January 2024
Volume 03
Issue 01

Param Science Magazine

A **Mythic Society** Collab

Science Flashbacks

Astronomy Watch (Dec/Jan)

Message from the Editorial Desk

As the new year begins, it marks a celebration of fresh beginnings and prompts reflection on our past. In tune with this spirit, Param Science Magazine has set itself on a path of reinvention, aiming to deliver even more interesting and "sciencey" content to our readers.

In this issue, we're reflecting on our Scientific past as we time travel with 'Science Flashbacks'— exploring one awesome discovery each month that changed the game for humanity. But that's not all – we present 'Astronomy Watch (Dec/Jan),' another section exploring three major Astronomy events that occur yearly.

And there's more to unveil! Introducing a new recurring segment, Science Updates,' a space curated by our editors where you can discover interesting and intriguing news from the ever-evolving world of Science.

As always, we are always eager to hear from you! Reach out to us at our new e-mail: **magazine@paraminnovation.org**

Happy New Year and Happy reading!

Saurab Gupta
Managing Editor

ON THE COVER
An AI visualisation of electricity, one of the greatest discovery of all time

All the references for this magazine can be found on **paraminnovation.org/magazine-references/**

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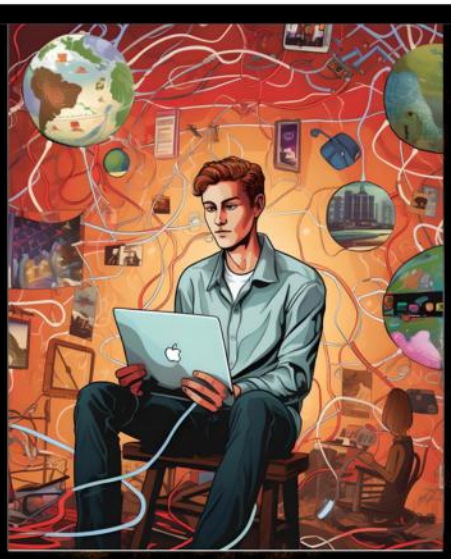
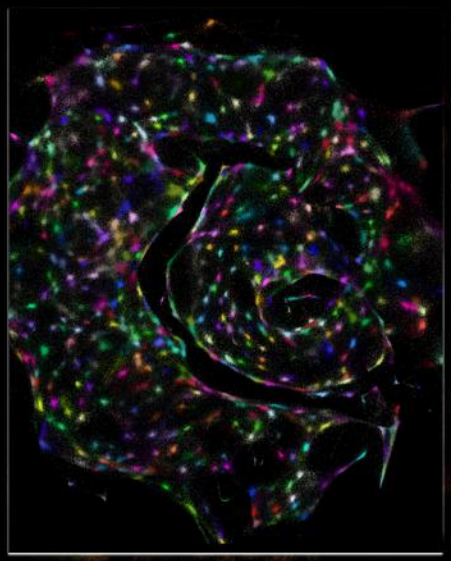
Science Flashback





Each year brings a fresh wave of discoveries and inventions, but it's important to remember the foundations they're built upon. That's why, month by month, we're thrilled to share incredible tales of scientific breakthroughs and inventions from years gone by.

ABOVE
An AI illustration showing the infinite possibilities unlocked after the discovery of the internet

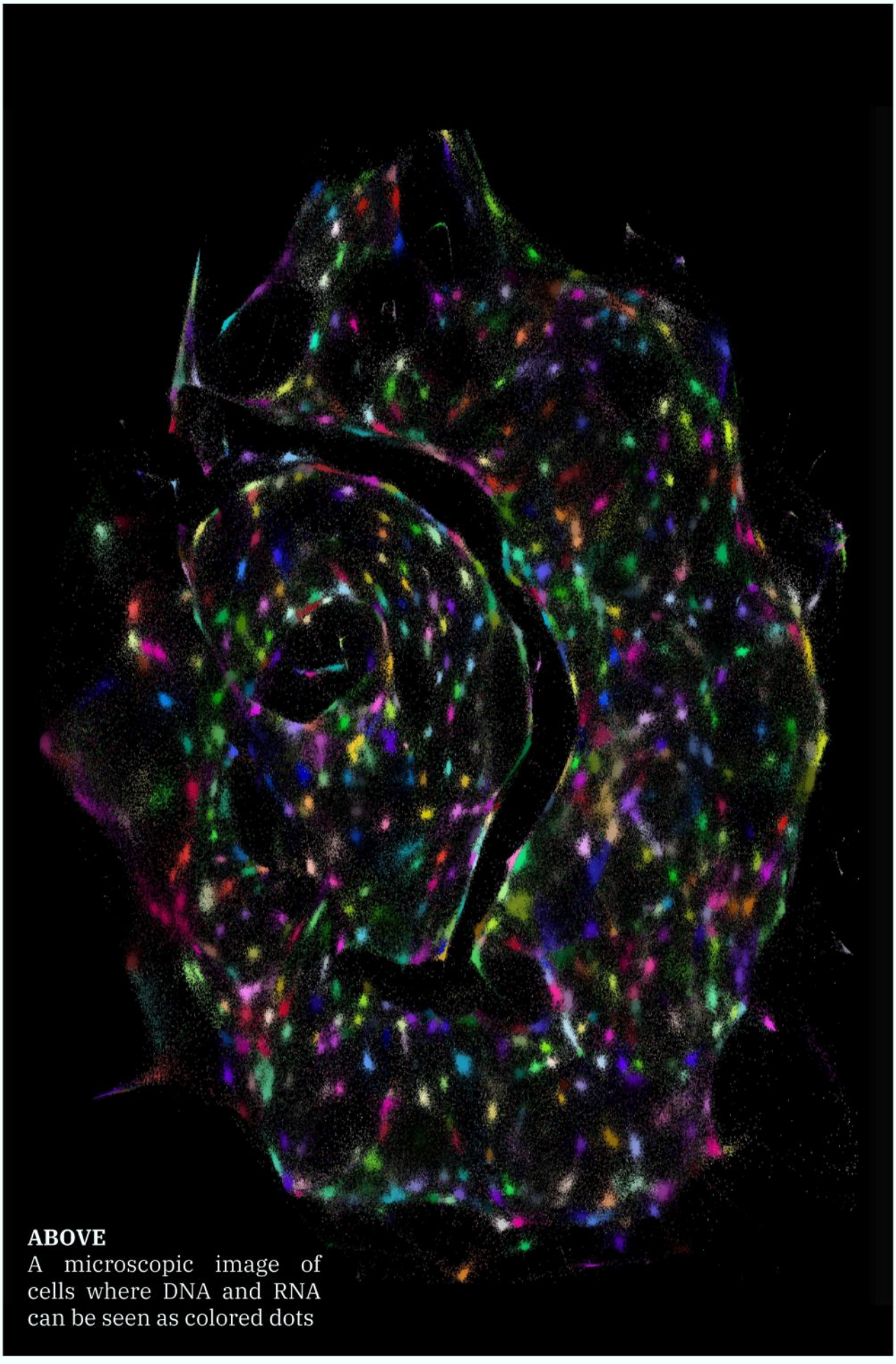
The Internet

Connecting the World Since 1983

On January 1, 1983, a revolution in communication was born: the Internet. Before this date, different computer networks couldn't easily talk to each other. The introduction of the Transfer Control Protocol/Internetwork Protocol (TCP/IP) changed everything, letting diverse computers on various networks communicate. This shift marked the official birth of the Internet, as ARPANET and the Defense Data Network adopted TCP/IP, creating a universal language for network connection.

