

California Institute of Technology  
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# C a l t e c h N e w s

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#### ON THE COVER

A much-abbreviated stairway to heaven, this ladder was designed to be an emergency exit from the Robinson Lab “pit,” built decades ago as part of the housing for Caltech’s solar telescope. Over the years, the facility took on new functions. The story begins on page 10.

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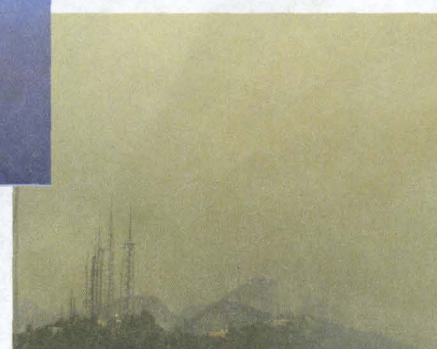
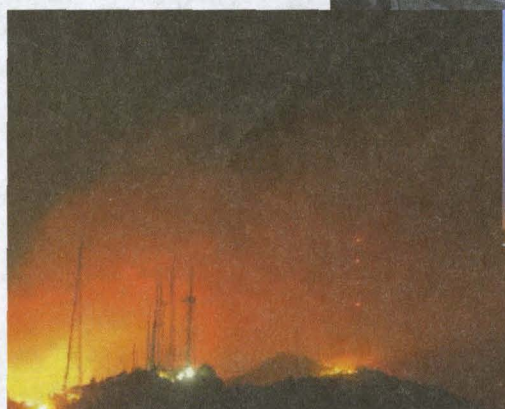
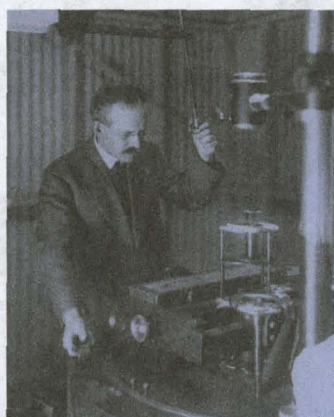
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F r o n t

## SAVING HALE’S OBSERVATORY

Chicago native George Ellery Hale was a sun worshipper long before he set foot in the Golden State, where he promptly went to work building a solar observatory on Mount Wilson in the San Gabriels. Later, of course, the visionary astronomer and self-described “born experimentalist” would play a

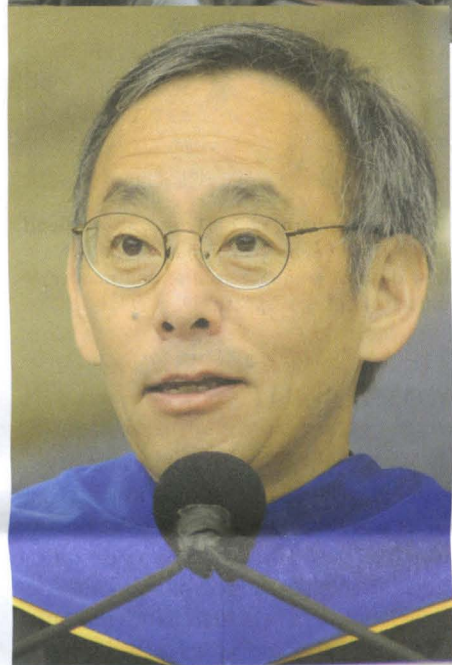
hands-on role in a constellation of Southern California projects, including the establishment of the Huntington Library and Palomar Observatory, and the transformation of Throop Polytechnic Institute into the California Institute of Technology. But solar astronomy was among Hale’s most enduring passions. He set a solar telescope in the middle of the Caltech campus (for more on its colorful history, see page 10) and created atop Mount Wilson a stargazing center that not only produced new findings about the sun but radically altered our view of the universe. Mount Wilson was where astronomer Edwin Hubble discovered that the Milky Way is only one galaxy, and a rather modest one at that, among a seemingly endless array of star systems, all of which he found to be rushing away from one another—a finding that led to the inescapable conclusion that the universe is expanding and set the stage for the Big Bang model of cosmic evolution. This summer, the historic observatory, which since 1986 has been operated by the Mount Wilson Institute under an agreement with the Carnegie Institution of Washington, faced a very different explosive scenario. The massive

Station Fire, burning through the Angeles National Forest, came perilously close to torching parts of the complex, where several universities, including Caltech, have active research programs. On September 1 and 2, a UCLA camera perched atop a 150-foot solar tower captured these vivid images of Mount Wilson engulfed in smoke, backlit by the deliberately set backfires that were part of the heroic firefighting efforts that ultimately saved the facility. For more information, go to [tinyurl.com/mdzyun](http://tinyurl.com/mdzyun).



An undated photo shows George Ellery Hale with a Mount Wilson spectrograph, while more recent images capture the fiery spectacle of an observatory under siege.





# High Energy Commencement

Students at Caltech's 115th graduation ceremony clowned a bit for the cameras before listening attentively to Secretary of Energy Steven Chu's engaging and witty commencement address.

As Caltech moves forward with an enhanced commitment to sustainability on many fronts, June 12 arrived with the timely reminder that few traditions sustain a university more profoundly than commencement. Although the day was cloudy and a bit chilly, with tendrils of cool mist drifting down, the crowds who gathered on Beckman Mall for the Institute's 115th graduation ceremony brought with them the usual array of festive sights and sounds: bouquets of flowers and balloons held by proud parents; the procession of faculty, administrators, and trustees looking, in their extravagant robes and caps, like they were headed for Mardi Gras; graduates sporting flip flops, leis, or purple hair—and, in at least one case, a karate robe—the soon-to-be alumna with the mini teddy bear perched on her mortarboard; the cymbal crashes; the trumpet bursts; and the triumphal cannon shot followed by streamers descending over the rows of banked seats while newly minted graduates tossed their mortarboards into the air.

In fact, sustainability was the watchword of the day, which featured a commencement address by Secretary of Energy and Nobel Laureate Steven Chu (a story on Chu's new Under Secretary for Science Steve Koonin '72 appears on page 7), and a major announcement by President Jean-Lou Chameau that the campus was about to embark on an ambitious new sustainability initiative.

Speaking a few moments before Chu began his address, Chameau announced the establishment at Caltech of the \$90 million Resnick Sustainability Institute. The institute, which will focus on innovative science and engineering developments required for groundbreaking and scalable energy technologies, is named for Caltech trustee Stewart Resnick, and his wife, Lynda, who have a long history of philanthropy to Los Angeles institutions. The couple's \$20 million gift establishing the first phase of the initiative is coupled with a \$10 million gift from the Gordon and Betty Moore Matching Program. The gift also includes support for a second phase of funding, which will begin next year as part of a challenge grant. The Resnicks are the owners, and Stuart Resnick the chairman, of Roll International Corporation, whose diverse interests include Paramount Citrus, Paramount Farming, and Paramount Farms, growers and processors of nuts and citrus; and POM Wonderful, the world's largest grower of pomegranates and makers of POM Wonderful pomegranate juice. Moore, who received his Caltech PhD in 1954 and went on to become a cofounder of Intel, is chairman emeritus of the Caltech Board of Trustees, on which he continues to serve as a senior trustee.

"At Caltech, a small group of extraordinary people do extraordinary things," Chameau said. "This small group has a history of addressing difficult and fundamental

scientific questions that can have a major impact on society. I have enjoyed many conversations with Stewart and Lynda on this initiative and the potential of scientific developments to help address our environmental and economic challenges. This generous gift reflects their passion, courage, and commitment to making a difference in the world."

Secretary of Energy Chu touched on the same themes in his address, as he focused on the potential of this year's graduates to make significant and world-changing contributions to some of the most pressing problems facing the planet, particularly in the arenas of global climate change and new energy technologies. Chu, who won the 1997 Nobel Prize in Physics for developing techniques for cooling and trapping atoms using laser light, has long been interested in alternative energy research. As director of the Lawrence Berkeley National Laboratory from August 2004 until last January, he helped the center become a leader of investigations into biofuels and solar-energy technologies.

The speaker began his remarks on a light note, assuring the graduates that they would never again have to listen to Caltech's finals-week staple, *Ride of the Valkyries*—unless of course that particular Wagnerian wall of sound had become a personal favorite. "Your quantitative and intellectually demanding training will allow you to venture wherever your curiosity may take you," Chu said. "Finally, you should be proud to be graduating from an institution where nerds are welcome."

Confessing that much of his speech was borrowed from a commencement address that he had delivered the previous week at Harvard, Chu said that Boston-area newspapers couldn't resist reporting that he had called himself a nerd. Citing a *Wikipedia* entry that claimed that nerds are obsessed with *Star Trek* and *Star Wars*, Chu then launched into a spirited defense of nerdiness.

"First, I dispute that a fondness for *Star Wars* is at the opposite end of the intellectual spectrum," Chu said. "Second, I claim that many of my fellow nerds are widely read, socially engaging, talented musicians, and good athletes. You might think, if a person is athletic, socially graceful, and has broad interests, then they're not nerds. Well, perhaps. But I want to celebrate people of intelligence, focus, and technical achievement. The ability to understand details does not mean you're incapable of forming deep insights. In your future life, it is important that you develop broad interests to help you see the forest as well as the trees. But it is also important that you cherish your skills to understand something deeply."

Chu directed his advice to the 214 bachelor of science candidates (130 of them graduating with honor) made up of 156 men and 58 women; 117 masters of science

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## BARTON NAMED TO HEAD CHEMISTRY AND CHEMICAL ENGINEERING DIVISION

Jacqueline Barton, Hanisch Memorial Professor and professor of chemistry, has been named chair of the Division of Chemistry and Chemical Engineering, succeeding David Tirrell, who is stepping down after a decade in the position. Barton began her new job on July 1.

In announcing Barton's appointment, Caltech provost Ed Stolper said that he and President Jean-Lou Chameau "are confident that Jackie has the judgment and energy to lead the division creatively and effectively, and that she will be an outstanding advocate for the division and for the Institute as a whole."

Barton's research focuses on molecular properties of DNA, such as how electrons can travel along the "rungs" of the DNA ladder, which may have implications for how cells find and repair damage to their genetic material; and how small molecules containing metal atoms can recognize and bind to specific sites on DNA, particularly to mismatches that may promote cancer.

Barton, who earned her AB from Barnard College and her PhD from Columbia University, joined the Caltech faculty in 1989 and was named the Hanisch Professor in 1997. Elected to the National Academy of Sciences in 2002, she has received numerous other honors in the course of her career, including the MacArthur Foundation Fellowship (the "genius" award) in 1991, the Alan T. Waterman Award from the National Science Foundation, and many awards from the American Chemical Society. She was elected in 1991 to the American Academy of Arts and Sciences and in 2000 to the American Philosophical Society. Barton holds honorary doctorates from eight institutions, including Williams College and Yale University, and has received university medals from her two alma maters, Barnard and Columbia. She has served on the Board of Directors of the Dow Chemical Company since 1993 and has participated on a number of other ACS, governmental, and industrial boards.

Barton is married to Peter Dervan, Caltech's Bren Professor of Chemistry, who himself served as the chemistry and chemical engineering division chair from 1994 to 1999.



## HERO JOINS CALTECH AS HEAD OF DEVELOPMENT AND ALUMNI RELATIONS

Peter deCourcy Hero has been named Caltech's new vice president for development and alumni relations, in which capacity he will oversee Caltech's institutional advancement efforts and create and implement strategies to elevate the Institute's profile with prospective donors and friends.

Hero comes to Caltech from the Bay Area, where he has been senior advisor to the CEO and board of directors of the Silicon Valley Community Foundation (SVCF) in Mountain View and a senior fellow at the Center for Social Innovation at Stanford University's Graduate School of Business, where he has also taught. He was recently appointed adjunct professor at the Swinburne University of Technology in Melbourne, Australia, where he has been a visiting lecturer as well as an advisor to its community foundation.

"I am delighted that Peter has joined the Institute community," said Caltech president Jean-Lou Chameau. "He has an impressive record of accomplishment, and we anticipate that his talent and experience will greatly enhance our fund-raising and alumni-

relations efforts. He is an unusually skilled relationship builder who can motivate and enlarge a donor base."

"It is a distinct honor for me to be selected as the next vice president for development and alumni relations at Caltech," says Hero. "I have long admired the institution and have closely followed its remarkable record of stunning research discoveries, accomplished graduates, and leading-edge thinking. I look forward to joining the Caltech family and to making its outreach/resource development strategies as high quality, high impact, and resoundingly successful as the education Caltech provides."

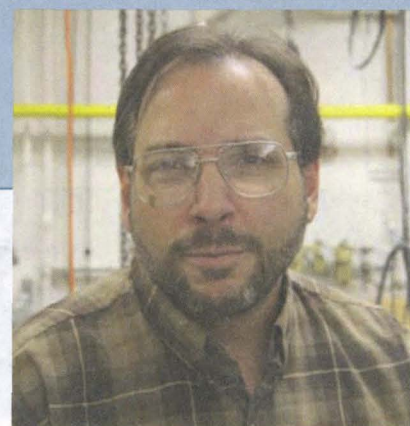
Before joining SVCF in 2007, Hero served from 1989 to 2006 as president and CEO of the Community Foundation Silicon Valley (CFSV). In that role, he created and implemented a strategic plan that increased the foundation's assets from \$8 million in 1988 to over \$1.1 billion in 2006, and he recruited such donors as eBay founder Jeff Skoll and Infoseek founder Steve Kirsch.

In a 2000 article, *Fortune* magazine recognized Hero's skill at persuading

## TWO ALUMNI FACULTY APPOINTED TO KEY STUDENT LIFE POSTS

Nobody understands Caltech better than its undergraduates . . . its graduate students . . . its alumni . . . its faculty . . . Views on who knows the Institute best may differ, but in selecting its new dean of graduate studies and master of student houses (MOSH), Caltech has touched every crucial base.

Joe Shepherd, who recently took on the top job in the grad studies office, received his PhD from the Institute in 1981, joined its teaching faculty in 1993, and is currently the Johnson Professor of Aeronautics and professor of mechanical engineering, and head of GALCIT's Explosion Dynamics Lab. New MOSH Geoff Blake spent his freshman year on campus before transferring to Duke, where he received his bachelor's degree in 1981. He came back to Caltech for his doctorate and graduated in 1986, essentially with a PhD in one hand and an invitation in the other to join the Caltech faculty, where he serves today as professor of cosmochemistry and planetary sciences. Blake's migration to Duke apparently had something to do with his mathematical aptitude, which enabled him to ascertain early on that Caltech's gender ratio ( $n:1$  male:female, with  $n > 1$ ) was not for him. But time moves on, and this year's entering class is more than 40 percent female. "I'm very happy about that," says Blake. "Some things have definitely changed for the better."

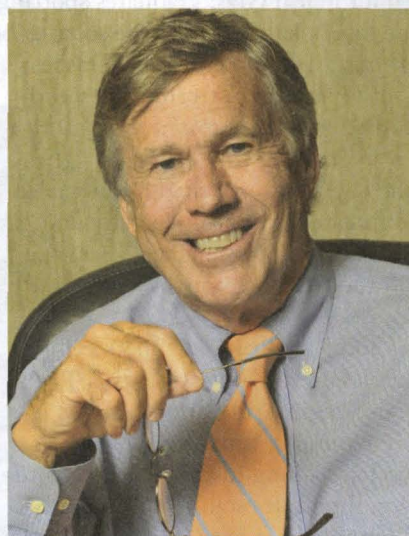


Top, Joe Shepherd, PhD '81, and, above, Geoff Blake, PhD '86, have been named Caltech's new dean of graduate studies and master of student houses, respectively.

