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NCU NEWSLETTER

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National Central University's New Leadership Team Sets Sail: President Hsiau Shu-San Charts the Future

On February 6, National Central University (NCU) held a welcome reception at Luo Jia-Lun Lecture Hall for its newly appointed President, Hsiau Shu-San, and senior administrators, attended by distinguished guests from various sectors. President Hsiau expressed gratitude for the support received and outlined his vision for the university, prioritizing talent cultivation, enhancing learning in the AI era, improving university rankings, strengthening alumni relations, advancing fundraising efforts, and developing the Bade campus. His goal is to establish NCU as a leading institution distinguished by its foundation in humanistic care and its commitment to interdisciplinary innovation.



In response to the AI era, NCU will integrate human-centered AI into teaching and learning, leveraging AI's potential through interdisciplinary collaboration. To address financial challenges, NCU will strengthen its fundraising mechanisms and actively develop the Bade campus, establishing a smart healthcare and medical innovation hub that unites the strengths of various disciplines, further expanding the university's influence.



During the event, appointment letters were presented to the new senior administrators, ushering in a fresh chapter for NCU. The president and his team reaffirmed their dedication to university governance, pledging to fulfill their responsibilities to the best of their abilities.

President Hsiau emphasized that talent cultivation is the university's foremost mission. He is committed to equipping students with interdisciplinary problem-solving skills, fostering an excellent research environment that enables faculty to focus on academic pursuits, and expanding international research collaborations to enhance NCU's global academic standing.



Taiwan's First Indigenous Lunar Science Payload: NCU's Deep Space Radiation Probe Successfully Transmits Initial Data

Taiwan's first domestically developed lunar science payload, the National Central University (NCU) Deep Space Radiation Probe (DSRP), has successfully transmitted its first batch of scientific data after being launched from Florida, USA aboard the Resilience lunar lander of Japan's ispace HAKUTO-R Mission 2. This milestone marks a significant achievement, bringing great excitement to the NCU scientific team.



Photo credit: Chou Yi-Hsuan



Photo credit：Department of Space Science and Engineering

According to Professor Loren Chang, Chair of NCU's Department of Space Science and Engineering, the lunar lander Resilience surpassed 10,000 kilometers in altitude on launch day, exiting low Earth orbit. The DSRP is Taiwan's first scientific payload to leave low Earth orbit, continuously setting new records for the flight distance of a Taiwanese space payload.

To ensure mission success, the team conducted extensive ground testing within limited time and space constraints, rigorously verifying functionality and performance despite numerous challenges. Their efforts paid off with a successful launch and data downlink.

The HAKUTO-R Mission 2 lunar lander carries three scientific payloads, with NCU being the only academic institution involved. The team has successfully converted raw data into radiation dose measurements and observed multiple bit-flip events caused by cosmic rays, demonstrating promising results.

The mission's primary scientific objective is to measure ionizing radiation dosesbetween Earth and the Moon as well as on the lunar surface. The collected data will contribute to the development of more precise radiation-resistant designs for future space components and capsules, while also providing important information for crewed flights.

The team member who traveled to Florida to witness the launch firsthand was first year graduate student Chou Yi-Hsuan. She described the experience as thrilling, with liftoff occurring at 1:11 AM local time. Having been involved in the design and implementation of flight software and environmental testing since her sophomore year, she expressed deep emotion in seeing her dream come true.