Its origins trace back to the Cold War era. In 1968, the Defense Advanced Research Projects Agency (DARPA) teamed up with BBN, a research company, to create ARPANET, initially to link Pentagon - funded computers via telephone lines. This project was spurred by military needs during the Cold War, aiming to develop a system resistant to nuclear attacks. Unlike previous systems like SAGE, which tracked enemy aircraft, they wanted a decentralised network immune to attack disruptions.

Visionaries like Licklider at ARPA sowed the seeds of the Internet by emphasising interactive computing. By 1966, the project director Robert Taylor noticed how people used connected mainframes for messaging and file sharing, forming interactive communities. Taylor's realisation of the need for a universal computer-language protocol led to securing funding for ARPANET's development.



ABOVE
A microscopic image of cells where DNA and RNA can be seen as colored dots

DNA

The Blueprint of Life Uncovered

In February 1962, James Watson, Francis Crick, and Maurice Wilkins celebrated a groundbreaking discovery and won the Nobel Prize for revealing the structure of DNA. It was a monumental step in our understanding of life.

The story began in the 1800s with Johann Miescher, a Swiss scientist. Miescher found something unique in white blood cells, which he named 'nuclein'. This substance was actually DNA, crucial for all life.

German scientist Albrecht Kossel later showed that nuclein was DNA and identified its components: adenine, cytosine, guanine, thymine, and uracil. For this, he received the Nobel Prize in 1910. In 1951, James Watson and Francis Crick started their work at Cambridge. Meanwhile, Maurice Wilkins at King's College London was exploring DNA using X-ray crystallography. Rosalind Franklin, a brilliant X-ray crystallographer, joined Wilkins. Despite their difficult relationship, Franklin's expertise proved essential. Her famous "image 51" captured DNA's helical structure, providing a critical clue.

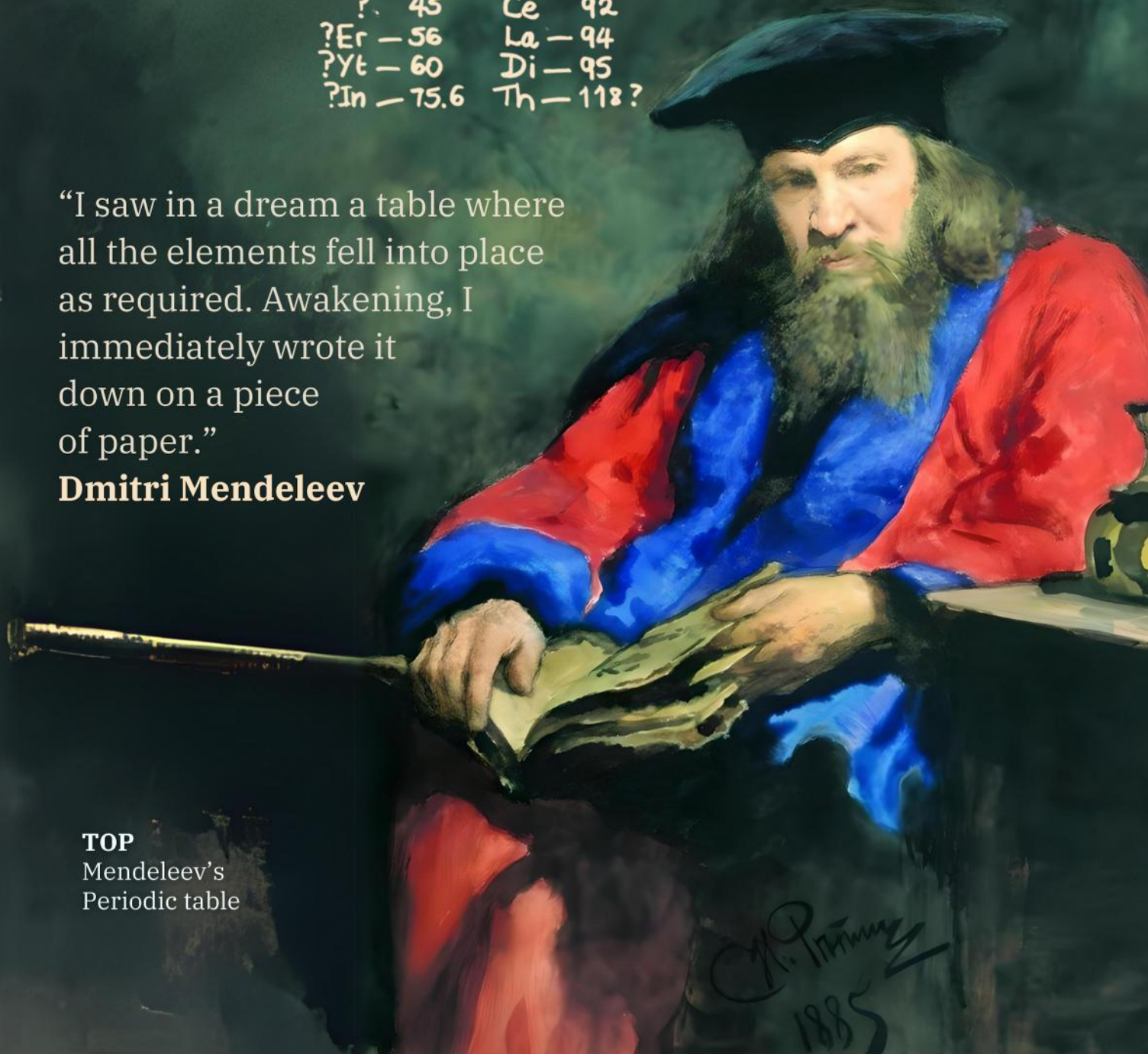
Watson, Crick, and Wilkins combined Franklin's insights with other data to model DNA's structure. Although their achievement revolutionized biology, the committee did not recognize Franklin's vital contribution with a Nobel Prize because they did not award it posthumously.

Mendeleev's Periodic Table

H — 1

	Be — 9.4	Mg — 24		Ti — 50	Zr — 90		? — 180
	B 11	Al — 27.4		V — 51	Nb — 94		Ta — 182
	C 12	Si 28		Cr 52	Mo — 96		W 186
	N — 14	P — 31		Mn — 55	Rb 104.4		Pt — 197.4
	O — 16	S — 32		Fe — 56	Ru — 104.4		Ir — 198
	F — 19	Cl — 35.5		Ni — Co — 59	Pd — 106.6		Os — 199
Li — 7	Ne — 23	K — 39		Cu — 63.4	Ag — 108		Hg — 200
		Cs — 46		Zn — 65.2	Cd — 112		
		? 45		? 68	Ur — 116		Au — 197?
		?Er — 56		? — 70	Sn — 118		
		?Yt — 60		As — 75	Sb — 122		Bi — 210?
		?In — 75.6		Se — 79.4	Te — 128?		
				Br — 80	J — 127		
				Rb — 85.4	Ce — 133		Tl — 201
				Sr — 87.6	Ba — 137		Pb — 207
				Ce 92			
				La — 94			
				Di — 95			
				Th — 118?			

