Mathematics Not Only for Geniuses, but for Everyone

Dialogue

By LONG Yun & ZHANG Gailun

At the age of 70, renowned mathematician Professor Efim Zelmanov remains deeply passionate about teaching undergraduate students in Shenzhen in south China. Before class, he makes tea and answers questions. When he speaks about mathematics, he treats it not as a subject meant for geniuses, but as something deeply woven into everyday life.

Zelmanov received the Fields Medal for solving a century-old problem on symmetry when he was only 39. The Fields Medal is the highest honor in mathematics, presented every four years at the International Congress of Mathematicians.

Since moving to China in mid-2022, he has helped establish the Shenzhen International Center for Mathematics at the Southern University of Science and Technology (SUSTech). His goal is not only to train future medalists but to build an environment where mathematical thinking can flourish at all levels of society.

Math part of daily life

When asked how the public should understand mathematics, Zelmanov pointed to ordinary experiences. "Each time you talk on your iPhone, withdraw money from an ATM, or log in with a username, some very nontrivial mathematics is involved."

During the 2008 economic crisis in the United States, the number of mathematics majors at the University of California, San Diego, increased fivefold in a single year. "People started to think about jobs. They knew that in mathematics, they would get a job."

Professor Efim Zelmanov. (COURTESY PHOTO)

Over his 30 years in the U.S., he said he has never met an unemployed mathematician. "Maybe they do not exist."

He noted that AI is accelerating this trend. "AI grew out of mathematics. It operates mathematical algorithms." Computer science emerged from mathematics departments before becoming a separate discipline. "It's like a family house. When children grow, they move to their own homes."

Zelmanov expressed admiration for China's commitment to science. "I was really amazed at the level of support for mathematics and all sciences at all levels of government. People really understand it. You don't need to tell them."

Persistence defines great mathematicians

Zelmanov rejected the myth that mathematics is the realm of geniuses. While talent helps, what truly sets great mathematicians apart is endurance. "Mathematical ability is the ability to think for a very long time about some problems," he said. "The most important qualities are independence, and then they have to be very persistent, very determined in their work, because 99.9 percent of the time when a mathematician works, they don't get a result."

He cautioned against overemphasizing competitions like the International Mathematical Olympiad. Though Olympiad winners often possess talent, "Olympiad is a sport. Mathematics is partially a sport, but not entirely." Real research problems cannot be solved in a few hours. "If you can solve a problem in five hours, it doesn't mean that you will be able to solve problems that take 10 years."

Still, he acknowledged that many Olympiad participants go on to have successful careers in technology or finance. "They won't necessarily become mathematicians, but they will find their place."

He spoke warmly of his Chinese students. "The young students with whom I've had a chance to work are hardworking and full of energy. And it's pleasant to work with them."

China's rise in mathematics

Asked to assess China's progress in mathematics, Zelmanov praised the country's deep-rooted respect for education, which "goes back thousands of years." He added, "I've been in China for three and a half years, and I'm very impressed by the support that mathematics and other sciences receive from society as a whole and from all levels of government. The support is amazing."

"And China's progress has been very strong. Let's tell the truth: China has changed well. Mathematics in China is extremely strong. I'm sure that there will be Chinese Fields Medalists."

But he stressed that individual awards matter less than building a strong foundation. "It's much more important to have, in general, a high level of mathematical development in the country: top universities, top high schools, top IT companies."

He noted a significant shift: While many top Chinese students once went abroad for graduate study, "right now, top Chinese universities are very strong. And more and more young international talents are coming to China for postdoctoral training. Now that's normal."

He praised Shenzhen's ambitions. "We are right at the beginning. We are making the rules." University leaders, he said, respond quickly to suggestions, and the university president, a respected scientist, understands researchers' needs.

Looking ahead, Zelmanov hopes the Shenzhen International Center for Mathematics will become a global hub for mathematical talent. "We are trying to put the center on the world map of mathematics."

