

That convergence is clearest in the national inputs. Most countries state that the FCC is their preferred option, with the Swiss particularly insistent that no other proposal is comparable. The Dutch and Austrians strike a more neutral tone, supporting a Higgs factory more broadly and emphasizing the importance of going ahead with plans to upgrade the LHC to collide particles at a higher rate.

A pivotal moment

What nearly everyone agrees on: The decision cannot be postponed. If CERN does not budget for the project, a new machine would not start until long after the LHC shuts down.

"If there's a big gap, we run the risk of losing valuable expertise and top talent to industry," says Thea Aarrestad, a researcher at ETH Zürich and a member

of the Physics Preparatory Group's detector instrumentation working group, which reviews proposals for particle detector technology for the ESPP.

The urgency doesn't make the decision easier. At stake is a commitment not only to a Higgs factory but potentially to the FCC-hh as well: The FCC-hh may no longer be necessary if the FCC-ee shows no signs of new physics or if riskier technologies with higher potential, like a muon collider, prove feasible (see *PHYSICS TODAY*, October 2022, page 22). A muon collider would combine the advantages of the FCC stages with signals as clear as electrons' at energies more comparable to protons, but the muon's short lifetime presents a major challenge for building and running such a machine. Meanwhile, a competing Chinese Higgs factory could be ready a decade

before the FCC-ee, potentially making both stages superfluous (see "China plans a Higgs factory," *PHYSICS TODAY* online, 17 December 2018). "If you go for the FCC program, you're betting on what kind of physics you want to do in 2070," Nikhef's Koppenburg says.

If funding doesn't materialize, CERN has backup proposals that involve reusing the 27-kilometer LHC tunnel for less ambitious projects than the FCC or a linear collider. But in a way, ambition is the point. While trying to understand the universe, CERN pushes the limits of technologies like magnets and high-speed data processing. "In a technologically competitive environment, which other research field would you say that Europeans dominate alone?" says ATLAS's Petersen. "Are we going to give that up so easily?"

Matt von Hippel

Q&A: Xiaoxing Xi on the wrongful arrest that upended his research and his life

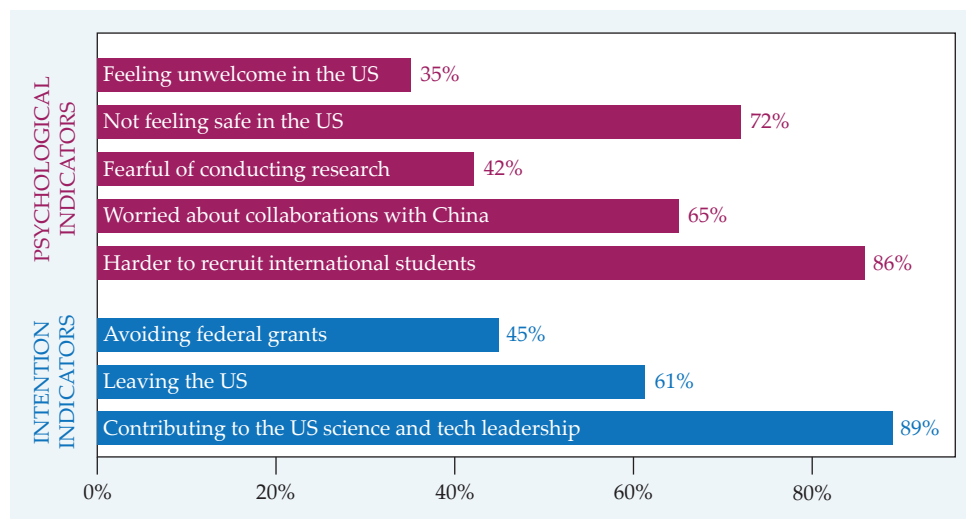
The physicist now advocates for other Chinese-born scientists in the US suspected of spying for China.

Xiaoxing Xi and his wife, Qi Li, were part of a growing wave in the 1980s and 1990s of scientists moving from China to the US at a time when US funding, facilities, and research were considered the best in the world. They had earned their PhDs in experimental condensed-matter physics at Peking University. From there, they went to Karlsruhe, Germany, for a couple of years before moving to the US in 1989.

