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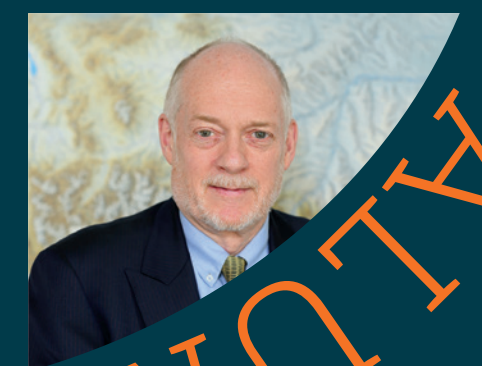
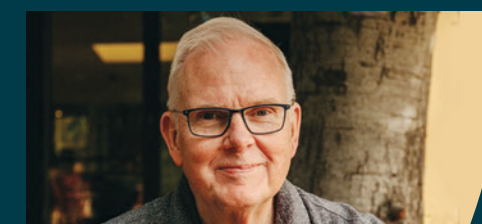


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**Caltech**

# Meet the 2024 DISTINGUISHED ALUMNI

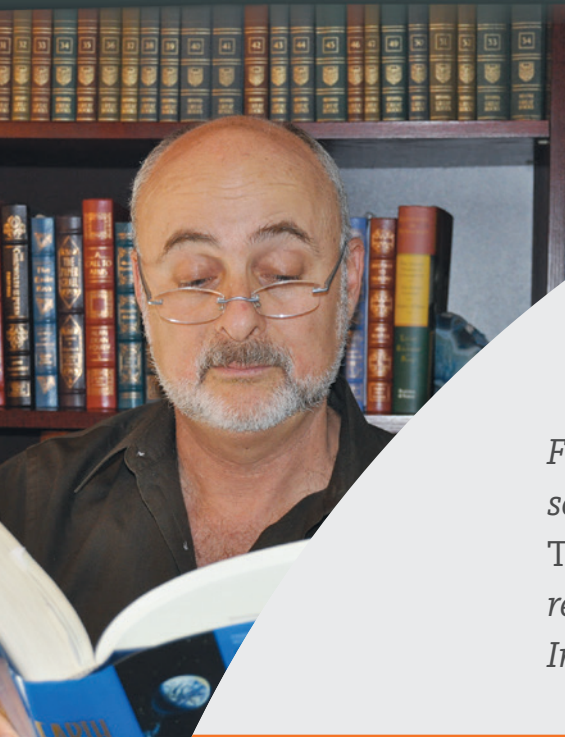
Caltech's annual **Distinguished Alumni Awards**—the highest honor the Institute bestows upon its graduates—recognize “a particular achievement of noteworthy value, a series of such achievements, or a career of noteworthy accomplishment.” The 2024 luminaries include a lauded best-selling science-fiction author and futurist; a chemist whose electron microscopy analysis revolutionized our understanding of genes and messenger RNA; a leading tech industry executive, venture capitalist, and mentor; and a chemical-sensing innovator whose research has led to life-saving discoveries.



By Chris Quirk

*Awardee interviews were conducted by the Caltech Heritage Project.*





## David Brin (BS '73)

Astronomy; Science Fiction Author and NASA and Corporate 'Futures' Consultant

*For his enduring excellence in storytelling, examining how change, science, and technology affect the human condition in his New York Times best-selling science fiction novels, and for his support of revolutionary ideas in space science and engineering through NASA's Innovative and Advanced Concepts Program.*

When David Brin began his studies at Caltech, he found it curious that many of his scientific heroes at the Institute had creative or literary pastimes—including Nobel laureates Murray Gell-Mann (an enthusiast of James Joyce, obscure English literature, and Greco-Roman history) and Richard Feynman (a bongo player and painter). “I was told by my father that he took me to see Einstein play the violin—at Caltech—when I was 3,” Brin says. “It always struck me how many top researchers also nurture an arty side.”

Brin came to Caltech to pursue his love of astronomy and went on to earn a doctorate in astrophysics at UC San Diego. But he, too, harbored an artistic passion: writing. During his student days in Pasadena, he crafted stories and novels on evenings and weekends.

He intended to continue in academics, but lightning struck. His second novel, *Startide Rising*, won both the Hugo and Nebula prizes in 1984 for best novel, cementing his place as a bright new talent. “It became clear that civilization valued my art a bit more than it valued my science,” he recalls. “Who am I to argue with civilization?”

