

# A Pure Heart to Help Patients Against Nerve Diseases

## Dialogue

By LONG Yun & GONG Qian

Canadian scientist Mohamad Sawan, internationally acclaimed for his work in the field of smart medical devices, where he has made significant contributions to developing implantable and wearable devices, is now focusing his research on the human brain in addition to his work in developing smart devices.

A fellow of the Royal Society of Sciences of Canada, Sawan is now living in the city of Hangzhou in east China's Zhejiang province, where he is a faculty member of Westlake University. As founder and director of the Center of Excellence in Biomedical Research on Advanced Integrated-on-chips Neurotechnologies (CenBRAIN Neurotech), he leads a team of 35 researchers working to improve healthcare by diagnosing and treating neurodegenerative disorders -- diseases caused mainly by the cells in the human nervous system malfunctioning, such as Parkinson's and Alzheimer's -- and large variety of brain-related medical conditions.

In this interview with *Science and Technology Daily*, he talked about CenBRAIN Neurotech, his work, and Hangzhou, a beautiful city with a rich culture and the venue of the 19th Asian Games.

Sawan called CenBRAIN Neurotech, with its excellent laboratory resources, an ideal environment for cutting-edge research and development where the researchers follow an interdisciplinary approach to develop innovative solutions, integrating biomedical engineering, neurotechnology, bioelectronics, and neuro-morphic-based AI.

"My dream is to use cutting-edge scientific research and technology to help patients with neurode-



Professor Mohamad Sawan. (COURTESY PHOTO)

generative diseases return to normal life and improve their quality of life," he said.

His electrical and biomedical engineering background enables him to approach the diagnosis and treatment of neurodegenerative diseases from an engineering perspective. He likened the brain to a "complex machine", where faulty components, or poor connections, cause dysfunctions. His proposed solutions are to use microsystems to replace the malfunctioning compo-

nents so that they can be stimulated and once again receive neuro signals and process them.

The lab's smart medical devices combine micro-electronic integrated circuits, wireless communication, energy harvesting, and other innovations. Its activities also extend to in-vitro diagnosis, diseases prediction, and body functions restoration.

Sawan encourages aspiring scientists, particularly the younger generation, to be creative and think beyond the conventional approach. He says he welcomes challenges to his authority and emphasizes the importance of independent thinking. He applauds China's commitment to education and the cultivation of talented young researchers, and hopes they will be innovative and courageous in expressing their ideas.

As an expert who has foreseen the emergence of AI technology, he urges people to see the positive side of this research and development sector. However, he also cautions against excessive reliance on AI by young people as it can hinder their critical thinking abilities.

As he indicated, scientific research demands time. He follows a draconian work schedule, getting up early and trying his best in the job. Despite the hectic schedule, he still manages to find time to jog around the picturesque West Lake, a prime tourist destination, and along the Qiantang River, enjoying the abundant green spaces, fresh air and bird songs.

His work has been recognized with awards at home and abroad, from the Chinese government's Friendship Award, the highest honor for a foreigner, to the Lebanon Presidential Award and the Barbara Turnbull Award instituted by Canadian Institutes of Health Research and the Barbara Turnbull Foundation for Spinal Cord Research.

This article is also contributed by Westlake University.

## Traditional Eastern Wisdom

Editor's Note:

The spirit of innovation and scientific thinking embedded in the 5,000-year-old Chinese civilization have shone brightly in various fields such as astronomy, geography, agriculture, medicine and mathematics.

As the saying goes, "To forge ahead into the future, one must not forget the past; to innovate better, one must be adept at inheritance." From this issue, a new series will be launched to introduce the stories of ancient Chinese inventions recorded in the book *Dream Pool Essays*, which reflects the highly significant sci-tech achievements of ancient China. The contributions made by Shen Kuo (1031-1095), the author, laid an important foundation for subsequent sci-tech development.

