sensitive telecommunications network consisting of an array of radio antennas — large parabolic dish antennas equipped with ultra-sensitive receiver systems, tuned to detect faint radio signals. Tracking such signals is akin to searching for a needle in a haystack.

Managed by NASA's Jet Propulsion Laboratory, the network is strategically spread across California in the US, Madrid in Spain and Canberra in Australia. This is to retain continuous communication even as the Earth rotates.

It collectively sends commands and tracks spacecraft cruising in interstellar space. Of the 11 scientific instruments onboard Voyager 1, four — the cosmic ray telescope (to measure high-energy particles), the low-energy charged particles experiment, the magnetometer (for measurements of magnetic fields) and the plasma waves experiment — continue to relay back data.

Why is the milestone significant?

NASA has described the feat as "a celebration of humanity's farthest reach." At one light-day, any light originating from Earth would take 24 hours to travel and reach Voyager 1.

Apart from their scientific significance, the Voyager missions have also helped symbolise human excellence and, somewhat ironically, the species' smallness in relation to the vastness of the universe.

Famed American astronomer Carl Sagan, who was also a member of the Voyager Imaging Team, suggested using cameras on one of the spacecraft to image Earth. "They (the team) wanted humanity to see Earth's vulnerability, and that our home world is just a tiny, fragile speck in the cosmic ocean," the NASA website says.

The image then captured, called the Pale Blue Dot, showed just that. "There is perhaps no better demonstration of the folly of human conceits than this distant image of our tiny world," Sagan said. "To me, it underscores our responsibility to deal more kindly with one another, and to preserve and cherish the pale blue dot, the only home we've ever known."

1. Voyager 1 & 2: Humanity's Farthest Reach

Source: The Indian Express | **GS III – Science & Technology (Space)**

Context: Voyager 1 is approaching the milestone of **one light-day from Earth (~25.9 billion km)**. Launched in 1977, it continues transmitting scientific data from interstellar space, nearly five decades later.

Voyager Missions

- **Voyager 1 (5 September 1977):** Explored Jupiter and Saturn; entered interstellar space in 2012.
- **Voyager 2 (20 August 1977):** Explored Jupiter, Saturn, Uranus and Neptune; entered interstellar space in 2018. It remains the only spacecraft to have visited Uranus and Neptune at close range.
- Both spacecraft continue studying the space environment beyond the Sun's influence, operating well beyond their original mission lifespan.

Scientific Contributions

1. **Jupiter:** Discovered active volcanism on Io (the first confirmed active volcanoes beyond Earth); studied Jupiter's atmosphere, magnetosphere, rings and moons.
2. **Saturn:** Revealed complex ring structures, discovered new moons and studied its atmosphere and moon Titan.
3. **Uranus:** First flyby in 1986; discovered moons and rings and studied its unusual magnetic field.
4. **Neptune:** First flyby in 1989; observed the Great Dark Spot, discovered moons and rings, and studied its atmosphere.
5. **Interstellar Space:** Measured cosmic rays, plasma waves and magnetic fields beyond the heliosphere, improving understanding of the interstellar medium and the Sun's interaction with it.

Important Concepts

- **Light-day:** Distance travelled by light in 24 hours (~25.9 billion km); signals from Voyager at this distance take nearly 24 hours to reach Earth.
- **Heliosphere:** Bubble formed by the Sun's solar wind and magnetic influence. The boundary separating it from the interstellar environment is the heliopause.
- **Pale Blue Dot:** Photograph of Earth captured by Voyager 1 in 1990 from nearly 6 billion km away. Popularised by Carl Sagan, it depicts Earth as a tiny speck, symbolising humanity's shared existence and the fragility of our planet.
- **Deep Space Network (DSN):** NASA's global radio antenna network located at Goldstone (USA), Madrid (Spain) and Canberra (Australia), used to communicate with deep-space spacecraft.

Significance

- Provides direct observations of interstellar space and cosmic radiation.

- Advances understanding of the heliosphere and interstellar environment.
- Demonstrates long-duration spacecraft engineering and deep-space communication capabilities.
- Reinforces Earth's uniqueness and the need for planetary protection.