Brin has since written more than 20 books, including both novels and short fiction, which have been translated into 20-plus languages; those books have earned him two additional Hugo awards, as well as other honors. *The Postman*, Brin's postapocalyptic tale of human redemption, was adapted into a 1997 feature film starring Kevin Costner.

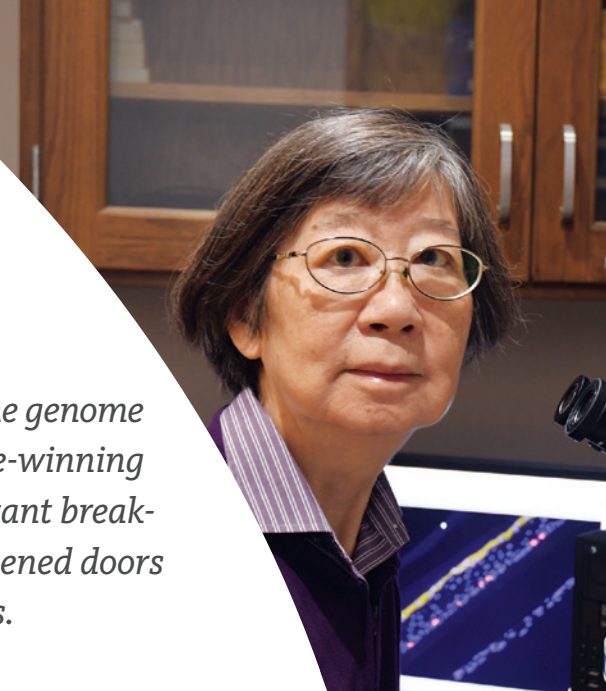
A sought-after public commentator on science and technology, Brin has appeared on CBS, PBS, the BBC, and other media outlets, and has served as a keynote speaker at more than 200 meetings and conferences.

In 2013, Brin assisted in the creation of the Arthur C. Clarke Center for Human Imagination at UC San Diego, where imagination is studied and cultivated through research that focuses on neuroscience, technology, speculative futurism, and the cosmos. As a “future-tech” consultant, he has worked with Google, Microsoft, the U.S. Air Force, the CIA, and NASA, among others, advising on topics as diverse as space exploration, national defense, nanotechnology, and the future of science and society. He is also a member of the External Advisory Council of NASA's Innovative and Advanced Concepts Program. “It's NASA's agency for looking—very successfully—into projects that are just this side of science fiction,” he explains.

Brin's books are regularly lauded for their level of scientific precision and detail, as well as their plausible extrapolation of the possible. But the story always comes first and, when circumstances dictate, Brin does not let fidelity to known scientific laws cramp his creativity. “I like to keep my work credible, but I don't allow that to exclude a rip-snorting yarn!” he says.

In 2023, Brin collaborated with the Institute's literary society TechLit to mentor “awesome-good writers” for its anthology *Inner Space & Outer Thoughts: Speculative Fiction From Caltech and JPL Authors*. “Of course, I already knew top science types can do excellent art,” Brin says. That same year, Caltech Playreaders premiered Brin's stage play *The Escape* at the Athenaeum.

Brin credits his time at Caltech as having a profound impact on his life and his writing. “I came away from Caltech with probably the best education I could possibly have had,” he says. “The exposure to ideas was fantastic, and the after-class discussions and arguments with the both classmates and teachers? Unparalleled.”



## Louise T. Chow (PhD '73)

Chemistry; Biochemist and Molecular Geneticist

*For her pioneering research using electron microscopy to determine genome organization and RNA transcription, which led to the Nobel Prize-winning discovery of split genes and RNA splicing, one of the most important breakthroughs in molecular biology, as well as for research that has opened doors to improved diagnosis and treatment of human papillomaviruses.*

Louise Chow, a world-renowned expert in human papillomavirus (HPV) biology, played a crucial role in the discovery of split genes and mRNA splicing.

After receiving a bachelor's degree from National Taiwan University in 1965, Chow came to Caltech as a chemistry graduate student in the lab of Norman Davidson, the Norman Chandler Professor of Chemical Biology, where she investigated relationships between bacterial genes and integrated bacteriophages using electron microscopic analyses. “Norman was brilliant and provided excellent training; I am grateful for his mentorship and kindness,” says Chow. She would go on to meet her future husband and lifelong collaborator, Thomas Broker, when he joined the lab as a postdoc in 1972.

