A Pioneer in Computational Chemistry

Dialogue

By LONG Yun

Arieh Warshel, Nobel laureate in chemistry in 2013, is widely recognized as one of the founding figures of computational chemistry.

Together with Martin Karplus and Michael Levitt, he developed the groundbreaking "multiscale model," a revolutionary approach that enabled accurate simulations of complex biological molecules, leading from chemistry and biology to drug discovery.

In a recent interview with *Science and Technology Daily*, Warshel, now 85, reflected on the beginnings of his scientific career, sharing his insights on international collaboration, AI, and the path ahead for young researchers.

Professor Arieh Warshel speaks to Science and Technology Daily in an exclusive interview. (PHOTO: YE Bin / The Wenzhou TV Station)

Convergence of luck and passion

Warshel attributed his path to computational chemistry to both personal passion and fortunate circumstances. His pioneering research began in the late 1960s and early 1970s, when computers were still primitive. During this period, he created methods and programs to simulate the behavior of biological molecules through multiscale models and paved the way for advances including new pharmaceuticals.

"I became fascinated by enzymes during my undergraduate studies," he said. "I wanted to understand how these biological catalysts work at the molecular level."

A pivotal moment came while doing his PhD at the Weizmann Institute of Science in Israel. Though his supervisor had never used a computer himself, he encouraged Warshel to explore computational approaches for studying molecular systems, and the institute happened to house one of the most advanced computers of the era.

"Earlier, during a summer job, I used a mechanical calculator to process large sets of numbers. That experience taught me the potential of automation," Warshel shared.

This combination of scientific curiosity and early access to emerging technology positioned him among the first scientists to apply computing power to simulate biological molecules, laying the foundation for modern computational biochemistry.

Science without borders

A strong advocate for global scientific cooperation, Warshel emphasized that shared scientific interests form the cornerstone of successful collaboration.

"Collaboration brings diversity of expertise, access to different resources, and fresh perspectives," he remarked. "Today, with tools like Zoom and email, working across continents has never been easier."

He has observed remarkable progress in China's scientific landscape: "The advancement is huge, the pace is fast, and I believe this progress will continue."

He added, "In certain fields, especially AI, Chinese researchers are not just catching up, they are leading the way."

Several members of his research team are Chinese scientists who have made outstanding contributions.

In 2017, the Warshel Institute for Computational Biology was established at The Chinese University of Hong Kong, Shenzhen, the university's first research laboratory founded by a Nobel laureate.

Warshel envisions it as a platform for global researchers to collaborate and make impactful contributions, a hub for major international projects, and a multidisciplinary education center nurturing the next generation of computational biologists.

Embracing AI with understanding

On AI's role in science, Warshel was both enthusiastic and cautious: "AI is incredibly powerful. It finds patterns and correlations, sometimes delivering astonishingly accurate predictions. I am using it in my own research on biological molecules."

However, he cautioned that "AI does not provide physical understanding. It tells you what happens, but not necessarily why. Do not shy away from AI. Embrace it, but never stop striving to understand the science behind the results."

He urged maintaining strong foundations in physically- based modeling: "There will always be a need to interpret what AI tells you. That requires deep knowledge, not just technical skill."

To aspiring researchers, Warshel's advice is: "Choose hard problems, the kind that if solved, will have real impact." He warned against playing it safe, noting that many important breakthroughs take decades to be recognized. His own work took over 20 years to gain full appreciation.

"Patience and persistence are essential. There will be setbacks. But if you believe in your direction, keep pushing forward. Science is not a sprint. It is a marathon," he added.

More than four decades after beginning his journey with a hand calculator and a dream to understand enzymes, Warshel remains deeply engaged in science and committed to nurturing the next generation. His message is clear: Pursue meaningful questions, collaborate across borders, harness new technologies wisely, and above all, persevere.

XIANG Yu also contributed to this article.

My China Story

An Azerbaijani Teen Found His Dream in China

By YIN Wei & BI Weizi

Eldar Ravanov. (COURTESY PHOTO)

On a crisp October day in 2025, Eldar Ravanov, a 17- year- old Azerbaijani freshman studying electronic information engineering at the University of Science and Technology of China, in Hefei, Anhui province, returned to Tianjin — the city that had shaped his dreams and marked the beginning of his journey in China.