My China Story

One Mission: Education Through Storytelling

By LONG Yun & ZHONG Jianli

In 2009, Alex Rivera arrived in Mianyang, Sichuan province, to teach Spanish at Southwest University of Science and Technology (SWUST). He carried little more than curiosity and a willingness to embrace the unknown. 16 years later, he is a deeply rooted member of the community, an educator, a cultural bridge-builder and a storyteller committed to fostering mutual understanding between China and his native Chile.

From his early days as a language instructor in Mianyang, Rivera expanded his role organically. He taught Latin American anthropology, led the Spanish program, and by 2018 had become the university's coordinator for all foreign faculties. His impact extends far beyond the classroom. He played an important role in establishing a sister-city relationship between Anzhou District in Mianyang and Caldera, Chile, a partnership grounded in shared values, educational exchange, and people-to-people ties. For this quiet diplomacy, he was awarded the Sichuan Friendship Award in recognition of his contribution to promoting international exchanges in 2025.

"I received this important award for helping bring countries together through diplomacy, collaboration, and genuine friendship," he told *Science and Technology Daily*. To him, this award is not just a recognition, it will encourage him to keep doing the same work.

As a teacher, Rivera has gained great popularity among students. Central to his philosophy is the belief that education must prepare students not only academically, but for the realities of life. He challenges conventional teaching methods by replacing rote group assignments with dynamic team projects that mirror professional environments. "In the real world," he tells his students, "you don't just split tasks equally. You collaborate with people based on strengths. That's the essence of teamwork." His courses emphasize 21st-century skills: cross-cultural communication, creativity, leadership, and adaptability, qualities, all essential for students who may one day teach Chinese abroad or work in international settings.

What surprises many students is that English is not Rivera's first language. "My native language is Spanish," he reveals on the first day of class. By sharing his own journey as a lifelong language learner, he empowers students to see challenges as part of growth, not failure.

Beyond academia, in 2023, Rivera co-founded Geeksy Studio, a bilingual platform dedicated to telling nuanced Chinese stories to global audiences. As the platform's creative director, he rejects the instant gratification of viral trends, insisting every production carries educational value. "I'm an educator. There must be components, such as historical context, cultural insight, or lessons in cross-cultural understanding," he said. Whether documenting intangible heritage fairs or exploring local landmarks like the Yuewang Tower, his content always asks: What 21st-century skill does this convey?

His decision to remain in Sichuan province was never premeditated. Initially motivated by a sense of adventure and planning to return to Chile after just one year, he hesitated before accepting the offer. "China felt so distant — both culturally and geographically," he recalls. "But my curiosity won out. I thought, 'Let's try it for a year.'" That year became two, then three and then he was in it for life. The university supported his growth, offering roles that mirrored his past leadership in Chile.

"The university's commitment to international faculty development is unparalleled. "Rivera said. SWUST has established a comprehensive ecosystem to empower international faculty. Strong institutional support in administration and integration has allowed him to focus on education, research, and cross-cultural work, transforming his expertise into practical international collaboration.

Over 16 years, he has witnessed China's transformation firsthand. When he arrived, cash was king; today, even street vendors display QR codes. "The pace of development is staggering," he notes, "but what matters most is how technology serves daily life, making it easier, safer, more connected."

Now, as he plans eight new video series through 2026, covering science, heritage, and everyday life across China, Rivera has not lost sight of his core mission: education through authentic storytelling.

In an era when cross-cultural ties can feel fragile, Rivera's story reminds us that real connection takes time and effort. He often says China has always welcomed him with open arms. But he also believes that being the recipient of that kindness isn't enough. "If a country opens its doors to you," he says, "the least you can do is walk through them with an open heart and an open mind."

How Does Influenza Virus Invade Our Body?

Science Outreach

By ZHANG Jiaxin & BI Weizi

Every winter, these unwelcome symptoms — fever, aches and runny noses — make their appearance.

The influenza virus, which floats in the air, is the culprit behind all this. It hitches a ride on airborne droplets, entering the human body and launching a carefully orchestrated "invasion" of human cells.

In the past, scientists were unable to observe this process in detail because the viruses are too minute and too fast, and most microscopic techniques require the destruction of cells in order to magnify the image.

However, a team of scientists led by the Swiss Federal Institute of Technology Zurich has now used high-resolution microscopy to capture the entire process of the influenza virus entering living cells for the first time.

