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LIFE IN CHINA

Scientific Collaboration Essential for Global Progress

Dialogue

By LONG Yun & BI Weizi

"Science is international by its nature, and collaboration is necessary to advance scientific understanding," according to Professor Viktor Gouretski in a recent interview with *Science and Technology Daily*.

Currently, Gouretski a renowned German scientist majoring in climatology and oceanography, works at the Institute of Atmospheric Physics (IAP), Chinese Academy of Sciences. After several years at IAP, he finds the working environment pleasant and conducive to his research. He singles out team spirit as being an essential component of the working culture, as well as being impressed by the engagement and hard work of Chinese students.

Providing valuable resources

Gouretski has made significant contributions to the field of observational oceanography through his research. His work has focused on analyzing large data sets and improving the quality of oceanographic data, leading to a better understanding of the ocean's role in global climate change.

One of his most significant contributions to the field was his research on systematic errors in oceanographic data. In a paper published in 2007, Gouretski and his colleague demonstrated that some of the substantial variability seen in the time series of the global ocean warming were not real but were, in fact, caused by errors in the data. Specifically, one of the instruments was found to provide a significant amount of data with systematic errors that varied over time. This variability had nothing to do with changes in the ocean itself and was distorting global warming trends. His discovery led to a number of follow-up studies that aimed to estimate and correct these errors, allowing scientists to use the data more accurately in their research.



Professor Viktor Gouretski. (COURTESY PHOTO)

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Another vital contribution Gouretski has made is the analysis of the World Ocean Database and the data from the World Ocean Circulation Experiment (WOCE) in particular. His work showed that the quality requirements set for scientists participating in that experiment had been met. His subsequent work resulted in creating a printed and digital atlas for the Atlantic Ocean based on the WOCE data. This atlas provides a valuable resource for researchers studying the ocean's properties and circulation.

From his professional perspective, China has made progress in promoting sustainable development, introduction of electric cars and buses throughout the country, a developed railway network, and solar photovoltaic plants. He also recognized that China is the world's leading manufacturer of solar panels, which could lead to an increase in the use of solar energy to produce electricity. Cooperation generates robust findings

Gouretski's views on international cooperation are not just theoretical, as he has put them into practice throughout his career. He has collaborated with scientists worldwide on projects such as the World Ocean Circulation Experiment (WOCE) and the Global Ocean Data Analysis Project (GLODAP). These initiatives have been important in advancing our understanding of the ocean and its vital role.

International cooperation is vital for the field of observational physical oceanography, according to Gouretski. He believes collaboration between countries is essential to gather the necessary data and to conduct analysis.

The ocean is a complex and vast system, and no single nation can provide all the data required to observe the entire global ocean. Therefore, international cooperation is needed to combine efforts and gather as much data as possible. This allows for a more complete and accurate understanding of the ocean's behavior, which can support critical decisions related to climate change, ocean conservation, and other important issues.

However, simply gathering data is not enough, according to Gouretski, only collaborative efforts of developing new ideas and analysis techniques can help bring new insights and understanding about the ocean. Collaboration also helps to ensure findings are more robust and reliable, he said.

Making the ocean's role visible

Global warming has aroused not only scientists' attention, but also the public's concern.

Gouretski's research has significantly contributed to our understanding of Earth's climate system. As he explains, the ocean is a critical component of the Earth climate system, storing more than 90 percent of the excessive heat energy. Therefore the global ocean heat content is a crucial climate index.

The professor believes his and other oceanographers' findings are crucial to the broader public's understanding of the ocean's significance. He gave an example that a recent article published in regard to progressive warming of the global ocean has had a strong impact and attracted significant media attention. This shows that ocean warming is essential and relevant issue to the broad public.

From his point of view, scientificoutreach activities are essential for conveying scientific knowledge, fighting against conspiracy theories, and promoting evidence-based thinking. For example, in the case of global warming, many people still do not believe that human activities are the primary cause of climate change, despite overwhelming scientific evidence to explain.

This article is also contributed by CHEN Ye from IAP.