## MOSH NOSH

We caught up with Blake and his wife, Karen (whom he did, in fact, meet at Duke), while they were hosting lunch as part of the weeklong orientation for this year's crop of resident associates—the graduate student counselors who live in Caltech's undergraduate houses. Fielding questions and fostering discussion with the new RAs comes naturally to Blake, who, despite his own fleeting tenure as a Caltech undergrad, has compiled an impressive record of involvement with campus students and student programs. He's currently starting his fourth and final year as chair of the Undergraduate Admissions Committee, and for the first two years of Avery House's existence, he, Karen, and son Garrett—now a senior at Pitzer College and a SURFer in the Grubbs group in chemistry—were billeted there while Blake was a faculty member in residence. Now that he's signed on for five years as MOSH, his sphere of influence has expanded to include all eight undergraduate houses. One of his key priorities will be to supplement the central role that the houses have traditionally played in undergraduate life with the creation of new opportunities for students to socialize all across campus.

"We'd like to encourage more interactions among the student houses and help students establish early connections beyond their houses through common academic interests and extracurricular activities," says Blake, whose own years as a Caltech student and professor have given him a keen appreciation of the pressures and expectations that daily confront your never-average Techer. "Students here are very approachable, but they're also extremely busy. We'll try to walk the houses on a regular basis to meet and mingle with



such "tech moguls" to become philanthropists, calling him the man who "more than anyone else has shown Silicon Valley how to give."

Under Hero's leadership, CFSV awarded more than \$500 million in the form of 40,000 charitable grants in Silicon Valley, the nation, and the world between 1996 and 2006, while

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## APPOINTEES TO OBAMA'S SCIENTIFIC ADVISORY COUNCIL DISCUSS GOALS, REFLECT ON NEW ROLES

Well before taking office, President Barack Obama announced his aim of paying attention to scientists when setting policy. And, in late April, he offered an indication of how he plans to “restore science to its rightful place” by appointing several of the nation’s preeminent scientists and engineers to his science and technology advisory council, including a Caltech professor and an alumnus. Among the distinguished researchers named to the council are Caltech’s Ahmed Zewail, Nobel laureate, Pauling Professor of Chemistry, and professor of physics; and William H. Press, PhD ’73, Raymer Professor of Computer Sciences and Integrative Biology at the University of Texas at Austin.

Officially called the President’s Council of Advisors on Science and Technology (PCAST), the group advises the president and vice president “in the many areas where understanding of science, technology, and innovation is key to strengthening our economy and forming policy that works for the American people,” according to the White House Office of the Press Secretary.

“This council represents leaders from many scientific disciplines who will bring a diversity of experience and views,” Obama said in a press release. “I will charge PCAST with advising me about national strategies to nurture and sustain a culture of scientific innovation.”

Bill Press should be able to provide input in multiple areas. A computer scientist and computational biologist, he began his scientific career as a theoretical astrophysicist, serving for more than 20 years as a professor of astronomy and physics at Harvard and then as the deputy laboratory director for science and technology at the Los Alamos National Laboratory before moving to Texas in 2004. Speaking from Austin, Press, who is also a senior fellow (emeritus) at Los Alamos, said, “I am especially proud of, but also especially humbled by, this appointment. These are times when many, if not most, key policy issues raise major science and technology issues. In our initial meeting, the president made clear that he expects, and will give weight to, advice from PCAST on all such issues.”



Press’s current research is in bioinformatics—which applies the tools and techniques of information science to molecular biology—and whole genome studies, surveying the entire human genome to identify and characterize specific genes associated with various diseases, disorders, and other inherited traits. Raised in Pasadena, he received his bachelor’s degree from Harvard before getting his PhD in physics from Caltech.

Zewail, who received his bachelor’s and master’s degrees from Alexandria University in Egypt before getting his PhD from the University of Pennsylvania, has also pursued a multidisciplinary career—at Caltech, he holds a joint appointment in chemistry and physics. Currently investigating structural dynamics in chemistry and biology with a focus on the physics of elementary processes in complex systems, Zewail was awarded the 1999 Nobel Prize in Chemistry for his pioneering research in the field of femtosecond spectroscopy, an ultrafast laser technique that made it possible to carry out real-time observations of how molecular bonds form and break during chemical reactions.

“This council is significant in view of the fact that the president is very much interested in being directly involved with the critical issues,” Zewail said. “Every committee has its own niche, and the purpose of this committee is to serve the national interests of lead-



Caltech chemical physicist and Nobel laureate Ahmed Zewail (left) and alumnus Bill Press of the University of Texas have been named to President Obama’s 20-member council of advisors on science and technology.

ership in science and innovation. So there is no better opportunity in terms of offering my perspectives. I am deeply honored to serve in such a capacity.”

The committee, which will meet about six times a year, will take up a wide variety of science-related issues, but both Zewail and Press said that there were particular matters that they plan to raise.

Said Press, “Aside from the economy, which is clearly this administration’s most pressing issue, the president has set out ambitious agendas in energy, climate, environment, health care, science education, international security, and nonproliferation—to mention just some issues with big technical components. Obviously PCAST hopes to contribute on all of these. My background makes me particularly interested in contributing to the latter three on this list.”

The top three issues on Zewail’s agenda are education and culture, science and innovation, and energy. He is looking forward to being actively engaged in all three areas, among the others with which PCAST is charged.

“We associate California with widespread innovation, but innovation cannot continue without having a quality educational base,” he said. “And I think that in recent years, overall, we have not been

doing too well in this country with regard to education. We need to re-think how we provide the most effective education in a 21st-century world to American students. We’ve got to find a way to excite our students about science, and to continue to welcome the most highly qualified foreign scientists. Support of curiosity-driven and creative basic research is essential for innovation and long-term leadership in the world.

“Another important issue is energy,” Zewail said. “The world population is about six billion, and soon we will run out of oil, leaving insufficient resources for people on this planet. America and the world are in need of breakthroughs that identify new directions for the energy problem, and it seems to me that we should be moving ahead essentially on all possible fronts, including solar power, geothermal power, and biofuels. And, we may be pleasantly surprised by previously unanticipated new discoveries resulting from creative research.”

“There are other issues that relate to the future of space programs and world stability that force us to think of climate change, weapons threat, and problems such as fanaticism and the spread of diseases. These are complex issues that require new perspectives, and hopefully PCAST can formulate the questions and frame some answers. President Obama wishes to address these critical issues. So, I am optimistic.”

PCAST is cochaired by John Holdren, a former Harvard professor and director of the Woods Hole Research Center, who also serves as director of the Office of Science and Technology Policy and as Assistant to the President for Science and Technology. His cochairs are Eric Lander, director of the Broad Institute of MIT and Harvard and a leader in the human genome project, and Nobel laureate Harold Varmus, president of Memorial Sloan-Kettering Cancer Center and former director of the National Institutes of Health.



## TEN WITH CALTECH CONNECTIONS ELECTED TO ACADEMY OF SCIENCES

Caltech professors Dennis Dougherty and Paul Sternberg have been elected to the National Academy of Sciences, one of the highest honors that can be bestowed on an American scientist or engineer. Dougherty, the Hoag Professor of Chemistry, and Sternberg, the Morgan Professor of Biology and a Howard Hughes Medical Institute investigator, are both involved in research that has significant biomedical applications. They are among the 72 new members, including eight Caltech alumni, chosen earlier this year by the academy, and their election brings the current Caltech membership in the NAS to 75 faculty and three trustees.

Dougherty was named to membership in the NAS for his pioneering theoretical and model studies of the cation- $\pi$  interaction, a potent binding interaction between molecules that plays a central role in establishing protein structures and in modulating how drugs bind to specific receptors in the body. Dougherty made the key discovery that cation- $\pi$  interactions are prevalent in biological systems, and it is now recognized to be important in a wide range of biological processes.

More recently, Dougherty has carried his investigations into molecular neurobiology, applying the tools and techniques of physical organic chemistry to the complex proteins of the nervous system, including the molecules of memory, thought, and sensory perception. These same proteins are the targets of pharmaceuticals intended to treat Alzheimer's disease, Parkinson's disease, schizophrenia, learning and attention deficits, and many other disorders. Dougherty's research in this area, carried out in collaboration with Caltech's Bren Professor of Biology Henry Lester, is yielding fundamental insights into how drug-receptor interactions operate in the nervous system. This work could help pharmacologists design new drugs to treat a host of neurological disorders, as well as drugs that might help to reduce alcohol and nicotine craving.

Dougherty, who joined the Caltech faculty in 1979 after earning his BS at Bucknell and his PhD at Princeton, was named professor of chemistry in 1989 and became the Hoag Professor

in 2002. From 1994 to 1999, he also served as executive officer for chemistry.

Biologist Paul Sternberg was elected to the NAS for his groundbreaking work in identifying mutations that disrupt the normal development of cells or animals and then using a combination of molecular cloning and genetic analysis to investigate the functions of

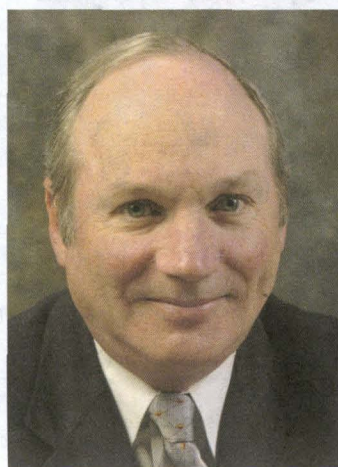
young nematode. He has also examined how one tissue signals another in developing organisms, as well as the role that chemical signals between cells play in controlling the behavior of adult worms. Among his key findings is the discovery that the roundworm versions of human proto-oncogenes—which can become tumor-inducing agents—are critical to guiding the worm's normal

development. And in the "truth is stranger than fiction" category, the Caltech biologist has also uncovered the peculiar fact that a class of defective proteins responsible for human autosomal dominant polycystic kidney disease—a serious condition that afflicts about one in

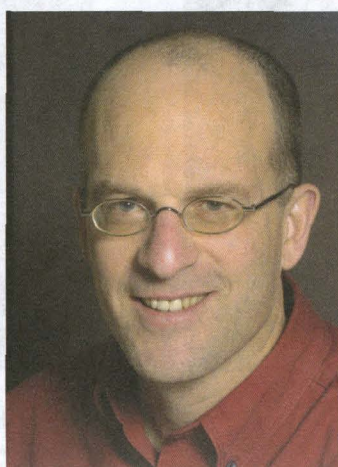
1,000 people and may ultimately result in renal failure—plays a crucial role in nematode mating, by enabling the male to sense the female.

In recent years, Sternberg has taken the lead in establishing a public database of roundworm genomics—WormBase.org—which has come to serve as a model for integrated biological databases. He is also now involved in genome sequencing of a number

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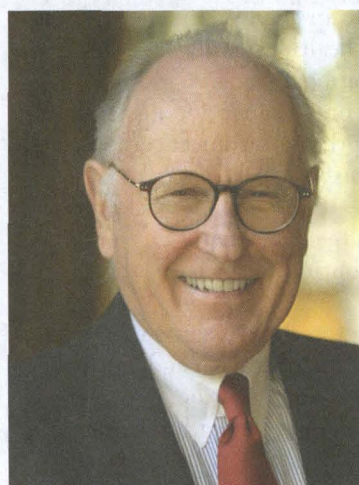


Caltech professors Dennis Dougherty (left) and Paul Sternberg are, along with eight alumni, Caltech's newest NAS members.



the genes identified by these mutations. Specifically, Sternberg has pioneered the use of *Caenorhabditis elegans*—a species of nematode, or roundworm—as a model system for these developmental genetics studies, investigating how various genes influence the formation and positioning of different types of cells as organs develop within the

## COMMUNICATIONS VEEP TAKES ON NEW ROLE



After 23 years of service to the Institute as "Mr. PR," Robert O'Rourke stepped down as Caltech's vice president for communications. On September 1, he moved to Parsons-Gates Hall of Administration and into a new part-time position as senior advisor to the president for external affairs. "Bob has been an integral part of the Caltech community and an extraordinarily effective ambassador for the Institute for nearly a quarter of a century," said President Jean-Lou Chameau in making the announcement to the campus. "I am very pleased that in his new role, he will continue to interact with key community leaders on Caltech's behalf."

With O'Rourke's transition, Caltech's communications functions will be integrated with those of the Office of Development and Alumni Relations, under the leadership of Peter Hero, recently appointed vice president for development and alumni relations (see page 4). Hero is working with staff members in both areas to define the structure for the new organization, which will also acquire a new name. Plans call for the consolidated group to be located in the Millikan Library.

During this transitional period, Denise Nelson Nash will serve as acting associate vice president for communications. In this capacity, she will support Hero by managing the Institute's ongoing communications operations (Campus Programs & Community Relations, Editorial & Content Development, and Media Relations & Online Communications).



## ALUMNA REGINA DUGAN NAMED TO HEAD DARPA

Defense technologies expert and entrepreneur Regina Dugan, PhD '93, has been named director of DARPA, the Defense Advanced Research Projects Agency of the Department of Defense. Dugan, the founder and CEO of RedXDefense, LLC, a Maryland-based firm that develops technologies to detect and counter explosives, becomes the 19th director and first woman to head DARPA, the DoD's principal research and development agency. DARPA's mission, in the words of its website, is "to maintain the technological superiority of the U.S. military and prevent technological surprise from harming our national security [and to] create technological surprise for our adversaries."

In the press release announcing Dugan's appointment, Zachary J. Lemnios, director for DoD Defense Research and Engineering, calls her "precisely the dynamic leader DARPA needs to open new technology frontiers and transition revolutionary technologies to serve our nation's interests. I am delighted she will be leading this agency and look forward to working closely with her."

In taking the top job at DARPA, Dugan is returning to the agency where she worked from 1996 to 2000 as a program manager in the Defense Science Office. In that role, she headed the \$50 million "Dog's Nose Program," whose aim was to develop an advanced portable system that troops could use in the field to detect the explosive content of land mines. In 1999, she received DARPA's program manager of the year award for her leadership of the project. She left DARPA in 2000 to take up a series of executive positions in industry, and in 2005, she cofounded RedXDefense. Dugan has also participated in active mine-clearance efforts in Mozambique and in equipment field tests in Bosnia and regions of Africa.

A recipient of the Bronze deFleury Medal of the Army Engineer Regiment and the Office of the Secretary of Defense Award for Exceptional Service, Dugan has participated in wide-ranging studies for the Defense Science

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## RECOGNITION

For an up-to-date list of awards and honors recently bestowed upon Caltech faculty and staff, go to <http://today.caltech.edu/today/on-campus.tcl> and scroll down to Honors and Awards in the right-hand column, as well as to the Archives link in that section.



## STEVE KOONIN TAKES SCIENCE HELM AT DOE

For sixties nostalgia buffs or those actually old enough to remember the vintage "LBJ" lyric from Hair, the recent career trajectory of Steven Elliot Koonin '72 offers a resonant counterpoint: SEK went from CIT to BP, then DOE. In May, Koonin, who was Caltech's provost from 1995 to 2004, and professor of theoretical physics at the Institute for more than 20 years, was confirmed as the Under Secretary for Science in the Department of Energy, after spending the last five years as chief scientist for the energy giant BP. In his new job, Koonin reports to Secretary of Energy Steven Chu (who presented the commencement address at Caltech's graduation ceremonies in June; see story, page 3). At DOE his responsibilities include monitoring the department's R&D programs, as well as advising the secretary on the coordination and planning of research activities within the department and on the management and the state of the roughly 20 national laboratories and technology centers overseen by DOE, among them Fermilab, Los Alamos, Lawrence Livermore, and the Stanford Linear Accelerator (SLAC).