UPSC Prelims PYQ – 2014 (GS Paper I)

Which of the following pairs is/are correctly matched?

Spacecraft	Purpose
1. Cassini-Huygens	Orbiting Venus and transmitting data to Earth
2. MESSENGER	Mapping and investigating Mercury
3. Voyager 1 and 2	Exploring the outer Solar System

Select the correct answer:

(a) 1 only
(b) 2 and 3 only
(c) 1 and 3 only
(d) 1, 2 and 3

Answer: (b) 2 and 3 only

Cassini-Huygens explored Saturn, not Venus; MESSENGER studied Mercury; Voyager 1 and 2 explored the outer Solar System.

• GEOPOLITICS

Why world is watching Trump-Xi-Putin meet

As the three leaders meet in Shenzhen, India and others will be looking for signs of whether the summit produces a grand bargain or simply remains a spectacle



SHUBHAJIT ROY

AS US President Donald Trump, Chinese President Xi Jinping and Russian President Vladimir Putin prepare to sit across the table for their first-ever trilateral meeting in Shenzhen, the world, and India, will be watching the summit's outcomes, and potential consequences, closely.

Many have compared the Asia-Pacific Economic Cooperation summit with the historic Yalta conference of February 1945, when US President Franklin D Roosevelt, British Prime Minister Winston Churchill and Soviet Union premier Joseph Stalin struck a deal that effectively divided post-war Europe into spheres of influence (see story alongside). At that time, World War II was coming to an end. In this case, the two wars in Russia-Ukraine and in West Asia against Iran appear rather intractable.

Before the trilateral, the Quad

Ahead of the trilateral meeting, Trump met the leaders of fellow Quad countries, India, Japan and Australia. All of them have long flagged China's belligerence in the Indo-Pacific region, and conveyed the concern at their meeting.

This was reflected in the joint document issued after the meeting of all four Quad leaders. It said the members strongly opposed any destabilising or unilateral actions that seek to change the status quo, including by force or coercion, which escalate tensions and undermine regional peace and stability.

The grouping flagged economic coercion, arbitrary export restrictions, choking of critical supply chains, freedom of navigation and overflight, deployment of trusted artificial intelligence (AI), resilient maritime transit corridors. Each of these are key challenges posed by Beijing. If that were not enough, the Quad leaders agreed to hold a maritime military exercise next year, double down on AI development and organise a business forum, signalling that they are keen on sticking together — even as Trump sups with Xi and Putin.

So, the worries of countries including India, Japan and Australia have been conveyed to Trump, despite him being soft on China in his second term. The question is, will he be able to hold the line?

China, to be sure, has always rejected the Quad, calling it a bloc that promotes confrontation and likening it to "sea foam".

The meeting of the strongmen

With Xi and Putin at the table, the temptation for Trump will be to cut a grand bargain with the two strongmen who face little to no challenge domestically.

Trump, however, is a democratically elected leader who has just been delivered a massive setback in the midterm elections. He may not be able to deliver the goods in the same way that both Xi and Putin can in their respective political contexts.

Xi would want his way in the South China Sea and Taiwan. Putin would want his way in Ukraine, where the war has now crossed World War I in duration. The Europeans will be watching Putin's actions more closely since it affects their security. Those in Southeast Asia, meanwhile, will be monitoring Xi.

Trump, as part of his strategic calculation, would want their help in stopping both the wars in Ukraine and West Asia. But for Xi, this is a golden opportunity. He wouldn't want to stop a war that has stretched American military, economic and diplomatic bandwidth.

Spectacle or substance

So, for many in the world watching the summit of the "big 3", or "group of 3", this would look like another spectacle — high-decibel, high on optics and without substantive outcomes. This playbook has happened before, from Trump's high-voltage meetings with North Korean leader Kim Jong Un and bilateral meetings with both Xi and Putin.

When Trump met Xi last year in October, the US President was able to buy time for the world. He had postponed the problem of the Rare Earth magnets and brought home the point of managing resilient supply chains when it comes to critical sectors.