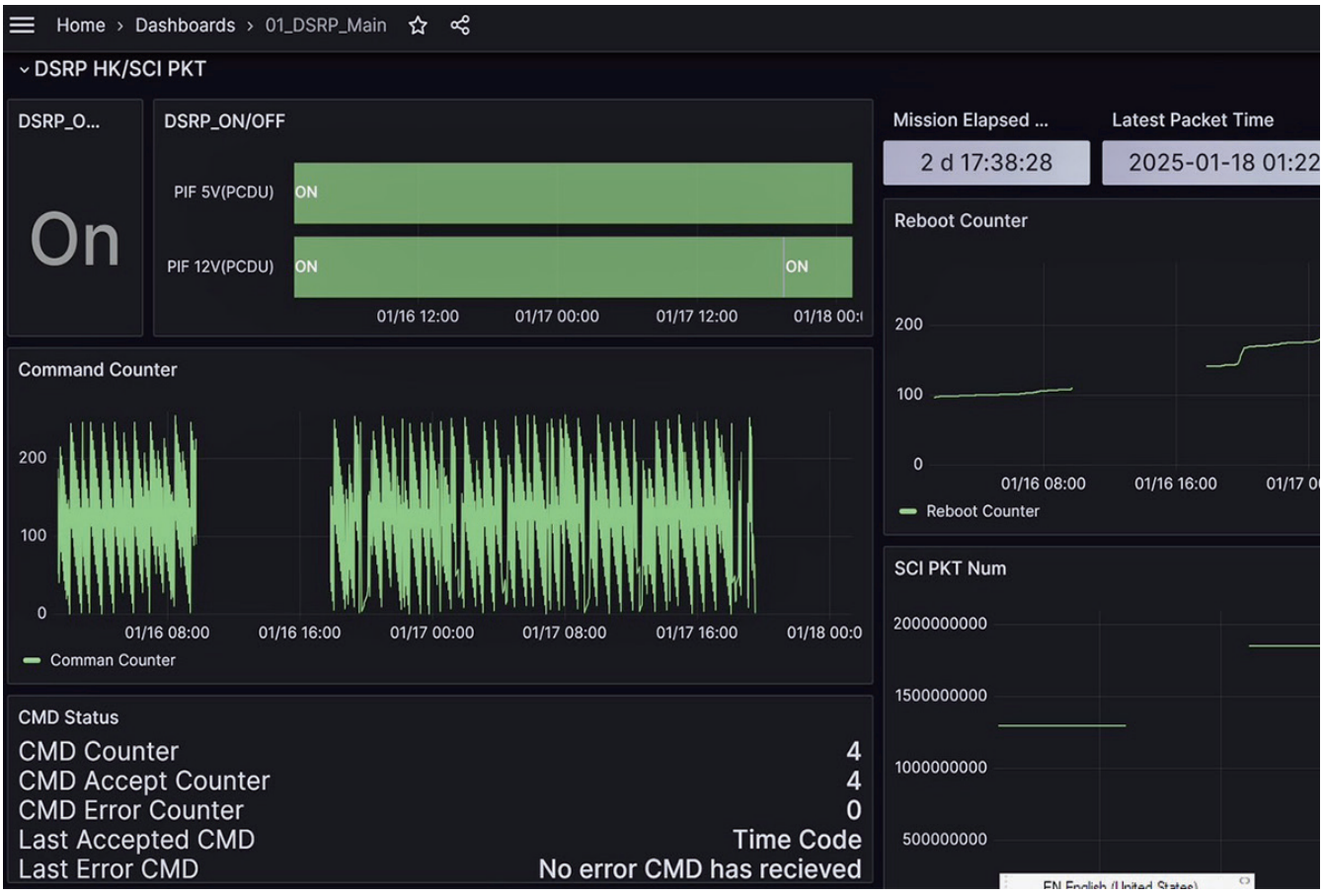


Photo credit：Department of Space Science and Engineering

NCU Research Team Participates in Findings in *Nature*, Revealing Accelerated Freshwater Loss and Sea-Level Rise by Melting Glaciers

Global glaciers are melting at an accelerating pace, reducing local freshwater resources and driving rapid sea-level rise. A multinational research collaboration, including Assistant Professor Zheng Whyjay and his research team from National Central University, recently published its findings in the prestigious journal *Nature*. The study reveals the escalating loss of global glacier mass and examines its impacts on sea-level rise and freshwater availability. This research, uniting 35 scientific teams worldwide, provides a detailed statistical analysis of glacier mass changes over the past 23 years.

