

## SCIENCE BREAKTHROUGH IN 2024

The year 2024 marked groundbreaking achievements in medicine, space exploration, and ancient genetics, leading to remarkable discoveries.



### Neanderthal Museum and Genetic Research

The newly opened Neanderthal Museum features an exhibit portraying the life of a Neanderthal family in a cave. Recent genetic studies have refined the timeline of interbreeding between humans and Neanderthals, deepening our understanding of shared history.

### Best Inventions and Discoveries of 2024

- HIV Prevention Drug Lenacapavir: Initially approved in 2022, Lenacapavir demonstrated exceptional results in 2024 trials, with a 96% success rate in one and 100% in another. Delivered as a

semi-annual injection, it is a groundbreaking PrEP (pre-exposure prophylaxis) solution for HIV, according to *Discover Magazine*.

- **Fruit Fly Brain Mapping:** In October 2024, scientists published a detailed map of 140,000 neurons in a fruit fly's brain, providing insights into human cognition and memory. This milestone was the result of a decade-long study.
- **New Super-Earth Discovery:** NASA identified TOI-715 b, a super-Earth 137 light-years away, located in a habitable zone that could support liquid water. An Earth-like planet, TIC 271971130.02, may also exist within its orbit.
- **Neanderthal and Human Interbreeding:** Genetic research of 59 ancient and 275 modern human genomes determined that humans and Neanderthals coexisted in Eurasia for about 7,000 years, from 50,500 to 43,500 years ago.
- **Advancements in CRISPR Technology:** CRISPR technology continues to evolve. Researchers at Profluent are developing OpenCRISPR-1, an open-source gene editing platform powered by large language models like ChatGPT, enhancing accuracy, safety, and ethical applications.
- **Oldest Known Reptile Skin:** Scientists discovered 20-million-year-old fossilized reptile skin, possibly belonging to *Captorhinus agouti*, a semi-aquatic species.
- **New Moons of Neptune and Uranus:** Three new moons were identified around Neptune and Uranus in 2024, raising their combined total to 30.
- **Cave Art Discovery in Patagonia:** In Cueva Huenul 1, Patagonia, researchers uncovered 900 pigmented cave paintings, some over

8,200 years old, depicting faces, geometric shapes, and llama-like creatures. These artworks likely served as tools for cultural learning and historical reflection for over 100 generations.

- **DermaSensor for Skin Cancer Detection:** The DermaSensor, a noninvasive device from Boston University, uses light technology to differentiate malignant from benign skin lesions. FDA-approved in January 2024, it was named one of *Time's* "Inventions of the Year" and promises to reduce missed diagnoses by half.
- **AI Model Predicts Alzheimer's Progression:** A machine learning model developed by Boston University predicts the progression of mild cognitive impairment to Alzheimer's disease with 78.5% accuracy, offering a breakthrough in early diagnosis.
- **Deep-Sea Rocks Generating Oxygen:** Researchers discovered that polymetallic nodules in the Pacific Ocean produce oxygen via seawater electrolysis, a process previously attributed only to sunlight-dependent organisms. This groundbreaking finding involved Boston University biologist Jeffery Marlow.
- **Space Cloud's Climate Impact on Earth:** Boston University researchers revealed that two million years ago, Earth encountered a dense interstellar cloud. This event compressed the sun's heliosphere, exposed Earth to radioactive particles, and likely caused a temperature drop, marking the first evidence of an external solar system encounter impacting Earth's climate.



## Reference

Hindustan Times: [2024 a breakthrough year for science: A look at some intriguing discoveries](#)

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