Chow discovered her strong aptitude for electron microscopy (EM) characterization of nucleic acids while at Caltech. “With the scope, you find structures of interest and assess what they are right on the spot,” she says. “I was good at and loved interpreting complex DNA pairing interactions.” This skillset initiated her 50-year career investigating the basic science of DNA tumor viruses.

Chow and Broker joined Cold Spring Harbor Laboratory in New York in 1975 and started mapping human adenovirus mRNAs by EM visualization the next year. In 1977, she and collaborators discovered split genes and mRNA splicing, which would garner the 1993 Nobel Prize in Physiology and Medicine for her Cold Spring colleague Richard Roberts, along with MIT's Phillip Sharp. Chow and Broker additionally demonstrated that adenovirus mRNA genesis used alternative polyadenylation sites and alternative splicing of primary transcripts; a year later, they found it used alternative promoters as well. These processes produce families of messages, greatly expanding the coding capacities of genomes and enabling sophisticated regulation of gene expression.

Many scientists felt Chow should have been awarded the Nobel Prize as well, noting that the EM experiments

unambiguously demonstrated split genes and mRNA splicing, and provided a logical interpretation of puzzling biochemical results from her colleagues. “The evidence she discovered was a critical part of the total creative insight that splicing was taking place. Only she could have interpreted those data,” Davidson told *The Boston Globe* at the time.

In 1982, Chow and Broker began investigating prevalent human papillomaviruses that can cause anogenital and oropharyngeal cancers. Their research continued at the University of Rochester from 1984–93, and then at the University of Alabama at Birmingham from 1993 onward, where Chow was a professor and Distinguished Professor of Biochemistry and Molecular Genetics, now Emerita. Their lab has characterized HPV RNA transcription, gene regulation, and viral DNA replication and amplification, and deciphered virus-host cell interactions and 3D tissue culture systems to recapitulate the productive infection program or to simulate HPV cancers. They exploit these systems to identify potential inhibitors of HPV-caused diseases that include benign lesions, dysplasia, and cancers.

Chow was awarded the American College of Physicians Medal in 1996; she was elected to the National Academy of Sciences in 2012 and Taiwan's Academia Sinica in 2013. She became a fellow of the American Academy of Microbiology in 2013.

Because HPV prophylactic vaccines have no effect on preexisting infections, Chow and Broker still work five days a week during retirement in the hope that their research will lead to effective, inexpensive drugs to treat HPV diseases. “It may not be in my lifetime, but at least we have a better knowledge of what could work,” she says.





## Bill Coughran (BS, MS '75)

Mathematics; Technology Investor,  
Executive, and Mentor

*For his influential role as a Silicon Valley executive, mentor, and investor, helping ambitious start-ups grow into transformative companies, and for overseeing the development and continual improvement of iconic products at Google, including Chrome, Maps, and Google Search.*

**B**ill Coughran first saw a computer as a middle-school student in Fresno in the 1960s. The local high school had just acquired a desktop Digital Equipment Corporation PDP-8 machine that used paper tape punches and readers. “It was an ancient system,” he recalls.

But the experience of trying out the machine propelled his early interest in math and science, a passion that brought him to Caltech and, later, to Silicon Valley, where his combination of technical know-how and business acumen has made him a lodestar in the tech industry. Coughran has served as a founder’s coach and partner at venture capital firm Sequoia Capital for more than a decade, mentoring numerous innovators and executives, and helping them navigate the tricky channels on the journey from great idea to successful company.

Coughran took so many math courses at Caltech that he earned both a bachelor’s and a master’s degree in four years. “Caltech was very challenging from an intellectual standpoint,” he says. “When I was an undergraduate, I enjoyed the smallness of the place because we got to know each other.” He then decided to pursue computer science at Stanford, earning a second master’s and a PhD.

In 1980, Coughran accepted a job at Bell Labs, then one of the most innovative research and development companies in the world. He had the freedom to work on open-ended projects, such as semiconductor simulations, and he reveled in the collaborative, multidisciplinary environment. “There were world-class physics people there, chemists, mathematicians, people working

on acoustics, and they had some remarkably strong research work in computer science,” he recalls.