In April, Koonin (shown below second from right at his swearing-in) and his fellow DOE undersecretary nominees testified before the Senate Committee on Energy and Natural Resources, which has jurisdiction over national energy policy. Koonin's statement, in which he spoke about his life in science, his involvement with cutting-edge energy issues, and how he views the challenges and opportunities of his new position, appears here.

Chairman Bingaman, Senator Murkowski, members of the committee, I am honored to appear before you as President Obama's nominee for Under Secretary for Science in the Department of Energy. With me this afternoon are my wife, Laurie, who has been my companion and support for 39 years, and the second of our three children, Alyson, a junior at the University of Richmond.

As you consider my nomination, I thought it would be useful for me to say something about myself beyond the bare biographical facts, something about my perceptions of science in the Department of Energy, and about what I hope to accomplish if my nomination is confirmed.

I have worked in science for almost four decades, most of that time as a professor of theoretical physics at the California Institute of Technology. As a researcher, I have several times had the thrill of understanding something new about nature: in the cosmos, in the atomic and subatomic realms, and in the earth's climate system. As a teacher, I have had the satisfaction of supervising some 25 PhD theses and educating hundreds of talented undergraduate and graduate students. And as Caltech's provost for nine years, I gained a deeper understanding of the breadth of technical cultures, supervised the selection and hiring of one-third of the Institute's professors, and shaped programs in the biological sciences, astronomy, the earth sciences, the social sciences, and information science.

For the past five years as BP's chief scientist, I've helped guide that company's long-range technology strategy, in the process forming a synthetic and synoptic understanding of energy and catalyzing a major initiative in biofuels. I also came to appreciate the dynamics, strengths, and weaknesses of the private sector, and to better understand the global context for U.S. research and education efforts. And in diverse government advisory roles for the past 25 years, including work with the JASON group, I've been exposed to the variety of technical problems facing the government, particularly in national security, and have even occasionally contributed to their solution.

Throughout my career, it has been a privilege and pleasure for me to learn and understand deeply from many teachers, mentors, and colleagues, to apply the substance and methods of science toward defining problems and seeking their solutions. Over the decades, my tastes have broadened from the fascinating, but relatively circumscribed, problems of basic science to the richer, and more difficult, problems that intertwine science, technology, economics, and politics.

My involvement with the DOE began as a Los Alamos summer graduate student in 1972. Since then, more by inclination than design, I've worked significantly in the three major areas of DOE technical activities—basic science, nuclear security, and energy technologies. Let me offer a few observations about each.

The basic research supported by the Office of Science is one of the jewels of the federal research portfolio. The long tradition of peer-reviewed support for university and national laboratory researchers and forefront user facilities continues to drive



advances on many fronts. We are on the cusp of understanding the origin of mass, the nature of most of what's in the universe, and how quarks and gluons combine to form nuclei. New instrumentation and new information technologies are enabling better understanding of the changing climate and new capabilities to predict, manipulate, and control materials, biological systems, and plasma. The commitments from Congress and the administration to double support for these activities over the next decade are more than justified.

In nuclear security, the president has set ambitious goals for reducing the U.S. stockpile of weapons while maintaining confidence in their safety, security, and reliability in the absence of nuclear testing. But these will not be achievable without a robust technical enterprise in the NNSA. The National Nuclear Security Administration's ongoing Stockpile Stewardship program of simulation, nonnuclear experimentation, and warhead surveillance and refurbishment has been effective for more than a decade, but faces growing challenges in maintaining technical capabilities. Strengthening these capabilities will be essential to achieving the president's non-proliferation goals.

In energy, President Obama has set ambitious goals to enhance energy security and reduce GHG [greenhouse gas] emissions while creating new jobs. Improvements in the technologies to produce, transmit, store, and use energy are essential to meeting these goals. But the scale, duration, cost, and complexity of energy matters pose great challenges. Technical understanding and judgment are important to making the right decisions about which technologies to pursue and how each should be advanced from research and development through demonstration and deployment. Novel forms of public/private and international partnerships will be required to address these global problems. I have pledged to Secretary Chu to work closely with the Under Secretary of Energy [Kristina Johnson] on these matters. I am confident that Dr. Johnson and I will work well together, should we both be confirmed.

What might I aspire to accomplish in the position to which I've been nominated?

*Throughout my career, it has been a privilege and pleasure for me to learn and understand deeply from many teachers, mentors, and colleagues, to apply the substance and methods of science toward defining problems and seeking their solutions.*

As you know, by statute the Under Secretary for Science has the dual responsibilities of overseeing the basic research carried out in the Office of Science, and of serving as the principal scientific advisor to the Secretary. In the former capacity, I would look forward to working with this committee, Secretary Chu, the director of the Office of Science, and the broader scientific community to see that the existing and planned incremental funds for basic research are wisely allocated and the programs well executed. In the latter capacity, I would hope to coordinate and harmonize technical activities across the department, looking for gaps and identifying synergies, bringing the rigor of appropriate peer review, program, and project management to all parts of DOE. Indeed, the tone Secretary Chu has already set, and the team he is assembling, are highly conducive to achieving those goals. I would also hope to promote thorough and unbiased technical assessments in all matters facing the department, as these necessarily underpin all good policy decisions.

In closing, let me say that I am both humbled and energized by the confidence President Obama has placed in me through this nomination. If confirmed, I will do my utmost to work with this committee, Secretary Chu, and others to sustain and enhance the Department of Energy's basic research and to ensure quality technical thinking across the entire spectrum of the department's activities.





## F r i e n d s

### NEW GIFTS PROVIDE SUPPORT FOR CALTECH

#### FUEL INJECTION: TWO GIFTS ACCELERATE THE INSTITUTE'S ENGINEERING PROGRAMS

This spring, chairman emeritus of General Motors Kent Kresa—who also chairs the Caltech Board of Trustees—and his wife endowed Caltech's new Joyce and Kent Kresa Professorship in Engineering and Applied Science, with a preference for faculty in aeronautics and aerospace engineering. The Kresa gift is matched with an additional \$1 million provided by the Gordon and Betty Moore Matching Program.

The Kresas see their gift as a way to accelerate technological development in perpetuity. Kent Kresa has stayed on the front lines of technology from the days of slide rules to the days of supercomputers, and he has used his awareness of trends to help industries strike out in new directions.

After studying aeronautics and astronautics at MIT, earning BS, MS, and Eng degrees, Kresa went to work in MIT's federally funded Lincoln Laboratory, developing air-defense technology. He subsequently transitioned to the Defense Advanced Research Projects Agency before moving to the private sector and joining Northrop Grumman in 1975. He was elected chairman and CEO in 1990 and quintupled revenues over the next 13 years, transforming the company from a struggling aircraft contractor to a leader in space systems, manned and unmanned aircraft, defense electronics, and shipbuilding. On his retirement in 2003, he joined the board of GM. Earlier this spring, he was selected as the automaker's interim chairman.

Now in his 14th year as a Caltech trustee, Kresa is a member of the National Academy of Engineering, an honorary fellow and past president of the American Institute of Aeronautics and Astronautics, and a former chairman of the Aerospace Industries Association.

Distinguished Alumnus Jim Hall '57, an automotive engineer whose innovations set the pace in racecar design for two decades, recently injected crucial support into Caltech's mechanical engineering program, helping to kick off an ongoing \$20 million ME fund-raising initiative.

Hall and his wife have pledged \$2 million to create the Jim and Sandy Hall Fund for Mechanical Engineering. Their gift will help students benefit from the same type of Caltech training in fluid dynamics, materials, and other fields that Jim Hall used to help transform auto racing.

When Hall left the Institute in 1957, Formula One giants Ferrari, Alfa Romeo, Porsche, and Maserati had begun to embrace aerodynamics, but none had engineered downforce, which helps cars grip the ground. Hall saw the opportunity. He founded Chaparral Racing Cars and introduced lightweight stressed-skin structures, space-age materials, and automatic transmissions into racing. His use of aerodynamic downforce to increase his cars' grip on the road is his most significant contribution to the field and has dramatically changed racecar design.

In acknowledgement of Jim and Sandy's contribution to Caltech's ME program, the newly upgraded design and prototyping laboratory in the Eudora Hull Spalding building will be named for Jim, and his and Sandy's names will grace a conference room in the soon-to-be-renovated Franklin Thomas Laboratory.

#### HOW TO OUTRUN A BEAR: DONORS CLOSE THE GAP TO KEEP A DISCOVERY FUND GOING STRONG

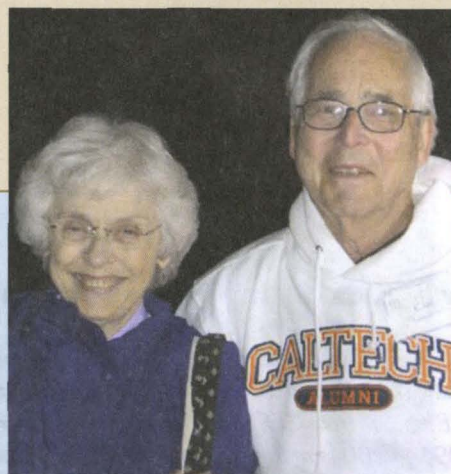
David Groce '58, PhD '63, and his wife, Barbara, have kept up with Caltech research for decades. Over the years, they've directed many donations to undergraduate classes, student programs, and faculty research projects that interest them. Their enthusiasm, involvement, and support have made them many grateful friends, perhaps most of all among Caltech's physicists. In the last few years, the Groces endowed a discovery fund and a faculty start-up fund that benefit the PMA division, with a preference for theoretical physics. Their support currently enables Assistant Professor of Physics Yanbei Chen, PhD '03, to develop theory crucial to gravitational-wave detection experiments such as LIGO (the Laser Interferometer Gravitational-Wave Observatory, which involves hundreds of scientists worldwide).

Earlier this year, the Groces called Caltech, concerned that the market impact on the Caltech endowment might adversely affect research prospects in the PMA division. After finding out how much the David and Barbara Groce Endowed Discovery Fund had dropped, they decided to make up the difference with an additional gift through the David and Barbara Groce Fund at the San Diego Foundation.

"David and Barbara are such thoughtful supporters," says Andrew Lange, the Goldberger Professor of Physics and PMA chair. "They saw the potential impact of the economic downturn on the research they sustain and stepped in to close the gap. They're the kind of people who keep exciting research happening here through thick and thin."

ANN WENDLAND

### ASSOCIATES ENJOY A STELLAR EVENT



This spring, President's Circle members of the Associates got a behind-the-scenes look at the science and scenic beauty of the Institute's historic Palomar Observatory when they took part in a travel program led by Rosenberg Professor and Professor of Planetary Astronomy Mike Brown. The group enjoyed lunch at the South Coast Winery and Spa in Temecula before traveling up Palomar Mountain to the observatory grounds. There they took a tour, dined under the dome of the 200-inch Hale Telescope, listened to a lecture by Brown on "How Palomar Killed Pluto," and had the opportunity to view Saturn through the facility's 60-inch telescope. Participants (above) included (from left) Bill Rihn '52, Bobbie Jones, and Bob Perpall '52, MS '56, shown at the winery with Brown (far right), and (top photo) Shirley and Carl Larson '52, enjoying the Palomar tour. For more information on the Associates travel programs, please contact the Associates office at 626/395-3919 or via e-mail at [caltechassociates@caltech.edu](mailto:caltechassociates@caltech.edu).

Hero . . . from page 4

simultaneously raising \$1.3 billion in new contributions.

While heading up CFSV, Hero also created a for-profit subsidiary (now independent), Lenders for Community Development. This consortium of 20 regional banks has provided some \$30 million in low-income housing and small-business development loans since its inception. He also created SV2, the Silicon Valley Social Venture Fund, a philanthropic network of 200 investors.

In 2006, Hero managed the merger of CFSV with the neighboring Peninsula Community Foundation, creating a new \$1.7 billion entity—the Silicon Valley Community Foundation—that is now the fourth-largest community foundation in the nation.

Prior to his work in Silicon Valley, Hero was president of Maine College of Art in Portland, Maine, where he tripled the institution's endowment and created the region's first graduate MFA degree program. From 1975 to 1984, he was director of the Oregon Arts Commission, collaborating with state government and the private sector on a strategic plan to use art and design to

build stronger rural communities and to pass the first "Art in Public Places" legislation in the United States.

Hero holds a BA, and an MA in Art History, from Williams College and an MBA from the Stanford University Graduate School of Business. He has served on a number of nonprofit boards, including those of the Public Broadcasting Service Foundation, the eBay Corporate Foundation, and the Haas Center for Public Service at Stanford. In 1992 President George H. W. Bush appointed him to the National Council on the Arts, and in 2002 the president of the Czech Republic, Vaclav Havel, chose him to serve on the Council of Advisors for the NATO Summit in Prague. Hero is the author of numerous publications, most recently *Local Mission, Global Vision: Community Foundations in the 21st Century*, which has been translated into four languages.



Commencement . . . from page 3

(87 men and 30 women); two engineers (one man and one woman); and 193 doctors of philosophy (140 men and 53 women). Many of these young scientists and engineers will likely soon be on the front lines in the battle against climate change and the search for renewable energy. And at times, Chu's speech sounded like a rallying cry for action.

The secretary of energy offered enough facts and dire predictions about global warming to sway perhaps all but the most die-hard climate change deniers. Pointing to a 50 percent decline in the size of the polar ice cap in the last half century and a steady rise in sea levels since the 1870s, he said that "if the world continues on a business as usual path, a number of studies predict that there's a 50-50 chance that the temperature will rise somewhere between four and five degrees by the end of this century. This increase may not sound like much, but let me remind you that in the last ice age, the world was only six degrees colder. During this time, Canada and the United States down to Ohio and Pennsylvania were covered year-round in glaciers. A world five degrees warmer will be a very different place. The change will be so rapid, that many species, including humans, will have a hard time adapting." And if that wasn't enough, he added that the thawing of the permafrost and the resulting rotting of organic matter will release so much greenhouse gas that "a runaway effect could begin."

Despite these ominous trends, Chu said that he refuses to accept the judgment that "it is impossible to transition to a sustainable world of nine billion people where the standard of living of everybody can be substantially elevated."

Like his boss in the White House, Chu said that he is hopeful.

"Most scientists are optimistic by nature, and if they're not, natural selection determines that to be so," he said. "Without optimism, we would not have had the audacity to believe we can go beyond the discoveries of the giants that went before us. Nor would we be willing to take on challenges where others have failed." The DOE head went on to call for a green revolution to make current agricultural practices sustainable and a "second industrial revolution" to replace fossil fuels.