Xi and Li eventually became professors at the Pennsylvania State University and naturalized US citizens. In 2009, Xi joined the physics faculty at Temple University, where he still is. His research was thriving until the early hours of 21 May 2015, when he was awakened by pounding on his front door. Agents from the Federal Bureau



XIAOXING XI (Photo by Joyce Xi.)



MANY CHINESE AMERICAN TENURE-LINE RESEARCHERS at US universities feel unsafe, are worried about collaborations with China, are thinking of leaving the US, and are avoiding applying for grants from federal agencies, according to a survey conducted in late 2021 and early 2022 for the Asian American Scholar Forum. (Figure adapted with permission from Y. Xie et al., *Proc. Natl. Acad. Sci. USA* **120**, e2216248120, 2023/CC BY-NC-ND 4.0.)

of Investigation arrested him at gunpoint for what he later learned were charges of economic espionage, the sharing of trade secrets with a foreign state actor. The charges were dropped four months later.

In the decade since his arrest, Xi has helped other Chinese-born university professors in the US who have been caught up in the campaign against economic espionage. Many of them were among the hundreds of Chinese American academics and scientists targeted under the China Initiative. The US Department of Justice launched the initiative in 2018 as part of a trend to tighten research security (see *PHYSICS TODAY*, June 2025, page 16). It was discontinued in 2022.

Xi is suing the US government. But his case is progressing slowly, he says. "They violated my constitutional rights. They did something wrong and should be held responsible." And, he adds, he'd like to learn more about why the government was after him.

PT: Why did you go into physics?

XI: I grew up in Beijing during the Cultural Revolution. When I graduated from high school in 1976, there were no college opportunities for most people. I was sent to the countryside to be reeducated. That meant working in the fields, tilling the land, and harvesting. And digging pigsties.

I thought I would be there for my entire life. When the Cultural Revolution ended, Deng Xiaoping [then vice chair of

the Chinese Communist Party's Central Committee and vice premier] restarted the university entrance exams.

It was a big shock. Before this, you tried to learn something so that you could have a better chance in your life to do something more than just simple labor. Now, you studied for the college entrance exam. I was studying in the countryside during my spare time.

In late 1977, I took the entrance exam for college. There was a general idea that if you are smart, you go into physics. You go to the physics department at Peking University, which is the best university in China. That's how I got into physics.

PT: And you got into Peking University's physics department?

XI: Yes. I started in January 1978, as part of the first class after the Cultural Revolution. I was 20 years old. I had classmates who were 16, 17—some hadn't finished high school—and others who were over 30 years old. After 10 years of no opportunity, everybody worked extremely hard.

PT: In the 1980s, many US graduate physics programs started to see an influx of students from China. Did you consider continuing your studies in the US?

XI: A lot of my classmates went to the US after they graduated. But I was thinking, "I'm not the smartest, and I'd like to be an academic in China, so probably I should establish myself more in

China before I go abroad." I found the best opportunity in China: I did my PhD at Peking University. My adviser, Weiyang Guan, was the director of the Institute of Physics of the Chinese Academy of Sciences.

Of course, the conditions for doing research were poor compared to the US and Europe. But I think it taught me to be resourceful—to accomplish things under less-than-optimal conditions.

PT: What was your research area?

XI: My PhD was on superconductivity. My adviser got his degree in the Soviet Union with [Pyotr] Kapitsa. I made multilayers of aluminum and silicon. I was able to see the critical temperature of aluminum increase when I mixed it with silicon by bombarding the multilayer with an ion beam.

PT: Where did you go from there?

XI: I went to Karlsruhe, Germany. There, I became the first person to make high-quality epitaxial yttrium barium copper oxide thin films.

Venky Venkatesan, a prominent physicist at Bellcore working in the same area, visited. He learned that my wife and I were interested in coming to the US. He made offers to us, and we came in 1989.

First, we were at Rutgers University. When Venky moved to the University of Maryland, we went with him. We were there for five years as research scientists, on soft money. Among other things, I

worked on high-temperature superconductor field-effect transistors. Then my wife got an offer from Penn State. I was the add-on hire.