## Hunyi: A Symbol of Ancient Chinese Astronomy



A model of Hunyi is on display at Guo Shoujing Memorial Museum in Xingtai city, Hebei province. (PHOTO: VCG)

By BI Weizi

Hunyi (An armillary sphere) is an ancient Chinese astronomical instrument, which consists of a circular spherical frame centered on Earth or the Sun, representing the longitude and latitude of the celestial body and other astronomical features, such as the zodiac. The Chinese armillary sphere, based on the Armillary Theory, is the symbol of ancient Chinese astronomy.

According to the Armillary Theory, the sky is round and shaped like an egg shell. The stars are projectiles embedded in the eggshell, with Earth being the yolk. Therefore, this instrument for observing the position of celestial bodies is named Hunyi, where Hun means a ball in Chinese.

According to the ancient book on Chinese science, *Dream Pool Essays*, the Hunyi sphere is a miniature representation of celestial objects in the sky, consisting of a series of concentric rings centered around a globe. The relative po-

sition of the rings could be adjusted to reflect the precession of the equinoxes and the regression of the lunar nodes along the ecliptic. The hollow tube in the innermost ring, called the sighting tube, is used to point at the object of observation.

Hunyi can be traced back to the 4th century BC, about 60 years earlier than ancient Greece invented their own armillary sphere. During the Tang Dynasty (618 - 907), an astronomer named Li Chunfeng designed a relatively sophisticated armillary ecliptic instrument. This was followed by the instrument being improved during the Yuan Dynasty (1271-1368), by Guo Shoujing, an influential astronomer in Chinese history, to establish the location of celestial bodies and the angles of the sun relative to Earth more accurately. The earliest existing armillary sphere in China was made in the Ming Dynasty (1368 - 1644) and is on display at the Purple Mountain Observatory in Nanjing.

# Welcome to Beijing-Tianjin-Hebei Region

## Expats Activity

By Staff Reporters

Over the past decade, cooperative mechanism for attracting experts has been established among Beijing, Tianjin and Hebei province, demonstrating their commitment to the coordinated development strategy. Through joint meetings, timely sharing of intellectual achieve-

ments, mutual recognition of qualifications for foreign experts, and a series of measures, including establishing platforms for exchanges and resource sharing, three local government departments have initiated branded events such as the "Academic Exchange Event in Beijing-Tianjin-Hebei" and other important activities. These activities have attracted more than 300 foreign experts, including Nobel laureates and internationally renowned experts.

Recently, the 2023 Academic Ex-

change Event for Foreign Experts in the Beijing-Tianjin-Hebei region was held in Tianjin from July 5 to 7. The event aimed to leverage the role of foreign experts in economic and social development of the region. Experts from 12 countries, including Canada, France, Germany, Italy, Japan and the U.S. attended the event.

During the three-day exchanges, the Tianjin Municipal Science and Technology Bureau provided a range of activities, including achievement exhibitions, policies to promote experts, and a spe-

cial session on policy introduction for the Tiankai Higher Education and Scientific Innovation Park. Foreign experts engaged in in-depth discussions on the development of the high-end manufacturing industry, the trend of scientific and technological progress, and the promotion of industrial cooperation in the Beijing-Tianjin-Hebei region.

This article is contributed by Tianjin Municipal Science and Technology Bureau.

# Hottest Season Arrives

## Photo News

By BI Weizi

Dashu is the twelfth of the twenty-four solar terms, a time system that embodies the traditional knowledge and social practices by which the Chinese obtain their perception of the regularity of the seasons and other local natural phenomena occurring throughout the year. Shu means scorching heat, and Dashu refers to extreme heat.

Dashu is the sunniest and hottest solar period of the year, with the most

thunderstorms and rainfall. The monsoon climate is the main characteristic of China's climate. In summer, influenced by the warm and humid air from the sea, many places in China are very hot, humid and rainy. Although it is unavoidable to suffer from heat and humidity, it is conducive to the growth of crops, which grow fastest during this period.

