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CONNECTION

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MESSAGE FROM THE EDITOR-IN-CHIEF

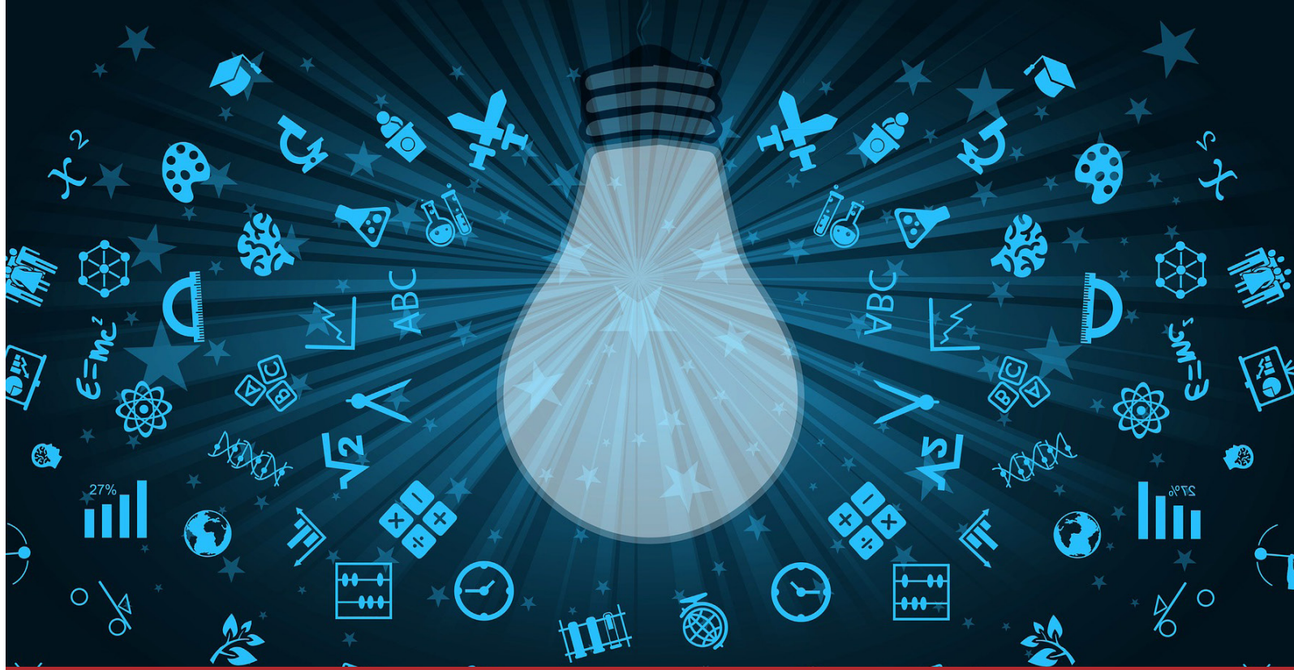
As we draw near to the end of another busy year, the ongoing pandemic continues to pose challenges, yet the crisis has driven deeper partnerships in response and further steps in our sustainability action plan—Z4G.

WLA University Presidents Forum highlighted Open Science for a sustainable future and the Global AgriInno Challenge 2021 inspired the young generation to explore paths to the future of digital agriculture. Joint labs have been launched with the University of Sydney and the University of Luxembourg respectively to reaffirm our shared commitment to the 2030 Agenda and multidisciplinary synergy.

The past months have witnessed a new round of accomplishments made by ZJU scientists, who respond in innovative ways to society's most complex challenges in the fields of health, environmental science, biotechnology, new materials, and etc. It is quite remarkable that seven members of our community were elected as new fellows of CAS and CAE, the most prestigious scientific society in China.

As always, we sincerely invite you to share with us your thoughts. Also, taking this opportunity, we'd like to extend our warmest gratitude for your support and our best wishes for a blissful new year.