Eventually, he was tapped to lead Bell’s scientific computing and numerical analysis group before heading up the renowned computer science research center.

Coughran returned to the West Coast in 2000 and co-founded fiber-optic broadband company EntriSphere, which was eventually bought by telecommunications company Ericsson. Then, in 2003, Google recruited Coughran to run the internet search firm’s infrastructure group. “Google had a few hundred employees when I joined, so it was a start-up, but it was a start-up with some heft already,” he says. Toward the end of his Google tenure, Coughran managed an engineering department of more than 7,000 employees on four continents. He had also overseen much of the development of Google Maps and helped create the Chrome browser team.

In 2011, Sequoia presented Coughran with a challenge that appealed to his spirit of innovation: working with entrepreneurs to develop small companies. “One of the things that is very hard to simulate inside a large company is the life-or-death experience in a start-up,” he says. “Tension and that existential risk adds a dynamic to a small company that’s stressful, but it also is a crucible that creates new ideas.”

Coughran now mentors a select group of promising start-ups and sits on the boards of several tech companies, as well as that of the San Francisco Opera.

“Caltech made me much better as a problem solver,” he says. “It heightened my ability to take ambiguous problems and constraints, analyze them, and deconstruct them into solvable components. The experience was transformative for me and made me intellectually stronger.”



## Timothy M. Swager (PhD '88)

Chemistry; Chemist

*For his groundbreaking advancements in molecular electronics and chemical sensing, which created a new generation of devices with unparalleled levels of chemical sensitivity, and for translating these discoveries to benefit humanity, such as keeping troops safe from explosives.*

**A**s a child in rural Sheridan, Montana, Timothy Swager felt more comfortable tending livestock than stepping into a classroom. As a teenager, he spent his summers working on the farm owned by his future wife’s grandfather and uncle. “I wanted to be a rancher,” Swager says. “I don’t think anybody back then would’ve expected me to be an MIT professor.”

Despite some early struggles with reading comprehension, Swager excelled at chemistry in high school, and when he began his studies at Montana State University, the department gave him the keys to the building. “I started doing research in that lab, and I didn’t look back,” he says.

Now the John D. MacArthur Professor of Chemistry at MIT, Swager has delved into some of the most complex regions of chemistry, and his discoveries have led to the creation of lifesaving tools and inventions. Most notably, Swager’s work has transformed the field of chemical sensing through the development of technologies that can detect vanishingly small traces of dangerous compounds.

Swager’s Fido explosive detection system, for instance, is a handheld device that can be used to sniff out explosives and land mines; it can detect as little as a femtogram of TNT in seconds. As a way to keep food supplies safe, he created a sensor to detect pathogenic bacteria. Recently, Swager developed a method of finding minute quantities of toxic PFAS (per- and polyfluoroalkyl substances), which are found in a variety of consumer products. “We can detect these forever chemicals in under an hour, at levels below the EPA limits, which are in the low part-per-trillion range,” Swager explains. “This is all really exciting and important. There are big health risks from

PFAS in the environment, and I feel good about the fact that we can help prevent exposure.”

As a Caltech student, Swager did research in the lab of the late Nobel laureate Bob Grubbs, who recruited Swager to his research program to start an effort in polymer chemistry. “Bob’s group was teeming for decades with spectacular postdocs and graduate students. Being part of the Grubbs clan also gave me a little cachet, and helped make good things happen for me,” Swager says. “Caltech is particularly good for people who really want to grow and find themselves because they encourage you to take courses outside your area and not just be monolithic in your coursework.”

In recognition of his groundbreaking research, Swager has received the Carl S. Marvel Award for Creative Polymer Chemistry from the American Chemical Society, the Christopher Columbus Fellowship Foundation Homeland Security Award, and the Lemelson–MIT Award for Invention and Innovation. Swager is also a fellow of the American Chemical Society, and is a member of the American Academy of Arts and Sciences and the National Academy of Sciences.

Swager notes that his teaching philosophy at MIT is informed by what he learned from his Caltech professors as a student. “From day one at Caltech, I felt that the culture was to be a virtuous scientist, and the Caltech philosophy prepared me to be the best scientist possible,” he says. “I tell my students that you can’t bury a piece of data because it doesn’t fit. In fact, that piece of data is usually telling you something profound.”