CHINA

Associate professor Dong Shuo from the Institute of Physics, Chinese Academy of Sciences, works at a lab in Beijing's Huairou district. PROVIDED TO CHINA DAILY

High-tech facility in Huairou aids cutting-edge research

Split-second laser pulses create 'high-speed camera for the quantum realm'

By YAN DONGJIE
yandongjie@chinadaily.com.cn

Amid the forested hills and mirror-like lakes of Beijing's Huairou district, a scientific revolution is unfolding at ultrafast timescales.

Within the Synergetic Extreme Condition User Facility — a crown jewel of China's Big Science Infrastructure — experimental setups pulse with red and green lasers, their beams threading through vacuum chambers with micron-level precision.

Here, associate professor Dong Shuo from the Institute of Physics, Chinese Academy of Sciences, orchestrates a symphony of light and material, deploying split second laser pulses to freeze-frame the frenetic dance of electrons within quantum materials.

"Think of it as a high-speed camera for the quantum realm," explained Dong, her eyes tracking real-time waveforms on a diagnostic screen. Her specialization in ultrafast material science enables unprecedented observation of microscopic particles like electrons, excitons and phonons. These capabilities are rewriting textbooks across disciplines, from photovoltaics to quantum biology.

From doubt to discovery

When Dong returned to China in early 2023 after completing her postdoctoral research in ultrafast optics at the Max Planck Institute in Germany, she had concerns.

"The commercial electron analyzer I needed for my experiment only became available in 2019," she said.

> "In Germany, I learned the techniques. Here in Huairou, we're building tomorrow's toolkit and explore more possibilities."
>
> **Dong Shuo,** associate professor from the Institute of Physics, Chinese Academy of Sciences

"My German colleagues were the pioneers, and I worried whether I could rebuild that level of capabilities here."

Her apprehension stemmed from the field's steep requirements — infrastructure gaps that once hindered China's ultrafast research.

The game-changer materialized at the 2.8-billion-yuan ($394 million) Synergetic Extreme Condition User Facility, which was commissioned in 2022 as part of China's 14th Five-Year Plan for major sci-tech infrastructure.

"It wasn't just the experimental hardware," Dong said. "The entire ecosystem — low-vibration laser table, zero underground transit interference, even humidity-stabilized cleanrooms — matches world-leading facilities just like the Max-Planck Institute or in some respects, is even better."

Beyond experimental facilities, Huairou Science City exemplifies China's holistic approach to research innovation. Since last year, the district has added three bilingual schools and two researcher-focused kindergartens within 5 kilometers of the facility.

"The children's school nearby has a 'Young Scientist Program' taught by CAS postdocs," Dong said. "It's about creating generational continuity in scientific exploration."

The facility is also attracting global talent. Over 23 percent of its users last year hailed from international institutions, drawn by open-access policies and collaborative networks.

Dong has observed transformative trends in China's scientific ethos.

"Early-career researchers now pay more attention to the potential applications," she noted, referencing CAS's 2023 initiative linking ultrafast labs with semiconductor and battery manufacturers. This shift from purely lab-based work to applied innovation reflects national priorities.

Yet the path remains challenging. Despite producing 37 percent of global ultrafast research papers in 2023, China contributes only 12 percent of key technique patents.

"We're transitioning from followers to architects," Dong said. Her team's current project — developing ultrafast dynamics and imaging spectroscopy for quantum materials — epitomizes this ambition. "Scientific publication is not the only goal; we must create tools that redefine what's possible."

Nurturing the next wave

The human factor remains pivotal. Ultrafast science demands interdisciplinary mastery spanning from materials science and laser engineering to big-data analytics — a skill set gap persisting across academia. CAS reports only 160 Chinese researchers specializing in such ultrafast techniques as of last year, compared to 380 in the European Union.

Dong champions grassroots science communication to ignite interest. Her team's program has brought 1,200 high schoolers to the facility since 2023.

"We show them how tracking electron motions helps design better solar cells or diagnose disease earlier," she explained. Preliminary tracking shows 19 percent of participants now pursue physics majors — triple the national average.