Letter to the Editor

Robotic Innovation in Medical Field

By CHI Wenqiang Misbahul Ferdous

Surgical robots are a significant technological advancement in healthcare that emerged in the 1980s to assist clinicians. The da Vinci robot is the most successful platform and has been installed more than 300 units in China.

Using robots in the medical field offers several benefits, including improved patient care, cost reduction, and a safer environment for both patients and clinicians.

The da Vinci robot is a telemanipulator for laparoscopic surgery, which enables surgeons to manipulate dexterous instruments intuitively while also improving surgical precision and stability. Similarly, Edge Medical from China released another four- arm robot that can manipulate three instruments simultaneously with one further arm to hold the endoscope. These robots can be gigantic in size, making it difficult to fit them in an operating room. Beijing Shuri Medical has proposed a single- arm system that can achieve similar surgical outcomes. The arm integrates four snake-shaped instruments together, which are extremely flexible but still offer great strength and stability.

Robots can hugely improve the precision of the surgical procedures while enhancing navigation to deep lesions inside the human body. The robotic navigation system can help the surgeon plan the path for surgical implants inside the bones, especially in orthopedic surgery. The navigation system uses information from pre-operative CT images as well as real- time tracking of the instruments and patients during the operation. Beijing Tinavi Robotics developed a robotic arm that can precisely place the implants following its navigated path, which has already benefited 30,000 procedures in China.

Robots can also reduce health risks to patients and clinicians in hazardous environments, such as reducing exposure to pathogens during the COVID-19 Operation Robot is a multi- arm platform used to manipulate elongated instruments such as catheters and wires for vascular intervention. The clinician can sit outside the operating room to perform the procedure while eliminating potential radiation- related health risks. The robotic manipulator can also improve instrument stability since catheters are extremely flexible and unstable to manipulate.

More advanced innovations in medical robotics focus on micro/nanoscale treatment inside the human body. Neuralink starts a new era for Brain- Computer Interface, proposing a "Stitching" robot that can insert microsized electrodes into the brain, which can perceive signals from some functional regions.

Not far off from something you would read about in science fiction, people can now swallow a tiny robot for better healthcare. AnX Robotica made a capsule robot named Navicam, whose movements are controlled by clinicians to view the stomach from inside the patient's body. It significantly improves patient comfort while also reducing risks and operational difficulties associated with conventional endoscopic techniques.

Recent developments are geared toward nanobots — tiny machines that operate at the nanoscale level, about a millionth of a millimeter. These robots can be programmed to manipulate cells and other biological materials at the molecular level, making them an exciting new tool for medical research and treatment. One promising application of nanobots is in the field of cell manipulation. By using nanobots, scientists can precisely target and manipulate individual cells, allowing for more accurate and efficient testing of new drugs and therapies. Additionally, nanobots can be used to deliver drugs or other therapeutic agents directly to diseased cells, potentially reducing side effects and increasing effectiveness. The development of nanobots for cell manipulation is still in its early stages, but the potential for this technology to revolutionize medicine is inspiring.

Traditional Eastern Wisdom

Brilliant Glazed Roof of Forbidden City

By BI Weizi

The Forbidden City, the political and ritual center of China for over 500 years and one of the world's most important cultural heritage sites, is a precious testimony to Chinese civilization during the Ming and Qing dynasties. The glazed roofs of the imperial palaces continue to shine, showcasing the advanced architecture of ancient China.

A glaze is an impermeable layer or glass-like coating applied to the ceramic body which is then melted by firing. The main component of the glaze is silica, while the type varies depending on the addition of other materials such as copper, aluminium and other components that affect the viscosity, colour and texture of the glaze.

Glazed tiles on the roof of the For-

bidden City serve an aesthetic and functional purpose by adding to the beauty of the building's facade, highlighting the function of the building, and protecting the roof from damage while also insulating the building. The tiles are mostly yellow, as in ancient times yellow was the embodiment of imperial power, creating a glorious atmosphere and reflecting the splendour of the royal palace. Other colors of glazed tile reflect buildings' functions — blue glazed tiles signify heavenly sacrifice, green signify gardens, black signify fire prevention.

