'The Speed of Validation in China Is Immensely Productive'

Dialogue

By LONG Yun & BI Weizi

That is how Dr. Imran Mahmood Khan, listed among the World's Top 2% Scientists, and assistant professor in smart food at the University of Nottingham Ningbo China (UNNC), sums up what surprised him most about working in China's research ecosystem: "The speed of validation in China drives immense productivity.

His team develops test strips that detect mold toxins in grain. They also design nanomaterials that kill bacteria with heat, and materials that could be used for cancer therapy. The applications vary, but the underlying principle does not.

One principle, many battlefields

Khan considers his most impactful achievement to be the translation of functional nanomaterials into practical, user-friendly food safety tools. His team has developed a strip-based point-of-care testing (POCT) device that detects aflatoxin B1 and citrinin in cereals and feed samples with the naked eye — no lab equipment required.

"We took sophisticated aptamer recognition and squeezed it onto a paper strip that costs pennies," he says. "That is the real victory — making high-tech invisible to the end-user."

However, his lab does not stop at detection. They have also created nanocomposites that bind to bacteria and inactivate them under near-infrared light. "If you can recognize a target, you can either report it or attack it. We chose to do both."

Looking ahead, he predicts greater convergence between food safety and biomedical technologies — intelligent food packaging with built-in antimicrobial activity, portable devices that both detect contaminants and treat them, and theranostic materials that identify hazards and neutralize them in one go.

Imran Mahmood Khan. (COURTESY PHOTO)

Publish or perish? Solve or serve

Khan supervises a culturally diverse team at UNNC, with members from Pakistan, China, India, Italy and beyond. He sees this diversity as a strength, bringing together different perspectives on materials, food science, engineering and real-world applications. "A culturally diverse team offers a multiplicity of perspectives," he remarks. "Some focus on materials, others on food science, engineering, or application scenarios. Such collaboration often sparks novel ideas."

His mentoring style encourages open discussion and respect for varied communication styles, while keeping the team united around clear objectives and rigorous data standards.

When it comes to the pressure young researchers face between publishing papers and solving real problems, his advice is blunt. "I tell my students three things," he says. "Research questions must originate from real-world needs; data must be reproducible; and publications represent only one form of scientific output. High-quality research does not chase trends or high metrics alone; it strives to make complex technologies simple, robust, and cost-effective, ultimately enabling end-user adoption."

Speed that surprises

Having moved from Pakistan to China for his postdoctoral training and now serving as faculty, Khan has witnessed first-hand the transformation of China's scientific landscape. What surprises him most is not the funding or the gleaming instruments — though those are impressive — but what he calls the speed of validation.

"In some countries, industry-academia collaboration means a yearly meeting and a report," he says. "Here, companies want to test your sensor in their production line within months. They provide real samples, real operators, and real complaints about cost and stability. That pressure is uncomfortable but immensely productive."

He attributes China's scientific progress to sustained investment, talent cultivation, major research infrastructure, and strong application-driven demand: "China's large market, complete industrial chain, and abundant real-world problem scenarios motivate researchers to test ideas in practical environments more quickly thereby fostering interdisciplinary collaboration across materials science, engineering, food science, and medicine."

Platforms and the last mile

He singles out China's large-scale interdisciplinary platforms and industry-academia collaboration models as especially effective. "For applied fields such as smart food systems and biosensing, a single laboratory cannot independently address materials, instrumentation, sample handling, algorithm development, and standard validation," he explains. "Large platforms connect these components, while industrial partners help assess whether technology is truly usable, durable, and scalable for production."

He has noticed a shift in research evaluation over the years, with growing emphasis on quality, impact, and practical value, alongside more open and shared lab facilities. That has changed his own approach: "I now consider not only novel materials and high sensitivity, but also sample pretreatment, stability, cost, batch fabrication, and compatibility with existing standards at an earlier stage."

That said, he sees room for improvement — stronger long-term support for fundamental research, more standardized validation systems, and earlier industry involvement. "Design with real samples, real operators, and real costs in mind," he says.

Regarding international collaboration, he reflects that sharing platforms, samples, and application scenarios offers huge opportunities, but communication costs, evaluation differences, and intellectual property norms remain challenges.

He mentions a China-Pakistan project on mycotoxin testing as a case in point: "Our cross-border team applied a strip-based POCT device to address a common challenge — rapid, onsite mycotoxin screening in cereals — delivering a practical, verifiable solution for food safety surveillance."

My China Story

Numbers and Characters, a Mathematician's China Story

By Staff Reporters

John Pardon. (PHOTO: International Mathematical Union)

John Pardon, a professor at the Simons Center for Geometry and Physics at Stony Brook University in New York, and also a professor at the university's Department of Mathematics, was one of four recipients of the 2026 Fields Medal, hailed as mathematics' equivalent of the Nobel Prize.