"In this revolution, there will be no single magical discovery that will rescue us," he said. "We will need a wide assortment of solutions in both the demand and supply side of energy. A price on carbon, energy-efficiency standards, and other policy mechanisms are necessary tools to align technology

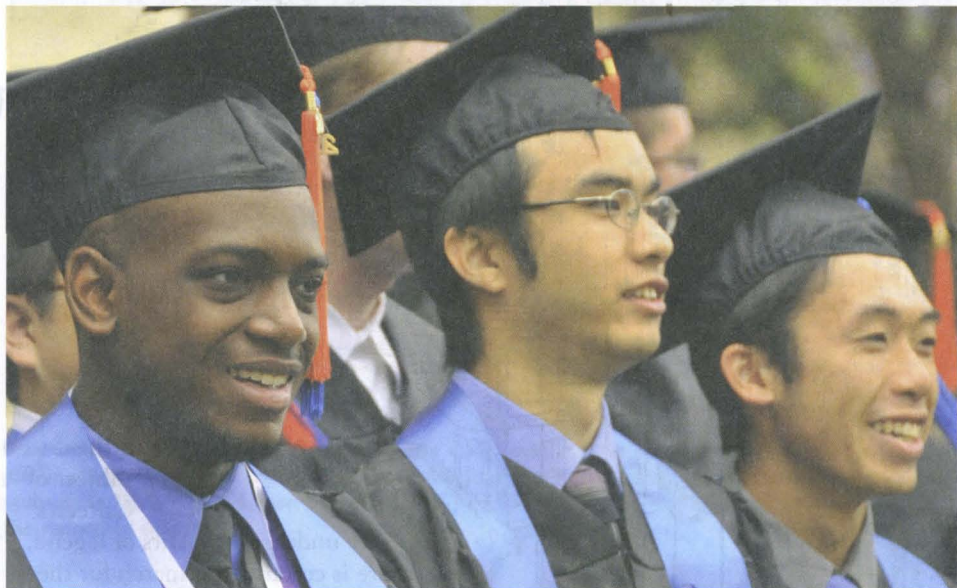
directions with environmental necessities. However, it is science and innovation that will provide the path forward."

Chu outlined a number of strategies that his department is advancing, including improved fuel-efficient automobiles, innovative car batteries, dramatic improvements in energy efficiency in buildings, and support of biofuel and photovoltaic research. But he reminded his listeners that success depends largely on them and their peers among the rising new generation of scientists and engineers.

"As we begin to lay the foundation for a sustainable energy future, we can frame the challenge, but the real answers will come from you, the graduates of 2009. As our future science and engineering leaders, take the time to learn more about what's at stake, and then act on that knowledge with your considerable intellectual horsepower."

"When you are old and gray, and look back on your life, you will want to be proud of what you have done," he said. "The source of that pride won't be the things you have acquired or the recognition you have received. It will be the lives you have touched and the difference you have made. I hope you will develop the passion and the voice to help the world in ways both large and small."

Although celebration and festivities were the hallmarks of the day, this year's commencement was also marked by a somber note. Early in the ceremony, Caltech Board Chairman Kent Kresa called for a moment of silence to honor the memories of two students who had recently died. Junior Brian Go, a computer science major, had been the



president of Page House, and senior Jackson Ho-Leung Wang, a gifted musician, was to have graduated that day with honors in mechanical engineering. At the ceremony, Wang was posthumously awarded his Caltech degree, to the prolonged and heartfelt applause of his peers and other assembled guests.

Dugan . . . from page 6

Board, the Army Science Board, and the National Research Council and Science Foundation. She currently sits on the Naval Research Advisory Committee and the Defense Threat Reduction Agency Science and Technology Panel. She is the coauthor of *Engineering Thermodynamics*, published in 1996. She holds one patent and is inventor or coinventor on several patents pending.

Dugan received her BS and MS degrees from Virginia Tech before coming to Caltech, where she earned her doctorate in mechanical engineering. She then worked for three years as a researcher at the Institute for Defense Analyses, from 1993 to 1996, before joining DARPA, to which she now returns as the agency head. For more information about DARPA and its programs, go to [www.darpa.mil](http://www.darpa.mil).

NAS . . . from page 6

of nematodes, in particular, parasitic ones, to help gain basic knowledge of the many nematodes that are pests and parasites.

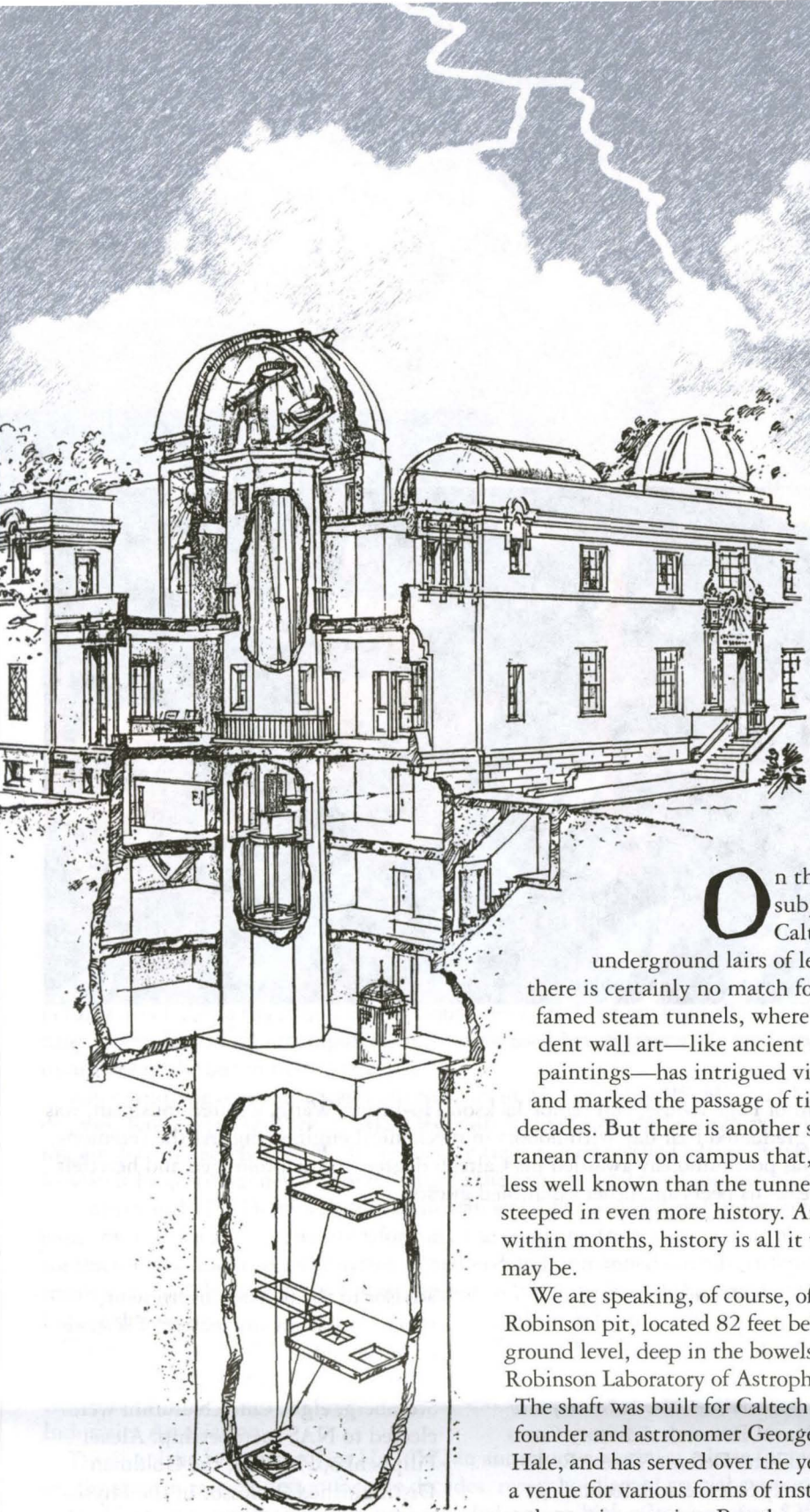
Sternberg came to Caltech in 1987, after receiving his BS from Hampshire College and his PhD from MIT. He became professor of biology in 1996, was named the Morgan Professor in 2004, and, after five years as an associate investigator with the Howard Hughes Medical Institute, became an HHMI investigator in 1997.

The National Academy of Sciences is a private organization of scientists and engineers dedicated to the furtherance of science and its use for the general welfare. It was established in 1863 by a congressional act of incorporation signed by Abraham Lincoln that calls on the academy to act as an official

advisor to the federal government, upon request, in any matter of science or technology.

In addition to Dougherty and Sternberg, eight Caltech alumni were elected to NAS membership: Alexei Filippenko, PhD '84, the Goldman Distinguished Professor in the Physical Sciences at UC Berkeley; Monty Krieger, PhD '76, the Whitehead Professor of Molecular Genetics at MIT; François Morel, PhD '72, the director of the Center for Environmental Bioinorganic Chemistry and the Blanke Jr. Professor of Geosciences, Princeton; Daniel Nocera, PhD '84, the Dreyfus Professor of Energy and professor of chemistry, MIT; Baldomero Olivera, PhD '66, Distinguished Professor of Biology, University of Utah; Dinshaw Patel, MS '63, Rockefeller Mauzé Chair in Experimental Physics and member of the structural biology program at Memorial Sloan-Kettering Cancer Center; John Sedat, PhD '71, professor of biochemistry, UC San Francisco; and Donald Truhlar, PhD '70, Regents Professor, University of Minnesota, Minneapolis.





## Subterranean Homesick Clues

*Caltech News* sleuths get down and dirty to pursue the mystery of an Institute pit . . . and a pendulum?

BY MICHAEL ROGERS AND HEIDI ASPATURIAN

**O**n the subject of Caltech's underground lairs of legend, there is certainly no match for the famed steam tunnels, where student wall art—like ancient cave paintings—has intrigued viewers and marked the passage of time for decades. But there is another subterranean cranny on campus that, while less well known than the tunnels, is steeped in even more history. And within months, history is all it well may be.

We are speaking, of course, of the Robinson pit, located 82 feet below ground level, deep in the bowels of the Robinson Laboratory of Astrophysics.

The shaft was built for Caltech co-founder and astronomer George Ellery Hale, and has served over the years as a venue for various forms of instruction and experimentation. But the residents of Robinson recently relocated across California Boulevard to the new Cahill

Center for Astronomy and Astrophysics, and their former haunts, now nearly 80 years old, are slated to get a new lease on life as Caltech's Ronald and Maxine Linde Center for Global Environmental Science.

The center will bring together faculty from chemistry, engineering, geology, and environmental science, among other disciplines, to work on issues related to global climate change. Reflecting this overall mission, Robinson will undergo an ambitious \$32 million rehab into a "green" building, with the goal of achieving a Leadership in Energy and Environmental Design (LEED) platinum certification—the highest designation.

Aiming high, Caltech will go low—all the way down to that subterranean Robinson lair—as part of a plan to maximize energy efficiency. In an innovative approach to climate control, the Institute plans to fill the pit below the lowest basement with water that will be used to cool the building during those warm summer months. "At first, we weren't sure if the walls could hold the water," says Brad Smith, senior project manager for design and construction in Caltech's Facilities department. "We looked at the original architectural drawings, and they showed that the walls of the shaft are two feet thick." Smith, who's charged with overseeing the ambitious renovation, says that the walls should be able to do the job once they've been coated with a sealant—a fluid-applied rubberized asphalt waterproofing, to be exact. With the shaft slated for a bold new role and the astronomers and astrophysicists now gone from

Robinson, the time may come when no one on campus remembers the original purpose of Hale's five-story solar duct. In fact, judging from a recent flurry of correspondence to *Caltech News*, its storied past may already be fading from memory.

The subject of the shaft materialized after a recent *Caltech News* (Volume 42, Number 4) published an investigative piece about a vanished campus sundial built by Hale's longtime colleague, Russell Porter. We thought we might hear more on that subject from our readers, and indeed we did, as a sequence of letters on sundials published in the next issue attests. But one letter prompted us to embark on a whole new investigation.

The note in question came from Michael D. Decker '69, who wrote, "This letter is stimulated by your recent 'Sundial' article. While taking the campus tour last year for Alumni Seminar Day, I asked the guide to remind me which building had the pit with the Foucault pendulum. I was told that was a myth, there was no such thing.

"Nonsense!" wrote Decker, who went on to get his MD from Rush Medical College in Chicago and is today the vice president for scientific and medical affairs and chief medical officer for the American division of Sanofi Pasteur, the world's single largest manufacturer of human vaccines. (This was before the swine flu outbreak, so Decker had a bit of time on his hands.) "During my tenure (1964–69) I visited the pit countless times, taking a number of dates down there. The pendulum was suspended about 3–4 stories above the sub- (or sub-sub) basement floor, descending through a round or octagonal central space about 15–25 feet in diameter. The floor was marked with a compass rose/clock face. The pendulum was magnetically driven, as I recall. Access was via a small elevator. There was a small 'mezzanine' level, one or two floors before the base of the pit, onto which persons unknown had wedged a ratty old couch, for obvious purposes.

"After the tour, I prowled around for quite a while trying to jog my memory as to its location. I suspect that it was in the astronomy building, in space now occupied by the solar telescope, but that's really conjecture. Can you track this down and restore this 'myth' to rightful 'legend' status?"

Despite the implications of certain of Decker's recollections, *Caltech News* decided to fearlessly follow the story up. Before we take this racy chronicle any farther, however, we should inject a bracing dose of science by reminding any readers who may have forgotten that the Foucault pendulum was conceived by the French physicist Léon Foucault as a device to conclusively demonstrate the rotation of the Earth. In 1851, he suspended a weight with a 67-meter wire from the dome of the Panthéon in Paris. The plane of the pendulum's swing, rotating clockwise 11 degrees per hour, proved Earth's rotation beyond question.

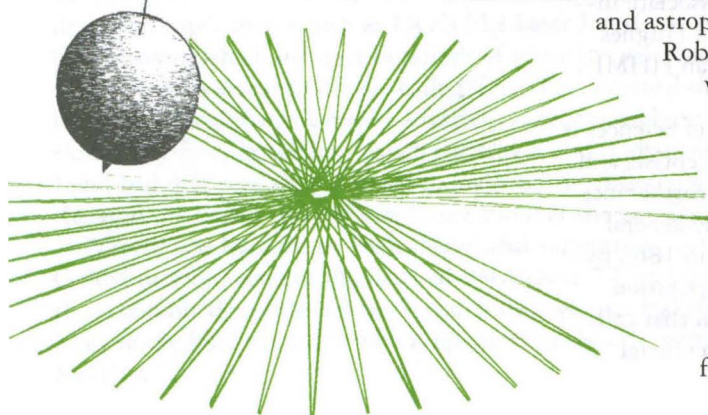
But what happened in Paris roughly 150 years ago did not, evidently, stay in Paris. Was Decker correct in asserting that Caltech possessed a Foucault device of its own? Naturally, *Caltech News* turned first to Senior Archivist Shelley Erwin, who suggested referring the matter to "longtime denizens of Robinson." We then consulted Marshall Cohen, professor of astronomy, emeritus, and Wal Sargent, Caltech's Bowen Professor of Astronomy, who, in the midst of their move to the new Cahill Center, kindly supplied us with their reminiscences.

### From Professor Cohen:

The pit certainly is and has been in Robinson since the building was built. The object was to aim the sun's image from a telescope on the roof down the shaft and into the pit and onto a mirror on the bottom, then reflect the image back up the shaft to another mirror that sent the image sideways to a focus in one of the basement rooms. This gave the system a very long focal length, with an expanded view of the sun.

"I don't know when they stopped using this system, perhaps in the '50s. Later a seismometer was installed at the bottom of the pit; it sent information to the earthquake people next door.

"I have heard stories about the couch. The Foucault pendulum? I don't recall hearing anything about that. But it hardly would have been in the pit itself. Rather, I think the rose would have been at one of the basement levels, where there are access doors into the shaft.