"I saw in a dream a table where all the elements fell into place as required. Awakening, I immediately wrote it down on a piece of paper."
Dmitri Mendeleev



TOP
Mendeleev's Periodic table

The Periodic Table

Mendeleev's Masterpiece

On March 6, 1869, Dmitri Mendeleev, a Russian chemist, presented a groundbreaking periodic table to the Russian Chemical Society, revolutionising our understanding of the elements.

While not the first attempt, his table stood out for its completeness and predictive power, becoming the foundation of the modern periodic table.

Mendeleev's brilliance was arranging elements by atomic weight and grouping them by chemical properties. With only 64 elements known, he left spaces for undiscovered ones and accurately predicted the existence and properties of germanium, gallium, and scandium, all identified by 1886.

As a professor and author, Mendeleev noticed patterns in elements while writing a chemistry textbook. This insight led to his historic 1869 presentation, where he revealed elements' properties depended on atomic weights.

His principles were simple yet profound: elements showed periodic properties when arranged by atomic mass, and similar elements had similar or regularly increasing atomic weights. Mendeleev also foresaw the discovery of new elements and the need to refine atomic weights.

Today, with 118 elements, many created in labs, Mendeleev's table remains a cornerstone of chemistry.

BELOW
A colorsed visualisation of the first EV made with the help of AI

Electrifying History

The Birth of Electric Vehicles

In April 1881, French inventor Gustave Trouvé debuted the first electric vehicle (EV) – a tricycle powered by a rechargeable battery – on the streets of Paris. This landmark event marked the beginning of the electric mobility era.

The journey to this breakthrough started much earlier. In 1828, Ányos Jedlik from Hungary designed a model car with an electric motor. The 1830s saw various inventors, including Robert Anderson and Thomas Davenport, experimenting with electric carriages and compact cars. The invention of the rechargeable lead-acid battery by Gaston Planté in 1859, later improved by Camille Alphonse Faure, was a pivotal moment for EV development. By the late 1800s, France and Britain led in EV innovation. In 1899, the Belgian electric racing car "La Jamais Contente" set a world speed record, a testament to the potential of electric mobility.

The United States embraced EVs in the 1890s, with notable contributions like A.L. Ryker's electric tricycle and William Morrison's six-passenger wagon. By 1900, electric cars made up 38% of all U.S. vehicles. Early electric taxis in New York City, introduced in 1897, highlighted the practicality of EVs despite charging and range challenges.

ABOVE
Edward Jenner vaccinating a boy. Oil painting by E. Hillemacher, 1884

Edward Jenner

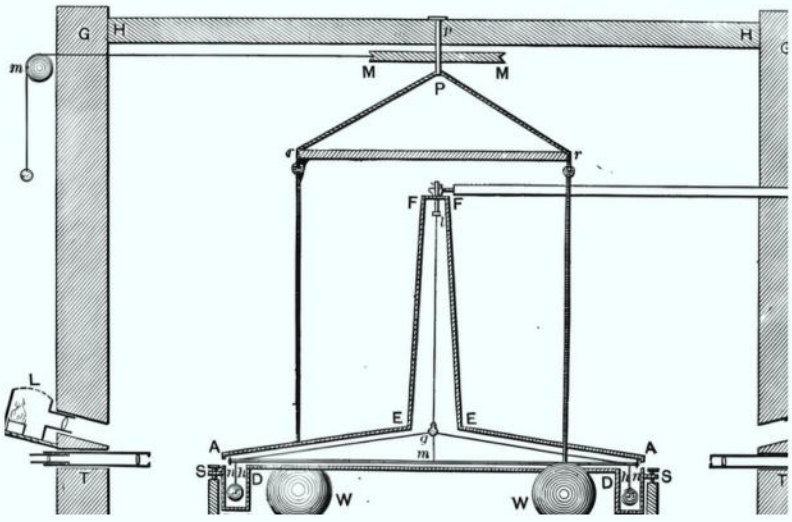
The Dawn of Vaccination

On May 14, 1796, Edward Jenner introduced the world's first smallpox vaccination, marking a monumental shift in medical history. This breakthrough was not an isolated event but the culmination of centuries of exploration in disease prevention.

Variolation, the practice of exposing healthy individuals to smallpox, dates back to the 15th century. Lady Mary Wortley Montagu brought this concept to Europe in 1721 from Turkey. The pivotal moment, however, came in 1774 with Benjamin Jesty. He observed cowpox's protective effect against smallpox and inoculated his family, laying the groundwork for Jenner's work.

Building on these insights, Jenner noticed dairymaids who suffered from cowpox were immune to smallpox. In 1796, he tested his theory by inoculating eight-year-old James Phipps with material from a cowpox lesion. When Phipps later resisted smallpox infection, Jenner's theory was proven.

Jenner's achievement was the scientific validation and widespread promotion of vaccination. His meticulous research and tireless advocacy set the stage for the eventual eradication of smallpox. He did not actually discover vaccination; instead, he was the first to apply rigorous scientific methods to the concept.



