

From Spinning Cotton Candy to Shaping the Future

Dialogue

By LONG Yun & BI Weizi

At first glance, the art of spinning cotton candy by street vendors might seem to have no link to the cutting-edge world of nanotechnology. However, according to Professor Seeram Ramakrishna of the National University of Singapore (NUS), the two scenarios share an unexpected connection.

"Using high-voltage electricity on solutions, we produce a range of nanomaterials, much like how candy threads are spun," Ramakrishna explained in a recent interview with *Science and Technology Daily*, drawing a vivid parallel between everyday life and scientific innovation. Over the years, he and his team have customized this electrospinning technology to advance a wide range of applications, making science and technology relevant to our daily lives.

His research has earned him global recognition, including being named "one of the world's most influential scientific minds" by Reuters. With a H-index exceeding 200 and about 200,000 citations, Ramakrishna's contributions to academia are indisputable.

An unexpected start in research

Despite these achievements, his path to nanotechnology was as much a surprise to him as to anyone else. When asked what initially inspired him to study nanomaterials, Ramakrishna said, "It was serendipity," adding that, "A challenge was given to me to pioneer nanotechnology in Asia."

His background in materials science and engineering, coupled with a natural curiosity, led him to explore how nature's intricate structures could inspire innovative technologies.

"I've always been fascinated by how natural material, from biological tissues to non-biological elements, are arranged from the nanometer scale to the macrometer scale," he said, and nanomaterials mimicking nature can improve the performance of various engineering solutions and products.

This interest soon translated into tangible results. From drug delivery systems to regenerative medicine, Ramakrishna's research is shaping the future of health care and beyond.

Innovations that change lives

While nanotechnology might sound abstract or futuristic, its impact is very real. One of Ramakrishna's most important contributions has been in improving air filtration systems. "Our research knowledge-based products have improved indoor air quality and provided personal protection against microbes and viruses," he explained, highlighting how his work directly benefits public health.

But the applications of nanotechnology go far beyond the present. Ramakrishna has a clear vision of where his research is headed. "In the coming years, nanotechnology advances will be used in regenerative medicine, drug delivery, air and liquid filtration, solid-state batteries, green hydrogen production, neural interfaces, and more," he said.

Diverse minds for common goals

From his perspective, a remarkable aspect of the 21st century is that human talent is distributed all around the world.

He said that, "Collaboration among diverse researchers leads to better solutions to the challenges humanity faces."

One recent example of a cross-border innovation he was involved in is the development of cooling systems for data centers. These energy-intensive facilities play a critical role in the digital age, but their high energy consumption is a concern.

Ramakrishna and his team developed a solution using metal organic frameworks in collaboration with a high-quality supplier in China, to reduce energy usage in cooling systems. "It's an example of how international cooperation accelerates innovation," he said.

'Because I like China'

Over the past three decades, a large number of Chinese researchers have been trained in the nanotechnology field and they are at various universities and organizations across China.

Over the course of his career, Ramakrishna has fostered strong ties with China, a relationship that has profoundly influenced his research.

Together, Ramakrishna and his Chinese collaborators have made remarkable progress. "We advanced the field of nanotechnology, giving researchers worldwide valuable tools," he said.

But his connection to China is not just professional. His social media profile features a cartoon panda,



Professor Seeram Ramakrishna. (COURTESY PHOTO)

signaling his fondness for the country. What Ramakrishna appreciates most about Chinese culture are values that resonate with his own approach to life and science. "The emphasis on sustained efforts, collective work, and strategic thinking resonates with me," he said.

Words for the next generation

For young science researchers hoping to make a significant impact, Ramakrishna offers simple yet practical advice: "Stay curious, be willing to take risks, and build diverse networks." He emphasizes the importance of interdisciplinary collaboration, which allows researchers to tackle complex challenges and view their fields and life from different perspectives.

"Cross-field collaboration not only brings new knowledge and skills to the table but also helps researchers grow personally," he added, encouraging the next generation to explore the frontiers of science with an open mind.

This article was also contributed by Ren Wei from the Shandong provincial science and technology department.