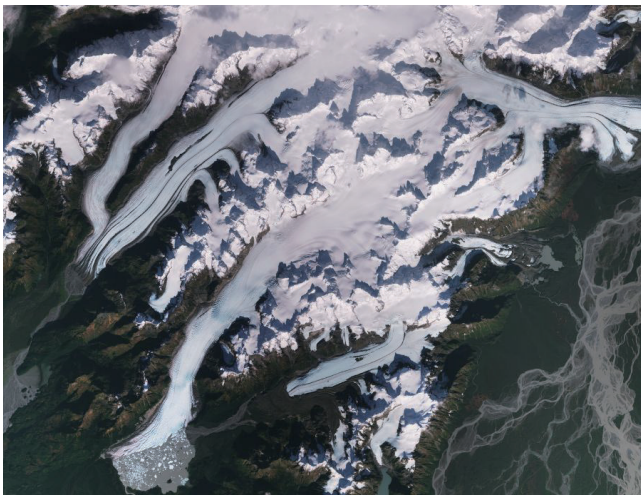


Image Provided by the European Space Agency

According to the findings, since 2000, global glaciers have lost an average of approximately 273 billion tons of ice annually. In 2000, glaciers (excluding the Greenland and Antarctic ice sheets) spanned 705,221 square kilometers and stored about 122 trillion tons of ice. However, over the past two decades, their total volume has decreased by roughly 5%, with regional losses ranging from 2% in the Antarctic and Subantarctic islands to a striking 39% in Central Europe.

Notably, the study found that the rate of glacier loss has accelerated significantly since 2010. Between 2012 and 2023, the volume of ice lost increased by 36% compared to the 2000–2011 period. Throughout the study period, glaciers lost 18% more ice than the Greenland Ice Sheet and more than twice the amount lost by the Antarctic Ice Sheet.



Photo by Zheng Whyjay

The study is part of the GlaMBIE project, an international research initiative funded primarily by the European Space Agency's Science for Society program and supported by the International Association for Cryospheric Sciences and various institutional partners. Conducted by the GlaMBIE team and led by the World Glacier Monitoring Service (based at the University of Zurich) and the University of Edinburgh, the project involved collaboration with Earthwave Inc. and 35 research teams worldwide.

"Benefiting from the different observation methods, Glambie not only provides new insights into regional trends and year-to-year variability, but we could also identify differences among observation methods. This means that we can provide a new observational baseline for future studies on the impact of glacier melt on regional water availability and global sea-level rise," explained Michael Zemp, who co-led the study.

Zheng Whyjay emphasized that beyond quantifying global glacier loss, the study aims to raise awareness within all the research participants' local communities about the effects of global warming. In Taiwan, he hopes the findings will underscore the urgency of carbon reduction and climate action. As the project progresses, the team will continue to investigate regional variations in glacier loss. This research marks a significant milestone in the United Nations International Year of Glaciers' Preservation and the upcoming Decade of Action for Cryospheric Sciences (2025–2034).

For more details, please refer to the article in Nature: https://doi.org/10.1038/s41586-024-08545-z.



Photo by He Han-Yu

Breakthrough in Optical Efficiency by Professor Sun Ching-Cherng's Research Team: 500% Increase in Optical Efficiency

In 2024, an advanced technology achieved 3% optical efficiency (1,300 nit/lm) in SRG-based lightguide at a 30° field of view, setting the highest publicly available benchmark. However, using SRG as an out-coupler induces eye glow and image leakage.

A multi-university joint research team led by Professor Ching-Cherng Sun at National Central University significantly advanced volume holographic lightguide AR glasses, achieving 9% optical efficiency—surpassing traditional methods by 500% and SRG-based systems by 300%.

