

# From Village Dreamer to Fields Medalist

## Dialogue

By Staff Reporters

Years ago, as a young mathematics student at Tehran University, Caucher Birkar would often gaze at the photographs of the Fields Medal winners displayed on the wall of the university's math club. "I would look at them and think, 'Would I ever meet any of them?'" he said in an interview.

Today, Professor Birkar, the 2018 Fields Medal recipient, has not only met some of those legendary figures but joined their ranks, showing how far he has come from that quiet moment of wondering.

### A new chapter

In 2021, he began a new chapter in Beijing, starting his full-time academic career at Tsinghua University.

The decision to move to China came quickly — just two months after receiving the formal invitation in 2019 — but it was rooted in long-standing connections. "Even before the offer, I had close academic ties with Tsinghua," Birkar explained. "Choosing to join (it) was natural. Tsinghua is an outstanding university, and Chinese mathematics is growing stronger every year."

Beyond academic excellence, he was also drawn by a desire for cultural exploration. "I wanted to experience a different way of life," he said. "China offers a rich history, diverse cultures, and vast geography. Every time I visit, I see more and learn more. I still have much to discover."

He sees strong parallels between Tsinghua and Cambridge. "As the top university in China, Tsinghua attracts the best students, just as Cambridge does in the UK," he said. "But what truly stands out is the support for researchers. The



Professor Caucher Birkar. (PHOTO: Tsinghua University)

university provides excellent resources and infrastructure, allowing scholars to focus fully on their work without unnecessary distractions. That kind of environment is invaluable for deep, meaningful research."

### Beauty of mathematics

Birkar's passion for mathematics began in elementary school in a small village in Iranian Kurdistan. Inspired by his older brother, who had a keen interest in science and technology, he started learning math at an early age. "At first, I followed his lead," he said. "Then I began reading math books on my own. The more I learned, the more I realized how fascinating and full of mystery mathematics truly is." For him, math is a source of deep personal joy: "Some people love sports or music. For me, solving problems and exploring ideas in math brings real happiness."

He says the value of mathematics operates on two levels. On a personal level, it's about passion and meaning. "If you love what you do, it gives your

life purpose and fulfillment. That inner drive is essential for success in any field, especially mathematics." Also, math is foundational on a social level. It underpins nearly every modern scientific and technological advance, from physics and engineering to economics and medicine. The more humanity progresses, the more it relies on mathematical insight.

Of course, the path of a mathematician is not without challenges. "You face problems you can't solve, ideas that don't work, and sometimes even lack of funding," Birkar admitted. "You have to learn to deal with failure and keep going."

To explain his work in birational geometry, a field central to algebraic geometry, he uses a simple analogy: "Think of polynomial equations, like the ones you learn in high school. We don't just look for solutions. We study the space of all possible solutions. Just as you might classify people by age, gender, or income, we classify geometric spaces using certain

mathematical parameters. My work helped develop tools to organize and understand these spaces systematically, leading to breakthroughs in classification and structure."

### To advance human knowledge

Winning the Fields Medal, recognized as the highest honor in mathematics, has changed Birkar's life in profound ways. The award opened doors. However, he views it as a platform to contribute more deeply to the mathematical community. While it has increased his visibility and responsibilities, he remains focused on research, mentorship, and fostering a culture of curiosity.

He firmly believes that becoming a mathematician is not reserved for the "genius" few. Creativity, hard work, patience, and courage are far more important than innate talent. A deep love for the subject, combined with persistence, is what enables progress. Anyone who earns a degree or completes a PhD in mathematics, he argues, has already demonstrated the capacity to contribute meaningfully. The goal, he insists, is not to be the best in the world, but to grow, understand, and advance human knowledge.

Looking at China's mathematical future, Birkar is optimistic. The country possesses vast intellectual talent and increasing financial resources, creating ideal conditions for scientific advancement. With a long tradition of scholarship and a growing commitment to research, Chinese mathematics has made remarkable progress in recent decades. Interdisciplinary work in areas like cryptography, computer science, and theoretical physics is already underway, and Birkar sees even greater potential ahead.

*This is an edited version of the original Chinese article by GUO Lili and ZHAN Meng from Tsinghua University.*

## Service Info

# Efforts to Promote Int'l Exchanges Stepped Up

By Staff Reporters

China aims to attract more foreign visitors for tourism, business, education and living purposes with a series of measures introduced during the 14th Five-Year Plan period (2021-2025). International exchanges and engagements are being promoted by simplifying visa regulations and enhancing accessibility.

