InFocus | "Einstein Probe" Fuels New Hope for Time-domain Astronomy

(Image: MicroSat)

With its unprecedentedly large field of view and excellent imaging quality, "Einstein Probe", a new satellite of the Chinese Academy of Sciences, is expected to greatly help X-ray observations on astronomical events drastically evolving over time, or transients. Successfully sent into preset orbit on Jan 9, 2024, it will sensitively detect the faint, weak X-ray signals from long-distance yet violent celestial events, like supernova explosions, gravitational waves, and black holes. The latter two were predicted by Einstein in his theory of general relativity, which has inspired the project.

To read more about this space mission in collaboration with the European Space Agency (ESA), the Max Planck Institute for Extraterrestrial Physics (MPE) in Germany and the French Space Agency (CNES) in France, please turn to page 8.

Special | Top 10 Science Advances in China for 2023

In this issue, we bring you a comprehensive overview of the highly anticipated annual Top 10 Science Advances in China for 2023, as announced by the National Natural Science Foundation of China (NSFC) on February 29, 2024. The prestigious selection, now in its 19th year, highlights the most significant breakthroughs across various scientific disciplines, as elected by a panel of esteemed scientists and experts from around the country.

Leading the pack are groundbreaking discoveries in life sciences and human health, including the startling connection between ancient "fossil" viruses and aging, the identification of a "biological clock" in the human brain, and the unveiling of a new mechanism triggering DNA replication. Additionally, advancement in areas such as weather forecasting, crop improvement, and energy storage underscores China's commitment to fostering innovative solutions for global challenges.

Notably, five of the listed achievements stem from the remarkable work of researchers affiliated with the Chinese Academy of Sciences (CAS). Among them, four are feats scored in the fields of life sciences and human health, including the unraveling of the aging mechanism driven by ancient "fossil" viruses in the human genome, the discovery of a pivotal genetic factor governing alkaline tolerance in crops, the development of a powerful genome editing tool called "PrimeRoot" for precise insertion of large DNA in plants, and the insights into the neural pathway linking artificial light exposure to impaired glucose metabolism.

In the field of astrophysics, an achievement made by a team working with the Large High Altitude Air Shower Observatory (LHAASO) won out. With its unprecedented observation of the brightest-ever jet-flow and TeV photons from a gamma-ray burst, this work challenges existing theories and hints at potential new physics.

Turn to page 11 for an in-depth exploration of these groundbreaking advances, showcasing the remarkable progress and innovative spirit of Chinese science in the past year.

Highlights | Unraveling the Secret of Smell: How the Brain Decodes Scents

New study shows that we smell scents by processing the substructure of odor molecules, rather than sensing them as pre-defined wholes. (Image by Dr. ZHOU Wen)

A new study published in *Nature Human Behaviour* on March 18, 2024, by Dr. ZHOU Wen and his team from the Institute of Psychology of the Chinese Academy of Sciences (IPCAS), has unveiled a fascinating mechanism behind our sense of smell. Challenging the long-held belief that odor molecules are processed as wholes, the researchers discovered that the olfactory system deconstructs these molecules into submolecular components and reassembles them into the unified perception we recognize as a particular scent. The finding sheds light on the dynamic and malleable nature of olfactory processing, potentially explaining why olfaction can seem so subjective and elusive compared to other senses.

For further insights, please refer to page 20.

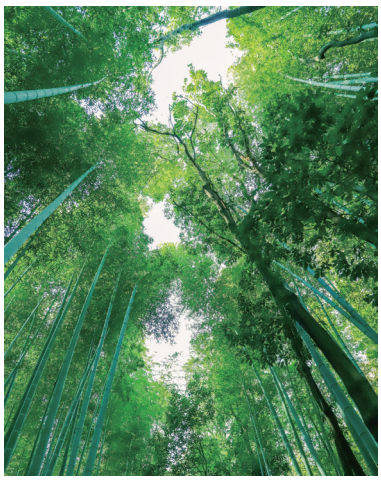
Turning pollutants into products: a new technique uses electricity and hydrogen to make useful chemicals from CO_2. (Image created using DALL-E by YAN Fusheng)

Highlights | Durable CO_2 Recycling for a Sustainable Future

In a recent study published in *Nature* on January 31, 2024, a joint team led by Dr. YAO Tao from the University of Science and Technology of China (USTC) and his collaborators from the Huazhong University of Science and Technology and the University of Auckland have developed a proton-exchange membrane (PEM) system that can efficiently and durably convert carbon dioxide (CO_2) into formic acid, a valuable chemical used in various industries. This innovative technology overcomes the long-standing challenge of carbonate precipitation, which had previously limited the utilization and stability of CO_2 conversion systems.

For further insights, please refer to page 22.

Highlights | Bamboo's Genomic Secrets Unraveled



The skyscraping bamboos are actually a type of grass. (Image by *Pixabay*)

Deep within the emerald canopies of Asia's forests, colossal bamboos rise like verdant skyscrapers, their lignified culms defying the conventional boundaries of grasses. For generations, these remarkable plants have captivated botanists and laypeople alike, their rapid growth and infrequent, synchronous flowering cycles shrouded in mystery.

In a recent study published in *Nature Genetics*, a joint research team led by Dr. LI Dezhu from the Kunming Institute of Botany under the Chinese Academy of Sciences has uncovered the genomic secrets behind these towering marvels, unveiling a tale of ancient hybridizations, polyploidizations, and the intricate dance of subgenome dominance that has sculpted the evolution of woody bamboos.

For more detail, please turn to page 25.

Article | The Impact Paths of Enterprise Innovation in Regional Green Development

To achieve green development, it is crucial to shift the economic development at the regional level towards a less resource-dependent pattern. Enterprises play an important role in regional economy, society and ecology, and their innovation hence might power the shift in regional development pattern.

For China, a country with vast territory and significant regional differences in natural environment and industrial structure, the situation could be complicated and hence it's necessary to explore how innovation made by enterprises could impact the regional green development.

Constructing a parallel multiple mediating effect model, policy researchers at the Institutes of Science and Development of the Chinese Academy of Sciences (CASISD) verify the impact of industrial enterprise innovation on the regional green development level and discuss the specific impact paths. For detail, please turn to page 27.