Known by his Chinese name, He Yan, Eldar reflected on how his time in this city marked the start of his transformation. "I only spent a year at Tianjin University studying Chinese, but this place will always be my alma mater. It's where I first connected with China," he said.

A fiery name

The name He Yan, given to Eldar by his Mandarin teacher at the Confucius Institute back in Azerbaijan, carries deep symbolism. The character "Yan(炎)" means "fire," representing energy and vitality. "My teacher said I learn quickly, and my eyes seem to have a certain spark," Eldar recalled with a laugh.

Born in Baku, the capital of Azerbaijan, in 2008, Eldar grew up in a city where the winds off the Caspian Sea stirred dreams of distant horizons. His upbringing was steeped in cross-cultural influences: his mother, a journalist, taught him the power of storytelling, and his father, an international oil trader, inspired him with a pragmatic global perspective.

In 2022, during his first year of high school, Eldar's father encouraged him to learn Chinese. "Azerbaijan was one of the first countries to actively support the Belt and Road Initiative. Over the years, our trade with China has grown, and my father believed that the future would bring even closer cooperation," Eldar recalled.

Then, a pivotal moment came in 2023 when Eldar participated in the "Chinese Bridge" language competition in Azerbaijan. He won third place and secured a place on a transformative two-week summer camp in China. It was this trip to China that ignited his passion for Chinese history and culture.

A storyteller is born

In September 2024, 16-year-old Eldar arrived in Tianjin alone, to begin his studies at Tianjin University, becoming the youngest international student on campus. The year- long language program not only enabled him to improve his Mandarin, but also to immerse himself in cultural activities.

He quickly became a familiar face in the university's cultural scene. He hosted New Year galas and cultural festivals, performed in the "Chinese Bridge" dubbing show and prepared speeches for competitions. By the end of the year, he had earned a reputation as "the foreign student who tells the best China stories."

Writing a new chapter

In September 2025, Eldar began his undergraduate studies at the University of Science and Technology of China. For him, combining language with technical expertise is essential. "I want to connect what I learn with real-world challenges," he explained.

He envisages a future in which his engineering studies will connect Azerbaijan's oil and gas resources, the wind power of the Caspian Sea, and China's manufacturing and technological expertise. "Through algorithms and circuits, I hope to connect these worlds," he said.

In Azerbaijani culture, fire symbolizes the land. In Chinese, He Yan represents rising flames. Together, these symbols reflect who he is: Eldar Ravanov from the shores of the Caspian Sea and He Yan, a student of Chinese language and culture. "I hope to use Chinese to tell stories," he said. "And I want to use technology to solve real problems."

Eldar's story is one of transformation — a boy from the shores of the Caspian Sea who once struggled to learn Mandarin, has grown into a confident young man who is fluent enough to share China's stories with the world. His journey from Baku to Tianjin, and now Hefei, is a story of dreams, resilience and an enduring flame that continues to burn brightly.

Ancient Art of Ivory Carving

Traditional Eastern Wisdom

By BI Weizi

China's ivory carving art dates back to about 7,000 years ago in the Neolithic period, when the first ivory products were only for practical use as tools. With the improvement of techniques, ivory was gradually carved and made into sculptures, ornaments and decorative or utilitarian items.

A carved ivory cup and ivory dagger with a bird- shaped handle unearthed at the Hemudu cultural site (5000 B.C. — 3300 B.C.) in modern-day Yuyao in Zhejiang province, east China, are the earliest known carved ivory products in China.

Carved ivory pipes, combs, beads and other exquisite ivory handicrafts were also discovered at the Dawenkou cultural site (6100 B.C. — 4600 B.C.) in Shandong province, also in east China.

Neolithic craftsmen already knew how to express their ideas by using various techniques such as carving, outlining and even carving in the round. These prehistoric ivory carvings demonstrate our primitive ancestors' grasp of the art and we cannot help but marvel at the creative talent and expressive power of primitive man.

After thousands of years of development, Chinese ivory carving formed a number of relatively centralized production centers, mainly in Guangzhou, Suzhou and Beijing during the mid-Qing Dynasty (around 18th century). Each of these centers has its unique characteristics in subject matter and style, but they also share some similarities.

Ivory carving generally involves three main steps. The first is to design and chisel out the basic shape. The second step is scooping, mainly to improve the brightness of the product. The third step is polishing. The fuzzy outer leaves of the large moso bamboo were used to polish the ivory products and make them softer.

