A New Hub for Math

Caltech trustee Richard N. Merkin, MD, founder and CEO of the Heritage Provider Network, will fund the Institute's new Richard N. Merkin Center for Pure and Applied Mathematics. As a hub for mathematical research on campus, the center will bridge disciplines and connect research in disparate areas that focus on the development of mathematical ideas and foundations in fields such as pure mathematics, computational biology, and quantum sciences.

Merkin and the Merkin Family Foundation have also provided funds to renovate the eighth floor of Caltech Hall. The reconfigured space, scheduled to open in early 2023, will provide a home for the Merkin Center as well as a base of operations for the American Institute of Mathematics (AIM), which will relocate from its current headquarters in San Jose, California. Sergei G. Gukov, Caltech's John D. MacArthur Professor of Theoretical Physics and Mathematics, has been named director of the Merkin Center. A member of the Caltech faculty since 2005, Gukov is known for important concepts relevant to string theory, quantum field theory, and pure mathematics.

Disco is Back

The Caltech student experience is unlike any other. From the House System to SURF to JPL, there is a lot for admitted students to consider and process as they make their decision about where to enroll as undergraduates. That is why the Caltech Undergraduate Admissions Office hosts Discover Caltech. The two-day event, also known as DiscoTech, made its return to campus in April 2022 alongside ecosySTEMs, a one-day pre-program that offers historically marginalized and underrepresented students the chance to experience the new community they will be joining.

Formally called the Pre-Frosh Experience, DiscoTech drew 433 attendees in 2022, including 222 who also joined ecosySTEMs. They heard from current students, faculty members, administrators, alumni, and others about not only Caltech's research, campus life, and commitment to diversity, but also what to expect after commencement. Nobel Laureate Frances H. Arnold, the Linus Pauling Professor of Chemical Engineering, Bioengineering and Biochemistry; and director of the Donna and Benjamin M. Rosen Bioengineering Center, welcomed the crowd with a keynote address about her lab's efforts to engineer enzymes using directed evolution.

EARTHQUAKE SCIENCE ON THE BIG SCREEN

For more than a century, Caltech's Seismological Laboratory has transformed society's understanding of earthquakes and geophysics through advanced instrumentation, data science, experimentation, engineering, and public outreach.

To celebrate the Seismo Lab's centennial, the Caltech Science Exchange, in collaboration with the Dr. Lucy Jones Center for Science and Society, will host a public event in Beckman Auditorium in November called "Shaking in our Seats: Earthquake Science on the Big Screen," to explores the science behind earthquakes in films such as 1974's *Earthquake* and 2015's *San Andreas.* Moderated by seismologist Lucy Jones, a panel of scientists, engineers, and disaster-response professionals will provide insight into what happens during and after earthquakes, how scientists and government officials interact, and the future of the field. Audience members will hear what Hollywood has done right and what it has done wrong, and will have the opportunity to ask questions.

The event is scheduled for ***Saturday, November 12,*** *at* ***1 p.m.***
For more information, visit: ***scienceexchange.caltech.edu/shaking***

Origins

The Institute for Quantum Information and Matter (IQIM)

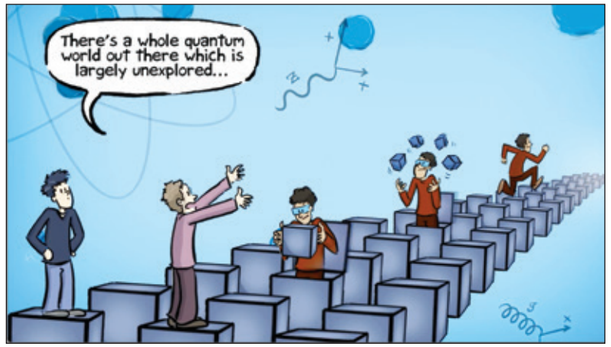
When John Preskill, now the Richard P. Feynman Professor of Theoretical Physics, came to Caltech in 1983, he planned to continue his work in particle physics and quantum field theory. By the mid-1990s, however, Preskill had switched his focus to a field that owes its existence to ideas posed by Nobel laureate and Caltech professor of physics Richard Feynman two decades earlier: quantum information theory. It was a career change that eventually led to the creation of what is now called the Institute for Quantum Information and Matter (IQIM), Caltech's long-standing home for cutting-edge quantum research.

Quantum information theory is the study of information processing on the quantum level. One of its primary aims is to guide the development of quantum computers, machines capable of far surpassing even classical supercomputers on certain problems of fundamental importance.

In the late 1990s, Preskill and H. J. "Jeff" Kimble, now the William L. Valentine Professor of Physics, Emeritus, received a grant from the Defense Advanced Research Projects Agency (DARPA), which was interested in quantum computing's potential applications in cryptography. Preskill and Kimble then hired Alexei Kitaev, now the Ronald and Maxine Linde Professor of Theoretical Physics and Mathematics, as a yearlong visitor.

Then, in 2000, Preskill and Kimble received a grant from the National Science Foundation, which they used to form the Institute for Quantum Information (IQI) that same year.

"NSF got a surge of funding for a program they called Information Technology Research, which included a lot of practical things, but also sort of a lunatic fringe of blue-sky research. And that's what we were part of," Preskill noted in an oral history for the American Institute of Physics conducted by science historian David Zierler, who now serves as director of the Caltech Heritage Project.



Guifre Vidal (Postdoc '01–'05), now a senior staff research scientist at Google, recalled those early days as a Caltech postdoc during a Heritage Project interview: "John had the vision ... to hire interesting young people for [IQI], then apply a hands-off approach. He's not the type of person who needs to control everything and everyone."

Liang Jiang (BS '04), a former IQI postdoc and current professor at the University of Chicago, told Zierler during a Heritage Project interview that weekly meetings were so full of discussion and questions that Preskill had to impose a time limit: "You could only talk for one minute because some group members would get really excited with the results and would talk a lot about their research."

By 2011, advances in quantum computing hardware, such as superconducting circuits and qubits (the quantum mechanical analogue of a classical bit), gave Preskill and Kimble the impetus to apply for more NSF funding as a means to broaden the IQI's scope to include experimental work. They received that funding and, in 2011, changed its name to the Institute for Quantum Information and Matter, for which Preskill serves as the Allen V. C. Davis and Lenabelle Davis Leadership Chair of the Institute for Quantum Science and Technology.

Spiros Michalakis, staff researcher and manager of outreach at IQIM, described this name change in a recent Heritage Project interview as a "visionary move," one that is still paying off: "We attach 'M'—matter—and it really mattered because … we started to have conversations with how you can implement certain things, and how you can convert some of the theories into experiments. … I didn't know many physicists or many people who were part of physics or even mathematical physics … who were not, basically, in one way or another, associated with IQIM. … If you look at the roster even now, for the second iteration of IQIM, the second cycle we have, there's a pretty cool medley of people."

Above: Still image from the 2013 video "Quantum Computers Animated" produced by IQIM in partnership with PhD Comics. The video features IQIM's **John Preskill** and **Spiros Michalakis.** Watch the video:

For more on the history of IQIM, visit:
magazine.caltech.edu/post/iqim-quantum-john-preskill