ABOVE
Set up for the Cavendish Experiment

RIGHT
Cavendish Experiment diagram

Henry Cavendish

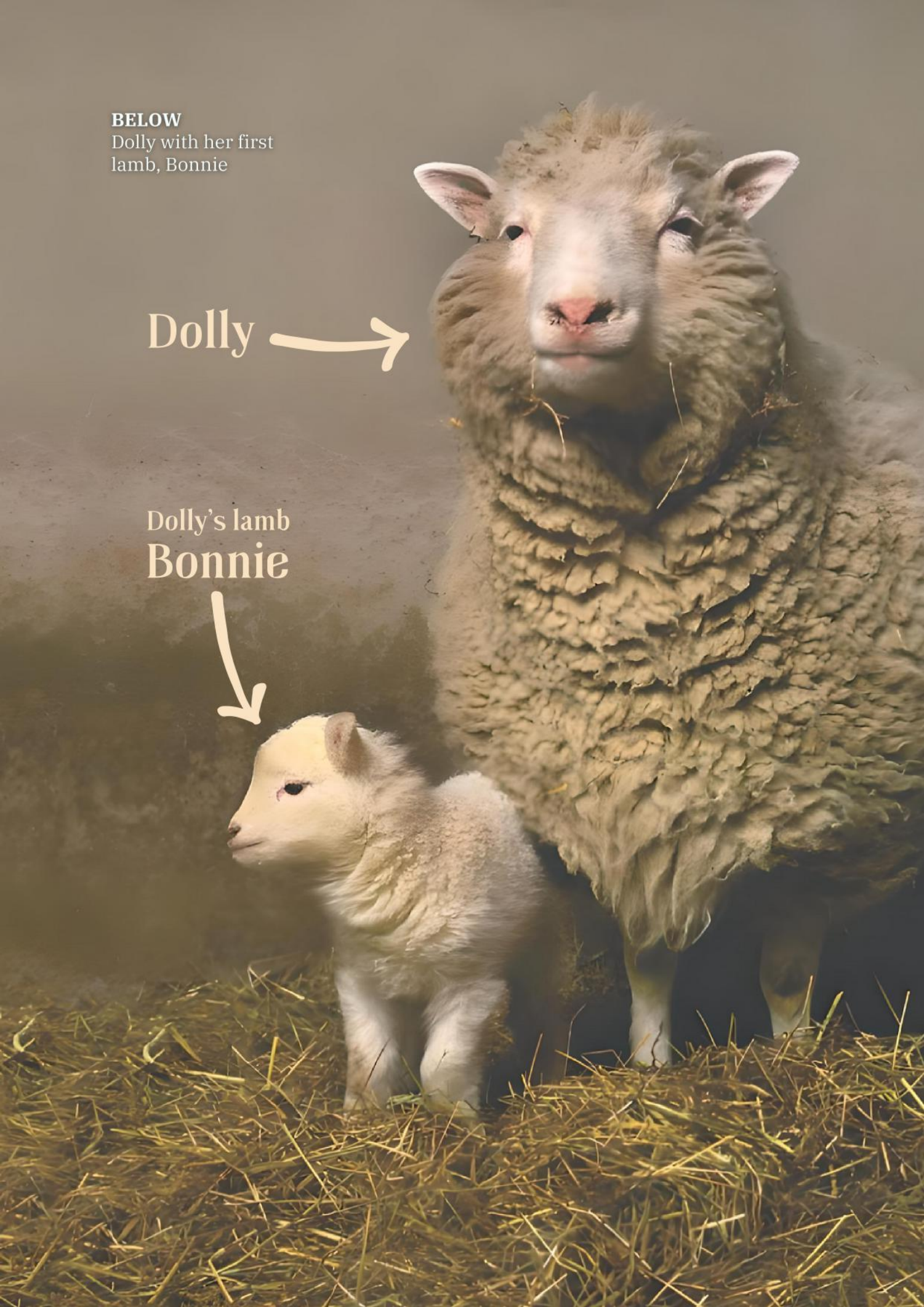
"Weighing" the Earth

In June 1798, Henry Cavendish achieved a scientific milestone by accurately measuring Earth's density, a pivotal moment in geophysics. This discovery stemmed from a quest initiated by the Royal Society's "Committee of Attraction" in 1772, aiming to calculate the planet's actual mass.

Early efforts to measure Earth's density, which included measuring a plumb bob's deflection near a Scottish mountain, estimated it to be about 4.5 times that of water. Cavendish, however, believed these methods needed to be revised. In 1797, at 67 years old, he set out to refine this measurement using a sophisticated apparatus his friend, Reverend John Michell, had developed.

Cavendish's experiment was a masterpiece of precision. He designed a torsion balance with two-inch lead spheres attached to a six-foot wooden rod, suspended and free to rotate. Nearby, he placed a second, larger dumbbell, using its gravitational pull to induce a torque on the rod. Cavendish conducted observations in a sealed room to ensure accuracy, using a telescope and eliminating any air currents or temperature fluctuations.

After meticulous experimentation and adjustments, Cavendish's results were groundbreaking. He published a detailed 57-page paper, concluding that Earth's density was 5.48 times that of water, remarkably close to today's accepted value of 5.52.



BELOW
Dolly with her first lamb, Bonnie

Dolly

A Leap Forward in Cloning

On July 5, 1996, Dolly, the first mammal cloned from an adult cell, was born, marking a pivotal moment in science. The Roslin Institute in Scotland achieved this genetic breakthrough, changing our understanding of what's possible in biology.

Scientists cloned Dolly using a mammary gland cell from a Finn Dorset sheep and an egg cell from a Scottish Blackface sheep. Inspired by country singer Dolly Parton, her name playfully refers to the origin of her DNA from a mammary gland. Dolly's birth was revolutionary, proving that a mature cell could be reprogrammed to create a new life – a concept previously thought impossible. Before Dolly, cloning was limited to embryonic cells, as demonstrated by earlier sheep clones. However, Dolly's creation from an adult cell opened new horizons in genetics. Professor Sir Ian Wilmut and a diverse team, including scientists and farm staff, led this breakthrough.

Dolly, the sheep, had six offspring with a Welsh Mountain ram named David throughout her life. Their first lamb, named Bonnie, arrived in April 1998. The following year saw the birth of twins Sally and Rosie. Following this, Dolly gave birth to triplets - Lucy, Darcy, and Cotton - in the subsequent year.

ABOVE
Campbell Aird, Scottish hotel owner, fitted with the world's first bionic arm

The Evolution of Prosthetics

From Iron Hands to Bionic Arms

In August 1993, Robert Campbell Aird became a part of medical history when he received the world's first bionic arm, known as the "Edinburgh Modular Arm System." This groundbreaking development followed Robert's difficult journey, which began in 1982 with a muscular cancer diagnosis leading to the amputation of his arm.

The Edinburgh team, led by Dr David Gow, equipped Robert with a prosthetic arm that surpassed traditional limitations. This bionic arm, embedded with microchips, circuitry, and a complex system of gears, pulleys, and motors, mimicked the movements of a natural limb.

Covered in realistic artificial skin, it could rotate, turn, and bend, allowing Robert to grip objects like his original arm. The arm was controlled through a cap containing micro-sensors, interpreting brain impulses and translating them into movements.

The history of prosthetic limbs is rich and varied. Ancient records mention prosthetics like Marcus Sergius' iron hand in 77 AD. The 16th century saw advancements like Ambroise Paré's spring-loaded hand and body-powered prostheses. During the two World Wars, the need for advanced prosthetics surged, creating dedicated organisations and more sophisticated designs.

ABOVE
Alexander Fleming studies mold cultures in his lab at the Wright Fleming Institute in London.