LI Min, Editor-in-Chief
Director, Office of Global Engagement



ZJU NEWSROOM

International

WLA University Presidents Forum highlights Open Science for a sustainable future

With less than 10 years left to achieve the SDGs, Open Science is often deemed as an accelerator and enabler of sustainable and innovative solutions. In response, the 4th WLA University Presidents Forum, co-hosted by Zhejiang University and World Laureates Association, kicked off in Shanghai on November 1, gathering leaders and distinguished scientists from leading universities in China and abroad, including Tsinghua University, Peking University, Fudan University, Zhejiang University, Harbin Institute of Technology, the University of Bristol, Université Paris-Saclay, Stanford University, Rockefeller University and Hebrew University of Jerusalem.

As part of Z4G, the Forum featured two sessions, where the participants shared their insights into the pathways towards Open Science for the SDGs and examined major challenges met by research universities in the endeavor from concept to practice.

The presidents and scientists who attended the Forum all agreed that universities should play a leading role in advancing Open Science in multiple dimensions ranging from consensus guidance, mechanism construction, policy design to public communication.

At the Forum, Prof. WU Zhaohui, ZJU's president, shared the University's exploration and practices by orienting research to major challenges, bridging the last mile between labs and lives and advancing cross-border collaboration.

Global youth showcase digital solutions to challenges of poverty and hunger

On December 9, 10 youth-led teams pitched their innovative solutions at the on-line Pitch Event of the Global AgriInno Challenge (GAC) 2021, which attracted over 600 viewers from five continents.

GAC 2021, themed on "Digital Villages: Solutions for the Four Betters", was co-organized by Zhejiang University and Food and Agriculture Organization of the United Nations, with the support from the Ministry of Agriculture and Rural Affairs of China and Pinduoduo, a leading e-commerce platform in China. The gold medal was awarded to "Grow For Me" from Ghana, whose solution is an interconnected value chain financing platform to provide micro-financing to people in rural areas via mobile money to buy commodities directly from farmers.

ZJU and USYD sign MoU to launch a joint lab on sustainable environment

On November 4, Zhejiang University and the University of Sydney signed a Memorandum of Understanding online to establish a joint lab on sustainable environment.

Both universities have enjoyed a long-standing partnership with a joint seed funding set up in 2018 to promote collaborative research. The launch of the joint lab will offer more opportunities for multidisciplinary collaborations and find solutions for common challenges to sustainable development, including environmental pollution remediation, ecosystem restoration, renewable and clean energy, and data science, etc.

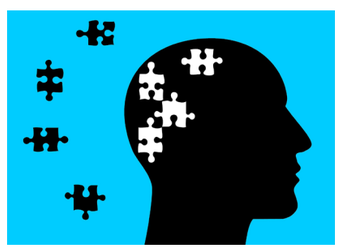
ZJU and UNILUX inaugurate joint lab to explore interdisciplinary collaboration

On December 6, the inauguration ceremony of Zhejiang University - University of Luxembourg Joint Lab on Advanced Intelligent Systems and REasoning (ZLAIRE) was successfully held online. The event brought together over 30 delegates from both countries.

Next year marks the 50th anniversary of diplomatic relations between China and Luxembourg. With the MoU and student exchange agreement signed this May and the launch of ZLAIRE, Zhejiang University and the University of Luxembourg will further join hands to give full play to their interdisciplinary advantages, and contribute to China-Luxembourg and China-Europe people-to-people exchanges.

Research

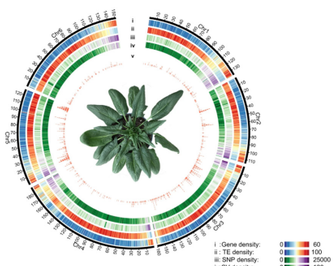
Does more attention necessarily lead to better working memory?



The research team led by Prof. CHEN Hui at the Department of Psychology and Behavioral Sciences published an article entitled "More attention with less working memory: The active inhibition of attended but outdated information" in the journal *Science Advances*. The study reveals that our brain tends to prevent attended but outdated information from entering working memory through active inhibition, a process that is subject to executive control resources. In this study, the researchers discovered that only key features were inhibited, while irrelevant features were retained, suggesting that the brain selectively removes unwanted information.

Spinach domestication and genetic basis of agronomic traits

Prof. JIAO Chen from the College of Agriculture and Biotechnology with her collaborator from Cornell University co-published a research article entitled "Genomic analyses provide insights into spinach domestication and the genetic basis of agronomic traits" in the journal *Nature Communications*.