### From Professor Sargent:

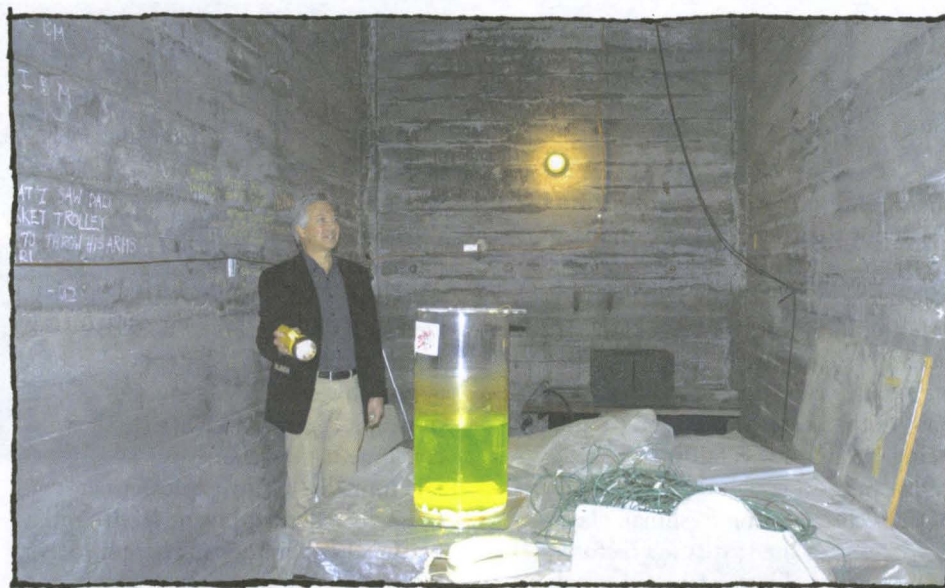
As Dr. Decker says, there is a pit 54 feet below the third basement of Robinson, which is part of the solar tower and which can be accessed only by a cramped elevator. A couch was installed there in the summer of 1961 when I was a postdoc and was used on occasion for the obvious purposes hinted at by Dr. Decker. A plaque hung above the couch containing a few appropriate lines from the Rubaiyat of Omar Khayyám:

'A Jug of Wine, a Loaf of Bread—and Thou  
Beside me singing in the Wilderness—'

"The couch disappeared many years ago, probably during the more puritanical era that followed the '60s. Curiously, a few graduate students and postdocs went down to the pit a few weeks ago during an architectural tour of Robinson before it is vacated by the astronomers. I don't recall a magnetic pendulum . . . .

The name Edgar Allen Poe does not automatically spring to mind in connection with Caltech, but there are affinities nonetheless. America's master of the macabre is generally associated with ravens (Caltech has at least two that annually nest in the window ledges outside Parsons-Gates), eccentric romantic attachments (readers might like to weigh in on this aspect), pits and pendulums, and, finally, the invention of the modern detective story. With the first two themes already represented on campus, this seemed like the ideal opportunity to bring the last two into the fold. Accordingly, not long after we heard from Sargent and Cohen, our *Caltech News* colleague, Barbara Ellis (whose husband, astronomer Richard Ellis, was part of the mass migration from Robinson to Cahill), asked Brad Smith if he would be willing to take us on an underground tour of the Robinson pit. Smith was kind enough to agree, and the following week found the four of us in the sub-subbasement of Robinson at the back of a newly vacated lab, standing in front of a 1930s-vintage Llewellyn elevator, complete with an interior sliding gate door and decorative metal gratings near the ceiling. The wooden door wheezed open, the four of us squeezed into a space about the size of a phone booth, and the ancient lift ferried us, Disneyland Haunted Mansion-style, three stories down, before creaking to a halt at what Smith assured us was the lowest point on campus.

The elevator doors opened, and, as we practically fell out of it, we found ourselves in a chamber not unlike a catacomb, measuring about 10 feet by 30. Smith flipped a switch, and two bare bulbs threw some yellowish light onto dingy gray concrete walls. As our eyes grew accustomed to our surroundings, we could see the shaft angling five stories upward, terminating at an octagonal opening onto what was presumably the roof. The room itself was dominated by a few large wooden tables, one of which held a dusty and bulky IBM "portable" personal computer, likely from the 1980s, and a large beaker of mysterious-looking liquid, which gave off an eerie green glow when Smith trained his industrial strength flashlight on it. For the record, we did not see a sofa or any poetic references to loaves and jugs. We did spot what appeared to be the remains of a *Lord of the Rings* Ditch Day stack—a sheet of paper showing a Xeroxed picture of either one very large ring (to rule them all?) or a very small dog collar and the words "Paths of the Dead: The ghost of a departed warrior will guide your next steps/Use the scraps with the letter board to decipher the clue." As we contemplated these words, one of us spotted another circular object—a large, extremely dusty metal disk—and almost immediately after that, we saw a wooden crate, with the words "Accessories for the Foucault pendulum" scrawled across it.



Brad Smith (above) shines his flashlight on an eerie-looking liquid at the base of the Robinson pit. To stand in that spot again, after the renovation that he is overseeing, Smith will have to don scuba gear. The elevator, shown below left, will be relocated and turned into a telephone booth in the renovated building.

Inside we found a jumble of wires and metal parts. Another box held the lead bob, about the size of a honeydew melon, and it took two of us to lift it up for a better look. The disk, we now realized, was probably the compass rose or clock face mentioned in Decker's letter. His recollections were apparently correct!

With the pendulum mystery at least partly settled, Smith explained that the shaft was originally built to house a system of mirrors called a coelostat for Hale's solar investigations. We then reboarded the elevator and rode to the roof of Robinson to look at the dome, which held the main equipment of the coelostat, still intact.

The primary mirror—42" in diameter—sat on an elaborate steel mounting structure, and was protected by a metal plate. Smith explained that during the days of solar astronomy research in Robinson, the mirror would be uncovered and maneuvered to intercept the sunlight, which it would then reflect to another, somewhat smaller

*The elevator doors opened, and, as we practically fell out of it, we found ourselves in a chamber not unlike a catacomb . . .*

mirror in the dome. The second mirror would send the sunlight down through the octagonal portion of the shaft to the floor where it would continue on the path described by Professor Cohen, until it reached the basement laboratory where the sunlight's spectrum would be analyzed. ("The sun is a star—the only one we can observe up close," Hale liked to say. Unlike other stargazers, a solar astronomer also wouldn't have to miss any sleep during the night.) Smith told us that the coelostat had been in use until about 20 years ago.

To shed more light on the coelostat, we contacted Rich Goeden, a retired electrical engineer, who used to maintain the coelostat for a group of Caltech solar astronomers. "I would set up the hardware and make sure the stuff was set up for experiments," he said. A few weeks after the tour with Smith, Goeden escorted us back to the shaft, and opened a door on the basement level to show us where the beams of sunlight would bounce off the final mirror in the instrument, and then be directed horizontally into a laboratory. Sitting on a granite slab, the dust-covered equipment in the room looked like it had been untouched since it was last used. In fact, it may have been last operated by Goeden himself, who deftly moved around the cramped space with great familiarity, pointing out where not to stand, unless one wanted to take the quickest way down the shaft. Goeden recalled that on at least one occasion, the equipment was used during an eclipse, in which the image of the sun was projected down a hall.

"The image of the sun was three feet in diameter," he says. "You could see the sun spots."

In an article that appeared in the *Astrophysical Journal* in 1935, Hale described in detail the entire coelostat and the shaft. However, it's an open question whether he ever put the instrument to use, writing in that same paper that "the 75-foot spectrograph is not yet ready, and other apparatus is under construction." Caltech archivist Erwin notes that Hale was ill from 1932 until his death in 1938 and says that she could find no evidence that he had ever conducted research with the instrument.

The days of astronomical investigation are over for Robinson, but the sun will

*Continued on page 14 . . .*



Student life . . . from page 4

them” and to motivate them to also reach out to other parts of campus.

Blake sees the faculty playing a key role here, and he says his office is considering how best to bring students and professors together in informal settings where they can relax and get to know one another better. One such program being launched this fall is an advisory consortium in which the 250 members of Caltech’s entering freshman class—the largest in the Institute’s history—will be divided into groups of roughly eight individuals, each with its own faculty mentor. Blake says that about 35 professors have already signed on as participants, and he’s hoping that more will volunteer as the program evolves.

In these and other initiatives to improve the quality of student life, Blake will work closely with VP for Student Affairs and Rosen Professor of Astronomy Anneila Sargent, PhD ’77, and the deans’ offices, and with seasoned staff in the student life and housing offices, including Sue Chiarchiaro, Peter Daily, and Tom Mannion. His predecessor, Professor Cathy Jurca, who stepped down after seven years as MOSH, will be spending the year on what Blake calls a “long-deserved sabbatical,” but, he says, “I have already had a number of great conversations with Cathy, and I expect she’ll be a terrific resource. Karen and I look forward to benefiting from her expertise.”

#### SHEPHERD OF GRAD STUDIES

Joe Shepherd recalls his graduate-student career as somewhat unorthodox, which is another way of saying that he had a pretty typical Caltech experience. He came to campus (“I’ve always claimed that the graduate admissions committee made a mistake”) from the University of South Florida intending to study applied physics. But then he got interested in fluid mechanics and, despite “my suspect background in physics,” he found a supportive thesis advisor in Professor Brad Sturtevant, PhD ’60. He went on to tackle a problem that combined elements of physics, aeronautics, and chemistry, becoming part of Caltech’s then-burgeoning emphasis on interdisciplinary research.

Shepherd was intrigued by a seemingly commonplace phenomenon—why does a water drop pop when you throw it into hot oil? “You’d be surprised at the things you can make a PhD thesis out of,” he says now, but his question turned out to be related to the larger one of what occurs at the boundary between a superheated liquid and an ordinary one. Shepherd not only found his answer, he also “had a chance to discover something no one else had seen before.” And equally important, throughout the many permutations of his graduate work, “no one at Caltech said, ‘You can’t do that.’”

As he settles into his new job as dean of graduate studies, succeeding Professor Michael Hoffmann, Shepherd hopes he can continue to promote that

spirit of inquiry, independence, and initiative that he regards as hallmarks of the Caltech environment.

“Caltech has always been characterized by a willingness to take risks and try new things,” says Shepherd. “It’s an approach that really brings out the best in people, and that’s what we should continue to strive for.”

From “little tiny explosions at Caltech,” Shepherd went on to Sandia National Laboratories, where he delved into the dynamics of much larger events, including accidents in nuclear power plants and the related safety engineering issues. Later he joined the faculty of New York’s Rensselaer Polytechnic Institute, “where I got very interested in detonations.” In 1996, three years after returning to Caltech, he was asked by the National Transportation Safety Board to serve on the investigation into the explosion and fatal crash of TWA 800, a catastrophe that was ultimately traced to an explosive atmosphere inside the aircraft’s main fuel tank. Today, he works with a group of grad students and postdocs carrying out research into combustion and explosion issues related to safety in aircraft, nuclear waste disposal, and marine structures—work supported by Boeing, DOE, and the U.S. Navy, respectively—and investigating similar hazards in a range of other areas.

Now that he’s moved into the presumably less explosive venue of the graduate student office, Shepherd will be working closely with Associate Dean Felicia Hunt, Assistant Dean Natalie Gilmore, and the graduate office staff in overseeing the activities of the Institute’s graduate students in all six academic divisions. Like Blake, he will be cutting back some on his teaching and research, but he too feels that the trade-off is worth it.

“Caltech has been very good to me over the years,” he says. “I think it’s important for faculty to continue the tradition of being involved in administrative jobs. Caltech grad students are the engine that makes so much of our research effort work. They are exceptionally bright, curious, hardworking, and adventurous. If we want to maintain our reputation as a great research institution, it’s essential that we continue to recruit and retain the best graduate students. Once they’re here, we want to make sure we can provide them with the kind of support they need to thrive in their academic and personal lives.”

Reflecting on his time as a Caltech graduate student and on his years of mentoring students, Shepherd speaks of “striking the right balance”—helping students to become more self-reliant and preparing them for the world outside Caltech, while at the same time providing “a bit of a cocoon that gives students time to learn and explore and gain confidence.” He notes that like many universities, Caltech is in a period of transition. “It’s a challenging time for all of us,” he says. “But it offers exciting opportunities too.”

## Alumni Update



The Caltech Alumni Association inducted its 2009–10 officers and new members of its board of directors at the CAA annual meeting in June and also welcomed back longtime CAA staffer Karen Carlson (right) as the Association’s newest honorary member. Carlson, who left her Caltech position last summer as the CAA’s associate director for alumni/student relations and careers to become director of alumni relations at Concordia College in Moorhead, Minnesota, her alma mater, was recognized for the extraordinary impact of her work among both students and alumni in the course of a Caltech career spanning more than two decades. For more on her honor, go to [tinyurl.com/mbgf77](http://tinyurl.com/mbgf77). Top photo, from left, are CAA officers Chris Wheeler ’78, past president; Jasmine Bryant ’95, president; Charles Halloran ’94, treasurer; Kristin Polito ’95, secretary; and Tom Lloyd, MS ’95, PhD ’99, vice president. Above, new board members are Myfanwy Callahan ’98, Samantha Foster ’98, Rhonda Morgan ’95, and Ray Feeney ’75.



### LUNCH WITH ALUMNI

Every month, alumni gather in Boston and several California locations to reconnect, network, and make new friends over lunch. Join in! For full details about monthly alumni lunches, visit the Alumni Association events calendar at <http://alumni.caltech.edu/events>. If you are interested in starting a monthly alumni lunch in your hometown, please contact [events@alumni.caltech.edu](mailto:events@alumni.caltech.edu).

Here is the schedule for the current Caltech alumni lunches—

- Boston: first Tuesday of the month
- Los Angeles (South Bay): second Thursday of the month
- Pasadena: first Friday of the month
- San Diego: second Thursday of odd-numbered months
- Silicon Valley: third Thursday of the month



## SEMINAR DAY DRAWS ALUMNI BACK TO PLANET CALTECH

The more than 1,100 alumni, family members, and friends who returned to Caltech in May for the Alumni Association's 72nd Seminar Day might have been excused for thinking they had landed not on campus but on Mars, as they listened to JPL Mars Rover Principal Investigator Steven Squyres (above right) present a lively and lavishly illustrated General Session address on *Spirit* and *Opportunity's* excellent adventures on the Red Planet and, apparently, introduce his appreciative audience to the Mars Walk (right). They might also have felt a bit like time travelers as they caught up with old friends and former classmates during Reunion Weekend and attended Seminar Day talks on topics that took them from the birth of the cosmos to work on the frontlines of quantum information science, and from ancient climates on Earth to climate change and alternative-energy research in the 21st century. And that was just a sampling of the lectures, tours, and exhibits on offer. (Check out more photos of the event at <http://tinyurl.com/mk6m9a>.) Seminar Day also included President Chameau's presentation of Caltech's highest honor, the Distinguished Alumni Award, to four new recipients.

