

ANNUAL SPECIAL | Top 10 News of S&T Advances for 2025: Chinese Academicians' Picks

A press conference held on January 26 in Beijing unveiled the Top 10 news of S&T advances both in China and overseas for the year 2025 as selected by top scholars of China (page 9).

Every January, Members of the Chinese Academy of Sciences (CAS) and the Chinese Academy of Engineering (CAE) cast their votes for the top 10 news of S&T advances for the previous year. Sponsored by CAS and CAE, this ballot has been held for 32 times, as an effort to celebrate science excellence and increase the public awareness of science.

Turn to page 11 for the Academicians' picks of annual tops for China, and page 17 for those of overseas.



(Credit: ASIPP)

ANNUAL SPECIAL | “Artificial Sun” of China Notches New Success

Dubbed “Artificial Sun” of China, the Experimental Advanced Superconducting Tokamak (EAST) is the first fully superconducting tokamak in the world. Working on this experimental device for magnetically confined nuclear fusion, scientists have achieved a series of breakthroughs. Among them a well-known one was the steady operation of a high-confinement plasma of 100-million-degree Celsius sustaining 1,066 seconds (see pages 11 and 23).

Recently the team reached another milestone when overcoming an empirical limit on plasma density in their experiment. They reported the progress in Science Advances.

Electron density of the start-up plasma is crucial for achieving the extremely high temperature (~150 million Kelvin) required to trigger a controlled, sustainable nuclear fusion. However, experiments worldwide have long been troubled with an empirical threshold called “Greenwald density limit.” Once the electron density approaches this threshold, the plasma would generally disrupt, with particles escaping the confinement of the magnetic fields.

For the first time, the EAST team achieved a “density-free” regime as predicted in the plasma-wall self-organization (PWSO) theory, verifying and theoretically developing the model. Turn to page 26 to know how they made it.

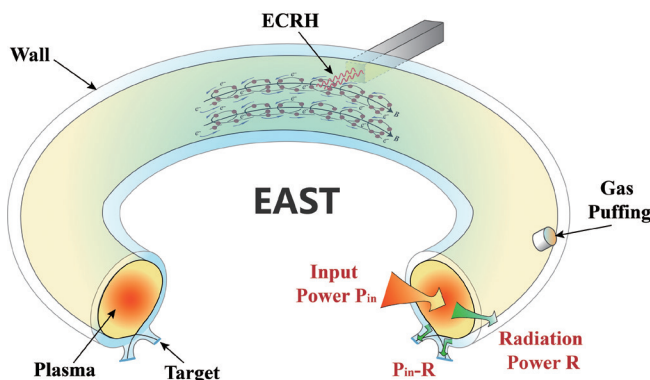


Image credit: The EAST team

HIGHLIGHT | Likely First Capture of an Intermediate-mass Black Hole Devouring a White Dwarf

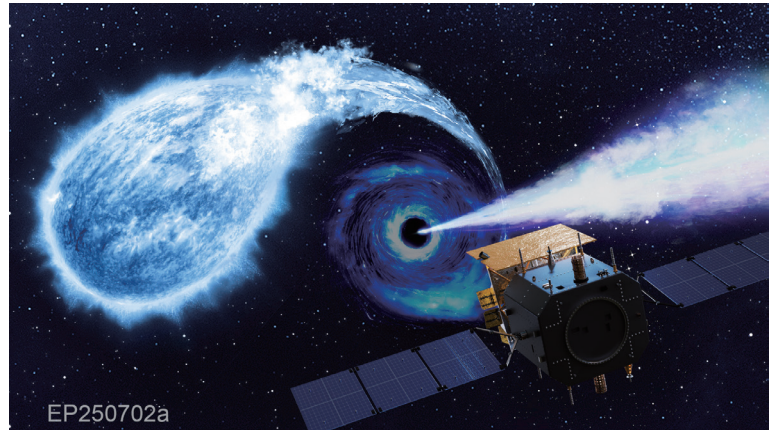
Back in July 2025, Einstein Probe (EP), an astronomical satellite built by the Chinese Academy of Sciences (CAS) in cooperation with its European partners, detected a weird source in X-rays. Unlike any previously documented transient, it was unusually bright, and evolved very fast. Its furious flares, first emerged in X-rays, shortly hardened and peaked at tens of MeV in the gamma-ray band, sustaining for hours. The peak flares decayed soon, and a soft X-ray afterglow rose to dominate the spectrum.

What drastic cosmic event could have produced such a bright, fast evolving radiation?

EP shared the location of the source with the whole astronomical circle; and the alert triggered an observation-

al campaign joined by different observatories, both space- and ground-based, covering wavebands from radio, near infrared, visible light, X-ray, to gamma-ray. The confluence of data gave a more comprehensive view, and helped scientists understand this spectacular event.

After analyzing the data and examining different alternative scenarios, the EP team proposed that it was most likely the tidal disruption of a low-mass white dwarf by a black hole of intermediate mass. For the full story, please refer to page 28.



Credit: EP Science Center, National Astronomical Observatories, CAS/Sci Visual

ARTICLE | Toward a Just Transition Balancing Development and Climate Goals

Just transition is moving into the focus of global climate discourse. Current narratives, however, largely reflect the experiences of developed economies, neglecting the Global South’s needs for industrialization, energy access, and poverty reduction. Bridging this gap, this study reframes climate just transition as a dynamic process of optimizing development paths under multiple constraints. Setting development as the baseline, decarbonization efficiency as the constraint, and structural transformation as the driver, the author proposes a model for a long-term equilibrium through synergies and trade-offs among the three dimensions.