The researchers assembled a much-improved chromosome-scale spinach reference genome using PacBio long reads and the high-throughput chromosome conformation capture (Hi-C) technology. They reconstructed the ancestral karyotype of Chenopodiaceae, which indicated substantial genome rearrangements in spinach after its divergence from ancestral Chenopodiaceae, coinciding with high repeat content in the spinach genome. The study provides not only insights into spinach evolution and domestication but also valuable resources for facilitating spinach breeding.

Rapid morphological shifts in response to habitat fragmentation

On the basis of the "island rule" and the rapid morphological change in animals, Prof. DING Ping at College of Life Sciences led his team to conduct field surveys in the Thousand Island Lake in Zhejiang Province with a view to probing into the story behind the rapid morphological adaptation of island animals in fragmented habitats caused by human activities. Their study was published in the journal *Diversity and Distributions*.

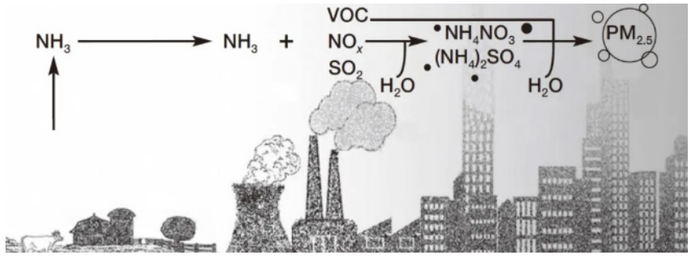
This study reveals that habitat fragmentation has profound implications for the body size of wild animals and even their evolution, thus providing guidance on working out the strategies for protecting species in fragmented habitats.

RESEARCH HIGHLIGHTS

More cost-effective way to mitigate $PM_{2.5}$ air pollution

The team led by Prof. GU Baojing from the College of Environmental and Resource Sciences along with the collaborators from Peking University and the UK Centre for Ecology & Hydrology analyzed for the first time the contribution of ammonia (NH3) and nitrogen oxides (NOx) in the formation of air pollution from $PM_{2.5}$ and their health impact. They also investigated the pathways and costs of controlling nitrogen emissions to mitigate the adverse health effects of $PM_{2.5}$ pollution. This study was published in *Science* on November 5.

Their research suggests that the effect of ammonia has been underestimated. "In the past, the effect of pollutants was often investigated from the mass-ratio perspective, allowing ammonia, which accounts for less than 10% of the total mass of $PM_{2.5}$, to be largely ignored. We revisited this problem in terms of the molar share of chemical reactions. Using data models, we found that $PM_{2.5}$ decreased by 40% or so when no nitrogen was emitted," said Gu.



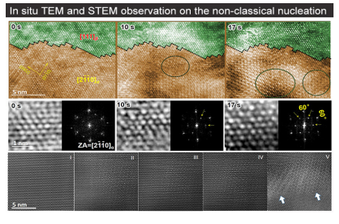
Researchers also constructed the N-share to quantify the contribution of global nitrogen emissions to $PM_{2.5}$ health effects in different countries, and found that ammonia abatement was more cost-effective than NOx abatement in global $PM_{2.5}$ pollution management.