Glazing can also be used to waterproof ceramics. Ordinary ceramic tiles have a rough texture and strong water absorption, however, glazed tiles have a smooth surface that does not absorb water, making them effective in protecting



A picture of glazed roofs of the Forbidden City, Beijing. (PHOTO: VCG)

buildings from rain and snow.

Glazed tiles are the embodiment of ancient technology in China's architec-

ture and can also reflect the rich art and culture of ancient architecture in China.

High-level Opening up Offers Global Business Opportunities

From page 1

The LCD panel cluster in China has become a leading base boating the most advanced technology, the largest production scale and the highest output efficiency in the nation. Meanwhile, a world-class flat panel display industrial base with a complete industrial chain has emerged.

None of these could have been achieved without China's commitment to open market and supportive policies from both central and local governments. LG Display is impressed with the favorable business environment and efficient administrative service in Guangzhou. "That is why we decided to settle here," said a Korean director at LG Display China.

More and more foreign companies such as ExxonMobil, Shell Group, BASF came to Guangdong and the Greater Bay Area in recent years, with projects worth more than 10 billion USD. As of December 2020, 350 Fortune 500 companies had invested in Guangdong with the accumulated registered capital exceeding 180.7 billion USD. The presence of foreign capital has also boosted cooperation in technological innovation. This has led to an increased focus on innovative R&D and advanced manufacturing. ExxonMobil has begun construction of the Daya Bay Technology Center in Huizhou in southern Guangdong province, which is its second R&D center in China after the first center in Shanghai.

Promoting high-standard opening up was reinforced in the report to the 20th National Congress of the Communist Party of China in 2022. According to the report, China will steadily expand institutional opening up regarding rules, regulations, management, and standards.

In January, the Ministry of Commerce and the Ministry of Science and technology put forward policies and measures for further encouraging foreign investment in establishing R&D centers and helping foreign investors participate in China's innovation-driven development and sharing the opportunities of China's high-quality development.

At present, many foreign R&D centers are growing rapidly in China, especially in Beijing, Shanghai and the Greater Bay Area. pandemic. Another such example is in radiation reduction in areas where X-ray imaging is heavily relied on. Shanghai

Science Outreach

Selenium's unique role in human

Selenium can improve the oxy-

gen-carrying capacity of red blood

cells, lower blood sugar in diabetics

and regulate insulin metabolism, Ru-

an Guangfeng of China Food Infor-

mation Center told S&T Daily, add-

ing that, "Selenium is an essential

trace element rich in antioxidant

trace elements and is involved in the

antioxidant process of the organism,

according to the Dietary Reference In-

takes for Chinese Residents published

by the Chinese Nutrition Society. It al-

so noted that selenium deficiency is

associated with Keshan disease (KD),

a fatal cardiomyopathy, and the clini-

cal manifestations of patients with KD

are mainly congestive heart failure,

acute heart failure, and cardiac ar-

Eating selenium-rich fruits and

Selenium is one of the essential

By Staff Reporters

health

properties."

rhythmias.

These two authors are researchers from Lepu Medical Company.

Tips on Selenium Supplements

vegetables to supplement selenium

Eating selenium- rich fruits and vegetables is an effective way to supplement selenium. Ruan said that in daily life, there are many natural foods rich in selenium, such as meat, eggs, fish, seafood and animal organs. Some vegetables, such as capers, asparagus, peas, cabbage, squash, onions and tomatoes, also contain a certain amount of selenium, and eating more of these foods can safely and effectively replenish selenium.

Overdose selenium may cause adverse consequences

A moderate amount of selenium is beneficial to the human body, but an overdose is harmful. Zhai Fengying, executive vice president of the Chinese Nutrition Society, said that long-term consumption of foods containing excessive amounts of selenium can be toxic, causing hair loss, nail deformation, nausea, vomiting, irritability, fatigue and so on.

Zhai also noted that determining whether the body is deficient in selenium is a complex process that requires detailed biochemical tests, and selenium supplementation may lead to adverse consequences. It is recommended to consult the nutrition department of a regular hospital before taking selenium supplements.