One significant step is the introduction of unilateral visa-free entry policies and mutual visa exemption agreements with 75 countries. According to Wang Zhizhong, head of the National Immigration Administration (NIA), these initiatives have not only facilitated travel for foreigners but also strengthened cultural exchanges and interactions.

By July 30, the number of countries eligible for visa-free transit to China was increased to 55, with entry ports expanding to 60 across 24 provinces, autonomous regions, and municipalities. Visa-free transit stay has been extended to 240 hours, making it easier for tourists and business travelers to explore and engage with China.

These optimized visa-free policies are part of a broader strategy to encourage "more visits, faster visits." Currently, China has comprehensive mutual visa exemptions with 29 countries and offers unilateral visa exemptions to citizens from 46 nations. Additionally, regional visa-free policies such as groups traveling to Hainan, tourist groups from ASEAN countries, and those arriving on

cruise ships have further facilitated travel for international visitors.

For urgent travel to China, the NIA provides convenient port visa services covering 99 open ports in 73 cities. Moreover, to ensure a comfortable and worry-free stay for international visitors, the services now include extending visas and replacing expired documents locally. These measures have significantly reduced both time and costs. In 2024, they contributed to a 96 percent increase in foreign tourist arrivals, compared to the previous year, reaching nearly 27 million visits.

Beyond short-term visits, China is also enhancing long-term support for foreign talent. To help foreign professionals "stay and thrive," the NIA has optimized work and residence procedures, including a "single-window" system that combines work permit and residence permit applications. Major enterprises can now transfer foreign employees across regions without reapplying for new residence documents.

Importance is also given to help foreigners "integrate well." In late 2023, a new version of the permanent resident ID for foreigners was launched, dubbed the "five-star card." This upgraded card is now widely accepted across public services such as transportation, hotels, tourism, banking, telecom and online platforms, as well as government services like tax filing and property registration to make daily life smoother for long-term residents.



Tourists from Spain take a selfie at Yuyuan Garden Mall in Shanghai, eastern China. (PHOTO: XINHUA)

# China's Classic Wooden Arch Bridges

## Traditional Eastern Wisdom

By BI Weizi

Traditional design and practices for building Chinese wooden arch bridges were added to the Representative List of Intangible Cultural Heritage of Humanity by UNESCO in 2024.

The wooden arch bridges, found mostly in eastern China's Fujian and Zhejiang provinces, are built without a single metal nail or rivet. According to UNESCO, the traditional design and practices for building these bridges involve the

use of wood and traditional architectural tools, and they combine craftsmanship, the core technologies of "beam-weaving" and mortise and tenon joints, as well as an experienced woodworker's understanding of different environments and the necessary structural mechanics. The wooden arch bridges also respond to the needs of local communities, while taking into consideration the environment and the management of natural resources. They are a reflection of the value of harmonious coexistence between humans and nature.

The origins of this architectural tradition can be traced back 900 years. The earliest documented wooden arch

bridge dates back to the Northern Song Dynasty (960-1127), as depicted in the painting *Along the River During the Qingming Festival*.

The key features of constructing wooden arch bridges involve mortise and tenon joints for binding, increasing curvature on the inner bridge surface for strength, and incorporating niches, stages, benches, beds, couplets and stalls for various functions. The building process includes selecting the site, building the pier, leveling, and building support columns. Given the rainy climate of eastern Fujian, bridges are designed with roofed corridors.

Wooden arch bridges serve as hubs

for gatherings, entertainment, trade and other social activities. Locals often hold events like weddings, funerals and birthdays on these bridges. During the Dragon Boat Festival, locals believe that the more times one crosses a bridge, the more prosperous their life will become, expressing hope for the future.

Today, the traditional arch bridge remains a source of livelihood for woodworkers. The bridges and the traditional techniques and knowledge used to build them are also an integral part of the cultural ecosystem of local villages. They serve as communication channels and cultural spaces, thus enhancing community harmony and cultural identity.

# Super-charging Stations Ease 'Charging Anxiety'?

## Science Outreach

By LIU Yuanyuan and BI Weizi

By the end of 2027, China will have more than 100,000 high-power charging facilities installed nationwide. What could be the potential technical difficulties arising from the large-scale promotion of these high-power facilities? Will they really alleviate the "charging anxiety" experienced by the owners of electric vehicles (EVs)? *Science and Technology Daily (S&T Daily)* spoke to several experts in this field to get the answers.