The world had come to notice the dependencies on China during the Covid-19 pandemic, and the leverage that Beijing had over the world's supply chain systems. Washington had managed to buy more time for the world to develop their own supply chain, and diversify from China. So, from that perspective, this was an important win for the US and the world.

For China, Trump's acknowledgement of it as part of a "group of 2" was a recognition of its status as a global power. Under Xi, Beijing has been pursuing the goal of becoming the world's foremost power.

That will be the bigger question in New Delhi. India stands to be affected if China is emboldened to take more aggressive actions without facing consequences. Trump's power play with Xi is particularly consequential for India, given its border with China, which has become "more alive", as External Affairs Minister S Jaishankar said last weekend. This has required India to maintain a much larger troop presence along the frontier on a sustained basis.

New Delhi will be hoping that this G-3 moment is short-lived and does not take India back to 2020, when it had to significantly increase its force deployment along the China border in just 10 days.



(From left) US President Donald Trump, Chinese President Xi Jinping with his wife Peng Liyuan, and Russian President Vladimir Putin in Shenzhen. AP

The message from Quad

Trump met leaders of fellow Quad members ahead of the trilateral.

•

They flagged economic coercion, export curbs and choking of supply chains.

•

Each of these are key challenges posed by Beijing.

When 'big 3' met at Yalta in 1945



British PM Winston Churchill, US President Franklin Roosevelt and Soviet premier Joseph Stalin in Yalta. WIKIMEDIA COMMONS

THE US-CHINA-RUSSIA summit in Shenzhen, has been likened to a "Yalta 2.0" — a reference to the historic Yalta Conference of February 1945 where the eventual victors of World War II met at Yalta, in Crimea, to decide the fate of a post-war world. The following emerged out of the discussions among US President Franklin D Roosevelt, British Prime Minister Winston Churchill, and Soviet premier Joseph Stalin:

GERMANY DIVIDED: The three leaders agreed that after Germany's surrender, the country would be divided into four post-war occupation zones, controlled by American, British, French, and Russian military personnel.

The Allies also decided to assume some — but not sole — responsibility for post-war reparations (which was finalised in Potsdam later that year), besides ensuring Germany was completely demilitarised and "denazified".

EASTERN EUROPE: Stalin promised to allow free elections in all eastern European countries liberated from the Nazi occupation, in return for the US and Britain agreeing that these future governments in those countries be "friendly" to the Soviet Union.

UNITED NATIONS: Stalin also agreed to the Soviet Union participating in the UN, envisioned as an international peacekeeping organisation at the time, on the condition that permanent members of the UN Security Council would hold the right to veto.

PACIFIC FRONT: Stalin also promised to join the war against Japan after Germany's surrender in return for control of territories Russia had lost to Japan in the Russo-Japanese War (1904-05).

The hopes raised at Yalta soon fizzled out. The end of one conflict would only be succeeded by the start of another, albeit a cold and longer one.

- ABHINAV CHAKRABORTY

2. Trump–Xi–Putin Meeting: Implications for Global Power Equations

Source: The Indian Express | **GS II – International Relations**

Context: The proposed first trilateral meeting of US President Donald Trump, Chinese President Xi Jinping and Russian President Vladimir Putin in Shenzhen is being closely watched for its potential impact on global geopolitics, economic competition and international security.

1. Strategic Interests of the Three Powers

- **United States:** Seeks economic and strategic gains, manages competition with China and explores diplomatic options on Ukraine and West Asia.
- **China:** Seeks recognition as a global power, greater strategic space in the Indo-Pacific and reduced US pressure.
- **Russia:** Seeks diplomatic legitimacy and greater bargaining power amid the Ukraine conflict and tensions with Western countries.

2. Major Issues

1. **Ukraine and West Asia:** Possibility of diplomatic engagement to address ongoing conflicts.
2. **Economic competition:** Trade restrictions, critical minerals, semiconductor supply chains and technology controls.
3. **Indo-Pacific security:** China's actions concerning Taiwan and the South China Sea.
4. **Global order:** Whether the meeting produces a substantive strategic understanding or remains largely symbolic.