My China Story

'Sharing Knowledge is Sowing Happiness'

By Krister Holmberg

In 1984, I visited China for the first time as a member of the Swedish Royal Academy of Engineering delegation, and from that moment, I developed a profound connection with China. Since then, my wife and I have visited China numerous times, engaging in deep exchanges with Chinese scientists. Since 2017, I have had the honor of serving as a guest professor at the Institute of Chemistry, Chinese Academy of Sciences, and later also as the chief scientist at Shandong GINZRE New Materials Development Co., Ltd. One of my two sons has also chosen to live and work in China. He spent the first 12 years in Shanghai and has been living in Hong Kong for the past five years. Together, our family has witnessed and participated in the historic process of the great rejuvenation of the Chinese nation. I have a deep affection for China and am full of anticipation for its future development.

The 20th Central Committee of the Communist Party of China's Third Plenary Session is a milestone meeting. It not only has profound significance for China's development but also injects new vitality into the global economy. China, in its continuous deepening of reform and opening up, constantly brings new development opportunities to the world. China proposed the development of "new quality productive forces," a strategy that not only focuses on high-tech development but also emphasizes the enhancement of innovation capabilities. The emergence of new quality productive forces will have widespread impacts across multiple sectors, significantly boosting productivity. I firmly believe this is critical for improving livelihoods and enhancing the quality of life.

As a long-term observer and participant, I am very confident about the prospects of China's economy and technology, and I believe China will continue to prosper, progress, and remain harmonious.

Science without borders, cooperation for mutual benefit

Alfred Nobel, the founder of the Nobel Prize, once said, "Sharing knowledge is sowing happiness." I resonate deeply with this. Scientific knowledge should be the common wealth of all humanity, not the private resource of any particular country or group. With the advancement of science and technology, scientific research is increasingly dependent on international cooperation, and

many of the significant breakthroughs in modern science are the result of collaboration between international teams. At present, the world faces complex challenges such as climate change, which cannot be addressed by the efforts of any one country alone.

Against this background, the concept of "science without borders" becomes all the more important. Through cross-national scientific cooperation, we can enhance global innovation capabilities, share the fruits of research, address the common challenges faced by humanity, and contribute to the wellbeing of all people.

During my work in China, the team at GINZRE company and I have, after eight years of continuous effort, successfully developed a series of products, including emulsion fracturing thickeners, quick-dissolving emulsion polymers for oil recovery, and extended surfactants.

The Chinese government has provided us with a great deal of convenience and support through its policies. My work in scientific and technological innovation in China has been strongly supported by the Chinese government, the Shandong provincial government, and the Jinan municipal government. In 2021, upon the recommendation of the Jinan Municipal Government, I was honored to receive the Chinese government's "Friendship Award."

Here, I would like to express my sincere gratitude to the various levels of the Chinese government and to all my friends who have supported and cared for me during my time working in China. I also hope that the Chinese government will continue to maintain and deepen its favorable policies, convenient services, and effective management, while enhancing its outreach to showcase a more open, inclusive, and prosperous China to the world.

Lastly, I would like to emphasize that China's education system, research environment, resource investment, and policy support have provided a solid foundation for nurturing outstanding scientists, fostering long-term scientific innovation and development. I firmly believe that in the future, more Chinese scientists will step onto the world stage and make even greater contributions to global science.

Professor Krister Holmberg is a member of the Royal Swedish Academy of Sciences (Nobel Prize awarding academy), and the Royal Swedish Academy of Engineering Sciences.

Beauty and Power of Chinese Brackets in Forbidden City

By BI Weizi

As the largest preserved royal palace complex still standing, the Forbidden City in Beijing has an extensive collection of art and artifacts, and is one of the most popular tourist attractions. One unique feature of the



Forbidden City, now known as the Palace Museum, is the design of its roofs.

They use dougongs or bracket sets, which are created by placing a wooden block ("dou") onto a column to form a solid base. Another wooden bracket ("gong") is then inserted into the dou to support either a wooden beam, or another gong, creating visually compelling and highly complex structures that support the roofs.