The awards were presented by the International Mathematical Union during the opening ceremony of the International Congress of Mathematicians (ICM) in Philadelphia on July 23. The Fields Medal is awarded every four years to two to four mathematicians under 40, recognizing both their past achievements and promise of future breakthroughs.

Coincidentally, this mathematician took part in the Chinese Bridge competition 15 years ago. He is highly fluent in Mandarin. In a speech, he quoted Confucius and cleverly used a homophone to joke, "Confucius said, 'At 40, I have no doubts.' At 40, you can't win the prize anymore!" He also made a playful reference to Confucius during a Chinese stand-up performance, again joking about the age limit.

Math was not the only difficult class he took in college. He also studied Mandarin and eventually became fluent in it. He recalled, "I was signing up for classes as a freshman in college, and I heard Chinese was pretty difficult, so I wanted a challenge."

After the first year, he attended Princeton University's Beijing Summer Chinese Program at Beijing Normal University. By his senior year, he had become a member of Princeton's Chinese debate team and went on to win the non-native speaker division of the International Varsity Debate, held in Singapore and broadcast across the Chinese-speaking world.

In 2011, he tied for first place with Bradley Roberts in the U.S. Eastern regional competition of the 10th "Chinese Bridge" Chinese proficiency competition, enacting a story from *Shuo Tang Hou Zhuan*, a narrative following Chinese Emperor Li Shimin's western military campaigns. It earned him a spot in the global finals in Changsha, China.

Throughout his college years, he continued taking advanced classes in classical Chinese, reading texts such as the *Book of Han*, the history of early Chinese dynasties; the *Records of the Grand Historian*, an epic history of China; and the *Analects*, a collection of sayings and ideas attributed to Confucius and his contemporaries. He said through these readings, he sought to understand Chinese culture. A photograph from Princeton's website shows him writing the famous Tang Dynasty poem *River Snow* by Liu Zongyuan (773-819) on the blackboard.

Professor Chih-p'ing Chou, director of Princeton's Chinese language program, observed that Pardon was one of the few students he had ever seen master the language in just four years. Chou, who coached the debate team, praised Pardon's performance as highly eloquent and animated, with a great sense of humor and wit. He added that Pardon effortlessly used several expressions from Confucius' *Analects* and other classical Chinese texts, many of which are normally used only by highly educated native Chinese speakers.

In the video on the Fields Medal presentation, Pardon explained his initial motivation for learning Chinese. The same video showed him quizzing his two sons, Alexandros and Andreas, on the Chinese characters pasted on their bedroom wall. He said, "I talk to them in Chinese a lot. We learn the characters. I read to them. I make them read to me."

He recalled that once Alexandros asked him very seriously, "Dad, were you born in China?" That small family moment illustrated how naturally he has integrated the language into his daily life, even as he now stands among the world's most celebrated mathematicians under 40.

This article is based on information from the ICM 2026 website, Princeton University's website, and China News Service.

How Aging Hijacks Brain's Vascular Shield

Science Outreach

By LUO Yunpeng & BI Weizi

As people age, they face an increased risk of cerebrovascular conditions and cognitive impairments. Understanding the role of early vascular dysfunction in neurological decline is crucial.

A research team led by Cheng Fang and Yinzhong Ma from the Shenzhen Institute of Advanced Technology at the Chinese Academy of Sciences revealed a vital mechanism through which aging compromises the brain's vascular protective system. The blood-brain barrier (BBB) is a selective boundary between the bloodstream and the brain. Deterioration of the BBB has been increasingly recognized as a major factor contributing to age-related cognitive decline, cerebral small vessel disease, vascular cognitive impairment, and neurodegenerative disorders.

Previously, it was thought that BBB leakage primarily resulted from disruption of the tight junctions between endothelial cells. In this study, the researchers discovered that the leakage with aging begins with the abnormal activation of endothelial transcytosis. This process involves the movement of molecules across brain endothelial cells via intracellular vesicles. Using mouse models, the researchers observed that BBB leakage began in midlife and progressively worsened with age. The leakage first manifested in the hippocampus. During this initial stage, the tight junctions between brain endothelial cells remained largely intact, while caveolae-mediated transcytosis had already increased significantly.

This discovery suggests that the brain's protective barrier may become vulnerable earlier than previously thought. Rather than leaking initially through spaces between cells, the aging BBB appears to lose control over transport routes within the endothelial cells.