3. Why the Meeting Matters

- A US–China understanding could reshape Indo-Pacific security dynamics.
- A US–Russia agreement could influence the Ukraine conflict and European security.
- Coordination among the three powers could affect global institutions and the balance of power.

4. Historical Linkage: Yalta Conference (1945)

- **Participants:** US President Franklin D. Roosevelt, British Prime Minister Winston Churchill and Soviet leader Joseph Stalin.
- **Discussions:** Post-war European order, Germany's occupation, Eastern Europe and arrangements for establishing the United Nations.
- **Relevance:** Like the proposed Shenzhen meeting, Yalta involved major powers discussing the future international order; however, the geopolitical contexts are different.

5. Implications for India

1. **Strategic autonomy:** Maintain balanced relations with all three powers.
2. **Border security:** Monitor changes in China's strategic calculations.
3. **Indo-Pacific:** Strengthen the Quad and regional maritime cooperation.
4. **Economic security:** Diversify critical mineral and technology supply chains.
5. **Global leadership:** Support a multipolar, rules-based international order.

11 states, UTs are 'fully literate'; MP leads in adult learners

Gayathri Mani
New Delhi, November 18

AS MANY as 11 states and Union Territories (UTs) have declared themselves "fully literate" under the Centre's adult literacy initiative ULLAS–Nav Bharat Saaksharta Karyakram. These are Ladakh, Mizoram, Goa, Tripura, Himachal Pradesh, Chandigarh, Andaman and Nicobar Islands, Sikkim, Uttarakhand, Jammu and Kashmir, and Lakshadweep.

Officials said "achieving 95% literacy in a state or UT is... equivalent to being fully literate, as 100% literacy is not possible due to reasons such as advanced age of some people and certain intellectual disabilities that may affect ability to read and write."

Over 90.96 lakh learners aged 15 and above have taken the Foundational Literacy and Numeracy Assessment Test (FLNAT) this academic year.

"... FLNAT is a mechanism under ULLAS to evaluate learners' reading, writing and numeracy skills. Successful learners are certified as 'Literate' by the National Institute of Open Schooling," said a government official.

The FLNAT is conducted twice a year, according to Ministry of Education data. More than 90.96 lakh learners have appeared in 2026-27 so far. Overall, 4.15 crore learners across 34 states and UTs have taken the test, with a success rate above 90%. Madhya Pradesh leads with 20.43 lakh adult learners, followed by Rajasthan (18.18 lakh), Odisha (12 lakh), Telangana (7.54 lakh), Maharashtra (6.5 lakh) and Tamil Nadu (4.5 lakh).

The Department of School Education and Literacy has been implementing the ULLAS–Nav Bharat Saaksharta Karyakram since 2022-23, said officials.

"In pursuance of NEP 2020, the scheme targets non-literate persons aged 15 and above. The scheme is being implemented in a hybrid mode through volunteerism, utilising school and higher education institution (HEI) platforms and community engagement. It consists of five components — foundational literacy and numeracy, critical life skills, basic education, vocational skills and continuing education," the official said.

Officials said the scheme has raised India's literacy rate to 81.1%, from 74.04% in Census 2011. More than 4.17 crore learners and 52.89 lakh volunteer teachers have registered on the ULLAS mobile app.



3. 11 States/UTs Declared Fully Literate under ULLAS

Source: The Indian Express | **GS II – Education, Social Justice**

Context: Eleven States/UTs have declared themselves fully literate under the Centre's ULLAS–Nav Bharat Saaksharta Karyakram.

1. ULLAS Scheme

- **Full form:** Understanding of Lifelong Learning for All in Society; also known as New India Literacy Programme (2022–27).
- Implemented by the Ministry of Education in alignment with **NEP 2020**.
- Targets non-literate persons aged **15 years and above**.
- Five components: Foundational literacy and numeracy, critical life skills, basic education, vocational skills and continuing education.

