

SCIENCE CENTRE NEWS LETTER

September 2025

Issue 114



Published by
Shalini Agarwal

I.A.S.
Municipal
Commissioner

Editor

D. B. Mistry

Dy. Municipal
Commissioner

Sub Editor

Divyeshkumar. S. Gameti

I/C Chief Curator

Co-ordinator

Dr. Pruthul Desai

Principal
P. T. Science College



SCIENCE CENTRE

Volume 10, Issue 6

WHAT'S NEW IN SCIENCE?

Bengaluru's Kaala Bhairav combat AI drone promises 30-hr range, swarm strike power and strategic autonomy at a fraction of Predator's price.

Flying Wedge Defence and Aerospace (FWDA) has announced the readiness of India's first AI-powered Medium Altitude Long Endurance (MALE) combat drone. The launch was held in Bengaluru on 22 August 2025, with the aircraft named Kaala Bhairav after the guardian deity associated with time. A video of the successful test flight was screened at the event.

The company revealed it has secured a \$25 million export order from a South Asian country, part of a \$30 million strategic deal. According to FWDA, the order underlines international trust in Indian-made autonomous aircraft and demonstrates India's emergence as a credible supplier of advanced defence systems.

Strategic autonomy at lower cost

Speaking at the launch, Suhas Tejaskanda, Founder and CEO of FWDA, said, "For decades, India has relied on foreign systems like Predator and Israeli Searcher models, but at a high strategic cost, from embedded kill-switch vulnerabilities to critical flight data routed through external servers. The global geopolitical landscape is shifting rapidly. India's strategic relations with the U.S. have taken a new turn this year, given that the much-touted defence...



He added, "With tightening U.S. defence regulations and shifting global policies, India cannot afford digital dependency during wartime. Dependence on foreign systems could limit India's strategic autonomy, as sensitive operational data may be routed through external networks and remain accessible to overseas

agencies."

Kaala Bhairav: Performance and features

The Kaala Bhairav, officially called the E2A2 (Economic and Efficient Autonomous Aircraft), has been designed and built in India. Its twin-boom configuration carries a 91 kg payload, including electro-optical sensors, guided rockets and fuel.

Key specifications include:

- Endurance of up to 30 hours
- Range of 3000 km with satellite communication
- Ceiling of 20,000 feet
- Cruise speeds between 42 m/s and 52 m/s
- Capability for short take-off and landing

The platform uses AI for adaptive targeting, autonomous flight pathing and live combat decision-making.

Main Source:-

<https://economictimes.indiatimes.com/news/defence/bengaluru-kaala-bhairav-combat-ai-drone-promises-30-hr-range-swarm-strike-power-and-strategic-autonomy-at-a-fraction-of-predator-drones-price/articleshow/123453552.cms?from=mdr>

SCIENTIST OF THE MONTH

Asima Chatterjee

Asima Chatterjee was born on September 23, 1917, at Kolkata in West Bengal. She did her D.Sc. from Calcutta University. She did her postdoctoral research, from the University of Wisconsin in U.S.A., during the year 1947-48. Asima Chatterjee contributed immensely to the fields of natural products, especially alkaloids, polyphenolics, terpenoids and coumarins derived from Indian medicinal plants. She has to her credit over 350 research papers. She worked as the Editor of the Journal of the Indian Chemical Society. She is also the author of



the 'Bharater Banushadi'(wild medicinal plants of India) and 'Sara Madhyamic Rasayana'. Professor Chatterjee was the recipient of the Nagarjuna Prize. She was nominated as the Member, Rajya Sabha for two terms in 1982, 1984. She received the Padma Bhushan in 1975, Sir C.V. Raman Award in 1985 and Shanti Swarup Bhatnagar Prize in 1961. She was elected 'Woman of the year' in 1975 by the Bengal chamber of commerce. She died on November 23, 1937.

Main source: 101, Great Indian Scientists Book, By Shyam Dum



Timings

Tuesday to Sunday

& Public Holidays

9.30 am to 4.30 pm

Address

Science Centre
City Light Road,
Surat - 395 007

Contact

0261 - 2255947
+91 97277 40807

Fax No.