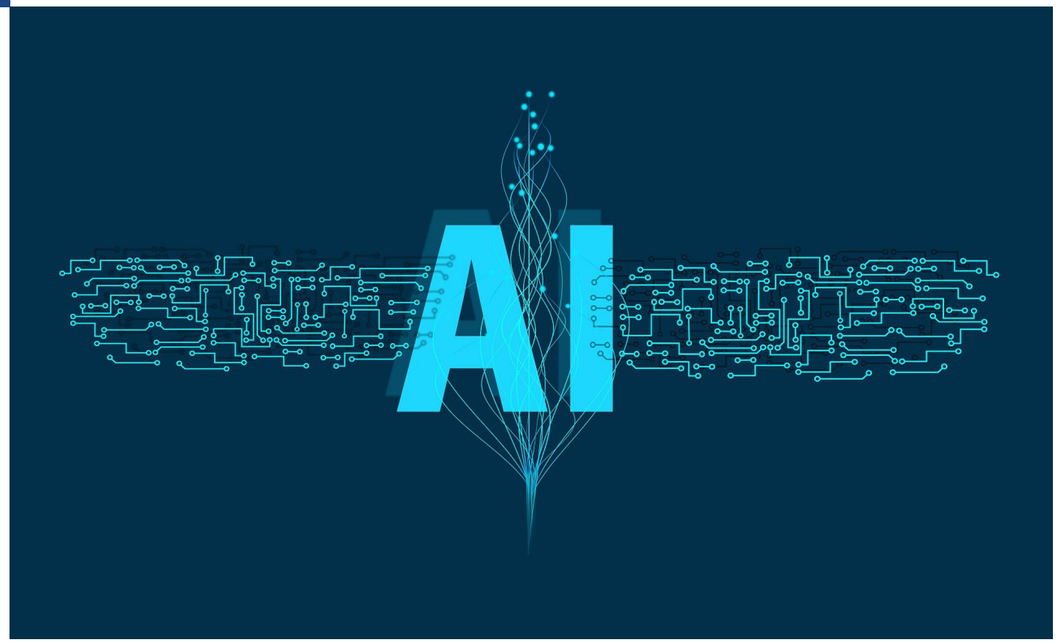
Phase transformation in titanium alloys observed at atomic scale

Prof. YU Qian in Prof. ZHANG Ze's group at the ZJU's Center of Electron Microscopy led her team, along with her collaborators from Xi'an Jiaotong University and the Pennsylvania State University, to explore how titanium evolves in microstructure at a high temperature. By employing cutting-edge in situ and multi-scale electron microscopy techniques as well as synchrotron radiation and computational simulations, the researchers together conducted an in-depth research into the α-β transformation mechanism in the titanium-molybdenum alloy. They discovered a significant distinction between this transformation process and what is described in classical nucleation theory. Their research findings appeared in the journal *Nature Materials* on November 26.

YU Qian et al. conducted a direct and time-resolved experimental observation of a non-classical nucleation-mediated phase transformation at sub-ångström resolution using a titanium-molybdenum alloy as a representative system. They discovered a nano-sized and chemically ordered superstructure in the α-phase matrix; its composition, chemical order and crystal structure were all found to be different from both the parent and the product phases, but triggered an increasingly low energy barrier for the transformation into the β-phase. This latter phase transition can proceed instantly via vibrational switching when the molybdenum concentration in the superstructure exceeds a critical value.

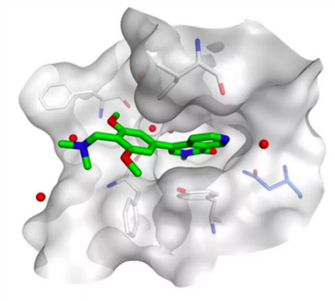
"It is the first time that such a non-classical solid-state phase transformation has been reported in titanium-based alloys," said Prof. Yu.





AI helps with drug discovery in the "galaxy"

Drug-target interaction (DTI) is a prominent research area in drug discovery. Chemists estimate that 10^{60} compounds with drug-like properties could be made — that's more than the total number of atoms in the Solar System, as an article reported in the journal *Nature* in 2017. It is apparent that traditional biological experiments for DTI detection are normally costly and time-consuming.



Prof. HOU Tingjun from the College of Pharmaceutical Sciences and Prof. HE Shibo from the College of Control Science and Engineering along with their collaborators from Central South University proposed a unified framework called KGE_NFM (knowledge graph embedding and neural factorization machine) by incorporating KGE and recommendation system techniques for DTI prediction that are applicable to the various scenarios of drug discovery, especially when encountering new protein targets. Their research was in the journal *Nature Communications* on November 22.

Researchers evaluated KGE_NFM in three real-world scenarios: the warm start, the cold start for drugs and the cold start for proteins. In the first two scenarios, AI algorithms were on par with traditional ones, and sometimes even slightly inferior to the latter. In the third, KGE_NFM outdistanced its rivals by 30%.

"This demonstrates the remarkable ability of AI in predicting the unknown protein targets. Discovering 'the unknown drug-target interactions' from 'the unknown protein targets' is an undeniably important undertaking in the future of drug discovery," Hou observed.