High-power charging stations (HPCs) are charging stations EVs that provide significantly faster charging speeds than the standard Level 2 chargers or DC fast chargers. "These facilities typically offer charging power ranging from 600 to 1000 kilowatts," said Wang Jiaojiao, director of the Charging Technology Department at China Automotive Technology & Research Center Co., Ltd.

"The core goal of high-power charging facilities is to significantly reduce the charging time, making the energy replenishment experience similar to the speed of refueling traditional fuel vehicles," Wang said.

*S&T Daily* reporters visited the Lianhuashan Super Charging Station in Shenzhen in south China. The station has four supercharging points with a maximum charging and discharging capacity of 600 kilowatts. At maximum capacity, it can charge and discharge at a voltageization speed of one kilometer per second. This means a car can be charged over 80 percent in just 10 minutes. Wang thinks HPCs will significantly reduce the waiting time for EV owners. When traveling long distances, they can recharge their EV battery at the service station while having a short break.

Ensuring charging safety is a key issue. While supercharging, large currents generate significant heat. One of the core difficulties in promoting HPCs is to address the problem of dissipating the heat issuing from the charging gun wires, connectors and battery packs under ultra-high currents, and prevent overheating and fire.

To ensure the safety of such facilities, correct installation must be prioritized. Electrical codes must be followed and preventative maintenance implemented, with safety features such as surge protection integrated. It is also vital to ensure proper spacing between charging stations, sufficient overhead room for fire suppression systems, and placement away from flammable materials or potential wildfire areas.

# Mega Power Loop Brings Clean Energy Across Desert

From page 1

To minimize the project's environmental impact, particularly on native desert plants such as populus euphratica, engineers adjusted tower heights, made minor route modifications, and laid more than 480,000 square meters of straw checkerboard, a widely used method in China to stabilize sand, Li explained.

### Meeting urgent demand

"The 220 kV power supply in Qiemu County cannot run high-voltage equipment, and many development projects in the county can only stay on the blueprint," said Dilshat, an official from Qiemo county, located in the heart of the desert. "The construction of the 750 kV power grid is an urgent project," he added.

Before the construction of the extra-high voltage power transmission loop, the power supply of the Tarim Basin mainly relied on a 220 kV power grid, which satisfies urban power supply and

regional power distribution. Dubbed the "power expressway loop," the new 750 kV transmission project can send power to a distance of more than 600 kilometers with a capacity of three million kilowatts, which can realize large-scale power transmission across regions, provinces and even countries.

The project, expected to become fully operational by November 2025 according to the contractor, will change the southern Xinjiang power grid and its long-chain power supply pattern. It is estimated that local maximum power supply capacity will increase by 800,000 kilowatts to one million kilowatts, and the new energy acceptance capacity will be increased by eight million kilowatts, greatly improving the collection and transmission of new energy such as photovoltaics, and effectively alleviating the grid connection bottleneck of large-scale wind power and photovoltaic power bases in southern Xinjiang.

In addition, the five prefectures in southern Xinjiang are rich in minerals, oil, natural gas, solar and thermal resources, and sufficient power supply is needed to achieve large-scale development and utilization and attract related industrial chains.

### Green development

In southern Xinjiang, clean energy such as wind, solar and water accounts for more than 66 percent of the total installed capacity, and the construction of new power systems has achieved remarkable results. Ten-million-kW new energy bases have been built in Bayingoleng Mongolian Autonomous Prefecture and Kashgar.

Apart from meeting local electricity consumption, Xinjiang serves as a key hub in China's west-to-east power transmission program. The 750 kV transmission loop builds an efficient channel for the eastward delivery and local consumption of clean energy.

Xinjiang Guosheng Qicheng New Energy Co., Ltd. mainly produces photovoltaic panels, and it selected Ruoqiang as a base because the starting point of the fourth DC channel of Xinjiang electricity eastward transmission is here, said Song Xiaojun, equipment director of the company.

In recent years, the development of new energy projects in southern Xinjiang has been accelerated, including the 2.05 million kW photovoltaic and sand control project in Qiemu county, the one million kW wind power project of PetroChina, and the 250,000 kW independent energy storage project of Rongyu Energy Storage.

It is estimated that after the 750 kV transmission project is put into operation, it will drive the development of 50 million kW of new energy in southern Xinjiang, with an industrial investment of more than 28.3 billion RMB and more than 8,000 jobs.