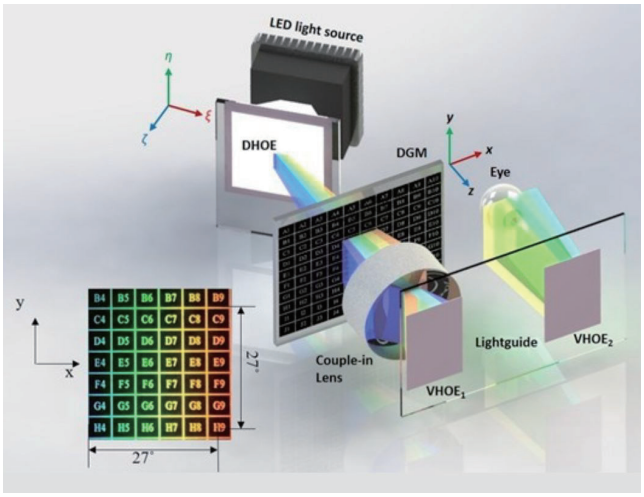
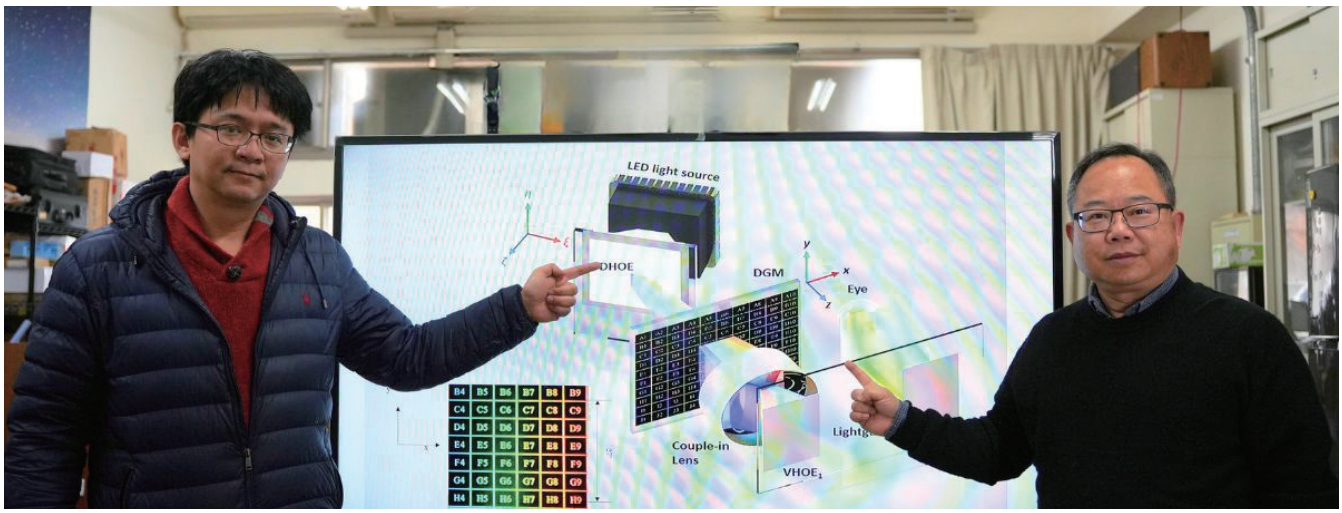


Image provided by Professor Sun Ching-Cherng

Near-eye AR/MR displays require seamless integration of virtual images while maintaining environmental transparency. Exit pupil expansion (EPE) is crucial for achieving a wide field of view and user comfort, yet conventional EPE techniques suffer from low optical efficiency. Volume holographic waveguides mitigate eye glow and enhance FOV but experience efficiency losses due to angle-dependent wavelength shifts.

Professor Yeh-Wei Yu developed an analytical solution for high-efficiency EPE wavelength distribution using Professor Sun's VOHIL model, with experimental validation. By optimizing wavelength characteristics, the team achieved unprecedented optical efficiency.

This breakthrough not only enhances AR/MR display performance but also improves energy efficiency, extending device battery life. The findings, published in Laser & Photonics Reviews, mark a significant step toward practical AR/MR adoption.