RIGHT
Penicillin mould made by Alexander Fleming

Penicillin

The Accidental Miracle in Medicine

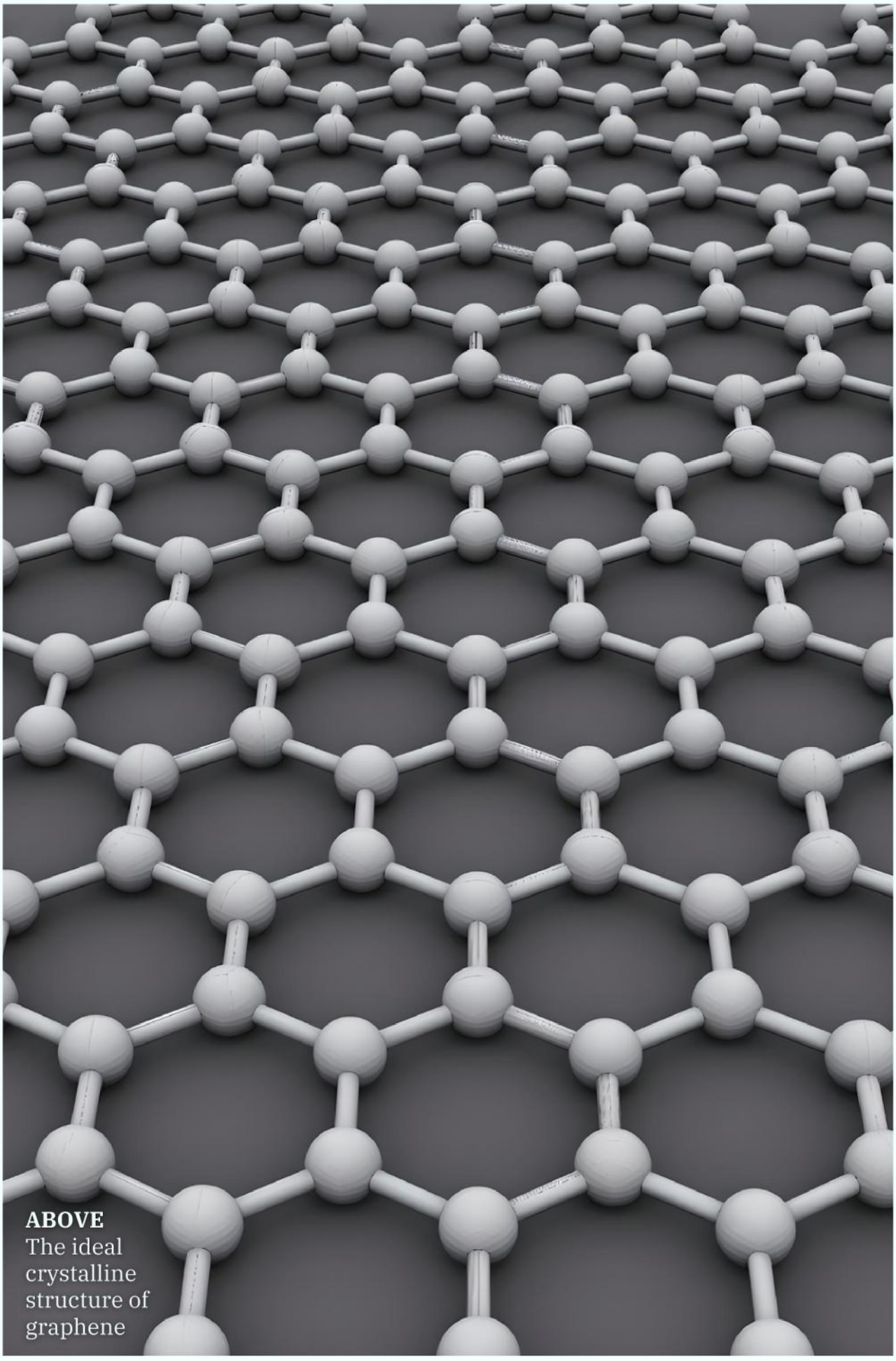
In September 1928, an unexpected discovery at St. Mary's Hospital, London, by Alexander Fleming marked a turning point in medical history. Upon returning from a holiday, Fleming noticed something remarkable in a petri dish that would revolutionise the treatment of infections: the world's first antibiotic, penicillin.

While sorting through Staphylococcus bacteria cultures, Fleming observed a mould - later identified as Penicillium notatum - inhibiting bacterial growth. This "mould juice" showed the potential to kill various harmful bacteria, sparking a new era in medicine. However, isolating pure penicillin from the mould proved challenging, and Fleming's efforts to refine this unstable compound were unsuccessful.

Fleming's groundbreaking finding, published in 1929, initially received little attention. For a decade, the potential of penicillin remained untapped, with Fleming even offering his Penicillium mould to other researchers in the hope of further development.

In the early 1940s, as Fleming neared retirement, scientists Howard Florey and Ernst Chain reignited interest in penicillin. Their commitment and scientific prowess enabled the mass production of penicillin just in time to play a crucial role during World War II.

Fleming's accidental discovery and subsequent efforts by Florey and Chain saved countless lives and heralded a new chapter in fighting infectious diseases.



ABOVE
The ideal crystalline structure of graphene

Graphene

A Revolution Unveiled with Scotch Tape and Pencils

In October 2004, a seemingly mundane act of peeling tape from graphite led to a groundbreaking discovery by Andre Geim and Konstantin Novoselov, transforming the world of materials physics. Their simple yet ingenious method of exfoliating graphite with adhesive tape isolated single sheets of graphene, a material just one atom thick yet incredibly strong and stable at room temperature.

Initially appearing rudimentary, this discovery sparked a global surge in graphene research. With its exceptional properties, graphene rapidly became a cornerstone for developing advanced computing applications, digital displays, flexible electronics, and composite materials.

While Geim and Novoselov's work achieved widespread acclaim, graphene's history traces back over a century. As early as 1948, Ruess and Vogt used electron microscopy to observe thin layers of graphite. In 1962, Boehm and colleagues detailed their studies on graphite flakes, identifying single and multilayer structures. It was in the 1970s that chemists managed to deposit carbon in graphene monolayers onto other materials, laying the groundwork for future breakthroughs.

ABOVE
The modern spotlight

BELOW
An AI visualisation of Michael-Faraday demonstrating the limelight effect

Limelight

The Illumination that Revolutionised the Stage

On November 9, 1825, Michael Faraday delivered a lecture that would illuminate the world in a new way. He demonstrated the limelight effect, a brilliant innovation by Sir Goldsworthy Gurney. This invention, which used a blowpipe to create an intensely hot flame from oxygen and hydrogen, produced dazzling light when directed at a piece of lime.

Initially, Gurney discovered that this intense flame could produce a brilliant light visible from nearly 100 miles away. This breakthrough caught the public's imagination, and soon, the limelight lit up significant landmarks like the British Parliament and Trafalgar Square. Its most famous application was in theatres, creating a spotlight effect that led to the phrase 'in the limelight' to denote the centre of public attention. The earliest recorded use of the limelight in a public performance was in 1836 for a magician's show in Kent. The technology quickly spread to theatres worldwide, revolutionizing stage lighting. Gurney didn't stop there; he later enhanced his invention to produce an even brighter white light, eventually lighting up his entire house and the British House of Commons with an advanced version of this technology.

However, by the end of the 19th century, with the advent of arc lighting, the limelight faded from literal use but retained its symbolic meaning.

ABOVE
An AI illustration showing global connectivity of radios

Birth of Global Connectivity

Transatlantic Radio Transmission

On December 12, 1901, a faint series of Morse-coded clicks traversed the Atlantic as the letter "s" forever changed the course of communication. It was the work of Guglielmo Marconi, an Italian physicist who defied the constraints of his time by sending the first radio transmission across 2,000 miles of ocean. This feat shattered the prevailing belief that radio waves were limited by the earth's curvature, previously thought to restrict transmission to under 200 miles.

Marconi's journey began with his fascination for Heinrich Hertz's experiments on radio waves. Starting in Bologna in 1894, he soon managed to send a radio signal over 1.5 miles. Unencouraged in Italy, Marconi took his dreams to England in 1896, establishing his own company. His progress was rapid; by 1899, he had transmitted messages across the English Channel. In a relentless pursuit to extend radio's reach, Marconi collaborated with Professor John Ambrose Fleming and attracted leading engineers like Reginald Fessenden and Lee de Forest. Their innovations culminated in Marconi's landmark achievement in 1901: receiving a transatlantic message sent from Cornwall, England, to Newfoundland.