Looking ahead, Dong envisions such ultrafast technology permeating diverse fields. Collaborations with Peking University Health Science Center are exploring ultrafast laser-based early cancer detection, while partnerships with Sinopec aim to optimize catalytic reactions.

"If we can map those steps, we enable rational material design rather than trial-and-error," she said.

As dusk settles over Yanqi Lake, casting golden ripples across the facility's glass facade, Dong prepares for a night shift capturing electron dynamics in topological insulators — a material class that could revolutionize quantum computing.

"In Germany, I learned the techniques," she said. "Here in Huairou, we're building tomorrow's toolkit and exploring more possibilities."

Fang Biling contributed to this story.

China's experience in cultivating mushrooms grows on Indian farmers

By YANG JUN
and **LIU BOQIAN** in Guiyang

At Guizhou University's College of Agriculture, the lab is filled with the earthy aroma of fresh mushrooms. Seated at clean benches under sterile airflow, students from India, Thailand and Pakistan carefully isolate and purify fungal strains for further study.

Southwest China's hot, humid climate and abundant rainfall create ideal conditions for fungal growth. Local culinary traditions, which include a wide variety of wild mushrooms, give researchers in Guizhou a natural advantage.

In 2023, Entaj Tarafder from Kolkata was drawn to Guizhou by its reputation in mycology and the province's ecological richness. He plans to apply what he's learning here to develop mushroom cultivation back home.

Under the mentorship of Professor Wang Yong, a plant pathologist at the college, postdoctoral researcher Tarafder is delving into mushroom taxonomy and ecology, exploring its promising environmental applications.

Over the winter break last year, Tarafder returned to Kolkata, where he led "PhD Village Chief" seminars on land preparation, edible fungus cultivation and disease management. In less than four weeks, more than 100 farmers and agronomy students attended his sessions.

This outreach is part of a university program that encourages international students to promote agricultural technology in their home regions, teaching cultivation methods and green pest management practices to boost farmers' incomes. Last year, participants ran similar projects in Pakistan's Punjab.

In a classroom at the University of Calcutta, Tarafder lifted a substrate bag to demonstrate its potential. "Did you know that in China this small bag can yield 500 grams of mushrooms?" he asked.

Though commercial mushroom farming is still in its infancy in eastern India, Tarafder said that adoption is accelerating.

"More farmers are embracing fungi both as food and income sources," he said.

During field surveys in the Himalayan foothills, farmers bombarded him with questions. "They wanted to know how to cultivate mushrooms — what temperature and humidity settings to use, and how to prevent disease," he recalled.

Because Guizhou's climate differs from India, Tarafder must adjust his planting methods to suit the higher temperatures in Kolkata.

"Warmer winter temperatures here actually favor mushroom growth," Tarafder said.

"I draw on my expertise to introduce techniques for cultivating high-value edible fungi," he added. "I train farmers in low-cost, eco-friendly methods that raise incomes and reduce reliance on traditional crops, and — just as importantly — I teach them strategies for disease resistance."

Chada Norphanphoun from Thailand is also a postdoctoral fellow in fungal pathology at Professor Wang's lab.

"Although most of my work is in the lab," Norphanphoun said, "I hope to help farmers fight crop diseases and increase yields, so that our research benefits people's everyday food supply."

Beyond crop disease, Tarafder believes that mushroom poisoning is not confined to China, but also occurs in India and Europe. Next, he plans a public-education campaign in India to teach people how to distinguish edible mushrooms from toxic look-alikes.

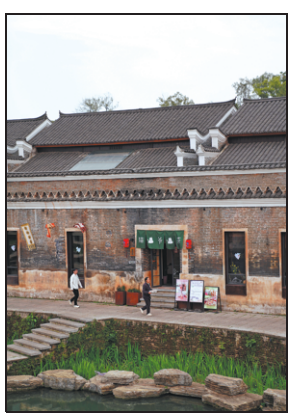
Contact the writers at yangjun@chinadaily.com.cn