After we moved to Penn State, my wife and I decided to work on things that do not overlap. I focused on ferroelectrics, and my wife worked more on magnetism. My group at Penn State successfully applied UV Raman scattering to ultrathin ferroelectric films. We also developed a highly effective technique to produce superconducting magnesium diboride films.

PT: Did you want to stay in the US?

XI: At the time, the US was the best place to do science. In China, it was more difficult. And they were behind in terms of the quality of the research and the quality of facilities.

After we had children and were relatively established, it was clear that our home would be in the US.

PT: Tell me about your arrest.

XI: It came out of nowhere. One morning, someone pummeled my door, and when I opened the door, I saw all these armed agents. They had a battering ram. They announced that I was arrested, but they wouldn't tell me why.

These guys with bulletproof vests and guns came running into my house yelling, "FBI! FBI!"

My wife opened the bedroom door to see what was going on. The men had a gun pointing at her and ordered her to raise her hands and walk out. At the time, both of my daughters were home. They were treated the same way when they were ordered to walk out of their bedrooms.

They put handcuffs on me. I had been asleep when they arrived and had put on only shorts and slippers when I went to the door, as the pounding was so urgent. I opened it barechested. They let me put on a shirt and a pair of pants. They took me away in front of my family. It was very scary.

My wife and I had lived through the Cultural Revolution, so we had heard of people being taken away, and you never knew how long they wouldn't see their family. My wife was very concerned about our younger daughter, who was 13 at the time.

PT: What were you charged with?

XI: They took me to their field office in Philadelphia. I was strip-searched by a US marshal. They asked me to bend over against the wall to check whether I had hidden anything in my body. You get many humiliations. I was released on bail that afternoon.

After they arrested me, they interrogated me. They read me the Miranda rights. I of course knew that I should not talk to them without a lawyer. But if I didn't know what they were charging me for, how would I prepare for my defense? I decided to talk to them.

They asked me questions about my work. Do you have students from China? Do you travel to China? When you travel to China, do you carry your computer and give a talk? Those kinds of things. But they still wouldn't tell me what they were charging me for.

Finally, I found out they were charging me for sharing information about a pocket heater, a device by a company with collaborators in China. The word "absurd" came out of my mouth. There was absolutely no possibility that was true.

PT: What was your connection to the pocket heater?

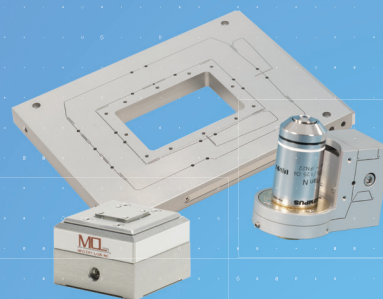
XI: The pocket heater was a widely known technology developed by a German professor. While I was on sabbatical with the company, I had made important contributions to the modification of the device to work with magnesium diboride instead of oxides. Later, I bought one from an inventor of the heater for my lab at Penn State.

PT: The charges were dropped. How did that happen?

XI: The Department of Justice charged me based on four emails I sent to my collaborators. None of the emails had anything to do with the pocket heater. It's not surprising that they didn't understand the emails, but they should have consulted experts.

My lawyers contacted the most authoritative experts in my field and also one of the inventors of the modified pocket heater. We gave them all my email communications with my Chinese collaborators. They wrote affidavits

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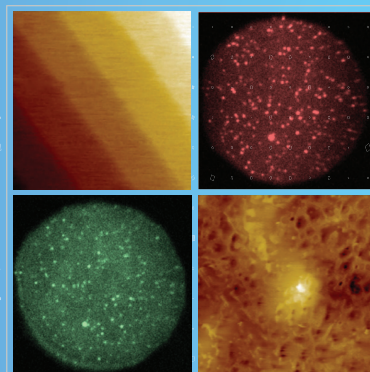


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Director Position: Institute for Fusion Theory and Simulation (IFTS), School of Physics, Zhejiang University (ZJU)

The School of Physics at Zhejiang University (ZJU) invites applications with no restriction on nationality for the position of Director of the Institute for Fusion Theory and Simulation (IFTS). We seek highly qualified candidates with expertise in plasma physics; in particular fusion plasma physics, who are committed to advancing research and education in the field of plasma physics.