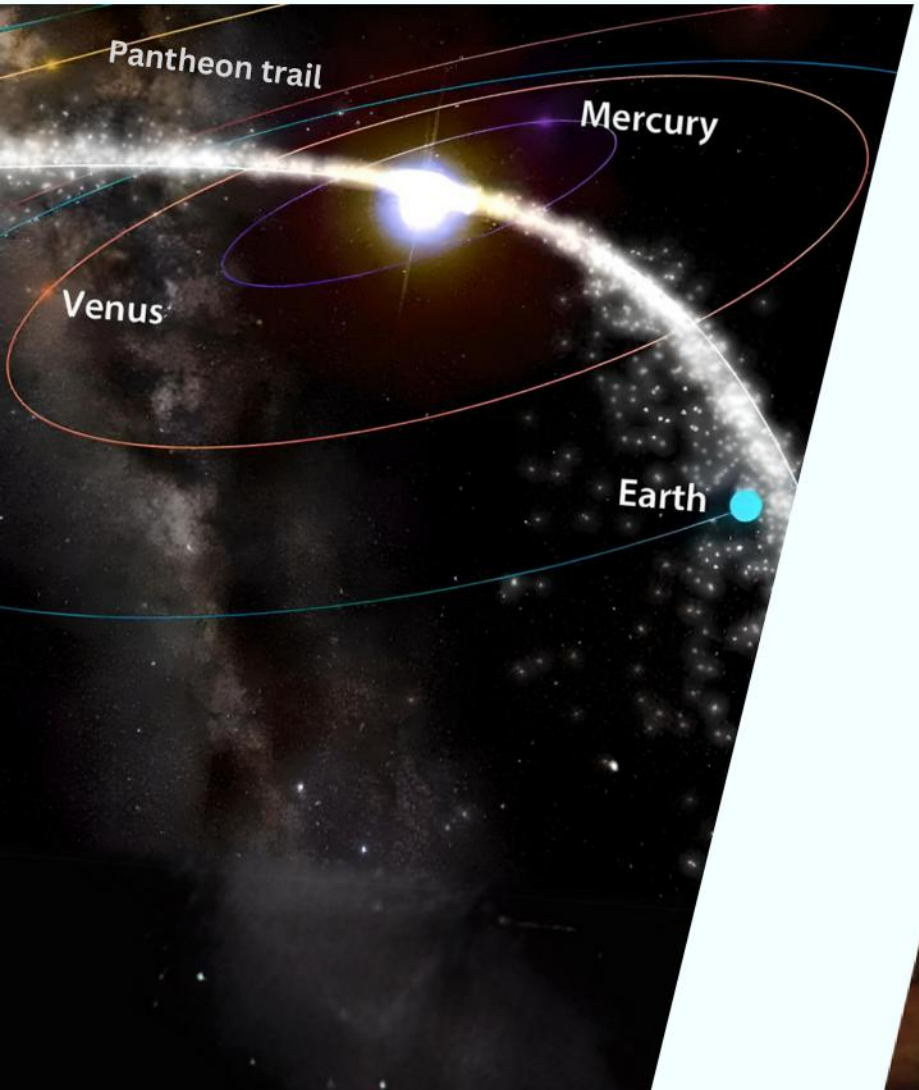
This groundbreaking event not only demonstrated that radio waves could travel beyond the horizon but also spurred the proposal of the existence of the ionosphere by Arthur Kennelly and Oliver Heaviside.

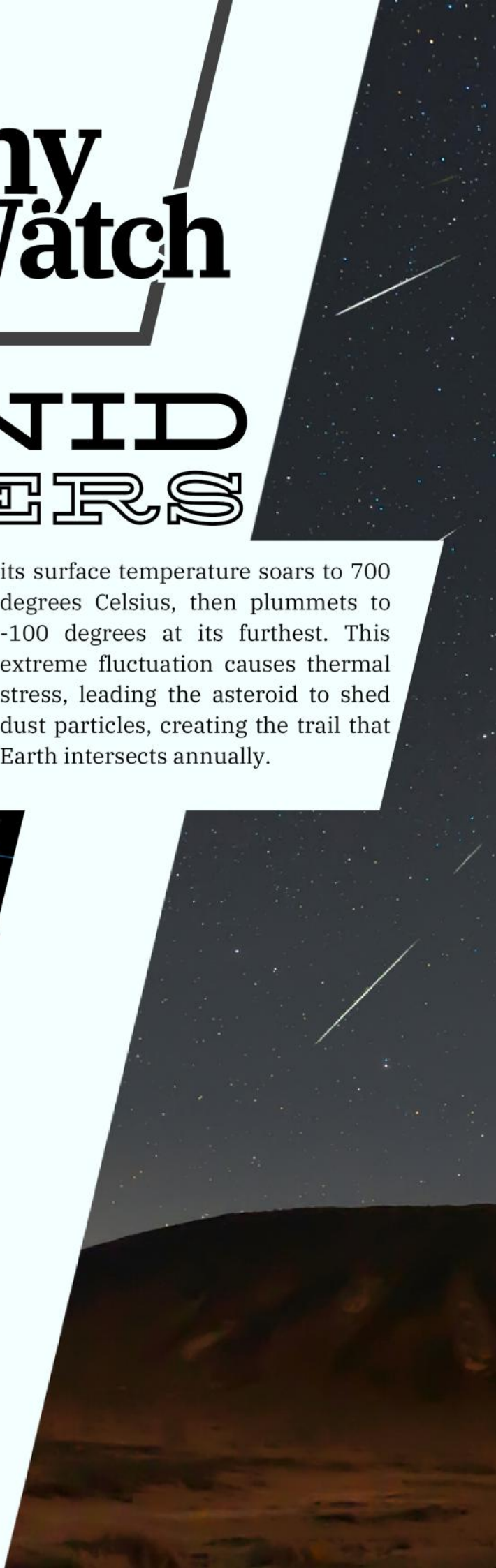
Astronomy Watch

(Dec/Jan)