New Breakthrough in the Study of Dark Matter and Solar Atmosphere

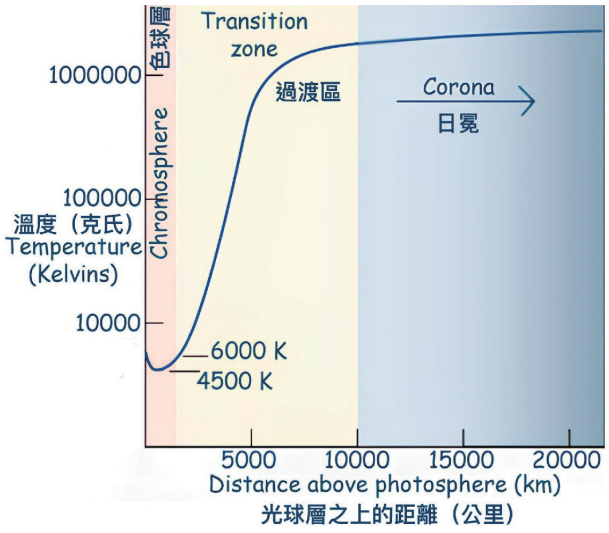
With support from the National Science and Technology Council, Professor Lin-Ni Hau of National Central University and her collaborators have developed a new theoretical model to explore the thermodynamics of galactic cold dark matter and the solar atmosphere. Their findings may explain the spatial distribution of dark matter temperature, which first increases and then decreases with distance from the center of a galaxy cluster. Additionally, their model successfully reconstructs the temperature distribution of the solar atmosphere, from the photosphere and chromosphere to the transition region and corona, offering new insights into these mysterious astrophysical phenomena.

The statistical thermodynamic model proposed by Professor Hau and her team describes dark matter as a self-gravitating system composed of numerous massive bodies, while the solar atmosphere is modeled as a many-particle gas or plasma under the Sun's gravitational field. In both systems, the particles—including dark matter—exhibit a wide range of velocities and kinetic energies. Their research also reveals that only extreme non-equilibrium conditions can produce the unique temperature distributions observed in dark matter and the solar atmosphere—phenomena that cannot be explained by conventional velocity distribution functions.

The study has significant implications for both space physics and cosmology. Solar research is crucial for understanding space weather and Sun-Earth interactions, as high-energy radiation and charged particles emitted from the Sun can disrupt Earth's electromagnetic environment and satellite communications. Meanwhile, the study of dark matter is essential to our understanding of cosmic fundamental compositions and evolution. This research was published in the February 2025 issue of *The Astrophysical Journal.*

Journal article: https://doi.org/10.3847/1538-4357/ada76f

Solar atmosphere temperature distribution:https://cseligman.com/text/sun/sunatmosphere.htm



The study published by Professor Lin-Ni Hau of National Central University and her collaborators establishes a new theoretical model for the study of cosmic dark matter and the solar atmosphere.

Image provided by Professor Hau.

Humanistic Care and Sustainable Development: NCU Honored with the 2024 Taiwan Sustainable University Excellence Award

Guided by its institutional development vision of "Humanistic Care and Sustainable Development," National Central University (NCU) has made significant strides in university social responsibility, humanistic care, and the creation of a green, low-carbon campus, contributing to a more resilient urban and rural environment. With the theme "Building a Resilient, Low-Carbon, and Healthy, Safe and Sustainable Campus and Collaborative Network," NCU participated in the inaugural Taiwan Sustainable University Awards hosted by the Taiwan Institute for Sustainable Energy, earning recognition with the Sustainable University Excellence Award.

NCU has established a Sustainable Development and Social Responsibility Committee as a cross-functional coordination body, integrating efforts across university departments to implement key initiatives such as campus resilience, carbon auditing, and energy conservation. In 2023, the university achieved a total carbon reduction of 240,756 kg CO_2e through water and electricity conservation efforts. Additionally, NCU has a solar power installed capacity of 4,000 kWp, generating 32,061 watts of green energy.

On the academic front, NCU established the Graduate College of Sustainability and Green Energy in 2023, fostering research talent in academia-industry integration. The university also offers sustainability courses, interdisciplinary social engagement credit programs, and self-directed learning communities to cultivate expertise in sustainability practices. Moreover, NCU collaborates with industry partners, local communities, and international partner universities to preserve global Hakka culture, stone weir ecosystems, and other public assets. To facilitate net-zero civic engagement initiatives and green life solutions, the university has also played a key role in developing resilient indigenous communities in Fuxing District and promoting cultural revitalization and eco-tourism. By positioning the university as a hub for sustainability, NCU continues to facilitate collaborations with the central government, local governments, and communities, driving sustainable voluntary actions at all levels.