About ZJU-IFTS:

The ZJU School of Physics is a multidisciplinary institute that offers a comprehensive research and educational program in physics. Among its specialized research centers is the Institute for Fusion Theory and Simulation (IFTS), which houses a strong program in plasma theory and simulation. Current research areas in plasma physics include magnetic fusion, inertial fusion, high-energy density physics, laser-plasma interaction and space physics. IFTS is dedicated to fostering a culturally diverse and intellectually stimulating environment; emphasizing excellence in both its research as well as teaching programs.

Application Details:

- **Application Deadline:** Full consideration will be given to applications received by **September 1, 2025**. Applications will be reviewed as they are received, and submissions after the deadline may be considered until the position is filled.
- **Expected Starting Date:** Fall 2025 (negotiable).
- **Salary:** Competitive and commensurate with qualifications and experience.

How to Apply:

To apply, please send your CV to the Dean of the School of Physics, Prof. Haiqing Lin at hqlin@zju.edu.cn to request the complete application package and detailed procedures.

About Zhejiang University:

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ISSUES & EVENTS

saying that my emails had nothing to do with the pocket heater. The emails were all about my own published research.

The Department of Justice dropped the case at the last minute before we had to file our motion to dismiss the charges.

PT: How did being falsely charged affect your personal and professional life?

XI: During that time, I was put on administrative leave. I was removed from chairing the department. I had the chance of being convicted and going to jail for 80 years. It was a real possibility. It was a very difficult time for myself and my family. Everyone in my family has continued trauma from the experience.

Nowadays, a lot of Chinese scientists in the US talk about a “fear factor.” I know exactly what they mean. Whenever members of my family communicate, we are afraid that the FBI could twist anything we have said in our emails or phone calls.

Nearly half of Chinese professors who responded to a survey said they would not apply for federal funding anymore [see the figure]. For a lot of professors charged under the China Initiative, it was because of the so-called nondisclosures in their grant proposals and in their conflict-of-interest disclosures with their university. If you don’t take federal money, then your risk of getting in trouble is smaller.

PT: Do you still apply for federal funding?

XI: Yes. I still have federal funding. If I don’t have funding, I have to teach three classes. If I do, I teach one class. I have two grants; one is on my own and one is a team proposal. I had nine grants when I was arrested. And I had 10 students. Now I just have two senior people working with me, no students.

I used to have two major research areas: magnesium diboride and oxides. My group had developed a powerful and versatile technique that can build oxide films one atomic layer at a time. That research has stopped.

The experience of being falsely charged took a huge chunk out of my desire to apply for federal funding.

Now I work under a combination of fear and still wanting to do something.

PT: How is your experience relevant in today’s climate of heightened tensions between the US and China?

XI: My experience 10 years ago taught me that Chinese scientists are being unfairly treated. That has not changed. Former FBI director Christopher Wray said there were a slew of nontraditional collectors for China: Professors, scientists, and students are suspected of spying for China. And recently, Senator Jim Risch said that each and every Chinese student in the US is an agent for the Chinese government. [Risch (R-ID) was speaking at a Senate Foreign Relations Committee hearing, “The Malign Influence of the People’s Republic of China at Home and Abroad: Recommendations for Policy Makers,” on 30 January 2025.]

With the new administration, it’s not just Chinese scientists. It’s all international students, professors, and scientists. They could be deported for no real reason.

PT: Tell me about your advocacy work.

XI: I have been taking every opportunity to tell my story and talk to various audiences about the racial profiling against Chinese scientists. I have been following all the cases and government pronouncements closely, so I have become quite knowledgeable in the legal and science policy areas.

My lawyer often asks me to be a reference for Chinese scientists who are charged. I see that some of them cannot eat. They cannot think. They cannot sleep.

As a scientist, I had absolutely no idea how the legal process worked. I think everybody should have some knowledge so they know what to expect if they are arrested and charged with espionage. And I think educating the public about the issues is something I can and should do given my unique experience.

PT: Is there anything you would like to add?

XI: I will be very pleased if people remember me for my research in addition to the advocacy work I have been doing in the last 10 years.

Toni Feder