2. Criteria for Full Literacy

- **95% or above literacy rate** is considered equivalent to full literacy.
- Literacy includes the ability to read, write and perform numerical calculations with comprehension.
- Learners are assessed through the **Foundational Literacy and Numeracy Assessment Test (FLNAT)**.

3. Fully Literate States/UTs (11)

- **States (6):** Mizoram, Goa, Tripura, Himachal Pradesh, Sikkim and Uttarakhand.
- **UTs (5):** Ladakh, Chandigarh, Andaman and Nicobar Islands, Jammu and Kashmir and Lakshadweep.

4. Progress

- Over **4.15 crore learners** across 34 States/UTs have appeared for FLNAT, with a success rate above 90%.
- Madhya Pradesh leads in adult learners assessed (20.43 lakh), followed by Rajasthan and Odisha.
- India's literacy rate reported at **81.1%**, compared with 74.04% in Census 2011.

5. Significance

1. Promotes inclusive education and lifelong learning.
2. Empowers women through greater financial and social awareness.
3. Improves employability and vocational skills.
4. Strengthens digital and financial inclusion.
5. Advances **SDG 4 – Quality Education**.

THE 10M X 10M LIVE EXCAVATION SITE WILL BE OPENED TO PUBLIC LATER

For SCO meet, Purana Qila opens cultural walk through 2,000 yrs of Delhi history

Divya A
New Delhi, November 18

ALMOST A century ago, a Sanskrit stone epigraph written in the Nāgarī script was recovered from a stepwell in the erstwhile village of Sarban, near the present-day Raisina Road in Delhi. It has since been preserved by the Archaeological Survey of India (ASI).

PAGE 1 anchor

The inscription referring to Delhi as Indraprastha, which is said to correspond with references in the Mahabharata text, is being rolled out for a specially curated display at Purana Qila, the venue for the first SCO Civilisational Dialogue Forum being hosted by India.

Besides the inscription dating back to the year 1328, delegates for the SCO event will get to see painted grey ware pottery pieces found during earlier rounds of excavation at the site, and an installation of "ashwamegh" (horse sacrifice ritual). These will be displayed around a 10mx10m live excavation site, showcasing over 2,000 years of culture in Delhi.

Called Astitva, the site will be inaugurated by Prime Minister Narendra Modi on Friday and showcased to SCO delegates over the weekend in an effort to highlight India's cultural and civilisational identity. The first-of-its-kind cultural walkthrough will later be opened to the public.

On Tuesday, the site was the scene of hectic activity, with workers giving the final touches ahead of the Friday deadline, and ASI officials and archaeologists supervising the work.

Vasant Swarnkar, ASI's Director (Museum), who is leading the present round of excavation at the site, said, "The present digging has reached up to 6.5 metres deep, exposing 2,100 years of continuous history, right from the Mauryan period to the Mughal period. This will be ready for showcase to the public once the SCO forum event is over."



The Astitva site in Delhi's Purana Qila is set to be inaugurated by Prime Minister Narendra Modi on Friday. DIVYA A

Swarnkar, who has led earlier seasons of excavation at Purana Qila, said, "At other corners excavated on the same mound previously, we have reached deeper down, finding continuous civilisational traces for 3,000 years."

The present citadel at Purana Qila is believed to have been built under Sher Shah Suri, but, according to Swarnkar, the excavations point to traces from around the 3rd century BC, the pre-Mauryan period.

On the ASI website, the description for Purana Qila says, "Sher Shah Suri seems to have razed to the ground the city of Dinpanah built by Humayun, and on the same site, which was also perhaps the site of Indraprastha, believed to be the capital of the Pandavas, he raised the citadel of Purana-Qal'a with an extensive city-area sprawling around it."

The then ASI director B B Lal had unearthed traces of painted grey ware under the mound in the first two rounds of excavations, in 1954-55 and 1969-72. Lal had embarked on a mission to excavate sites mentioned in the Mahabharata text and claimed to have found such traces as a common feature.

Apart from the excavated trench with its story told through special laser effects, a temporary exhibition is being set up for the SCO Forum. Officials said pieces of pottery found here and at other sites relating to the same culture, including Hastinapur, will be on display.