They were surprised to discover that this invasion is not simply "breaking and entering," but rather a complex and dynamic "dance" between the cell and the virus. Rather than being passive victims, the cells even "actively cooperate" with the virus's entry.

This may sound counterintuitive. However, it turns out that the cells "cooperate" because the cunning influenza virus "hijacks" a crucial everyday transport system within the cell. This system is the cell's lifeline and is responsible for transporting essential substances, such as hormones, cholesterol and iron, from outside the cell to inside it.

The influenza viruses then travel along the cell surface until they find an area with a high density of receptors — their ideal entrance.

When the receptors detect the virus attachment, a precise process of cellular engineering begins. The cell membrane at the point of attachment then starts to invaginate, forming a small pit. Clathrin proteins then arrive and deepen the pit, completely enclosing the virus in a vesicle. The cell's transport system then carries this vesicle, containing the "dangerous package," to the interior. Finally, the vesicle membrane dissolves and the virus is officially established inside the cell.

Surprisingly, cells also actively participate in this process. Not only do they rapidly mobilize clathrin proteins to the site of the virus to "construct" a structure, but their cell membranes also actively deform, undulating like waves in an attempt to "retain" viruses that are trying to leave, ensuring they are captured and brought inside.

These images had never been seen before. Thanks to a technology that combines atomic force microscopy and fluorescence microscopy, scientists can now finally track the detailed dynamic process of viruses entering cells.

This technology is not only applicable to influenza viruses, but is also expected to help people understand the invasion tactics of other viruses and observe how vaccines "train" immune cells in advance to prepare them for battle.

Traditional Eastern Wisdom

Yongle Dadian: Largest Encyclopedia in World History

By BI Weizi

Yongle Dadian, a Chinese compilation, is the world's largest known encyclopaedia. It was compiled during the Ming dynasty (1368-1644) by thousands of Chinese scholars under the direction of Emperor Yongle (reigned: 1402-1424) and was completed in 1408. Containing 22,937 "juan" or sections (including the index), in 11,095 volumes, the work was designed to include everything ever written at that time on the Confucian canon, history, philosophy, and the arts and sciences.

In effect, it was a vast collection of excerpts and entire works from Chinese literature. However, fewer than 400 volumes of the three manuscript copies survive today. Around 800 rolls have been published as photo-offset copies.

The encyclopedia's physical appearance differed from that of any other Chinese encyclopedia of the time. It was larger in size, made of special paper and bound in a "wrapped-back" style. The use of red ink for titles and authors — a mark of imperial commission — confirmed that the volumes were of royal origin.

Each volume was protected by a hard cover wrapped in yellow silk. Unlike other encyclopaedias, this one was not arranged by subject, but by *Hongwu Zhengyun*, a system in which characters are ordered phonetically or rhythmically. This system helped readers to find specific entries with ease.

Although printing had already been invented long before the Ming dynasty, *Yongle Dadian* was written entirely by hand. Each entry was a compilation of existing literature, some of which was derived from rare and fragile texts. The compilation's importance lay in preserving such texts and covering such a vast range of subjects.

Yongle Dadian represents the accumulated knowledge of the Chinese nation over thousands of years. In its entry on "Encyclopedias," the Encyclopedia Britannica calls it "the largest encyclopedia in world history," and it has become an important symbol of Chinese culture.

Photo News

Dongzhi literally means "Winter's Arrival" — one of the 24 solar terms of China's traditional solar calendar. It has long been celebrated on China's Winter Solstice when the night is longest, and the day is shortest in the Northern Hemisphere. It falls on December 21 this year. Dongzhi became an imperially recognized traditional festival during the Han Dynasty era (206 BC-220 AD).

Chinese people celebrate Dongzhi Festival in many ways. The most popular ones are worshipping heaven and ancestors, counting the Nines of Winter (which separates winter into nine intervals of nine days), making rice wine, and eating dumplings and ginger rice.

Visitors take part in a traditional activity — touhu (a Chinese game of arrow throwing)— at an exhibition, spanning Dongzhi to the Lantern Festival, in Beijing. (PHOTO: XINHUA)