91-261-2255946

E mail

sciencecentre@suratmunicipal.org

Web Site

www.suratmunicipal.gov.in



SCIENCE FACTS SEPTEMBER 2025

1 September 1877	British Chemist and Physicist Francis William Aston (Winner of the 1922 Nobel Prize in Chemistry for his discovery of isotopes in many non- radioactive elements and for his enunciation of the whole number rule) was born.
2 September 1853	German Chemist Wilhelm Ostwald (Winner of the 1909 Nobel Prize in Chemistry for his scientific contribution to the fields of catalysis, chemical equilibria and reaction velocities) was born..
3 September 1899	Australian virologist Frank Macfarlane Burnet (Co-winner of the 1960 Nobel Prize in Physiology/Medicine for predicting acquired immune tolerance) was born.
3 September 1938	Japanese Chemist Ryoji Noyori (Co-winner of the 2001 Nobel Prize in Chemistry for their work on chirally catalysed hydrogenation reactions) was born.
4 September 1906	German Biologist Max Delbruck (Co-winner the 1969 Nobel prize in Physiology/ Medicine for their discoveries concerning the replication mechanism and the genetic structure of viruses) was born.
6 September 1892	English Physicist Edward Appleton (Winner of the 1947 Nobel Prize in Physics for his work proving the existence of the ionosphere) was born.
7 September 1917	Australian Chemist John Cornforth (Co-winner of the 1975 Nobel Prize in Chemistry for his work on the stereochemistry of enzyme-catalysed reactions) was born.
8 September 1918	British Chemist Derek Harold Richard Barton (Co-winner of the 1969 Nobel Prize in Chemistry for contributions to the development of the concept of conformation and its application in chemistry) was born.
9 September 1922	German –born Physicist Hans Georg Dehmelt (Co-winner of the 1989 Nobel Prize in Physics for co-developing the ion trap technique) was born.
10 September 1892	Arthur Holly Compton (Inventor of Compton effect) was born.
12 September 1897	French Physicist Irene Joliot-Curie (Co-winner of the 1935 Nobel Prize in Chemistry for their discovery of induced radioactivity) was born.
16 September	“International Day for the preservation of the Ozone Layer”. (U.N.)
18 September 1907	American Physicist Edwin McMillan (Co-winner of the 1951 Nobel Prize in Physics who is the first to produce a transuranium element, Neptunium) was born.
21 September	"International Day of Peace"(U.N.).
21 September 1926	American Physicist Donald A. Glaser (Winner of the 1960 Nobel Prize in Physics for his invention of the bubble chamber used in subatomic particle physics) was born.
22 September 1791	Michael Faraday (Discoverer of electromagnetic Induction) was born.
22 September 2025	Autumnal equinox: On this day, Day and night becomes equal on the earth.
23 September 1915	American Physicist Clifford Shull (Co-winner of the 1994 Nobel Prize in Physics for the development of the neutron scattering technique) was born.
25 September 1866	American geneticist Thomas Hunt Morgan (Winner of the 1933 Nobel Prize in Physiology/ Medicine for discoveries elucidating the role that the chromosome plays in heredity) was born.
28 September	“World Rabies Day”. (WHO)
28 September 1852	French Chemist Henri Moissan (Winner of the 1906 Nobel Prize in Chemistry for his work in isolating fluorine from its compounds) was born.
28 September 2008	SpaceX launches the first ever private spacecraft, the Falcon 1 into orbit.
29 September 1901	Enrico Alberto Fermi (Winner of the 1938 Nobel Prize in physics for his work on Induced Radioactivity) was born.

U.N. – United Nations

WHO – World Health Organization

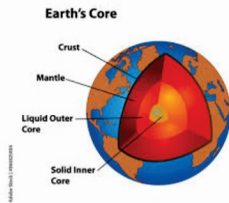
UNESCO – United Nations Educational Scientific & Cultural Organization

Ans: 1. a 2. c 3. b 4. d 5. d

SCIENTIFIC QUESTION

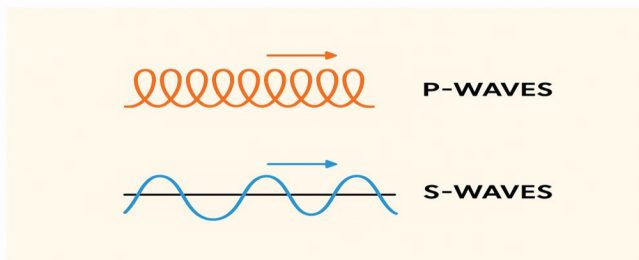
How Do We Know Earth's Outer Core is Liquid?

Scientists cannot drill deep enough to directly observe Earth's core—the deepest borehole ever dug is only about 12 km, which is a tiny fraction of Earth's 6,371 km radius. Instead, they rely on **seismology**, the study of earthquake waves, to investigate Earth's internal structure. These seismic waves act like natural X-rays that reveal what lies deep inside the planet.



A crosssection of Earth showing the crust, mantle, outer core (liquid), and inner core (solid)

When an earthquake occurs, it sends out energy in the form of **seismic waves**. There are two main types used to study Earth's core. **P-waves (Primary waves)** are compression waves that can travel through solids, liquids, and gases. **S-waves (Secondary waves)** are shear waves that can only travel through solids—they cannot move through liquids or gases.