Photo curtesy：Taiwan Institute for Sustainable Energy

Reaching for the Moon:
NCU Space Science Students Achieve International Recognition

A team of students from the National Central University (NCU) Department of Space Science and Engineering has earned first place in the Pre-9th Mission Idea Contest (PreMIC9), held in South Africa at the end of 2024. Their winning proposal, Lunar Ionosphere Characterization and GNSS Evaluation through Multi-Satellite Occultation (LIGEMO), highlights Taiwan's innovative capabilities in the field of space technology around the globe.





Organized by the University Space Engineering Consortium-Global (UNISEC-Global), PreMIC9 is a prestigious competition that encourages students worldwide to develop novel applications for small satellite missions. The challenge of the competition in 2024 focused on designing lunar-orbiting CubeSat missions to address future lunar exploration needs. NCU's LIGEMO proposal stood out for its innovation and technical feasibility, earning high praise from the judges.

With this victory, the team has secured a spot in the final competition, set to take place in Tokyo in 2025, where they plan to refine their proposal and take on an even greater challenge.



Photo credit：Department of Space Science and Engineering

UAiTED Annual Conference Held in Taiwan: Academic Leaders Gathered at NCU

On November 29, 2024, National Central University (NCU) hosted the Annual Conference of the University Alliance for International Talent and Education Development (UAiTED), organized by the Sayling Wen Educational Foundation and the UAiTED. The event brought together 16 scholars from 9 universities across Singapore, Malaysia, Taiwan, and Hong Kong, fostering academic collaboration and exchange.

The UAiTED signed its first memorandum of understanding with its initial alliance members in 2019. It now comprises 16 university members across the four regions. Each year, the alliance selects one of the locations to host its annual conference, which includes academic discussions and visits to local member universities.

During the conference, Professor Lin Tang-Huang, Director of the Center for Space and Remote Sensing Research, presented the center's missions, key features, and research contributions, emphasizing its crucial role in Taiwan's land conservation efforts as well as space and remote sensing technology development.

Additionally, Dr. Yang Ya-Hui, Associate Director of the Center for Astronautical Physics and Engineering, introduced NCU's latest advancements in space technology, highlighting the center's active collaboration with government agencies and private enterprises. Following the conference, participants toured NCU's Satellite Receiving Station and Space Payload Laboratory, gaining firsthand insight into the university's research capabilities.





Taiwan Polar Institute Engages in International Arctic Conferences, Showcasing Scientific Diplomacy on Global Stage

In February 2025, Director Ni Chuen-Fa, Associate Director Chien Hua, and Observation Station Director Slawomir Jack Giletycz of the Taiwan Polar Institute (TaiPI) attended the 2025 First Asia Arctic Conference and the 39th International Symposium on the Okhotsk Sea & Polar Ocean in Japan, at the invitation of Hokkaido University's Arctic Research Center. This marks Taiwan's first official participation, where the TaiPI team shared Taiwan's current polar research progress and key achievements across six scientific fields, demonstrating the country's commitment to polar research and its contributions to science.



The conference welcomed participants from over 10 countries, including six Arctic Council member countries, with more than 200 experts in natural and social sciences. A leader of one Arctic Council member country has made a striking statement: "What happens in the Arctic does not stay in the Arctic." This underscores the global impact of polar issues, reinforcing Taiwan's motivation for engaging in polar research.



Established in 2023, with its first scientific expedition to the Arctic in 2021, the TaiPI has been building research collaborations since 2019. At this high-profile international conference, the NCU-led delegation presented six different thematic topics, receiving strong recognition and validation from the global scientific community.