GEMINID SHOWERS

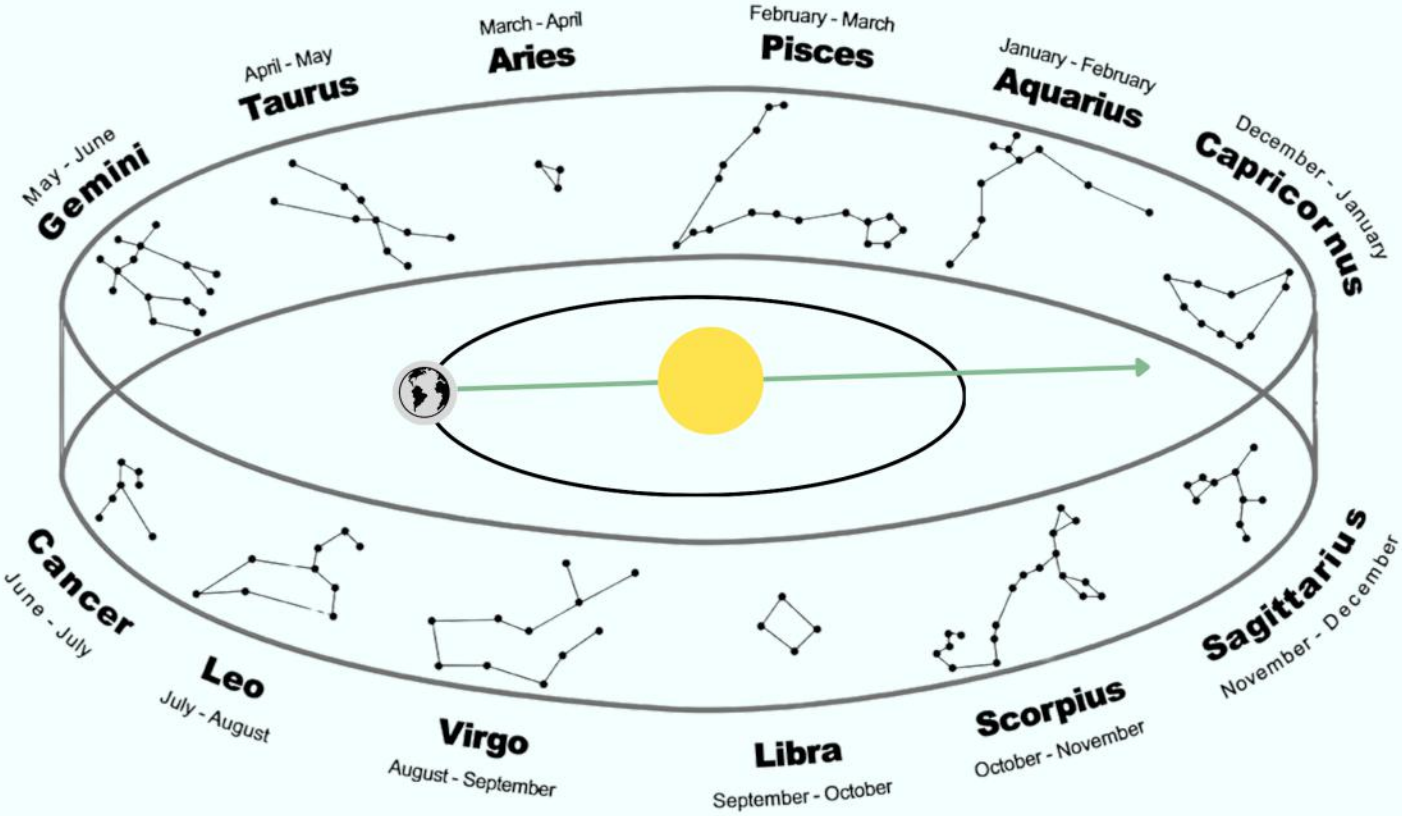
Gazing up at the night sky, have you ever witnessed the ethereal dance of the Geminid meteor shower? This celestial spectacle, a canvas of fleeting luminance against the dark, unfolds due to the orbit of 3200 Phaethon around the sun. As Phaethon swings near the sun, its surface temperature soars to 700 degrees Celsius, then plummets to -100 degrees at its furthest. This extreme fluctuation causes thermal stress, leading the asteroid to shed dust particles, creating the trail that Earth intersects annually.





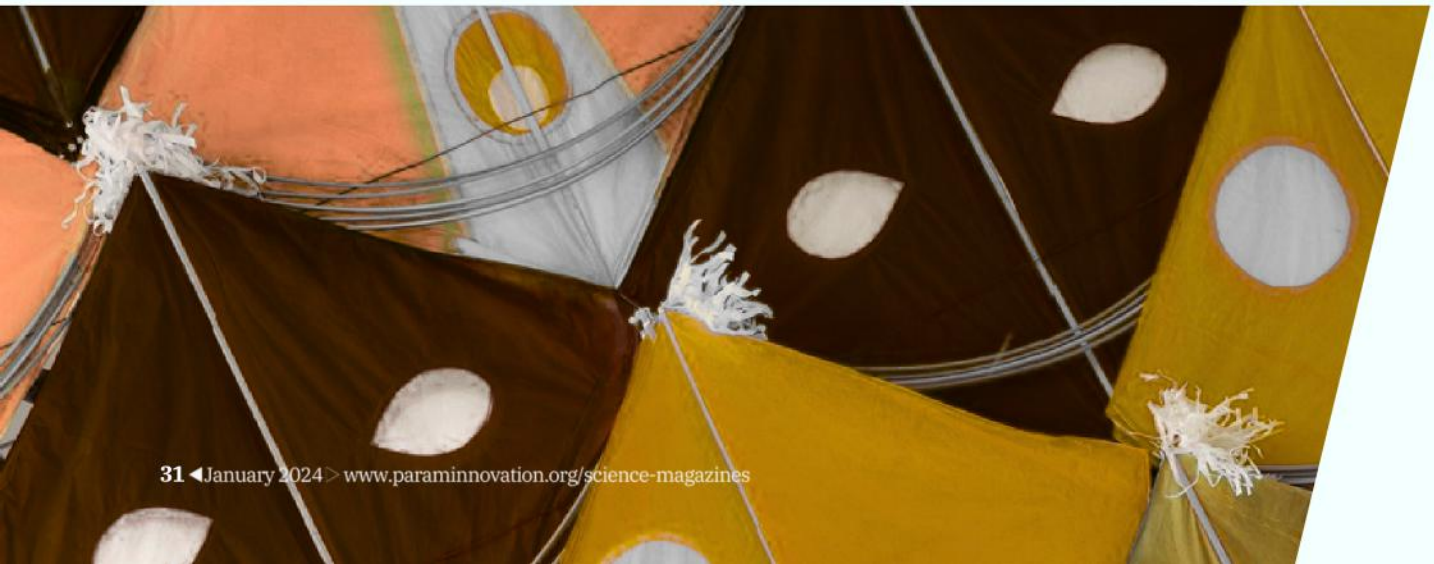
This intersection results in the Geminids, as dust grains slam into Earth's atmosphere, 34 kilometres per second, superheating the air to produce the brilliant flashes of light we see as shooting stars. These grains vaporise in a process called 'ablation', especially intense in the densest part of Phaethon's debris.

MAKAR SANKRANTI

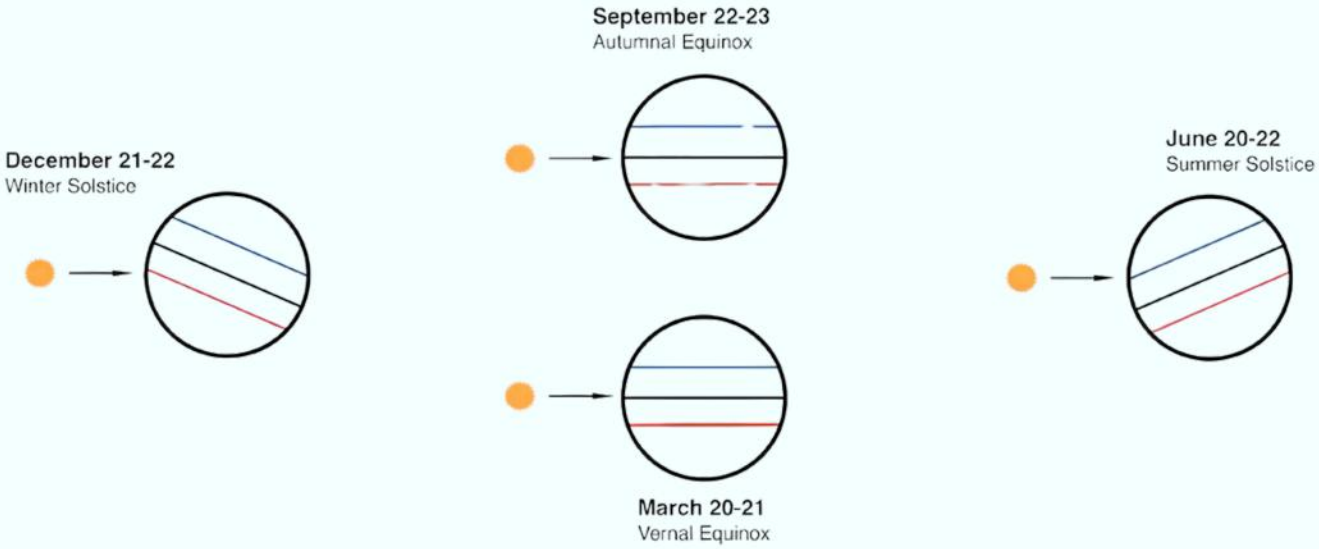


Makar Sankranti, a major harvest festival celebrated in India, holds significant astronomical importance. It celebrates the Sun's transition into Capricorn (Makara in Sanskrit).