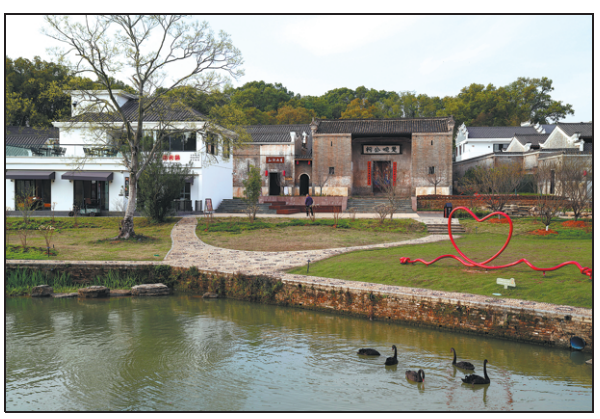
Entaj Tarafder (middle) explains disease management for edible mushrooms to farmers in India. PROVIDED TO CHINA DAILY

Village restores agricultural soil with organic content

NANCHANG — Tucked into the undulating hills of Ji'an city in Jiangxi province, Diaoyuan village has stood for over 1,100 years — the layout from above bearing a striking resemblance to a Taoist tai chi diagram. A winding ridge splits the landscape, encircled by more than 20,000 ancient camphor trees, some once pushed to the edge of survival by degraded soil.

For the 11th time, Kasem Soytong, a professor from Thailand's King Mongkut's Institute of Technology Ladkrabang, crouched to collect soil samples. After nearly two years of microbial technology interventions, the once-compacted, acidic soil of Diaoyuan now meets green standards, with improved organic content and texture.





From left: An old house is transformed into a tea shop in Diaoyuan village, Jiangxi province. The village is known for its fine examples of ancient architecture. PHOTOS BY WEI HAI / XINHUA

Diaoyuan, founded in the late Tang Dynasty (618-907), embodies China's agrarian heritage. Yet years of neglect left it grappling with erosion and ecological decline. Four years ago, local authorities partnered with Alor Valley, a boutique hospitality brand, to awaken the "sleeping" village. "Restoring ancient architecture wasn't enough — we needed to heal the ecosystem," said Sun Zhiming, general manager of Alor Valley's Diaoyuan project. He turned for solutions to Soytong, a 30-year veteran of organic agriculture and biodiversity research in China.

Initially captivated by Diaoyuan's natural and cultural charm, the harsh realities soon became clear to Soytong: soil and water tests revealed severe chemical contamination. The cleanup would be far from easy.

Reviving the camphor trees required rebuilding the soil's health, yet Soytong's approach was unconventional. Using village waste — rice straw, fallen leaves and kitchen scraps — his team created organic fertilizer through microbial degradation, feeding the earth with its own nutrients.

Skepticism ran high among villagers. "Isn't this just compost? How is that 'high-tech'?" questioned those initially unimpressed by Soytong's soil improvement methods. They argued that traditional chemical fertilizers worked just as well — if not better — for boosting crop growth, and were far more efficient.

The Thai professor explained that long-term use of synthetic fertilizers acidifies soil, causes compaction, and leaves toxic residues that pose health risks. To prove his point, he tested the technology on a small vegetable plot, banning chemicals entirely.

His approach cultivated pollution-free, high-quality soil, enabling truly organic and eco-friendly crop cultivation. The visible results soon won over skeptical villagers. Now, working with the professor, they monitor soil acidity and use only organic amendments.

"The vegetables tasted fresher and looked more vibrant," said Li Zhi, a resident of the village.

Thanks to its superior quality, Diaoyuan's organic rice became highly sought-after by consumers.

"Last year, our 50,000-kilogram organic rice harvest commanded 44 yuan ($6.10) per kg, up from 4 to 6 yuan previously," said Li Weichao, who oversaw Alor Valley's agricultural division at Diaoyuan.

He noted that Soytong's soil restoration technology has already been implemented across 33 hectares of farmland in the village, with another 33 hectares planned for this year.

From barren fields emerged a thriving ecosystem: once-fetid ditches now teem with fish, ducks and frogs. In 2024, Diaoyuan was recognized by the Association of Agricultural Technology in Southeast Asia as a green eco-resort village.

"This year, we plan to build a large-scale microbial composting station to produce tailored organic fertilizers," Soytong said, adding that it will advance agricultural technology exchange between Thailand and China.

XINHUA