As multiple dougong brackets are added, the weight of the roof is distributed evenly throughout the structure. This way, individual parts can withstand splitting or cracking and the system of interlocking beams is resilient to stress, such as the stress created by earthquakes.

"The bracket is made up

of many small wooden components that are inserted and stacked horizontally and vertically. Although these components are small, when they form a bracket, they are able to bear the weight of the entire roof and pass the weight downward to the lintel and pillars," Zhou said.

Besides being a unique construction technique that has helped Chinese buildings stand the test of time, the dougong is also an aesthetically beautiful creation. The brackets are arranged in an orderly manner under the eaves. Their size gradually increases from bottom to top, creating a beautiful arc.

The beauty of the brackets also comes from their uniform symmetry. The height and width of each component are basically the same, and only the length, and appearance are different according to the overall needs.

The use of brackets in the Forbidden City reflects the power and beauty of ancient Chinese architecture and is the crystallization of the sweat and wisdom of ancient Chinese craftsmen.

Making Beijing a Talent Highland

By Staff Reporters

Last week, 85 overseas talents from renowned universities and research institutions in 20 countries and regions were invited to the 13th "Overseas Talents Beijing Tour" organized by Beijing Overseas Talents Center, a five-day trip to learn about Beijing in a more in-depth way.

During the event, a basket of talent attraction projects, policies and service initiatives were introduced to the overseas talents; they also participated in

the subforum of the China-EU Talent Forum 2024, appreciated the beauty of ancient Beijing and gained first-hand experience of how the capital was modernized.

A "one-on-one" discussion session attracted 59 employers in Beijing with vacant positions and enabled mutual understanding and mutual trust between job seekers and the companies.

More than half of the 85 overseas talents took the jobs offered by employers on-site.



The 2024 China-Europe Talent Forum is held in Beijing on October 15. (PHOTO: VCG)

China, France Promote Nuclear Energy Standardization

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Tony D'aleto, nuclear energy counselor at the French Embassy in China, said that this May the China National Nuclear Group and EDF jointly released *A Prospective Study 'Bluebook' on Nuclear Energy to Support Low Carbon*.

He called the conference an important activity based on the release of the bluebook, realizing the role of standardization in promoting innovative cooperation and providing a new platform for advancing global nuclear governance.

Yan Xiaohong from the China International Nuclear Fusion Energy Program Execution Center emphasized that a strong technological nation requires proactive standardization. The international ITER program, a large scientific project that integrates high technology and multiple disciplines, needs standardized support for progress. Yan said the conference highlighted the vast cooperation potential and bright prospects for Sino-French collaboration in nuclear fusion standards.

Huang Mingang, chief economist of CNNC, said the world needs collaborative development of standards, as standards promote global connectivity. The conference, jointly held by the CNNC and EDF, was an important measure to promote innovative cooperation in key nuclear energy technologies and construction fields, leveraging standards as a focal point.

Bernard Salha, vice president of EDF, said both China and France view nuclear energy as a vital choice for building a clean, low-carbon energy system and achieving carbon peak and neutrality goals.

The two countries have continuously advanced standardization cooperation, enhancing the technical level of nuclear power standards and fostering mutual understanding and trust among technical personnel. This has created a positive pattern of joint development in nuclear energy standardization.

Luo Qingping, chairman of the China Institute of Nuclear Industry Strategy, said standardization is key to promoting technological advancement, ensuring safety,

and enhancing efficiency.

It is the cornerstone for ensuring technological advancement and international compatibility in nuclear energy, and serves as a bridge for promoting international communication and cooperation. Luo called the conference a declaration of collaborative progress and a shared future.

The event received high attention from related government departments of both countries and international standardization organizations.

Representatives from the French Embassy in China, the Ministry of Ecology and Environment (National Nuclear Safety Administration), the Ministry of Science and Technology, the State Administration for Market Regulation, the National Energy Administration, the China Atomic Energy Authority, and the International Organization for Standardization attended it.

There were 120 participants from the CNNC, EDF, and domestic and foreign enterprises, universities, and research institutions.