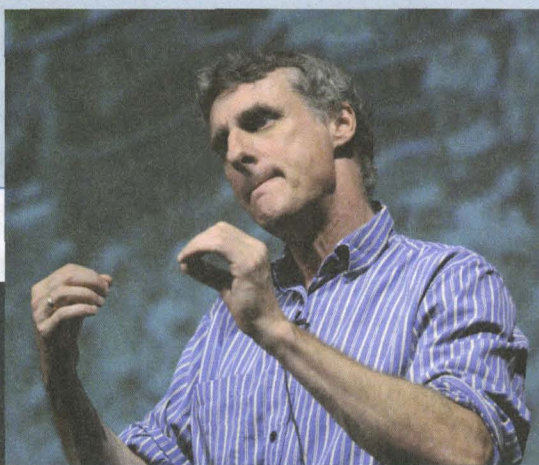
Pictured below, with President Chameau (center), are Caltech's Distinguished Alumni honorees for 2009. From left, David Kirk, PhD '93, has made multifaceted and innovative contributions to graphics hardware and algorithm research, through his technical and scientific leadership at video-game company Crystal Dynamics and at visual computing technology leader NVIDIA, and is known for his overall role in bringing high-performance graphics to personal computers. His honors include election in 2006 to the National Academy of Engineering (NAE), one of the highest professional distinctions for U.S. engineers.



David W. Thompson, MS '78, has been chairman and CEO of Orbital Sciences Corporation since cofounding it in 1982. One of America's leading space-related R&D and manufacturing companies, Orbital provides affordable space systems to commercial and government customers worldwide and has performed hundreds of rocket launches and satellite deployments in support of commercial communications, Earth and space science, and the national defense.

A recipient of the National Medal of Technology, Thompson is a member of the NAE and the International Academy of Astronautics. He is a fellow of the American Astronautical Society, the Royal Aeronautical Society, and the American Institute of Aeronautics and Astronautics, where he serves as president for 2009–2010.

François M. M. Morel, PhD '72, the Blanke Professor of Geosciences and director of the Center for Environmental Bioinorganic Chemistry at Princeton, is a leader in the aquatic and



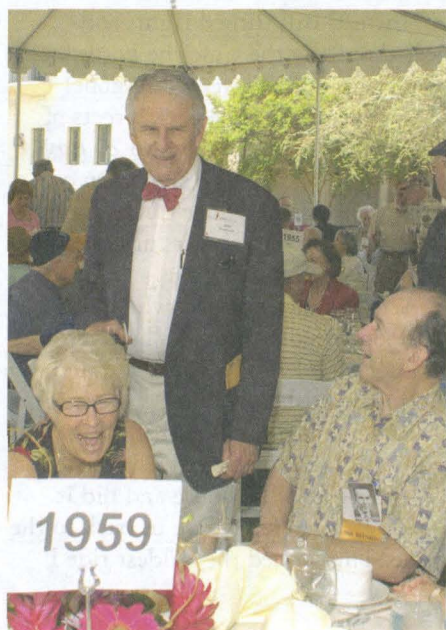
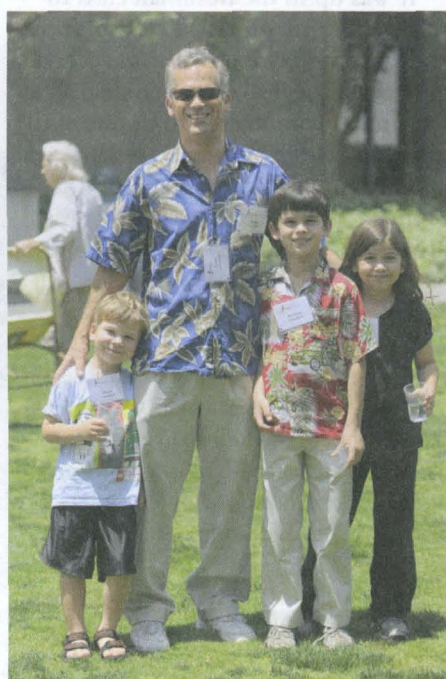
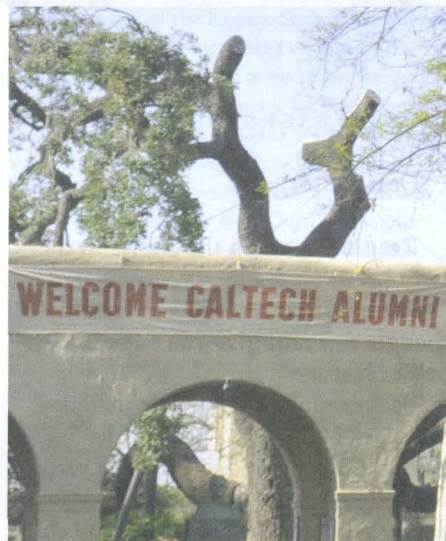
marine sciences and one of the foremost biogeoscientists working today. His work blends geochemistry, microbiology, biochemistry, and genetics in an attempt to understand how ocean life depends on its chemical environment and in turn shapes that environment, and he is renowned for how effectively he has shared that vision with students and colleagues. Before joining Princeton, he was a professor at MIT and director of the university's R.M. Parsons Laboratory from 1991 to 1994.

Morel's honors include the Clair Patterson Medal, the Maurice Ewing Medal, and a Guggenheim Fellowship. A fellow of the Geochemical Society and the American Geophysical Union, he has been an environmental consultant to private firms and public interest groups, and served on numerous national scientific committees.

Robert Lang '82, PhD '86, is internationally regarded as a leading practitioner of the ancient Japanese art of origami, and is also well known for his pioneering explorations of the field's mathematical linkages and engineering applications. Following a career as a physicist and engineer, during which he authored or coauthored over 80 technical publications and received 40 patents on semiconductor lasers, optics, and integrated optoelectronics, Lang is now a full-time origami artist. His work combines aspects of the Western school of mathematical origami design with the Eastern emphasis on line and form, and his elegant and varied paper sculptures, now numbering more than 500, include some of the most complex designs ever created. Lang is the author or coauthor of eight books and numerous articles on origami, and his work has been shown in Paris's Carrousel du Louvre; New York's Museum of Modern Art; and the Nippon Origami Museum, in Kaga, Japan, among others.

An invited guest at origami conventions around the world, Lang has presented several refereed technical papers on origami math. He has also consulted on applying origami to engineering problems ranging from airbag design to expandable space telescopes.

For more on this year's Distinguished Alumni quartet, go to <http://tinyurl.com/mavp5c>.





## BEAVER BACKSTORIES

Dear Editor,

Reading through the article in the last *Caltech News* (vol 43, no. 1), “Nature’s Engineer” Gets a Retrofit,” I thought I would give you some ancient beaver history.

Background: Your article included the black and white photo of the stuffed beaver that was borne to various Caltech sporting events. In those days, the main event was the Caltech-Occidental football game. This beaver mascot was guarded carefully by the Caltech frosh from our archrival Occidental College, whose mascot was a two-foot black-orange tiger. Several times, the Caltech students had captured their tiger. The usual operation was to remove the tail and hang it with the others in the steam tunnels. The body was painted green, and sent back to Oxy by Railway Express, *collect*.

The Oxy students had never been able to get their hands on the Caltech Beaver, although they tried several times!

It was up to the freshman class to provide the guard for the beaver during the Caltech-Oxy football game every year when the beaver was on display at halftime. I volunteered to be one of the guards at the 1939 game.

The only person in the group that I remember was Bill Pettit, who was providing the transportation with his father’s brand-new 1939 Chrysler Imperial.

At the end of halftime, we loaded the beaver into the Chrysler and headed out, only to find that the Oxy students on the outside had closed the gates. The Caltech football team coming out of the locker room saw our problem and easily cleared and opened the gate for us.

Lined up outside were several hopped-up Model A Fords with their engines running, all facing east, expecting that would be the way we would go. Instead Bill turned right, and peeled out. By the time the Fords had turned around, we were long gone!

Going through the back streets of Pasadena, he slowed down to 20 mph while running the stop signs. On one street we passed a police car going the other way. By the time it turned around we, again, were long gone.

Arriving at his house, which had 10-foot doors leading into his backyard, another guard and I slipped out and hid in the bushes in front, to be sure that no one had followed us. Meanwhile Bill and the other frosh carried the beaver into the house and hid it.

He very carefully took us back to the game. Thus ended the wildest ride I

had ever had in my life (I’m now 87!). Knowing his father as I did, I am sure that he never learned of our escapade!

—Earle Bunker ’43, MS ’47

I thoroughly enjoyed reading the article in the latest issue of *Caltech News*. That was the first I had ever heard that Caltech owned a mascot costume. I was head cheerleader (yes, we did have them: proof can be found in the yearbooks from the years 1980 to 1983) for the four years I was there, and that would have added to the fun at the sporting events we covered. I was there during the time the basketball teams highlighted in the movie *Quantum Hoops* were playing, so extra spirit would have been appreciated. I assume it was created mid- to late-1980s as we never saw it in the four years I was there.

—Gloria Badilla Jew ’83

*Subterranean . . . from page 11*

still have a primary place there through both the solar energy research that will be carried on in the building, and the new role that will be played by the mirrors in the dome. A computer will automatically turn the dome and open its window during sunny days. The mirrors will beam the sunlight down the shaft, which will be painted a light color for better reflectivity, and windows cut into the shaft will allow natural light to stream into interior offices and labs. At the lowest basement levels, the mirrors will direct sunlight into custom light fixtures. Smith said that additional energy-saving measures, including the solar-shaft cooling system, will end up reducing by at least 60 percent the energy use of a similarly sized new building.

As for that film noirish elevator, Smith says that the cab will be removed and placed somewhere else in the building and turned into—what else?—a telephone booth. Will people put away their cell phones and return to the ancient technology of a pay phone? Or is the booth more likely to figure in Ditch Day stacks involving caped crusaders? The solution to that mystery may start to emerge near the end of 2010, when the Robinson rehab is scheduled for completion.

*Does this story bring back memories of unrecorded, little-reported Institute lore and legends, or similar capers? How about other unsolved campus mysteries of general interest? If so, we’d like to hear from you. Write to [hja@caltech.edu](mailto:hja@caltech.edu) or to [mrogers@caltech.edu](mailto:mrogers@caltech.edu).*

1942

Chang-Nee Tsu, MS, writes, “I did the Sudoku on page 8 [of *Caltech News* 43, no. 1] in 14 minutes. I participated in the 2008 Olympic torch relay in Zhongwei, Ningxia, China on June 29, 2008, as a Lenovo team member and carried a torch for ‘18 meters’ as No. 192.”

1946

Joseph O. Weisenberg, MS, Eng ’47, reports that, at last count, he has four children, 11 grandchildren, and five great-grandchildren, and that he’s “age 90 and still kicking.”

1951

Marshall Klarfeld writes that his book *Adam: The Missing Link* has been featured in three radio interviews with George Noory on “Coast to Coast AM,” a radio program that “has an audience of nearly 50 million listeners.” Marshall feels that his book, “which presents the case for man’s creation by genetic engineering, is a significant contribution to the debate between Evolution Theory and Intelligent Design.”

1957

Cavour Yeh, MS ’58, PhD ’62, retired after more than 40 years of teaching and research, has recently written a book with his Caltech colleague and ex-classmate Fred Shimbukuro, PhD ’62, on modern guided waves. Entitled *The Essence of Dielectric Waveguides* (522 pages), it was published in June 2008 by Springer. Yeh also obtained in 2003 a patent, “Wavelength division multiplexed optical solitons,” with another Caltech colleague, Larry Bergman, MS ’74, on the discovery of optimum pulses for maximum information transmission in a single-mode fiber.

1958

John F. Asmus, MS ’59, PhD ’65, a research scientist with UC San Diego’s Institute for Pure and Applied Physical Sciences who specializes in lasers and plasma physics and who has pioneered the use of holography, lasers, ultrasonic imaging, digital image processing, and magnetic resonance imaging in the practice of art conservation, writes: “Seminar Day was especially meaningful to me due to the play *Life of Galileo*. My UCSD team restored Galileo’s office at the University of Padova. We used the latest optical instrument (laser) to conserve carved stonework where the earliest optical instruments (telescopes) were developed. Poetic justice: I think.” The work in Padova, done in the early 1990s, was featured on the Smithsonian Institution television program *Invention*.

1959

Willard Wells, PhD, is the author of a new book, scheduled to be published in June by Springer jointly with Praxis Publishing, U.K. According to the publisher, *Apocalypse When? Calculating How Long the Human Race Will Survive* “will be a key trailblazer in a new and upcoming field. The author’s predictive approach relies on simple and intuitive probability formulations that will appeal to readers with a modest knowledge of astronomy, mathematics, and statistics. Wells’ carefully erected theory stands on a sure footing and thus should serve as the basis of many rational predictions of survival in the face of not only natural disasters such as hits by asteroids or comets, but perhaps more surprisingly from man-made hazards arising from genetic engineering or robotics.” Taking

as his starting point a formula derived by J. Richard Gott III of Princeton University in the 17 May 1993 issue of *Nature*, Wells provides “a thorough approach in which four lines of reasoning are used to arrive at the same survival formula. One uses empirical survival statistics for business firms and stage shows. Another is based on uncertainty of risk rates. The third, more abstract, invokes Laplace’s principle of insufficient reason and involves an observer’s random arrival in the lifetime of the entity (the human race) in question. The fourth uses Bayesian theory.” The book “gives the numerical estimates of human survival” and “refutes the existing Doomsday argument.”

1960

Neil Sheeley Jr., PhD ’65, a scientist in the Space Science Division of the Naval Research Laboratory (NRL), has been chosen by the Solar Physics Division of the American Astronomical Society (AAS) as this year’s winner of the George Ellery Hale Prize. The honor recognizes Sheeley, the prize’s 22nd winner, “for his continuing outstanding contributions to our understanding of the solar magnetic field, coronal holes, and coronal mass ejections. His wide-ranging observational and theoretical work has laid the foundation for much current research in solar and heliospheric physics, and continues to have important applications in space weather prediction.” The awarding of the prize in June at the 214th meeting of the AAS in Pasadena, California included a plenary address by him on his work and a speech he gave a week later to the Solar Physics Division at its annual meeting in Boulder, Colorado. An international award, the Hale Prize is “given annually to a scientist for outstanding contributions to the field of solar astronomy over an extended period of time.” Sheeley, who began his solar research at Caltech, using the Mount Wilson 60-foot Tower Telescope built by Hale, currently heads the Solar-Terrestrial Theory Section in the Solar-Terrestrial Relationships Branch at NRL. There he formulates and carries out a program of interdisciplinary studies regarding solar and interplanetary phenomena and their relationship to the terrestrial environment. Before that, he spent eight years at the Kitt Peak National Observatory in Arizona. He is a member of the American Astronomical Society, the American Geophysical Union, and the International Astronomical Union. He has also served on the *Solar Physics Journal* editorial board as well as many peer-review and other national committees.

## FOR THE RECORD

Max Mahmud ’81, reported as deceased in the last issue of *Caltech News* is not only alive and well but in duplication, working as the IT manager for Xerox, in Rochester, New York. “Actually,” said Mahmud, when we reached him, “I was going to let it stand and see who would find me on Facebook, and how they would react. Also, I was hoping I wouldn’t have to pay income taxes anymore.”