According to Swarnkar, evidence of "ashwamegh" was found here during an earlier excavation, so an installation recreating that will also be created. A model of a four-room house complex from the Kushan period will be on display, besides coins belonging to traders, officials said.

The delegates from SCO countries visiting India, including China, Pakistan and Iran, will get a first-hand experience of India's civilisational history, officials from the Ministry had said at a press conference announcing the event last week.

4. Purana Qila: Tracing 2,000 Years of Delhi's History

Source: The Indian Express | **GS I – Ancient History, Art & Culture, Archaeological Heritage**

Context: The Archaeological Survey of India (ASI) is showcasing excavations at Delhi's Purana Qila through 'Asttiva', a cultural exhibition for the Shanghai Cooperation Organisation (SCO) Civilisational Dialogue Forum, highlighting Delhi's ancient settlement and cultural evolution.

1. Historical Background

- **Ancient association:** Traditionally identified with **Indraprastha**, the capital of the Pandavas mentioned in the Mahabharata; archaeological evidence has not conclusively established this identification.
- **Humayun (1533):** Founded **Dinpanah** (Refuge of the Faith) and developed the fort as part of his new capital.
- **Sher Shah Suri (1540–1545):** Defeated Humayun, took control of Delhi and developed the fort complex, traditionally associated with Shergarh.
- **Humayun (1555):** Regained Delhi and the Mughal throne; died in 1556 after falling from the steps of Sher Mandal.

2. Important Architectural Features

- **Qila-i-Kuhna Mosque (1541):** Built by Sher Shah Suri; an important example of Afghan architecture and a transitional phase in Indo-Islamic architecture.
- **Sher Mandal:** Double-storeyed octagonal pavilion associated with Humayun, traditionally believed to have been used as his library.
- **Bada Darwaza and Humayun Darwaza:** Important gateways reflecting the fort's architectural character.

3. Archaeological Excavations and Findings

- First major excavation conducted by **B.B. Lal in 1954–55**, followed by subsequent excavation phases.
- Findings indicate successive habitation layers extending from the **pre-Mauryan period to the Mughal period**.
- **Painted Grey Ware (PGW):** Pottery associated with the early Iron Age and often linked in historical discussions with the Mahabharata period.
- Other findings include pottery, coins, terracotta objects, a Kushan-period house complex and evidence of different cultural phases.
- Recent excavation has reached approximately 6.5 metres, revealing around 2,100 years of historical remains, as reported.

4. Latest Development – Asttiva

- A 10 × 10 metre live excavation site is being showcased to SCO delegates.
- Exhibits include pottery, coins and an installation depicting the Ashvamedha (horse-sacrifice) ritual.
- The site is expected to open to the public after the SCO event.

5. Significance

1. **Civilisational continuity:** Reveals successive phases of Delhi's settlement and cultural evolution.
2. **Historical understanding:** Archaeology helps reconstruct ancient societies, material culture and patterns of habitation.
3. **Heritage conservation:** Highlights the importance of scientific excavation and preservation.
4. **Cultural diplomacy:** Showcases India's archaeological heritage to international visitors through the SCO forum.

UPSC Prelims PYQ – 1993 (GS Paper I)

Which one of the following is a monument constructed by Sher Shah?

(a) Qila-i-Kuhna Mosque at Delhi
(b) Atala Masjid at Jaunpur
(c) Bara Sona Masjid at Gaur
(d) Quwwat-ul-Islam Mosque at Delhi

Answer: (a) Qila-i-Kuhna Mosque at Delhi

• CULTURE

Saraiki: Language of folk song seeing surge in popularity

Suanshu Khurana
New Delhi, November 18

AN AGE-OLD folk song has now become a cross-border social media hit after an acoustic rendition by two Pakistanis, medical student Shanzy Sial and musician Mohsin Lashari. *Chhalrey Chhalrey Waal* (translating to curly hair), is the story of a woman praising her beloved's charms. What has caught the eye is that the song is in the Saraiki language — spoken predominantly in southern Pakistan, and extending into parts of western and central-western Pakistan as well as by some communities in India.