In the 1980s, as a result of the global conservation movement, elephants were declared a protected species and hunting the pachyderms was prohibited. The Chinese government strictly follows the law and today, only artificial materials are used for "ivory carving" in China.

What Does the eSIM on Smartphones Bring to the Public?

Science Outreach

By Staff Reporters

On October 13, 2025, China took a major step forward in mobile technology.

The country's three major telecom operators — China Mobile, China Telecom, and China Unicom — announced that they had received official approval from the Ministry of Industry and Information Technology (MIIT) to conduct commercial trials of eSIM services for smartphones. The service is now available in 31 provinces, autonomous regions and municipalities across the Chinese mainland.

This marks the first time that eSIM technology has been officially extended from Internet of Things devices and smart wearables to smartphones on a national scale, entering a new phase of commercial application.

New experience

Electronic SIM or eSIM, short for embedded SIM, integrates the traditional SIM card directly into a device's chip. There is no need for a removable physical card.

"If a traditional SIM card is like a 'removable USB drive,' then an eSIM is like a 'solid- state drive soldered onto the motherboard,'" explained Yan Huaizhi, director of the Institute of Computer Network Attack and Defense at Beijing Institute of Technology, in an interview with *Science and Technology Daily*. He compared the eSIM to a "digital ID" permanently embedded in a phone's hardware, storing identity credentials such as phone numbers and account encryption keys directly within the device.

Compared with phones that use physical SIM cards, eSIM- enabled smartphones allow users to freely switch between multiple carrier profiles. They also free up internal space, allowing more room for larger batteries, advanced cameras, and other components. The absence of a SIM card slot reduces openings in the device, significantly improving water and dust resistance.

In terms of function, eSIM phones offer the same core services as those with physical SIM cards, including voice calls, text messaging and mobile data. Users can also activate value-added services such as international roaming based on their needs.

More secure

Because an eSIM has no physical form, it eliminates the risks associated with losing, stealing, or tampering with a physical card.

Yan added that although some people worry eSIMs could be easier to hack, in reality, they are more secure. A physical SIM card is more like a "portable wallet" that can be taken and misused.

Physically, the eSIM is embedded on the phone's mainboard; removing it would require destroying the device. Technically, critical information is transmitted through encrypted TLS (Transport Layer Security) channels and requires user authorization for activation. To clone or copy an eSIM, attackers would need to break the chip's encryption and bypass the carrier's server authentication — a highly difficult task.

Chen Fengwei, deputy general manager of China Unicom VSENS Communications Co., Ltd., stated that eSIM offers greater security than traditional SIM cards in two key areas: technical architecture, such as data encryption and anti-tampering mechanisms, and physical design, as the built-in structure prevents wear from repeated insertions and blocks unauthorized replacement.

However, like physical SIM cards, eSIMs are not completely immune to risks such as cloning or unauthorized transfers. According to security guidelines, users can enhance eSIM security by using strong passwords and biometric authentication, enabling two- factor authentication, and regularly updating device software and carrier settings.

Humanoid Robotics Industry Eyes Commercialization

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China has made significant strides in motion control and responsiveness. For example, the humanoid robot Walker has demonstrated stable bipedal locomotion and precise manual operation, while the Tienkung robot can navigate autonomously and maintains stability even in complex environments.

Moreover, continuous breakthroughs in other core components, such as perception algorithms, which provide robots with the ability to perceive and understand their environment, have further enhanced robot performance, laying a solid foundation for large-scale application.

Humanoid robots here to stay

There are growing examples of how humanoid robots are shaping the future. Galbot, a humanoid robot developed by Chinese tech firm Beijing Galbot Co., Ltd., has been officially put to work in a smart factory in Beijing, where it performs complex tasks such as quality inspection, item sorting and logistics management. Relying solely on visual perception, it navigates around obstacles and accurately identifies objects in real time.

Another robot, Alpha Mini, serves as a companion in thousands of households in Shenzhen. It plays with children, tells stories, and even responds to family members based on their emotions.

The application of humanoid robots is the result of breakthroughs and integration across multiple key technologies.

Zhong said that although they have been deployed in specific scenarios, challenges still remain in terms of cost, reliability and intelligence before large-scale adoption can be achieved.

Ke acknowledged that the high cost of developing and manufacturing core components makes the current price of humanoid robots high.

However, as technology matures and mass production is realized, costs are expected to decline and humanoids be widely adopted for general purpose use.