Given that priorities vary significantly across various economies of different development stages, the author advocates that just transition must shift from a single-target goal to differentiated policy mixes, supported by restructured international cooperation. All in all, just transition can only become a substantive force in climate governance when it accommodates the developmental aspirations of the Global South.

For detail, refer to page 33.

INDEPTH | Accreting Blackhole-jet Systems: Possible Engines for PeVatrons

Scientists have long wondered how cosmic rays have come to be. Is it true that they are just the legacy from supernovae? A trend of expedited loss of cosmic particles toward ultra-high energies, forming a knee-shape bend at around 3 peta-electrovolt on the spectrum of all composition cosmic rays, also puzzles them. Some theories depicted that this “knee” indicated an upper threshold in energy to which Galactic particles can reach.



Credit: IHEP

LHAASO, the Large High Altitude Air Shower Observatory hosted by the Institute of High Energy Physics (IHEP) of the Chinese Academy of Sciences, detected dozens of “PeVatrons” within our Milky Way. Such cosmic accelerators can drive particles to energies of peta-electrovolts. Their discoveries demonstrated that such powerful engines are ubiquitous in the Milky Way.

What actually are such PeVatrons in nature? Why the “knee?”

Now with two papers lately published separately in *National Science Review* and *Science Bulletin*, LHAASO team gave their own answers to both the questions: Accreting blackholes that have developed relativistic jets could be the reason.

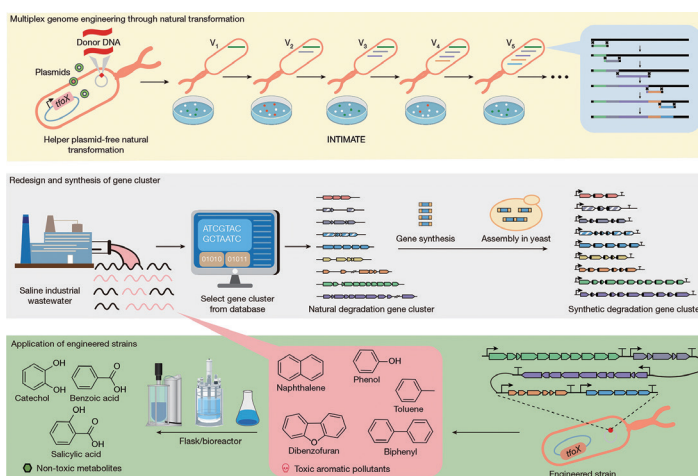
For more detail, refer to page 41.

IN DEPTH | Tailoring Microbes to Decompose and Recycle Industrial Wastes

Many high-polymer materials, like commercial polyurethanes, are built to last—but therein lies a problem. From the cross-linked polymers in our seat cushions to the aromatic compounds lingering in industrial runoff, we have engineered materials that defy nature’s cycle of decay. Microbes, refined by billions of years of evolutionary trial and error, are still no match for the complex urethane bonds of modern plastics or the toxic, saline chemistry of refinery wastes. The result is a one-way journey: a linear path from factory to landfill—or worse, to the ocean.

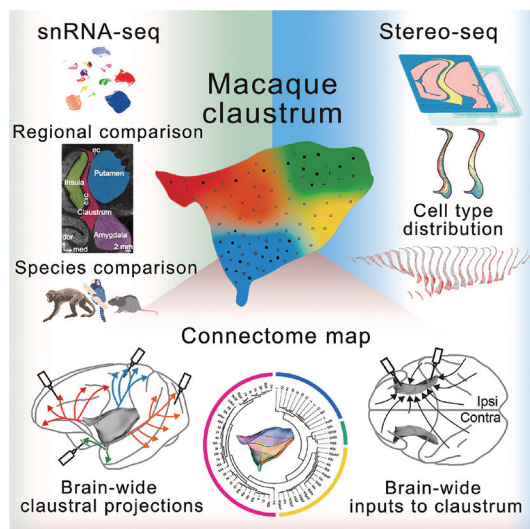
Now, researchers from the Institute of Microbiology (IMB) and the Shenzhen Institutes of Advanced Technology (SIAT), both under the Chinese Academy of Sciences (CAS), are developing new biotechnologies to decompose and recycle modern industrial wastes.

Read the full story at page 48.



Graphic: Su, et al., 2025

IN DEPTH | Scientists Are Now Creating a “Google Earth” for Biology



Credit: Lei et al., 2025

By uniting single-cell sequencing with spatial omics, researchers are moving beyond traditional observation to map life itself in molecular detail. They are essentially building a “Google Earth” for biology—a comprehensive map that lets us zoom in on a single molecule and zoom out to grasp the very architecture of life.

Three groundbreaking studies by CAS scientists, published in *Cell* in 2025, chart this bold new frontier. Each pushes the boundary of what we can know about living systems: exploring the primate brain’s enigmatic “seat of consciousness,” tracing the evolutionary blueprints of vascular plants, and decoding the molecular clocks ticking within the human body—these studies reveal the staggering potential of a “Big Science” approach to deciphering life’s complexity.

Turn to page 52 for the full story.