The origins of Saraiki

An Indo-Aryan language, Saraiki is spoken predominantly in southern Punjab in Pakistan, particularly in and around Multan, Bahawalpur, Dera Ghazi Khan and Muzaffargarh. The language extends into northern Sindh and parts of Balochistan and Khyber Pakhtunkhwa.

It is also spoken by migrant communities in India, particularly those whose families came from the Saraiki-speaking regions of western Punjab during Partition. While it is not an official language in India, it is spoken by some in Punjab, Delhi, Haryana and Uttar Pradesh, among others. Some of its variants, like Jhangi and Derawali, are also spoken in India. According to Pakistan's 2023 census, around 12% of the country speaks the language.

Saraiki is closely related to Punjabi, Sindhi and other north-western languages. A 1977 paper by British linguist Christopher Shackle describes Saraiki as "the language of the middle Indus valley". It comes under the umbrella term Lahnda, the dialects of western Punjab. Lahnda means the land where the sun sets. The language developed in close contact with Punjabi and Sindhi while having its own form. It was also called Multani once.

5. Saraiki: Language of Folk Song Witnessing a Surge in Popularity

Source: The Indian Express | **GS I – Indian Culture, Literature and Regional Languages**

Context: The traditional Saraiki folk song *Chhalrey Chhalrey Wall* has gained cross-border popularity through a contemporary rendition, highlighting the linguistic and cultural heritage of Saraiki-speaking communities.

1. Classification of Indian Languages

Indian languages are broadly classified into four major language families:

Language family	Major languages
Indo-Aryan	Hindi, Bengali, Punjabi, Gujarati, Marathi, Assamese, Odia, Sindhi, Kashmiri, Saraiki
Dravidian	Tamil, Telugu, Kannada, Malayalam
Austroasiatic	Santali, Mundari, Khasi, Ho
Sino-Tibetan (Tibeto-Burman)	Bodo, Manipuri (Meitei), several languages of Northeast India

2. Classification of Indo-Aryan Languages

Indo-Aryan belongs to the **Indo-Iranian branch of the Indo-European language family**. Its development is broadly divided into three stages:

Stage	Major languages

Old Indo-Aryan	Vedic Sanskrit, Classical Sanskrit
Middle Indo-Aryan	Pali, Prakrit, Apabhramsha
New Indo-Aryan	Hindi, Punjabi, Bengali, Gujarati, Marathi, Assamese, Odia, Sindhi, Saraiki

Saraiki belongs to the New Indo-Aryan stage.

3. Saraiki: Origin and Distribution

- An Indo-Aryan language spoken predominantly in southern Punjab, Pakistan, particularly Multan, Bahawalpur, Dera Ghazi Khan and Muzaffargarh.
- Also spoken in parts of Sindh, Balochistan and Khyber Pakhtunkhwa.
- In India, spoken by migrant communities, particularly those with roots in western Punjab.
- Around 12% of Pakistan's population speaks Saraiki, according to the 2023 Census.

4. Linguistic and Literary Heritage

- Closely related to Punjabi and Sindhi, with distinct grammar, vocabulary and pronunciation.
- Historically associated with **Lahnda**, an umbrella term for western Punjabi dialects; earlier also known as Multani.
- **Khwaja Ghulam Farid:** 19th-century Sufi poet known for devotional poetry (*Kafis*).
- **Pathanay Khan:** Folk singer who recorded *Chhalrey Chhalrey Wall* in 1989.
- Saraiki folk music and Sufi poetry preserve regional identity and oral traditions.

5. Cultural Significance

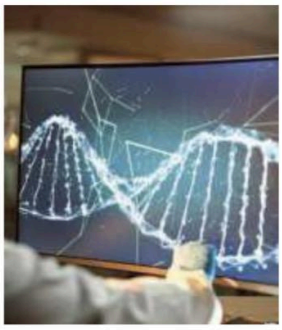
1. Preserves South Asia's linguistic diversity and folk traditions.
2. Reflects shared cultural heritage across India and Pakistan.
3. Sustains Sufi poetry, music and syncretic traditions.
4. Promotes regional languages through contemporary music and digital platforms.