Since ancient times, people have had the custom of drinking herbal tea (fucha), burning incense and drying ginger during Dashu. Since it is the hottest and most humid season of the year, the focus of healthcare is on "preventing heat stroke" and "eliminating humidity."



People in Guiyang city play and swim in a river during Dashu, enjoying the summer coolness. (PHOTO: VCG)

## China's First Offshore Carbon Storage Project Goes Live

The soil in this area is very soft and can't provide enough support for the drilling tool. Engineers therefore divided the construction into four phases and adopted four different sizes of drill bits. They used low temperature rheological stable drilling fluid to provide more support for the path of drill bits.

Another challenge is the CO<sub>2</sub> corrosion. When CO<sub>2</sub> meets water, it produces carbonic acid, which severely corrodes the steel and cement of the channel and leads to the risk of leaking.

"The technical team carried out research and found that by adding element chromium (Cr), the corrosion resistance of the pipe can be greatly improved, along with the use of anti-corro-

sion cement," said Mi, adding that these technical achievements will ensure the channel safety during the operation period of several decades.

### Demonstration project

Enping 15-1 offshore carbon storage project became operational on June 1. It can store a maximum of 300,000 tons of CO<sub>2</sub> a year. Although this capacity is not noteworthy in the field of carbon capture, utilization and storage (CCUS) across the country, the main role of this project is a demonstration for further application of offshore carbon storage, said Mi.

As the main carbon sink for our planet, the ocean absorbs excess heat and energy released from rising greenhouse gas emissions trapped in the

Earth's system. For China, its seabed has rich and suitable geological conditions for offshore carbon storage.

In January, the Ministry of Natural Resources released the assessment of the offshore carbon storage potential, stating that it can reach 258 trillion tons, about 200 times more than China's total carbon dioxide emissions in 2022.

Offshore storage of CO<sub>2</sub> has become an important option for China to solve the contradiction between economic development and carbon emissions in its eastern coastal areas.

CNOOC has launched China's first ten-million-ton CCUS cluster project in Huizhou, Guangdong province, which will capture CO<sub>2</sub> emitted in the Daya Bay area in the future, and transport it to the seabed through pipelines and ships for storage, said Mi.

# Japan's Ocean Discharge Plan to Have Unpredictable Impact

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The plan has focused on the treatment of tritium and carbon-14, which is the common difficulty faced by the nuclear industry and makes the plan sound more acceptable. Meanwhile, it fudged the other radionuclides that Japan is able to treat, said Wang Jianlong, a professor from the Institute of Nuclear and New Energy Technology, Tsinghua University.

### Unpredictable consequences

The reliability and long-term effectiveness of Japan's purification facility, the advanced liquid processing system (ALPS), remains untested. The ALPS has never been used to treat such a huge amount of contaminated water from a

nuclear accident, and nobody knows whether it will work in the next three decades, Wang pointed out.

Even though treated by the ALPS, and diluted by seawater, radionuclides may accumulate and concentrate in marine organisms. It takes 12.3 years for tritium and 5,730 years for carbon-14 to decay naturally in the ocean, said Li Yun, an engineer from the National Marine Environmental Forecasting Center.

It requires more studies on the long-term accumulation and concentration of radionuclides. Their impact on marine life and human health will be tested over time, said Wang.

Once released, there's no way to put the genie back into the bottle.

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This structure is like an inverted "giant bowl" which not only has a large storage capacity, but also has a strong sealing ability, and thus can store CO<sub>2</sub> stably for a long time, said Mi. Carbon dioxide is not automatically separated from the associated gas, and requires a series of processes such as capture, separation, dehydration and pressurization.

"When CO<sub>2</sub> is pressurized to 11 MPa, it will reach a supercritical state," Mi told *Science and Technology Daily*, adding that it takes only about 20 minutes to inject supercritical carbon dioxide from the Enping 15-1 platform into the storage structure.

### Building a channel

To transport the processed CO<sub>2</sub> back into the seabed requires a channel that connects the offshore oil platform and the storage structure.