SPOTLIGHT ON STUDENTS

ZJU in top ten at the 2021 iGEM competition

On November 14, team ZJU-China, with its project named ViruGuard, won a gold medal from the 2021 International Genetically Engineered Machine (iGEM) Competition, ranking in the top ten for the first time. This is the ninth gold secured by the ZJU team since its participation in 2010.

Mentored by Prof. CHEN Ming and Assoc. Prof. YANG Fan of the College of Life Sciences, the 13-membered team is multidisciplinary, comprised of undergraduates from 5 colleges.

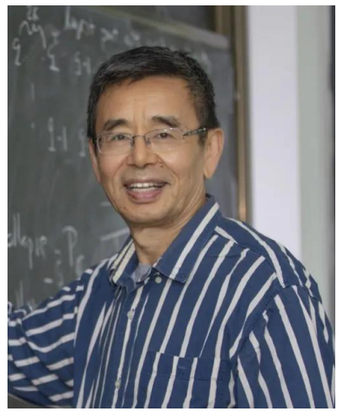
Inspired by the traditional Chinese concept of 'counteracting one toxin with another, the team managed to develop a new type of oncolytic virus for hepatic cancer treatment through 9 months of assiduous trial and error. With several safety designs, the modified oncolytic virus kills tumor cells without causing possible virulence to normal cells.

With the resounding success in the competition, the team wished to go even further. "We compiled a user manual, which elaborated the exact way how patients and doctors can use it," said WU Haoran, the team leader. "We hope that ViruGuard can one day come into the market and really benefit the patients who suffer from hepatic cancer on this planet."

FACULTY

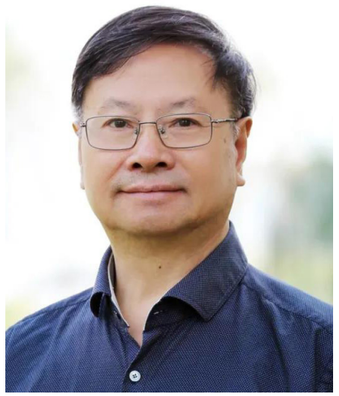
Editor's Note: On November 18, the Chinese Academy of Sciences (CAS) and the Chinese Academy of Engineering (CAE), the most prestigious scientific society in China, unveiled 149 new fellows and 45 foreign fellows, including 7 members of ZJU community.

2 CAS fellows



Prof. RUAN Yongbin, Institute for Advanced Study in Mathematics

Focusing on symplectic geometry and mathematical physics, he has made significant contributions to Gromov-Witten invariants and quantum cohomology, Chen-Ruan cohomology, FJRW theory and their applications.



Prof. XU Shilang, College of Civil Engineering and Architecture

An expert in safety of concrete structures, he has made tremendous contributions to theoretical innovations in terms of concrete fracture mechanics as well as material development and engineering.

1 CAS foreign fellow

Prof. Hywel Rhys Thomas, Professor of Civil Engineering at Cardiff University and ZJU's Qiushi Chair Professor

His research interests lie in the area of "Coupled Processes in the Ground" which investigates the burial of nuclear waste and the complex behavior of water, gas, heat and chemicals below ground.

3 CAE fellows

Prof. ZHENG Jinyang, College of Energy Engineering

He has long dedicated himself to research into high-pressure vessels and pipelines. His enormous achievements in high-pressure hydrogen storage, cryogenic vessels and ductile high-pressure composite pipelines have been highly recognized.

Prof. GAO Xiang, College of Energy Engineering

Dedicated himself to the carbon reduction in the field of energy and environment, he has made remarkable achievements in ultra-low emissions of power plants, efficient flue gas treatment and efficient purification of vessel exhausts.

Prof. YU Jingquan, College of Agriculture and Biotechnology

Focusing on research into vegetable growth and quality control, he has made substantial contributions to the establishment of the modern vegetable production theory and the anti-resistance and high-yield technology system.

1 CAE foreign fellow

Prof. Billie F. Spencer Jr., Nathan M. and Anne M. Newmark Endowed Chair at the University of Illinois at Urbana-Champaign, ZJU's Qiushi Chair Professor and ZJUI's adjunct professor

Focusing on intelligent structures, he has pioneered research and development of smart dampers based on magnetorheological fluid technology. He has also made breakthroughs in open-source hardware/software architectures for wireless sensor technology for structural health monitoring.