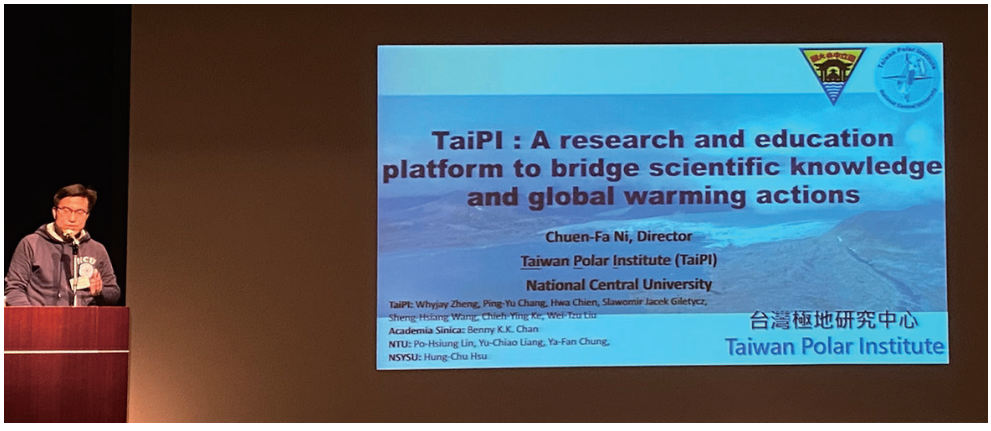


Photo credit：Taiwan Polar Institute



Wishing for a Smooth Year of Snake 2025: NCU International Students Celebrated Auspicious Lunar New Year

To celebrate the Lunar New Year, the Student Housing Service Division hosted a special event for international students, bringing them together to make tangyuan, perform the trending "APT." dance, and enjoy a traditional New Year's feast. Faculty members extended warm wishes, emphasizing the university's care for students from around the world.

The event began with a lively dance performance, showcasing how dance transcends borders. Everyone joined in, dancing with enthusiasm despite varying levels of familiarity with the moves. Students from Tanzania, Vietnam, and Indonesia then shared their countries' unique New Year traditions. The Tanzanian Maasai jumping competition, which participants compete to see who can jump the highest, fascinated the audience.



Vice President for International Affairs Hsu Hsieh-Lung reminisced about celebrating Christmas abroad during his student years, encouraging international students to fully embrace the Lunar New Year experience in Taiwan. Chung Chih-Chung, Chief of the Student Housing Service Division, welcomed students to treat their dormitories as a second home, ensuring they feel comfortable and at ease. Associate Vice President for Student Affairs Yen Horng-Yuan wished every student a sweet New Year, encouraging students to treat their roommates as family and take the opportunity to share their cultural traditions together. May the Year of the Snake bring peace and happiness to all!



NCU Conducts First Campus Wildlife Survey, Revealing Rich Biodiversity

National Central University (NCU) is home to a diverse natural ecosystem. To better understand the distribution of wildlife on campus, the Office of General Affairs commissioned the Wild Bird Society of Taoyuan to conduct NCU's first-ever campus wildlife survey, spanning over six months. The goal was to document local species and develop appropriate conservation strategies.

The survey identified 153 animal species, including 5 mammal species, 44 bird species, 13 amphibian and reptile species, 10 fish and crustacean species, 74 insect species (32 butterflies, 14 dragonflies, and 28 others), and 7 additional species. Notably, four species are endemic to Taiwan: the Taiwan blue magpie, the Taiwan scimitar babbler, the Taiwan barbet, and Swinhoe's tree lizard. Eight species are classified as protected, including the Taiwan blue magpie, the besra sparrowhawk, the crested serpent eagle, the crested goshawk, the common kestrel, the collared scops owl, the brown shrike, and the checkered keelback. Additionally, 21 non-native species were recorded, mainly among birds and fish. The survey also noted seasonal variations in bird populations, with the presence of migratory and wintering birds increasing species diversity.

Beyond cataloging campus wildlife, the survey aimed to better understand the behaviors of animals on campus, providing valuable insights for sustainability initiatives, environmental education, and campus management. Faculty, staff, students, and visitors are encouraged not to feed wildlife, maintain a respectful distance while birdwatching, and minimize disturbances, ensuring a truly nature-friendly and ecologically balanced campus environment.



scientific name：Urocissa caerulea



scientific name：Megalaima oorti



scientific name：Orthetrum pruinosum neglectum Rambur

Photo credit：Office of General Affairs

National Central University

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