New AI-based blood test uses changes in DNA to identify multiple types of cancer

Afshan Yasmeen
BENGALURU

A blood test that looks for cancer-related changes in DNA has shown the potential to detect multiple types of cancer. In a study, the test detected 72% of cancer cases, with a false-positive rate of 1.4%.

The blood test, CancerSpot, developed by Bengaluru-based Strand Life Sciences, uses DNA sequencing and Artificial Intelligence (AI) to identify changes in DNA that can indicate the presence of cancer. The research, involving 1,480 participants and 43 hospitals across India, including five in Karnataka, was conducted over four years as part of the development and clinical validation of the test.


The blood test uses uses DNA sequencing to detect cancer.

The findings have been published in the *Proceedings of the National Academy of Sciences (PNAS)*, a peer-reviewed scientific journal.

Cells in the body release small fragments of DNA into the bloodstream. These are known as circulating or cell-free DNA. In people with cancer, some of these fragments originate from tumour cells and carry changes that can help identify the disease.

AI-based analysis

CancerSpot combines DNA sequencing with AI-based analysis to examine patterns of DNA methylation. Methylation refers to chemical modifications of DNA that influence how genes function. These patterns differ between cancer cells and normal cells.

By analysing these patterns, the test aims to detect multiple types of cancer through a single blood test, without requiring a tissue biopsy for the initial detection, said Ramesh Hariharan, CEO of Strand Life Sciences, who is one of the authors of the study.

CancerSpot was evaluated in newly diagnosed patients with 14 types of cancer and healthy individuals. In an independent validation cohort, it detected 72% of patients with cancer, with a false-positive rate of 1.4%.

A low false-positive rate is important in cancer screening, as it can help reduce unnecessary follow-up investigations and invasive procedures among healthy individuals.

6. CancerSpot: AI-Based Blood Test for Detecting Multiple Cancers

Source: The Indian Express | **GS III – Science & Technology, Biotechnology, Health**

Context: Bengaluru-based Strand Life Sciences has developed **CancerSpot**, an AI-based blood test that combines DNA sequencing and artificial intelligence to identify multiple types of cancer through changes in circulating DNA.

1. How Does It Work?

- **Cell-free DNA (cfDNA):** Small DNA fragments released by body cells into the bloodstream. Cancer cells also release fragments carrying tumour-related changes.
- **DNA Methylation:** Chemical modification of DNA that regulates gene activity without altering its sequence. Abnormal methylation patterns can indicate cancer.
- **AI-based analysis:** Identifies abnormal DNA methylation patterns to distinguish cancer-related changes from those in healthy cells.

2. Study and Performance

- Tested on **1,480 participants across 43 hospitals**, covering 14 cancer types.
- Detected **72% of cancer cases**, with a **1.4% false-positive rate** in independent validation.
- Findings published in *Proceedings of the National Academy of Sciences (PNAS)*.

3. Significance

1. **Early detection:** Potential to identify multiple cancers through a single blood test.
2. **Non-invasive screening:** May reduce the need for tissue biopsy during initial detection.
3. **Diagnostic advancement:** AI-based analysis improves identification of complex molecular patterns.
4. **Healthcare accessibility:** Potential to expand cancer screening and enable earlier medical intervention.

Limitation: It is a promising screening technology, not a replacement for confirmatory diagnosis; further clinical validation is required.

UPSC Prelims PYQ – 2019 (GS Paper I)

With reference to recent developments in science, which one of the following statements is NOT correct?

(a) Functional chromosomes can be created by joining segments of DNA taken from cells of different species.

(b) Pieces of artificial functional DNA can be created in laboratories.

(c) A piece of DNA taken out from an animal cell can be made to replicate outside a living cell in a laboratory.

(d) Cells taken out from plants and animals can be made to undergo cell division in laboratory Petri dishes.

Answer: (a)

Related concept: DNA synthesis, DNA replication and cell culture.