**C. Gordon Fullerton '57, MS '58** (above left), a former astronaut and research pilot, has received the Smithsonian's National Air and Space Museum Trophy for Lifetime Achievement, the museum's highest honor. Shown here with fellow recipient John Casani of JPL (right) and museum director Jack Dailey (center), Fullerton had what amounted to three careers in aeronautics and spaceflight during his years with the U.S. Air Force and NASA. He spent 30 years with the Air Force as a bomber and research test pilot—many of those years as an astronaut in NASA's Apollo, Skylab, and Space Shuttle programs—retiring in 1988 with the rank of lieutenant colonel. As an astronaut, Fullerton served on several Apollo lunar-mission support crews at NASA's Johnson Space Center and then, in 1977, joined one of the two-man flight crews that piloted the Space Shuttle prototype *Enterprise* during the approach and landing test program at NASA Dryden. In 1982, he piloted the eight-day orbital flight-test mission that exposed the *Columbia* to extremes in thermal stress and tested the 50-foot Remote Manipulator System used to grapple and maneuver payloads to orbit, and, in 1985, he commanded the Spacelab 2 mission flown on the *Challenger*. Fullerton then transferred to NASA Dryden, where he served NASA for 22 more years as a flight research test pilot, working as project pilot with a number of research and support aircraft, including F-15 and F-18 fighter aircraft, the highly experimental X-29, NASA's DC-8 airborne science laboratory, and the modified 747 Shuttle Carrier Aircraft. He finished his career as chief of the flight-crew branch of Dryden's Flight Operations directorate and retired from NASA in January 2008. During his career, Fullerton logged over 380 hours of spaceflight and 16,000 hours of flight time in 135 different aircraft. He received the trophy at a private ceremony on April 29 in the museum building on the National Mall in Washington, D.C.

**1964**  
**Ramani Mani, MS, PhD '67**, of Schenectady, New York, has been chosen by the American Institute of Aeronautics and Astronautics to receive its 2009 Aeroacoustics Award. He was honored at an awards luncheon on May 12 as part of the 15th AIAA/Confederation of European Aerospace Societies Aeroacoustics Conference, held May 11–13 at the Hyatt Regency Miami. The award, which consists of a medal, a certificate of citation, and a rosette pin, recognizes "his continued discoveries and advancement in jet and fan aeroacoustics, especially in mean flow/acoustic shielding and prediction method for high tip speed fans." Mani is retired from General Electric's Global Research Center in Niskayuna, New York, after a 34-year career specializing in aeroacoustics and problems involving the mechanics of unsteady fluids, particularly associated with gas turbines. He is an AIAA associate fellow.

**George M. Whitesides, PhD '64**, the Woodford L. and Ann A. Flowers University Professor of Chemistry at Harvard University, has won the inaugural Dreyfus Prize in the Chemical Sciences. The prize, to be given biennially by the Camille and Henry Dreyfus Foundation, "recognizes exceptional and original research in a selected area of chemistry that has advanced the field in major ways." Conferred this year in materials chemistry, the prize consists of a monetary award of \$250,000—one of the largest awards dedicated to the chemical sciences in the United States—as well as a citation and

a medal. The award ceremony will take place at Harvard on September 30 and will include a lecture by Whitesides. Widely recognized as one of the most innovative and prolific among contemporary chemists, he has the distinction of being the most highly cited living chemist in the world. His research into new materials extends across multiple disciplines, including biochemistry, drug design, and materials science, and his innovative materials have led to the development of new drugs, medical diagnostics, microelectronics, and consumer devices such as solar cells. His many honors include the National Medal of Science, and he is a member of both the National Academy of Sciences and the National Academy of Engineering. In addition to his academic research, Whitesides has helped found 12 companies in biotechnology and materials science and holds more than 50 patents. A member of Harvard's faculty since 1982, he has also served on numerous advisory and corporate boards.

**1970**  
**Esin Gulari, MS, PhD '73**, the first woman to serve as dean of Clemson University's College of Engineering and Science, has been named to the National Science Board. Made up of 24 part-time members, each appointed by the president of the United States and confirmed by the U.S. Senate, the NSB establishes the policies of the National Science Foundation and serves as advisor to both the president and Congress on national policy issues related to science and engineering research and education. As dean

of the College of Engineering and Science, Gulari has created two new units—the School of Computing and the Department of Engineering and Science Education. The latter is designed to improve science and engineering teaching at the university level and to provide outreach to K–12 education. Prior to becoming dean, she served as professor and chair of the chemical engineering and materials science department at Wayne State University. From 2000 to 2004 she was director of the chemical and transport systems division in the National Science Foundation's Engineering Directorate and, for most of that time, the directorate's acting assistant director. She has also held the position of chief technology officer at nanoSEC, a start-up company formed to manufacture and market nanocomposites produced using supercritical fluid processing.

**Linda Sokalski, MS**, has been appointed to the board of directors of Pardee Hospital, a not-for-profit community hospital located in Hendersonville, North Carolina. Founded in 1953, the facility is licensed for 222 acute-care beds and offers adult day care, home health services, health education, a rehab and wellness center, a women's health center, an urgent-care facility, several family and internal medicine practices, and high-tech diagnostic and treatment capabilities, as well as wellness and prevention outreach. Sokalski received her PhD in electrical engineering with a specialty in medical electronics from Stanford University, and she has spent the majority of her career with Bell Labs and AT&T.

**1971**  
**Henry Jay Melosh IV, MS, PhD '73**, is this

year's recipient of the Eugene Shoemaker Memorial Award, which is presented each year to a leading scientist in honor of his or her life and work by the BEYOND Center for Fundamental Concepts in Science at Arizona State University. The honor included his delivering the annual Shoemaker Memorial Lecture on March 4—the title of his talk was "Our Catastrophic Solar System: Impacts and the Latest Revolution in Earth Science." A Regents' Professor of Planetary Science at the University of Arizona's Lunar and Planetary Lab, Melosh is a member of the science team for NASA's Deep Impact mission, which successfully cratered comet Tempel 1 on July 4, 2005. His other honors include the American Geophysical Union's Hess Medal, the Geological Society of America's Gilbert Prize, and the Meteoritical Society's Barringer Medal. A member of the National Academy of Sciences, he has also been a Guggenheim Fellow, as well as a Humboldt Fellow at the Bavarian Geological Institute. Asteroid 8216 was named "Melosh" in his honor. A former chair of Caltech's geological and planetary sciences division, the late **Eugene Shoemaker '47, MS '48**, was known for his pioneering research with his wife, Carolyn, in the field of asteroid and comet impacts. Apollo 17 astronaut **Harrison Schmitt '57** was the first recipient of the Shoemaker Memorial Award in 2007, and last year's recipient was Walter Alvarez, geologist and author of *T. rex and the Crater of Doom*.

**1977**  
**Mustafa Abushagur, MS, PhD '84**, professor in microsystems engineering and professor of electrical engineering at the Rochester Institute of Technology (RIT), as well as founder and chief technology officer of Photronix, an optical fiber

**KEEP US INFORMED THROUGH THE  
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Name \_\_\_\_\_

Degree(s) and year(s) \_\_\_\_\_

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## CALTECH ALUMNUS CALLS FOR WAR YEARS REUNION

—A message from  
Bud Mittenbal '48

On May 12, 1995, a Caltech War Years dinner took place at what was then the Huntington-Ritz Carlton Hotel in Pasadena. The 222 people who attended included many alumni, mostly from the classes of 1940 to 1949, as well as their families and some Institute faculty. William Pickering '32, PhD '36, the head of JPL from 1954 to 1976, informally presided over this event and provided engrossing information on Caltech's activities during the World War II period.

However, for many alumni, something was missing—namely the wartime activities of the alumni themselves. These activities ranged from participating in many battles to carrying out classified work in science and engineering that helped to win the war. Student life at Caltech was mainly a demanding intellectual experience, but it was also punctuated with pranks, parties, and physical education. Similarly, many alumni had some entertaining (at least to the listener) wartime experiences to relate to complement the harsh realities of battle.

Bud would like to create an opportunity for alumni to reconnect and to share these memories and experiences. If there is enough interest, the Alumni Association will facilitate a reunion for war-year alumni in May 2010. Organizing such an event will be based on the number of responses and interest. If you would like to attend or are interested in volunteering to help plan such an event, please contact Patsy Gougeon, associate director, at 626/395-8366, or e-mail [patsy@alumni.caltech.edu](mailto:patsy@alumni.caltech.edu).

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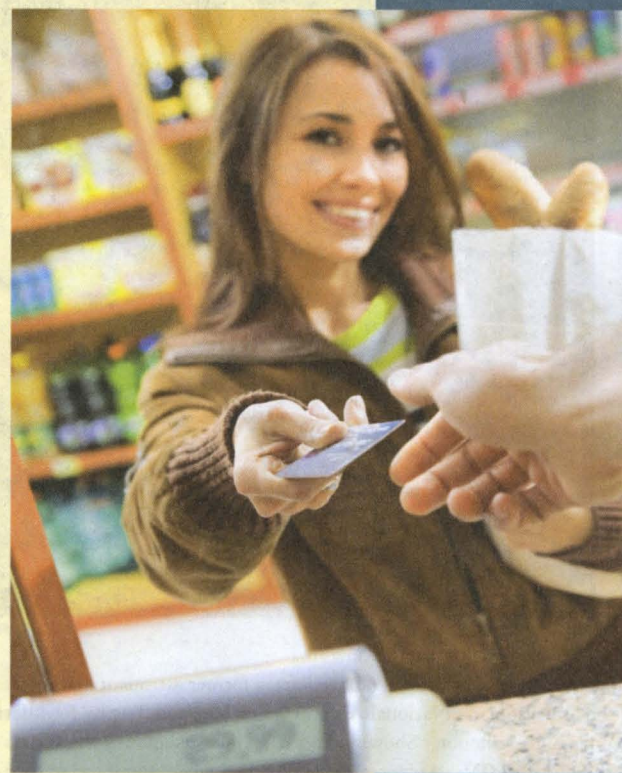
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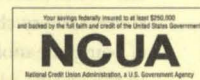
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components company, reports that in August he assumed the position of president of RIT Dubai. A branch campus of the Rochester Institute of Technology, RIT Dubai currently offers MSc degree programs in engineering, business, and computing. Abushagur is a fellow of the Optical Society of America and the International Society of Optical Engineers and does research in photonics, optical communication, and sensing and optical microelectromechanical systems.

1979

**John S. Chen**, MS, chairman, CEO, and president of Sybase Inc. since 1998, has been elected chairman of the Committee of 100, effective May 4. A recognized expert on global business and international trade, Chen has testified before Congress on U.S.-China trade relations, served on the President's Export Council, and cochaired the Secure Borders and Open Doors Advisory Committee. Under his leadership, Sybase has become a leader in enterprise mobility infrastructure. *Forbes* magazine has named Chen

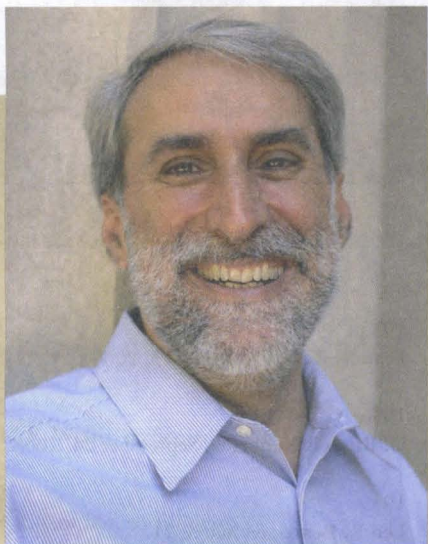
one of the Top 25 Notable Chinese Americans in Business and, in recognition of his leadership in building U.S.-Asia business relationships, the California-Asia Business Council has presented him the New Silk Road Award. Chen is also a trustee of Caltech and a governor of the San Francisco Symphony. Founded in 1990, the Committee of 100 (C-100) is a national nonpartisan, nonprofit organization composed of prominent Chinese Americans in a broad range of professions and dedicated to encouraging constructive relations between the peoples of the United States and China, and the full participation of Chinese Americans in all aspects of American life.

1981

**Manos Maragakis**, MS, PhD '85, Reno Foundation Professor and, since July, interim dean of the College of Engineering at the University of Nevada, Reno, has been named dean of the college. Maragakis joined the university in 1984 and had previously served for 14 years

as chair of the department of civil and environmental engineering. During those years he played a key role in establishing for the college a strong reputation nationally and internationally in the area of building and bridge response to earthquakes, and his department's Center for Civil Engineering Earthquake Research received worldwide recognition as well, with its multimillion-dollar, state-of-the-art laboratory developing unparalleled capacities in the field of bridge engineering. His tenure also saw the department grow to include an environmental engineering program, and *U.S. News & World Report* last year ranked the department among the top 50 public-institution programs in civil engineering. Maragakis has received numerous National Science Foundation grants for research and has a lengthy record of published articles in engineering journals. Most recently, he has been leading a multidisciplinary team of researchers and engineers from around the country in a Grand Challenge project on the seismic response of nonstructural systems.





Daniel Nocera, PhD '84, has been named to the 2009 Time 100. Compiled by *Time* magazine, the list represents “the people who most affect our world.”

The Time 100 famously had its genesis in a debate during a 1998 symposium in Washington, D.C., featuring such lights as Dan Rather, Mario Cuomo, Condoleezza Rice, and Irving Kristol, along with *Time* managing editor Walter Isaacson. One result was that *Time* in 1999 published a list of what it considered to be the 100 most influential people of the 20th century. The list proved so popular that in 2004 the magazine made it annual.

Having the “most” effect, the list makes clear, doesn’t necessarily mean for the better—in the 2009 roster, for example, Ponzi-meister Bernie Madoff shows up under “Builders and Titans” cheek by jowl with Treasury Secretary Timothy Geithner.

Fortunately Nocera, Henry Dreyfus Professor of Energy and professor of chemistry at MIT, appears under “Scientists and Thinkers,” where this year there is sufficient emphasis on economics, the environment, and energy that he is keeping company with the likes

of Nobelist Paul Krugman, Rocky Mountain Institute founder Amory Lovins, and Energy Secretary Steven Chu.

Nocera is being recognized for his research into how hydrogen fuel might be made from water. Biologists had discovered that the mechanism by which plants split water using sunlight actually breaks down regularly, and Nocera realized that human-created catalysts don’t need to be stable either, but rather can be allowed to fall apart and then repeatedly regenerate, using just small amounts of sunlight.

As Fred Krupp, president of the Environmental Defense Fund, writes in his Time 100 essay about Nocera (<http://tinyurl.com/fkrupp>), “His discovery makes it conceivable that by midcentury we could satisfy our global energy needs by splitting—each second—just a third of the water in MIT’s swimming pool. That’s all we’d need to power the world.”

Meanwhile, Nocera was also elected to the National Academy of Sciences (see page 6) “in recognition of his distinguished and continuing achievements in original research.”

1988

Larry Edwards, PhD, Distinguished McKnight University Professor in the department of geology and geophysics at the University of Minnesota, Twin Cities, is one of 180 artists, scientists, and scholars, out of nearly 3,000 applicants in the United States and Canada, to be awarded a 2009 Guggenheim Fellowship. The award by the John Simon Guggenheim Memorial Foundation recognizes his career of research on climate change—his improvements to uranium-thorium dating, applied to cave deposits from China, have allowed past patterns to be compared to recent ones and helped establish how humanity has influenced the climate. Edwards originally worked on uranium and thorium measurements while investigating how lava is formed, then used the method on coral skeletons to determine sea levels in the past, thereby contributing to the creation of a time line of ice ages. A fellow of the American Academy of Arts and Sciences, he is a member of the American Geophysical Union, the Geological Society of America, the Geochemical Society, and the American Association for the Advancement of Science. His honors include the C. C. Patterson Award and the Taylor Distinguished Research Award. Edwards has been married to Missy McDonald for 20 years, and they have two daughters.