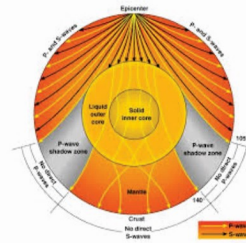


(Simple diagram showing P-waves moving like a slinky and S-waves moving side-to-side like a rope)

By recording earthquakes across the globe with seismographs, scientists made three important observations.

1. **S-waves disappear beyond 103° from the earthquake's origin.** This creates an S-wave “shadow zone,” proving that they are blocked by a liquid layer deep inside Earth.
2. **P-waves do not vanish but instead bend (refract) sharply** as they pass through this liquid, creating a P-wave shadow zone between 103° and 150°. This bending shows that P-waves are slowing down in a liquid medium.
3. Beyond 150°, P-waves reappear, and seismologists have even detected very faint S-waves (called PKJKP

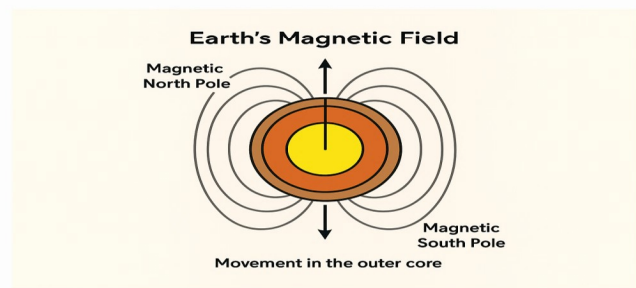
waves) that pass through the innermost region. This provides strong evidence that the **outer core is liquid**, while the **inner core is solid**.



(Seismic wave paths drawn through Earth with clear S-wave shadow zone and P-wave shadow zone highlighted)

The explanation for this structure lies in temperature and pressure. The **outer core is extremely hot (about 4,000–6,000°C)**, which is above the melting point of iron and nickel at those pressures, so the metals remain molten. The **inner core, although even hotter (~6,000°C+)**, is under such enormous pressure that iron solidifies again.

Finally, the liquid outer core is not just a scientific curiosity—it plays a critical role in life on Earth. The **movement of molten iron in the outer core generates Earth's magnetic field** through the geodynamo effect. This magnetic field shields the planet from harmful solar radiation and makes Earth habitable.



(Diagram of Earth's magnetic field generated by movement in the outer core)

In summary: Earth's liquid outer core was discovered by studying how seismic waves travel during earthquakes. The blocking of S-waves and the bending of P-waves reveal that the outer core is molten, while the return of some P-waves and faint S-waves show that the inner core is solid. Together, these patterns provide a clear scientific explanation of Earth's hidden structure.

SCIENCE FAIR 2025

“Science Fair-2025” was organized by Surat Municipal Corporation at Art Gallery of Science Centre, which was inaugurated by Cultural Committee Chairperson Smt. Sonalben Desai. Total 80 projects Prepared by 157 Students and 58 Teachers from 51 Schools of Surat were displayed in this Science Fair, during 22 & 23 August, 2025

The theme of this Science Fair was “Empowering Indian Youth for Global Leader in Science and Innovation for Viksit Bharat”. In this Science Fair, projects having innovative ideas were displayed by the students of the School under the following topics:

1. Building Sustainable future of Digital India for the Global Leadership - 29 projects
2. Empowering youth for Viksit Bharat - 10 projects
3. Enhancing skill development of youth in the field of Science & Innovation - 41 projects

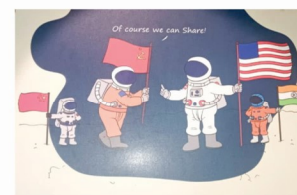
Cultural Committee Chairperson Smt. Sonalben Desai and Leader-Ruling party Smt Shashiben Tripathi visited the science fair observed the projects and presented mementos to the participants.



KNOW THE ENTERING SPACE GALLERY EXHIBIT

International Space Law (Seclected)

The exploration and use of outer space, astronomical bodies, shall be carried out for the benefit and in the interests of all countries, irrespective of their degree of economic or scientific development.



This exhibit is located in the Entering Space Gallery on the first floor of the Science Centre, situated between the Fun Science Gallery and the Power of Play Gallery.

QUIZ

1. Which color is at the top of rainbow seen in the sky?
a. Red b. Purple c. Blue d. Green
2. Which light phenomenon is responsible for the early sunrise and late sunset?
a. Atmospheric reflection b. Splitting of light
c. Atmospheric refraction d. Total internal reflection
3. In which direction does the rainbow seen during the rainy season in the morning?
a. East b. West c. North d. South
4. To which phenomenon is the brilliance of a diamond attributed?
a. Reflection of light b. Refraction of light
c. Scattering of light d. Total internal reflection of light
5. Rainbows are caused by which light phenomenon?
a. Refraction b. Splitting c. Internal reflection d. All give