This century-old event is not just a celestial shift but also a crucial turning point in the solar cycle that significantly impacts climatic conditions and agricultural patterns in India.



WINTER SOLSTICE



The winter solstice, another important astronomical event, is often referred to as Uttarayan. It is commonly confused with Makar Sankranti, but these are, in fact, distinct phenomena. The solstice, which marks the shortest day and the longest night of the year, results from Earth's axial tilt of 23.5 degrees. During this time, the tilt is away from the Sun, causing it to appear at its southernmost point in the sky. During this time, the tilt is away from the Sun, causing it to appear at its southernmost point in the sky. The summer solstice in June, occurring when the tilt is towards the Sun, is the opposite phenomenon, marking the longest day as the Sun appears in the northern sky.

Science Updates

Impact of Light Color on Sleep and Circadian Rhythm

A study by the University of Basel and the Technical University of Munich reveals that light colour doesn't significantly influence sleep or the human internal clock. The research counters prior assumptions and highlights the primary role of light-sensitive ganglion cells over perceived colour.

Significance of Reduced Carbon Dioxide in Exoplanet Atmospheres

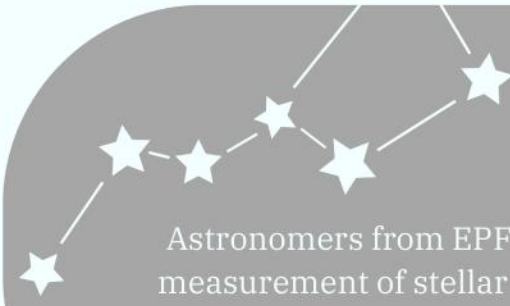
Research by MIT and the University of Birmingham indicates that lower carbon dioxide levels in a planet's atmosphere might signify the presence of liquid water and potential life, offering a new approach to identifying habitable exoplanets.

Apes Remember Long-Lost Friends

Johns Hopkins University research reveals that apes can recall groupmates, even friends, not seen for over 25 years. Using photos and eye-tracking, the study found that chimpanzees and bonobos especially recognize those with whom they had positive past interactions. This study, showcasing the longest-lasting social memory seen outside humans, provides insights into the deep evolutionary ties between humans and apes and underscores the complex social fabric of these endangered species.

Breathing's Role in Sleep-Related Memory Processes

A study by LMU, Max Planck Institute for Human Development, and the University of Oxford reveals that breathing patterns during sleep affect memory reactivation and consolidation. This research highlights the potential impact of respiratory patterns on cognitive health, particularly in relation to age-related changes in sleep and memory functions.

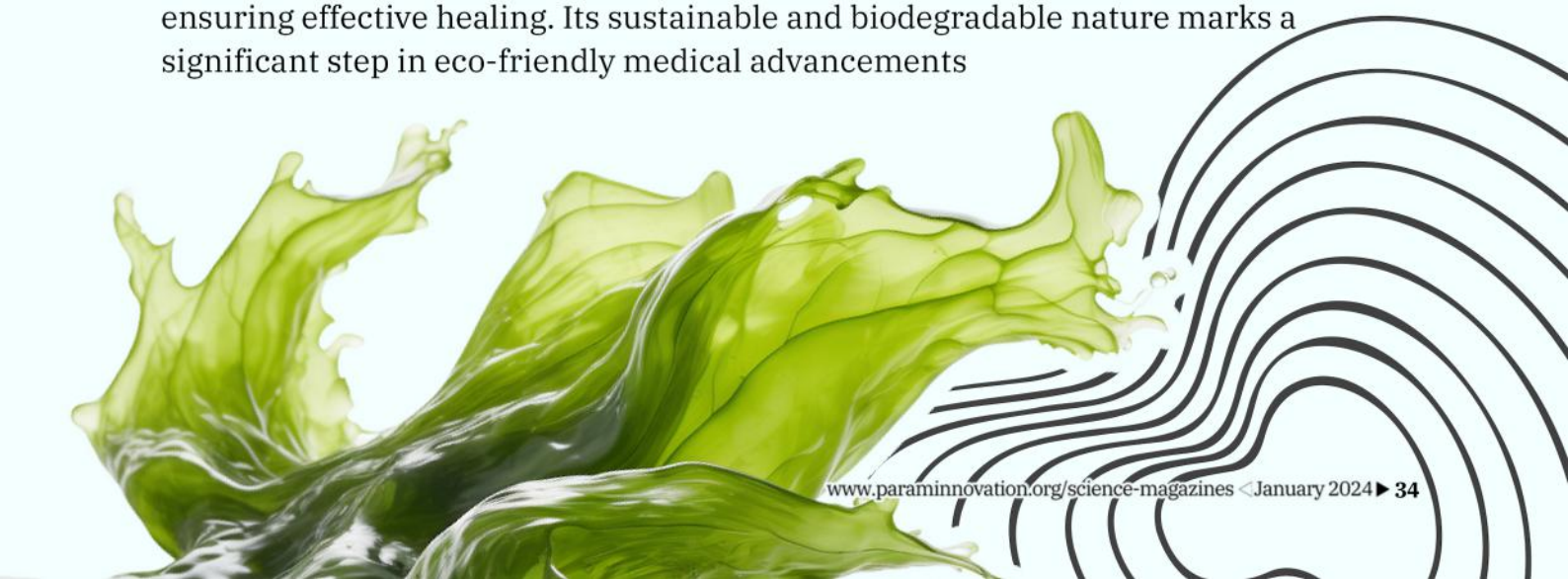


Measuring Stellar Distances Using Star 'Music'

Astronomers from EPFL and the University of Bologna have advanced the measurement of stellar distances using asteroseismology. This technique, analyzing star vibrations like seismic waves on Earth, provides a more precise alternative to the Gaia mission's methods, enhancing our understanding of the Universe and aiding various astronomical studies.

New Seaweed-Based Hydrogel for Skin Healing

A groundbreaking hydrogel, created from seaweed and carbonated water, offers an improved approach to skin wound treatment. This novel hydrogel minimizes skin adhesion and swelling, which are common issues with current hydrogels while ensuring effective healing. Its sustainable and biodegradable nature marks a significant step in eco-friendly medical advancements



Support Us

Philanthropy can transform visions into realities, as shown in the story of Dr. Leroy Hood. His idea for an automated DNA sequencer initially met with skepticism, was brought to life through the visionary support of philanthropist Sol Price. This breakthrough paved the way for the human genome project, illustrating how strategic donations can lead to monumental scientific achievements.

In this spirit, Param Science Magazine invites you to be part of a similar transformative journey. Your contributions are integral to our mission of making science accessible, engaging, and inspiring. By supporting Param, you do more than just fund a magazine, you nurture a culture brimming with innovation and discovery.

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