1990

Lois M. Banta, PhD, was promoted by Williams College from assistant professor to the rank of associate professor with tenure, effective July 1. Although Banta’s focus is on microbiology, her teaching interests extend to human genetics, agricultural technology, and public health, and she has recently taught courses on integrative bioinformatics, genomics, and proteomics as well as microbiology. Her

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**PURDUE PROFESSOR  
GABRIELA WEAVER  
'89 NAMED HEAD  
OF UNIVERSITY'S  
NEW DISCOVERY  
LEARNING CENTER**



Gabriela Weaver '89, professor of chemical education and physical chemistry and associate head of the department of chemistry at Purdue University, has been named the new Jerry and Rosie Semler Director of the university's Discovery Learning Center, effective May 1.

Weaver is taking over the center as it begins its move into a \$25 million, four-story research and learning facility in Discovery Park, in West Lafayette, Indiana. A Purdue research and learning complex, the park comprises 11 interdisciplinary centers in which more than 1,000 faculty and 3,000 students carry out studies in areas that range from curing cancer to developing advanced manufacturing technologies. The aim of the Discovery Learning Center is to serve as a catalyst for educational research initiatives that involve faculty across many disciplines and to advance research and innovation that can revolutionize learning in science, technology, engineering, and math.

A first-generation college student who was born in Chile, Weaver grew up in the Los Angeles area after her family emigrated to the United States in 1970. She developed an interest in science at a very early age. "I don't even remember how old I was," she says. "As a young girl I was fascinated by astronomy and geology. Most of my fascination was encouraged and supported by my father. He would take me to the Griffith Park Observatory, which was one of my absolute favorite places. My father also would take me to places where we could look at and buy rocks—he had been a jeweler in Chile before we moved to the United States."

Like many immigrant parents, hers put a premium on education. "Poor grades were really not acceptable in my household," she says, "so the expectations were very high." She excelled in math and science at Immaculate Heart High School and was accepted at Caltech, where she majored in chemistry.

At Caltech, she both participated in the Summer Undergraduate Research Fellowships (SURF) program and worked at JPL, which proved, she says, "an incredible life-enriching experience in terms of doing research."

Her SURF project involved investigating what is often referred to as the culture of poverty, and it allowed her to apply statistical analysis to the impact of poverty on education and also gave her the opportunity to interview several families. It was her first time using methodologies from anthropology and sociology, and she has continued to utilize those techniques throughout her career. Moreover, she says, "SURF helped me see that my interest in science was larger than what I could accomplish in the laboratory."

After receiving her PhD in chemical physics from the University of Colorado at Boulder in 1994, Weaver joined the university's Denver campus as an assistant professor in the chemistry department. While at Denver, she decided to shift the focus of her research work from physical chemistry to educational research and the development of instructional technologies.

"I've always loved science," she says. "What I found is that it became harder and harder to speak to nonscientists about my research. I found myself wanting to connect with people about how science affects their lives. I really want people to be able to look back on their chemistry class and say, 'That opened my eyes and helped me understand how science is relevant to my world.'"

Weaver says that making science more relevant and accessible to students will be a top priority. She bases her approach to science education on the idea that learning builds on what the student already knows—his or her life experience to that point—and that teaching must be tailored to the individual. The emphasis is on hands-on science and education technologies that really give a feel for how science is done.

About the Discovery Learning Center, Weaver says "We have a broad portfolio. The center is involved with educational initiatives at all academic levels—K-12, undergrad, grad, and even public/workforce education."

Weaver joined Purdue in 2001 as an associate professor and in 2004 became director of the Center for Authentic Science Practice in Education, a Discovery Learning Center project funded by the National Science Foundation's chemistry division. She had been serving as interim director of the Discovery Learning Center since September 2008.

In taking on her new job, Weaver will continue the center's basic mission, but plans to focus its research work in particular areas, such as the effects of learning environments—both physical and virtual—that will transform actual classroom practice. She hopes, she says, that "the Discovery Learning Center will come to be nationally and internationally recognized for its educational research and able to inform educational policy at the state and national levels."

research, which centers on interactions between soil bacteria and their plant hosts, plant defense responses, and bacterial genomics, has been published in the *Proceedings of the National Academy of Sciences*, the *Journal of Bacteriology*, *Molecular and Cellular Biology*, and the *Journal of Cell Biology*, among others. Banta has served as a member of the National Research Council committee charged with reviewing the National Plant Genome Initiatives, and she is program director of a multicollge grant from the Teagle Foundation for genomics curriculum development. The National Science Foundation, National Bioethics Institute, and National Institutes of Health have supported her research, and she was a Fulbright Fellow at Leiden University in 2000. She taught at Haverford College before joining the faculty at Williams.

2002

**Louis A. Madsen**, PhD, assistant professor of chemistry in both the College of Science and the Macromolecules and Interfaces Institute at Virginia Tech, has received a \$475,000 National Science Foundation (NSF) Faculty Early Career Development (CAREER) Award. Madsen's research focuses on improving advanced polymers for fuel cells and reverse-osmosis water purification by combining detailed analysis of these materials with theoretical understanding. The CAREER Awards are the NSF's "most prestigious awards in support of junior faculty who exemplify the role of teacher-scholars through outstanding research, excellent education and the integration of education and research within the context of the mission of their organizations." Madsen's research will focus on charged polymers used in water purification and in fuel cells. In order to understand the behavior of such materials in depth and to improve performance, he will apply a range of magnetic-resonance, electron-microscopy, and computer-modeling techniques. In the area of education, he plans to include promising university students in his project and he intends to build an outreach program specifically for girls in elementary school and for their parents.

2006

**Kevin Bundy**, PhD, a postdoctoral researcher in astronomy at UC Berkeley, has been chosen by the Astronomical Society of the Pacific to receive its 2009 Trumpler Prize, awarded for the best North American thesis "whose research is considered unusually important to astronomy." According to the award's citation, Bundy in his Caltech thesis "used observations with the Wide Field Infrared Camera (WFIR) at Palomar Observatory to quantify the galactic process called 'downsizing,' in which the sites of active star formation shift from high-mass galaxies early in the history of the universe to lower mass galaxies as time goes on. His study indicated that there is a galaxy mass limit beyond which some mechanism inhibits star formation so that massive galaxies become quiescent. Bundy's analysis of the evolution of the star formation rates and of galaxy morphology has been widely cited and is considered an important constraint on theories of early galaxy formation." Bundy did his doctoral work under the supervision of Richard Ellis, Caltech's Steele Family Professor of Astronomy and a Fellow of the Royal Society.

## Obituaries

1935

**Francis R. Gay**, on June 13, 2008.

1936

**G. Russell Nance**, on September 24, 2008.

1939

**Leo R. Beard**, on March 21.

1940

**Rolf O. Langerud**, on January 26.

1941

**William B. Hebenstreit**, on April 16; **William Schubert**, on March 21.

1942

**Victor G. Bruce**, on May 29; **Thomas L. Kirtley**, MS, on August 31, 2008; **Kenneth D. Schureman**, on March 5; **Haskell Shapiro**, MS '47, PhD '57, on February 4.

1943

**George D. Avant**, MS, on October 1, 2007; **Robert G. Gustavson**, on January 10, 2008; **George R. Stuart**, Meteorology Certificate, MS '52, on February 6, 2008.

1944

**E. Erdley Beauchamp**, MS, on April 7; **William R. Davis**, MS '47, on January 28; **Almeron J. Field**, on January 25; **James B. Garrison Jr.**, CAVU, MS '50, on May 14; **William F. Roberts**, on May 5.

1945

**Dale H. Austin**, on February 18; **George McIntosh Wilhelm**, on February 2; **Ralph D. Winter**, on May 20.

1946

**William F. Horton**, MS '48, on February 2; **Webster C. Roberts**, MS, on March 16; **David H. Whitlow**, MS, on October 13, 2007.

1947

**Walter T. Ogier**, PhD '53, on May 5.

1948

**Stuart M. Butler Jr.**, on March 17; **Edward A. Taylor**, MS, on March 16.

1950

**Harvey J. Amster**, on August 23, 2008; **Charles R. Bennett**, on March 6; **Howard E. Clark Jr.**, on January 14, 2006; **Palmer E. Hakala**, MS, on August 8, 2005; **Michael A. Hall**, on March 19; **Richard H. Knipe**, on March 9; **James A. Vivian**, MS, on February 15.

### READ COMPLETE CALTECH NEWS OBITUARIES ONLINE

*The full Caltech News obituaries may be found at <http://alumni.caltech.edu/network/obituaries>, where readers can browse expanded content and additional biographical information about the alumni listed here.*



1956  
Hans C. Freeman, Ex, on November 1, 2008.

1958  
David E. Wallis, on September 22, 2006.

1962  
John R. Golden, on February 23.

1964  
Michael McCammon, on June 9, 2008.

1965  
Thomas C. McGill Jr., MS, PhD '69, on March 19.

1967  
Donald G. Coyne, PhD, on October 1, 2008;  
David A. Hammond, on March 17.

1971  
John P. Messmer, on February 1; Terrence M. Morris, MS, on April 27.

1972  
James C. Fuhrman, on April 6; Thomas S. Hedges, on November 16, 2007.

1973  
William A. Hiscock, on April 21.

1974  
Phillip J. Arnold, on April 8.

1984  
Richard E. Honrath Jr., on April 17.

## HANS LIEPMANN 1914–2009



Hans Wolfgang Liepmann, 94, a pioneering researcher and passionate educator in fluid mechanics, died on June 24 at his home in La Cañada Flintridge. The Theodore von Kármán Professor of Aeronautics, Emeritus, came to Caltech in 1939 and served as director of the Institute's Graduate Aeronautical Laboratories (GALCIT) from 1972 to 1985.

Known for his sharp wit and distinctive accent, Liepmann was a renowned teacher who mentored more than 60 PhD students and hundreds

of undergraduates during his career at GALCIT. His students became leaders in the aerospace industry as well as noted scholars in universities around the world.

Liepmann was born in Berlin in 1914 and grew up surrounded by the political turmoil and liberal Berlin society of the 1920s. His father—a well-known physician and hospital director—had a passion for the humanities and a marked dislike of mathematics. Insisting that Hans have a classical education despite his interest in physics, he nearly ended his son's scientific career before it began. Looking back, Liepmann once observed that “of my years in high school I can remember no more than maybe three teachers who were more than drillmasters.” Those experiences likely contributed to his commitment to quality teaching at Caltech.

Liepmann's father left Germany after the Nazis came to power in 1933. In 1934 Hans joined his family in Turkey, where his father had become head of the gynecology department at the University of Istanbul, and enrolled in the university to study physics, mathematics, astrophysics, and mechanics. He subsequently went to Switzerland, where he enrolled in the physics department at the University of Zürich and did his doctoral work in low-temperature physics. Throughout his life, he would maintain the perspective of a physicist, always emphasizing to his students the importance of a scientific approach.

Liepmann came to Caltech in 1939 after impulsively expressing an interest in “hydrodynamics” during a drinking party that followed the successful defense of his PhD thesis. An offer from GALCIT's first director, Theodore von Kármán, led Liepmann to a research position there, investigating boundary-layer instability and transition to turbulence, as well as various turbulent flows that are relevant to engineering application—a recurring theme throughout his career. After America entered World War II, he began research on problems associated with high-speed flight, including transonic flight phenomena and the interaction of shock waves with boundary layers on aerodynamic surfaces. This work also marked the beginning of a longtime association with Southern California's aircraft industry. With Professor Allen Puckett he organized short wartime courses on high-speed aerodynamics for working engineers, resulting in their pioneering textbook, *The Aerodynamics of Compressible Flow*. This was followed in 1956 by *Elements of Gas Dynamics*, coauthored with Professor Anatol Roshko, and subsequently translated into Russian, Spanish, and Japanese.

In the rapid expansion of scientific and applied research that followed

World War II, Liepmann emerged as a respected and influential contributor to the aeronautics scene and to the physics of fluid flow. By 1949 he had become professor of aeronautics at Caltech and had developed a vigorous program of research. Believing strongly that experimental research must be firmly rooted in a theoretical foundation, Liepmann began collaborations with applied mathematicians—visitors as well as Caltech faculty—an initiative that led to the establishment of the applied mathematics option at Caltech in 1967. He was also instrumental, along with Caltech professors Amnon Yariv and Roy Gould, in the creation of the applied physics option, in 1974.

Under his guidance, Liepmann's group made pioneering contributions to a wide range of areas that frequently anticipated future technologies. These include flow instability and transition, turbulent shear flow, transonic flow, shock wave–boundary layer interaction, turbulent skin friction at supersonic speeds, aircraft buffeting, rarefied gas flow, magnetohydrodynamics, plasma physics, fluid mechanics of liquid helium, chemistry of turbulent mixing, and flow control. Liepmann was also devoted throughout his career to teaching both graduate and undergraduate courses. The enthusiasm, clarity, and effectiveness of his lectures became legendary during his more than four decades of educating Caltech students. He stepped down from the directorship of GALCIT as von Kármán Professor Emeritus in 1985.

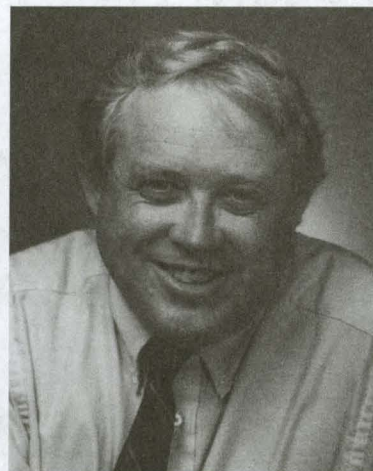
Among his numerous accolades, Liepmann was elected a member of both the National Academy of Engineering and the National Academy of Sciences. He was a recipient of the National Medal of Technology and the Ludwig Prandtl Ring—the highest honor conferred by the German Society for Aeronautics and Astronautics. In 1986, he was awarded the National Medal of Science.

Liepmann is survived by his sons Dorian, Till, Christopher, and Paul, and two grandchildren. His wife, Dietlind, died in 1990.

### STAR BARK

**Boldly going where relatively few fluffballs (except, of course, those pesky Tribbles) have gone before, the pensive pooch on the back-page poster, whose collar bears a celebrated name, was smartly attired in a festive sweater for Caltech's 115th commencement. We can't be sure how Canine Kirk reacted to graduation speaker Steven Chu's Trekkie references in his commencement address (see page 3), although it does seem that, unlike the storied captain of the *Enterprise* on more than one occasion, he kept his shirt on.**

## THOMAS MCGILL 1942–2009



Thomas C. McGill, PhD '69, professor of applied physics, emeritus, died on March 19. The pioneering semiconductor researcher would have been 67 on March 20.

McGill was born in 1942, in Port Arthur, Texas. He received his BS from Lamar State College of Technology in 1964 before coming to Caltech as a graduate student. In 1971, he was the first faculty member hired in the new discipline of applied physics. He was the Fletcher Jones Professor of Applied Physics from 1985 to 1999 and became emeritus in 2008.

In his research, McGill investigated and made use of such solid-state phenomena as Schottky barriers, heterojunctions, and superlattices, and applied his vast knowledge of the properties of amorphous materials to develop devices for applications ranging from infrared detectors and high-speed memory chips to solid-state lighting.

McGill authored or coauthored hundreds of papers, and directed the theses of over 50 PhD students in electrical engineering, physics, and applied physics. He served for nearly 30 years as a consultant to the Defense Science Research Council of the Defense Advanced Research Project Agency (DARPA), was a member of the congressionally mandated Semiconductor Technology Council, and served as chief of the Naval Operations Executive Panel.

He is survived by his wife, Toby Cone McGill, and two daughters, Angela McGill Avogaro and Sarah McGill.