Additionally, Mfsd2a was identified as an essential protective factor in brain endothelial cells. It aids in preserving BBB integrity by inhibiting non-specific caveolae-mediated transcytosis. As aging occurs, Mfsd2a expression in endothelial cells decreases and Caveolin-1 (Cav-1) increases. Restoring Mfsd2a expression or decreasing Cav-1 in older mice significantly reduced endothelial vesicle formation and BBB leakage.

To understand why Mfsd2a expression declines with age, researchers found that transforming growth factor-β1 (TGF-β1) inhibits Mfsd2a expression in brain endothelial cells. TGF-β1 stimulates the TGFBR2-SMAD2/4 signaling pathway in brain endothelial cells, which reduces Mfsd2a transcription.

The researchers also found that TGF-β1 levels increased in both the brain and blood during aging. Increasing TGF-β1 levels in young mice replicated key characteristics of an aged BBB, including decreased Mfsd2a expression, increased endothelial transcytosis, and heightened barrier permeability. Conversely, specifically deleting Tgfbr2 in endothelial cells or pharmacologically blocking TGF-β signaling in older mice restored Mfsd2a expression, reduced abnormal transcytosis, enhanced BBB integrity, and mitigated neurological impairment.

These results suggest that the age-related breakdown of BBB is not merely a passive consequence of structural decline. Rather, it is actively influenced by signals of systemic aging and by disrupted endothelial transport within the neurovascular unit. This research sheds light on how vascular issues in the brain contribute to cognitive decline and suggests potential strategies for preserving BBB stability in age-related neurovascular conditions.

Progress in Integrated Computing Network Construction

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A series of policies have been implemented. The western regions coordinate national computing hubs with renewable energy bases, while the eastern regions plan distributed computing alongside distributed power, microgrids, and virtual power plants. Eligible facilities are encouraged to use direct green power and trade green certificates. Computing loads are optimized based on task-specific power usage and regulation potential.

For computing power to flow freely, the support of a high-speed, stable and dynamically perceptible communication network is necessary. More efficient and precise matching of computing power demands and resources requires the participation of operators, computing power service providers, industry users, equipment manufacturers and other entities.

During the 15th Five-Year Plan period, greater emphasis will be placed on aligning supply with demand, and strengthening coordination between the computing network and the planning and construction of power grids and communication networks.

Empowering intelligent industries

This year's government work report proposed creating new forms of smart economy. With the computing network as the connection, the AI Plus Initiative is being advanced. Deeper integration of digital technology and the real economy is driving the upgrading of the entire industrial chain.

Innovative services such as "computing banks," "computing supermarkets," and "token packages" enable centralized resource allocation and affordable computing, helping small and medium-size enterprises overcome access barriers. Computing power scheduling supports manufacturers' digital upgrades, such as digital twins and smart inspection. County-level medical communities extend quality services to the grassroots with AI tools.

Exploring application scenarios around AI, advanced manufacturing, sci-tech innovation, government services, medical and health care, will form a virtuous cycle of "promoting construction through application and driving supply through demand," and ultimately promote efficient operation and sustainable development of the computing power network.

Bronze Ice Container, Earliest Refrigerator

Traditional Eastern Wisdom

By DU Xuanyi & ZHONG Jianli

The use of bronze in China evolved from ritual purposes to daily items and ultimately, to symbols of social status, with each stage featuring representative examples of bronze artifacts. One of the most famous bronze artifacts is the BingJian (bronze ice container) discovered from the tomb of Marquis Yi, who ruled the Zeng state in the Warring States period (475-221 BCE). This can be regarded as the earliest refrigerator.

The BingJian consists of two independent vessels nested together. The outer layer is called FangJian (square bronze container); the inner layer ZunFou (wine vessel). Before banquets, people put ice into the space between the FangJian and ZunFou, and poured wine into the ZunFou to make it ice-cold. It also has a lid and four feet to insulate it from heat.

The BingJian was made in three stages.

Craftsmen first used piece-mold casting to make the parts. They made a clay core first, then fabricated mold sections and poured molten bronze inside to create the main structure of the BingJian.

After that, they used cast-in-place joining, like making pre-cast mortise holes for inserting handles into the body. Or they used brazing technique to fix the structure.

The last step was lost-wax casting, which involved making clay-coated beeswax patterns, then heating them to melt the wax out, leaving a mold for pouring molten bronze. Lost-wax casting was used usually to make *panchi* (coiled dragon) motifs or reliefs.

The BingJian has become a Chinese symbol on the world stage. At the opening ceremony of the 2008 Beijing Winter Olympic Games, the fou (a traditional Chinese bronze drum) inspired by the BingJian, was recreated as the 2,008 Olympic Fou, resounding with the profound historical heritage and vibrant cultural identity of China.